JAVA
AND ALGORITHMIC THINKING
FOR THE COMPLETE BEGINNER

The Answers

Aristides S. Bouras
Loukia V. Ainarozidou

RCode: 180925

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Chapter 1

1.7 Answers of Review Questions: True/False

1. false
2. false
3. true
4. false
5. false
6. true
7. true
8. false
9. false
10. true
11. true
12. false
13. false
14. false
15. false
16. true
17. true
18. false
19. false
20. true
21. false
22. false
23. true

1.8 Answers of Review Questions: Multiple Choice

1. b
2. d
3. b
4. c
5. f
6. d
7. c
8. b
9. c
10. b
11. a

Chapter 4

4.16 Answers of Review Questions: True/False

1. true
2. false
3. false
4. false
5. false
6. true
7. false
8. true
9. true
10. true
11. false
12. false
13. true
14. true
15. false
16. true
17. false
18. false
19. false
20. true
21. true
22. true
23. false
24. false
25. false
26. false
27. true
28. true
29. false
30. false
31. false
32. false
33. true
34. false
35. false
36. false
37. false
38. true
39. true
40. false

4.17 Answers of Review Questions: Multiple Choice

1. c
2. b
3. c
4. c
5. a
6. a
7. b
8. d
9. a
10. d

Chapter 5

5.9 Answers of Review Questions: True/False

1. false
2. false
3. true
4. false
5. false
6. true
7. false
8. false
9. true
10. false
11. true
12. false
13. true
14. false
15. true
16. false
17. false

5.10 Answers of Review Questions: Multiple Choice

1. e
2. a
3. d
4. b
5. c
6. b
7. d
8. a

5.11 Answers of Review Exercises

1. 1 – c, 2 – d, 3 – a, 4 – b
2. 1 – d, 2 – c, 3 – b, 4 – a

Chapter 6

6.4 Answers of Review Questions: True/False

1. true
2. true
3. true
4. false
5. false

6.5 Answers of Review Questions: Multiple Choice

1. a
2. b
3. b

Chapter 7

7.7 Answers of Review Questions: True/False

1. false
2. true
3. false
4. false
5. false
6. false
7. false
8. false
9. false
10. false
11. true
12. false
13. false
14. false
15. true
16. false
17. true
18. false
19. false
20. false
21. true
22. false
23. false

7.8 Answers of Review Questions: Multiple Choice

1. c
2. c
3. b
4. d
5. c
6. d
7. d
8. d

7.9 Answers of Review Exercises

1. ii, iv, v, ix
2. i. String, ii. Boolean, iii. String, iv. String, v. Real, vi. Integer
3. i. d, ii. f, iii. c, iv. e
4. i. 26, ii. 28
5. i. 5, ii. 6
6. i. 1, ii. 0, iii. 1, iv. 1, v. 0, vi. 1
7. i. 2 * 3, ii. 4
8. i. 2, ii. 0, iii. 1, iv. 0, v. Division by zero error, vi. 0
9. i. 2, ii. 10.5
10. My name is George Malkovich
11. i. (-3), ii. 1
12. California, California

Chapter 8

8.2 Answers of Review Questions: True/False

1. false
2. true
3. false
4. false

8.3 Answers of Review Exercises

1. Solution

For the input value of 3

Step	Statement	a	b	c	d
1	`a = Integer.parseInt(cin.readLine())`	**3**	?	?	?
2	`a = (a + 1) * (a + 1) + 6 / 3 * 2 + 20`	**40**	?	?	?
3	`b = a % 13`	40	**1**	?	?
4	`c = b % 7`	40	1	**1**	?
5	`d = a * b * c`	40	1	1	**40**
6	`System.out.println(a + ", " + b + ", " + c + ", " + d)`	40, 1, 1, 40 is displayed			

For the input value of 4

Step	Statement	a	b	c	d
1	`a = Integer.parseInt(cin.readLine())`	**4**	?	?	?
2	`a = (a + 1) * (a + 1) + 6 / 3 * 2 + 20`	**49**	?	?	?
3	`b = a % 13`	49	**10**	?	?
4	`c = b % 7`	49	10	**3**	?
5	`d = a * b * c`	49	10	3	**1470**
6	`System.out.println(a + ", " + b + ", " + c + ", " + d)`	49, 10, 3, 1470 is displayed			

For the input value of 1

Step	Statement	a	b	c	d
1	`a = Integer.parseInt(cin.readLine())`	**1**	?	?	?
2	`a = (a + 1) * (a + 1) + 6 / 3 * 2 + 20`	**28**	?	?	?
3	`b = a % 13`	28	**2**	?	?
4	`c = b % 7`	28	2	**2**	?
5	`d = a * b * c`	28	2	2	**112**
6	`System.out.println(a + ", " + b + ", " + c + ", " + d)`	28, 2, 2, 112 is displayed			

2. Solution

For the input values of 3, 4

Step	Statement	a	b	c	d	e
1	`a = Integer.parseInt(cin.readLine())`	**3**	?	?	?	?
2	`b = Integer.parseInt(cin.readLine())`	3	**4**	?	?	?
3	`c = a + b`	3	4	**7**	?	?
4	`d = 1 + a / b * c + 2`	3	4	7	**8.25**	?
5	`e = c + d`	3	4	7	8.25	**15.25**
6	`c += d + e`	3	4	**30.5**	8.25	15.25
7	`e--`	3	4	30.5	8.25	**14.25**
8	`d -= c + d % c`	3	4	30.5	**-30.5**	14.25
9	`System.out.println(c + ", " + d + ", " + e)`	30.5, -30.5, 14.25 is displayed				

For the input values of 4, 4

Step	Statement	a	b	c	d	e
1	`a = Integer.parseInt(cin.readLine())`	**4**	?	?	?	?
2	`b = Integer.parseInt(cin.readLine())`	4	**4**	?	?	?
3	`c = a + b`	4	4	**8**	?	?
4	`d = 1 + a / b * c + 2`	4	4	8	**11**	?
5	`e = c + d`	4	4	8	11	**19**
6	`c += d + e`	4	4	**38**	11	19
7	`e--`	4	4	38	11	**18**
8	`d -= c + d % c`	4	4	38	**-38**	18
9	`System.out.println(c + ", " + d + ", " + e)`	38, -38, 18 is displayed				

Chapter 9

9.5 Answers of Review Exercises

1. Solution

The statement `S = S1 + S3 + SS` is wrong. It must be `S = S1 + S3 + S5`

2. Solution

For the input values of 5, 5

Step	Statement	a	b	c	d	e
1	`a = Double.parseDouble(cin.readLine())`	**5**	?	?	?	?
2	`b = Double.parseDouble(cin.readLine())`	5	**5**	?	?	?
3	`c = a + b`	5	5	**10**	?	?
4	`d = 5 + a / b * c + 2`	5	5	10	**17**	?
5	`e = c - d`	5	5	10	17	**-7**
6	`c -= d + c`	5	5	**-17**	17	-7
7	`e--`	5	5	-17	17	**-8**
8	`d -= c + a % c`	5	5	-17	**29**	-8
9	`System.out.println(c + ", " + d + ", " + e)`	-17, 29, -8 is displayed				

For the input values of 4, 8

Step	Statement	a	b	c	d	e
1	`a = Double.parseDouble(cin.readLine())`	**4**	?	?	?	?
2	`b = Double.parseDouble(cin.readLine())`	4	**8**	?	?	?
3	`c = a + b`	4	8	**12**	?	?
4	`d = 5 + a / b * c + 2`	4	8	12	**13**	?
5	`e = c - d`	4	8	12	13	**-1**
6	`c -= d + c`	4	8	**-13**	13	-1
7	`e--`	4	8	-13	13	**-2**
8	`d -= c + a % c`	4	8	-13	**22**	-2
9	`System.out.println(c + ", " + d + ", " + e)`	-13, 22, -2 is displayed				

3. Solution

For the input value of 0.50

Step	Statement	a	b	c
1	`b = Double.parseDouble(cin.readLine())`	?	**0.50**	?
2	`c = 5`	?	0.50	**5**

3	`c = c * b`	?	0.50	**2.5**
4	`a = 10 * c % 10`	**5**	0.50	2.5
5	`System.out.println(a)`	Value 5 is displayed		

For the input value of 3

Step	Statement	a	b	c
1	`b = Double.parseDouble(cin.readLine())`	?	3	?
2	`c = 5`	?	3	**5**
3	`c = c * b`	?	3	**15**
4	`a = 10 * c % 10`	**0**	3	15
5	`System.out.println(a)`	Value 0 is displayed		

For the input value of 15

Step	Statement	a	b	c
1	`b = Double.parseDouble(cin.readLine())`	?	15	?
2	`c = 5`	?	15	**5**
3	`c = c * b`	?	15	**75**
4	`a = 10 * c % 10`	**0**	15	75
5	`System.out.println(a)`	Value 0 is displayed		

Chapter 10

10.2 Answers of Review Exercises

1. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double base, height, area;

  System.out.print("Enter base: ");
  base = Double.parseDouble(cin.readLine());
  System.out.print("Enter height: ");
  height = Double.parseDouble(cin.readLine());

  area = 0.5 * base * height;

  System.out.println(area);
}
```

2. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double angle1, angle2, angle3;

  System.out.print("Enter 1st angle: ");
  angle1 = Double.parseDouble(cin.readLine());
  System.out.print("Enter 2nd angle: ");
  angle2 = Double.parseDouble(cin.readLine());

  angle3 = 180 - angle1 - angle2;

  System.out.println(angle3);
}
```

3. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int g1, g2, g3, g4;
  double average;

  System.out.print("Enter 1st grade: ");
  g1 = Double.parseDouble(cin.readLine());
  System.out.print("Enter 2nd grade: ");
  g2 = Double.parseDouble(cin.readLine());
  System.out.print("Enter 3rd grade: ");
  g3 = Double.parseDouble(cin.readLine());
  System.out.print("Enter 4th grade: ");
  g4 = Double.parseDouble(cin.readLine());
```

```
  average = (g1 + g2 + g3 + g4) / 4.0;

  System.out.println(average);
}
```

4. Solution

```
static final int PI = 3.14159;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double r, perimeter;

  System.out.print("Enter radius: ");
  r = Double.parseDouble(cin.readLine());

  perimeter = 2 * PI * r;

  System.out.println(perimeter);
}
```

5. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double charge, tip, tax, total;

  System.out.print("Enter charge for a meal: ");
  charge = Double.parseDouble(cin.readLine());

  tip = charge * 10 / 100;
  tax = charge * 7 / 100;

  total = charge + tip + tax;

  System.out.println(total);
}
```

6. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double a, t, s;

  System.out.print("Enter acceleration in m/sec2: ");
  a = Double.parseDouble(cin.readLine());
  System.out.print("Enter time traveled in sec: ");
  t = Double.parseDouble(cin.readLine());

  s = 0.5 * a * t * t;

  System.out.println(s);
}
```

7. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double f, c;

  System.out.print("Enter temperature in Fahrenheit: ");
  f = Double.parseDouble(cin.readLine());

  c = 5 / 9 * (f - 32);

  System.out.println(c);
}
```

8. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int w, h;
  double bmi;

  System.out.print("Enter weight in pounds: ");
  w = Integer.parseInt(cin.readLine());
  System.out.print("Enter height in inches: ");
  h = Integer.parseInt(cin.readLine());

  bmi = w * 703.0 / (h * h);

  System.out.println(bmi);
}
```

9. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double s_total, g_rate, tip, total, ;

  System.out.print("Enter subtotal: ");
  s_total = Double.parseDouble(cin.readLine());
  System.out.print("Enter gratuity rate: ");
  g_rate = Double.parseDouble(cin.readLine());

  tip = s_total * g_rate / 100;

  total = s_total + tip;

  System.out.println("Tip is " + tip);
  System.out.println(" and Total is " + total);
}
```

10. Solution

```
static final double VAT = 0.20;
```

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double btax_price1, btax_price2, btax_price3, atax_price1, atax_price2, atax_price3, avg;

  System.out.print("Enter before-tax price 1: ");
  btax_price1 = Double.parseDouble(cin.readLine());
  System.out.print("Enter before-tax price 2: ");
  btax_price2 = Double.parseDouble(cin.readLine());
  System.out.print("Enter before-tax price 3: ");
  btax_price3 = Double.parseDouble(cin.readLine());

  atax_price1 = btax_price1 + btax_price1 * VAT;
  atax_price2 = btax_price2 + btax_price2 * VAT;
  atax_price3 = btax_price3 + btax_price3 * VAT;

  avg = (atax_price1 + atax_price2 + atax_price3) / 3;

  System.out.println(avg);
}
```

11. Solution

```
static final int VAT = 0.20;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double atax_price, btax_price;

  System.out.print("Enter after-tax price: ");
  atax_price = Integer.parseInt(cin.readLine());

  btax_price = atax_price / (1 + VAT);

  System.out.println(btax_price);
}
```

12. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double i_price, discount, f_price, saved;

  System.out.print("Enter price: ");
  i_price = Double.parseDouble(cin.readLine());
  System.out.print("Enter discount: ");
  discount = Double.parseDouble(cin.readLine());

  f_price = i_price - i_price * discount / 100;
  saved = i_price - f_price;

  System.out.println(f_price + " " + saved);
}
```

13. Solution

```
static final int VAT = 0.20;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i_kWh, f_kWh, kWh_consumed;
  double cost;

  System.out.print("Enter kWh at the beginning of the month: ");
  i_kWh = Integer.parseInt(cin.readLine());
  System.out.print("Enter kWh at the end of the month: ");
  f_kWh = Integer.parseInt(cin.readLine());

  kWh_consumed = f_kWh - i_kWh;

  cost = kWh_consumed * 0.06;
  cost += cost * VAT;

  System.out.println(kWh_consumed + " " + cost);
}
```

14. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int day, month, days_passed, days_left;

  System.out.print("Enter day: ");
  day = Integer.parseInt(cin.readLine());
  System.out.print("Enter month: ");
  month = Integer.parseInt(cin.readLine());

  days_passed = (month - 1) * 30 + day;
  days_left = 360 - days_passed;

  System.out.println(days_left);
}
```

Chapter 11

11.3 Answers of Review Questions: True/False

1. true
2. false
3. false
4. false
5. false
6. false
7. false
8. true
9. true
10. true
11. true
12. false

11.4 Answers of Review Questions: Multiple Choice

1. d
2. d
3. b
4. c
5. a
6. b

11.5 Answers of Review Exercises

1. Solution

For the input value of 9

Step	Statement	a	b	c
1	`a = Integer.parseInt(cin.readLine())`	**9**	?	?
2	`a += 6 / Math.sqrt(a) * 2 + 20`	**33**	?	**?**
3	`b = Math.round(a) % 4`	33	**1**	**?**
4	`c = b % 3`	33	1	**1**
5	`System.out.println(a + ", " + b + ", " + c)`	33, 1, 1 is displayed		

For the input value of 4

Step	Statement	a	b	c
1	`a = Integer.parseInt(cin.readLine())`	**4**	?	?
2	`a += 6 / Math.sqrt(a) * 2 + 20`	**30**	?	**?**
3	`b = Math.round(a) % 4`	30	**2**	**?**
4	`c = b % 3`	30	2	**2**
5	`System.out.println(a + ", " + b + ", " + c)`	30, 2, 2 is displayed		

2. Solution

For the input value of -2

Step	Statement	a	b	c
1	`a = Integer.parseInt(cin.readLine())`	**-2**	?	?
2	`b = Math.abs(a) % 4 + Math.pow(a , 4)`	-2	**18**	**?**
3	`c = b % 5`	-2	18	**3**

4	System.out.println(b + ", " + c)	18, 3 is displayed

For the input value of -3

Step	Statement	a	b	c
1	a = Integer.parseInt(cin.readLine())	**-3**	?	?
2	b = Math.abs(a) % 4 + Math.pow(a , 4)	-3	**84**	**?**
3	c = b % 5	-3	84	**4**
4	System.out.println(b + ", " + c)	84, 4 is displayed		

3. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double degrees, radians;

  System.out.print("Enter angle in radians: ");
  radians = Double.parseDouble(cin.readLine());

  degrees = radians * 180 / Math.PI;

  System.out.println(degrees);
}
```

4. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double a, b, hypotenuse;

  System.out.print("Enter side A of a right-angled triangle: ");
  a = Double.parseDouble(cin.readLine());
  System.out.print("Enter side B of a right-angled triangle: ");
  b = Double.parseDouble(cin.readLine());

  hypotenuse = Math.sqrt(Math.pow(a, 2) + Math.pow(b, 2));

  System.out.println(hypotenuse);
}
```

5. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double adjacent, opposite, th;

  System.out.print("Enter angle (in degrees) of a right-angled triangle: ");
  th = Double.parseDouble(cin.readLine());
  System.out.print("Enter length of adjacent side: ");
  adjacent = Double.parseDouble(cin.readLine());

  opposite = Math.tan(th * Math.PI / 180) * adjacent;
```

```
  System.out.println(opposite);
}
```

Chapter 12

12.2 Answers of Review Exercises

1. Solution

i. a, e, g, h

ii. c, f

2. Solution

i. `y = Math.pow(x + 3, 5 * w) / (7 * (x - 4))`

ii. `y = Math.pow(3 * Math.pow(x, 2) - Math.pow(x, 3) / 4, 1 / 5.0)`

iii. `y = Math.sqrt(Math.pow(x, 4) - 2 * Math.pow(x, 3) - 7 * x * x +x) / Math.pow(4 * (7 * Math.pow(x, 4) - 3 / 4.0 * Math.pow(x, 3)) * (7 * x * x + x), 1/3.0)`

iv. `y = x / (x - 3 * (x - 1)) + x * Math.pow(x - 1, 1 / 5.0) / ((Math.pow(x, 3) - 2) * Math.pow(x - 1, 3))`

v. `y = Math.pow(Math.sin(Math.PI / 3) - Math.cos(Math.PI / 2 * w) , 2)`

vi. `y = Math.pow(Math.sin(Math.PI / 2 * x) + Math.cos(3 * Math.PI / 2 * w), 3) / Math.pow(Math.tan(2 * Math.PI / 3 * w) - Math.sin(Math.PI / 2 * x), 0.5)`

3. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double x, y;

  System.out.print("Enter value for x: ");
  x = Double.parseDouble(cin.readLine());

  y = Math.sqrt(x) * (Math.pow(x, 3) + Math.pow(x, 2));

  System.out.println(y);
}
```

4. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double x, y;

  System.out.print("Enter value for x: ");
  x = Double.parseDouble(cin.readLine());

  y = 7 * x / (2 * x + 4 * (x * x + 4));

  System.out.println(y);
}
```

5. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double w, x, y;

  System.out.print("Enter value for x: ");
  x = Double.parseDouble(cin.readLine());
  System.out.print("Enter value for w: ");
  w = Double.parseDouble(cin.readLine());

  y = Math.pow(x, x + 1) / Math.pow(Math.tan(2 * w / 3 + 5) - Math.tan(x / 2 + 1), 3);

  System.out.println(y);
}
```

6. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double w, x, y;

  System.out.print("Enter value for x: ");
  x = Double.parseDouble(cin.readLine());
  System.out.print("Enter value for w: ");
  w = Double.parseDouble(cin.readLine());

  y = (3 + w) / (6 * x - 7 * (x + 4)) + x * Math.pow(3 * w + 1, 1 / 5) * (5 * x + 4) / ((Math.pow(x, 3)
+ 3) * Math.pow(x - 1, 7));

  System.out.println(y);
}
```

7. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double w, x, y;

  System.out.print("Enter value for x: ");
  x = Double.parseDouble(cin.readLine());
  System.out.print("Enter value for w: ");
  w = Double.parseDouble(cin.readLine());

  y = Math.pow(x, x) / Math.pow(Math.sin(2 * w / 3 + 5) - x, 2) + Math.pow(Math.sin(3 * x) + w, x + 1)
/ Math.pow(Math.sqrt(7 * w), 3 / 2);

  System.out.println(y);
}
```

8. Solution

```
public static void main(String[] args) throws java.io.IOException {
```

```
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double a, b, c, area, semi;

  System.out.print("Enter length A: ");
  a = Double.parseDouble(cin.readLine());
  System.out.print("Enter length B: ");
  b = Double.parseDouble(cin.readLine());
  System.out.print("Enter length C: ");
  c = Double.parseDouble(cin.readLine());

  semi = (a + b + c) / 2;
  area = Math.sqrt(semi * (semi - a) * (semi - b) * (semi - c));

  System.out.println(area);
}
```

Chapter 13

13.2 Answers of Review Exercises

1. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int last_digit, n, result;

  System.out.print("Enter an integer: ");
  n = Integer.parseInt(cin.readLine());

  last_digit = n % 10;
  result = last_digit * 8;

  System.out.println(result);
}
```

2. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int digit1, digit2, digit3, digit4, digit5, number, r, reversed;

  System.out.print("Enter a five-digit integer: ");
  number = Integer.parseInt(cin.readLine());

  digit5 = number % 10;
  r = (int)(number / 10);

  digit4 = r % 10;
  r = (int)(r / 10);

  digit3 = r % 10;
  r = (int)(r / 10);

  digit2 = r % 10;
  digit1 = (int)(r / 10);

  reversed = digit5 * 10000 + digit4 * 1000 + digit3 * 100 + digit2 * 10 + digit1;
  System.out.println(reversed);
}
```

3. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int n, result;

  System.out.print("Enter an integer: ");
  n = Integer.parseInt(cin.readLine());
```

```
  result = n % 2;

  System.out.println(result);
}
```

4. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int n, result;

  System.out.print("Enter an integer: ");
  n = Integer.parseInt(cin.readLine());

  result = 1 - n % 2;

  System.out.println(result);
}
```

5. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int days, hours, minutes, number, r, seconds, weeks;

  System.out.print("Enter a period of time in seconds: ");
  number = Integer.parseInt(cin.readLine());

  weeks = (int)(number / 604800);  // 60 * 60 * 24 * 7 = 604800
  r = number % 604800;

  days = (int)(r / 86400);         // 60 * 60 * 24 = 86400
  r = r % 86400;

  hours = (int)(r / 3600);
  r = r % 3600;

  minutes = (int)(r / 60);
  seconds = r % 60;

  System.out.print(weeks + " weeks " + days + " days " + hours + " hours ");
  System.out.println(minutes + " minutes and " + seconds + " seconds");
}
```

6. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int amount, r, usd1, usd10, usd20, usd5;

  System.out.print("Enter amount to withdraw: ");
  amount = Integer.parseInt(cin.readLine());
```

```
  usd20 = (int)(amount / 20);
  r = amount % 20;

  usd10 = (int)(r / 10);
  r = r % 10;

  usd5 = (int)(r / 5);
  usd1 = r % 5;

  System.out.print(usd20 + " notes of $20 " + usd10 + " notes of $10 ");
  System.out.println(usd5 + " notes of $5 and " + usd1 + " notes of $1");
}
```

7. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int distance, feet, inches, miles, r, steps, yards;

  System.out.print("Enter number of steps: ");
  steps = Integer.parseInt(cin.readLine());

  distance = steps * 25;

  miles = (int)(distance / 63360);
  r = distance % 63360;

  yards = (int)(r / 36);
  r = r % 36;

  feet = (int)(r / 12);
  inches = r % 12;

  System.out.print(miles + " miles " + yards + " yards ");
  System.out.println(feet + " feet and " + inches + " inches");
}
```

Chapter 14

14.5 Answers of Review Questions: True/False

1. true
2. false
3. false
4. true
5. true
6. false
7. true
8. false
9. true
10. false
11. false
12. true
13. false
14. true
15. true
16. false
17. true

14.6 Answers of Review Questions: Multiple Choice

1. d
2. b
3. a
4. d
5. b
6. b
7. c
8. a
9. c
10. d

14.7 Answers of Review Exercises

1. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  String first_name, last_name, middle_name, title;

  System.out.print("First name: ");
  first_name = cin.readLine();
  System.out.print("Middle name: ");
  middle_name = cin.readLine();
  System.out.print("Last name: ");
  last_name = cin.readLine();
  System.out.print("Title: ");
  title = cin.readLine();

  System.out.println(title + " " + first_name + " " + middle_name + " " + last_name);
  System.out.println(first_name + " " + middle_name + " " + last_name);
  System.out.println(last_name + ", " + first_name);
  System.out.println(last_name + ", " + first_name + " " + middle_name);
  System.out.println(last_name + ", " + first_name + " " + middle_name + ", " + title);
  System.out.println(first_name + " " + last_name);
}
```

2. Solution

```
public static void main(String[] args) throws java.io.IOException {
  String alphabet, rnd_word;
```

```
  alphabet = "abcdefghijklmnopqrstuvwxyz";

  rnd_word = ("" + alphabet.charAt((int)(Math.random() * 26))).toUpperCase() +
                   alphabet.charAt((int)(Math.random() * 26)) +
                   alphabet.charAt((int)(Math.random() * 26)) +
                   alphabet.charAt((int)(Math.random() * 26)) +
                   alphabet.charAt((int)(Math.random() * 26));

  System.out.println(rnd_word);
}
```

3. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  String name, password;

  System.out.print("Enter name: ");
  name = cin.readLine().toLowerCase();

  password = "" +
             name.charAt((int)(Math.random() * name.length())) +
             name.charAt((int)(Math.random() * name.length())) +
             name.charAt((int)(Math.random() * name.length())) +
             (1000 + (int)(Math.random() * (9999 - 1000 + 1)));

  System.out.println(password);
}
```

Chapter 15

15.8 Answers of Review Questions: True/False

1. true
2. false
3. false
4. false
5. false
6. false
7. true
8. true
9. true
10. true
11. true
12. true
13. true
14. true
15. true
16. false
17. false
18. true
19. true
20. false
21. true
22. true
23. true

15.9 Answers of Review Questions: Multiple Choice

1. b
2. a
3. a
4. a
5. c
6. d

15.10 Answers of Review Exercises

1. Solution

i. c, e, g
ii. a, j
iii. d, f
iv. b, h, i

2. Solution

a	b	c	a != 1	b > a	c / 2 > 2 * a
3	**-5**	**8**	True	False	False
1	**10**	**20**	False	True	True
-4	**-2**	**-9**	True	True	True

3. Solution

Boolean Expression1 (BE1)	Boolean Expression2 (BE2)	BE1 || BE2	BE1 && BE2	!(BE2)
False	**False**	False	False	True
False	**True**	True	False	False

True	**False**	True	False	True
True	**True**	True	True	False

4. Solution

a	b	c	a > 3 || c > b && c > 1	a > 3 && c > b || c > 1
4	**-6**	**2**	True	True
-3	**2**	**-4**	False	False
2	**5**	**5**	False	True

5. Solution

Expression	Value
`Math.pow(x + y, 3)`	8
`(x + y) / (Math.pow(x, 2) - 14)`	1
`x - 1 == y + 5`	true
`x > 2 && y == 1`	false
`x == 1 || y == -2 && !(flag == false)`	true
`!(x >= 3) && (x % 2 > 1)`	false

6. Solution

i. false
ii. true

7. Solution

i. `age < 12 && age != 8`
ii. `age >= 6 && age <= 9 || age == 11`
iii. `age > 7 && age != 10 && age != 12`
iv. `age == 6 || age == 9 || age == 11`
v. `age >= 6 && age <= 12 && age != 8`
vi. `age != 7 && age != 10`

8. Solution

i. `x != 4 || y == 3`
ii. `x + 4 > 0`
iii. `!(x <= 5) && y != 4`
iv. `x == false`
v. `!(x < 4 && z <= 4)`
vi. `x == 2 || x < -5`

9. Solution

i. `!(x < 4 || y == 10)`

ii. `!( x - 2 < 9)`

iii. `!( !(x < 2) && y == 4)`

iv. `!( x == false && y != 3)`

v. First approach: `!(!(x < 2 || y < 2))`

Second approach: `x < 2 || y < 2`

vi. `!( x == -2 || x > 2)`

Chapter 16

16.2 Answers of Review Questions: True/False

1. false
2. false
3. true
4. false
5. false
6. false
7. true
8. false

16.3 Answers of Review Questions: Multiple Choice

1. b
2. c
3. d
4. d
5. d

16.4 Answers of Review Exercises

1. Solution

The corrections/additions are in red

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double x, y, x2;

  x = Double.parseDouble(cin.readLine());

  y = - 5;
  if (x * y / 2 > 20) {
    y--;
    x -= 4 * x * x;
  }

  System.out.println(x + y);
}
```

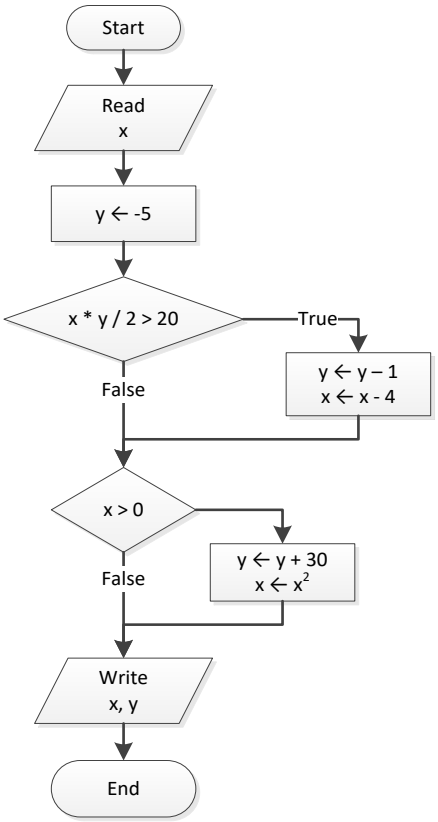
2. Solution

For the input value of 10

Step	Statement	x	y
1	`x = Double.parseDouble(cin.readLine())`	**10**	?
2	`y = - 5`	10	**-5**
3	`if (x * y / 2 > 20)`	False	
4	`if (x > 0)`	True	
5	`y += 30`	10	**25**
6	`x = Math.pow(x,2)`	**100**	25
7	`System.out.println(x + ", " + y)`	100, 25 is displayed	

For the input value of -10

Step	Statement	x	y
1	`x = Double.parseDouble(cin.readLine())`	**-10**	?
2	`y = - 5`	-10	**-5**
3	`if (x * y / 2 > 20)`	True	
4	`y--`	-10	**-6**
5	`x -= 4`	**-14**	-6
6	`if (x > 0)`	False	
7	`System.out.println(x + ", " + y)`	-14, -6 is displayed	



3. *Solution*

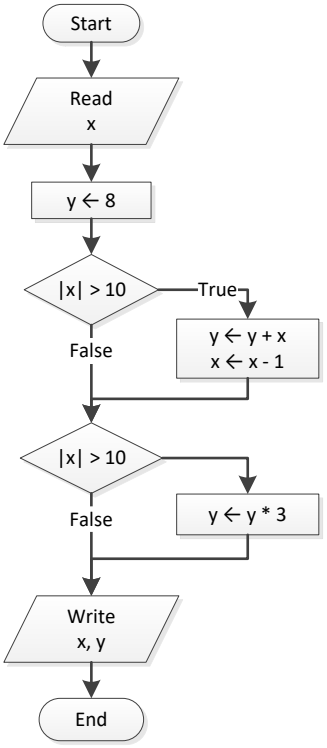
For the input value of -11

Step	Statement	x	y
1	`x = Integer.parseInt(cin.readLine())`	**-11**	?
2	`y = 8`	-11	**8**
3	`if (Math.abs(x) > 10)`	True	
4	`y += x`	-11	**-3**
5	`x--`	**-12**	-3

6	`if (Math.abs(x) > 10)`	True	
7	`y *= 3`	-12	**-9**
8	`System.out.println(x + ", " + y)`	-12, -9 is displayed	

For the input value of 11

Step	Statement	x	y
1	`x = Integer.parseInt(cin.readLine())`	**11**	?
2	`y = 8`	11	**8**
3	`if (Math.abs(x) > 10)`	True	
4	`y += x`	11	**19**
5	`x--`	**10**	19
6	`if (Math.abs(x) > 10)`	False	
7	`System.out.println(x + ", " + y)`	10, 19 is displayed	



4. Solution

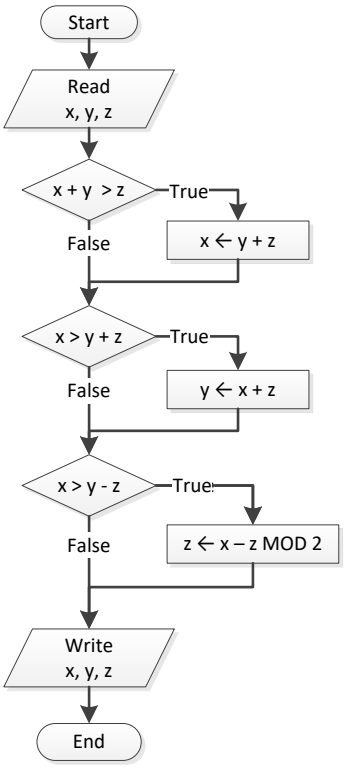
For input values of 1, 2 and 3

Step	Statement	x	y	z
1	`x = Integer.parseInt(cin.readLine())`	**1**	?	?
2	`y = Integer.parseInt(cin.readLine())`	1	**2**	?
3	`z = Integer.parseInt(cin.readLine())`	1	**2**	**3**
4	`if (x + y > z)`	False		

5	`if (x > y + z)`	False		
6	`if (x > y - z)`	True		
7	`z = x - z % 2`	1	2	**0**
8	`System.out.println(x + ", " + y + ", " + z)`	1, 2, 0 is displayed		

For input values of 4, 2 and 1

Step	Statement	x	y	z
1	`x = Integer.parseInt(cin.readLine())`	**4**	?	?
2	`y = Integer.parseInt(cin.readLine())`	4	**2**	?
3	`z = Integer.parseInt(cin.readLine())`	4	**2**	**1**
4	`if (x + y > z)`	True		
5	`x = y + z`	**3**	2	1
6	`if (x > y + z)`	False		
7	`if (x > y - z)`	True		
8	`z = x - z % 2`	3	2	**2**
9	`System.out.println(x + ", " + y + ", " + z)`	3, 2, 2 is displayed		



5. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double x;
```

```
  System.out.print("Enter a number: ");
  x = Double.parseDouble(cin.readLine());

  if (x > 0) {
    System.out.println("Positive");
  }
}
```

6. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double x, y;

  System.out.print("Enter a number: ");
  x = Double.parseDouble(cin.readLine());
  System.out.print("Enter a second number");
  y = Double.parseDouble(cin.readLine());

  if (x > 0 && y > 0) {
    System.out.println("Positive");
  }
}
```

7. Solution

```
static final String IS_NUMERIC = "[+-]?\\d+(\\.\\d+)?";

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  String x;

  System.out.print("Enter a number: ");
  x = cin.readLine();

  if (x.matches(IS_NUMERIC) == true) {
    System.out.println("Numeric");
  }
}
```

8. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  String str;

  System.out.print("Enter a string: ");
  str = cin.readLine();

  if (str.equals(str.toUpperCase()) == true) {
    System.out.println("Uppercase");
  }
}
```

9. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  String str;

  System.out.print("Enter a string: ");
  str = cin.readLine();

  if (str.length() > 20) {
    System.out.println("Many characters");
  }
}
```

10. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double n1, n2, n3, n4;

  System.out.print("Enter 1st number: ");
  n1 = Double.parseDouble(cin.readLine());
  System.out.print("Enter 2nd number: ");
  n2 = Double.parseDouble(cin.readLine());
  System.out.print("Enter 3rd number: ");
  n3 = Double.parseDouble(cin.readLine());
  System.out.print("Enter 4th number: ");
  n4 = Double.parseDouble(cin.readLine());

  if (n1 < 0 || n2 < 0 || n3 < 0 || n4 < 0) {
    System.out.println("Among the given numbers, there is a negative one!");
  }
}
```

11. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double a, b, c;

  System.out.print("Enter 1st number: ");
  a = Double.parseDouble(cin.readLine());
  System.out.print("Enter 2nd number: ");
  b = Double.parseDouble(cin.readLine());

  if (a > b) {
    c = a;
    a = b;
    b = c;
  }

  System.out.println(a + ", " + b);
}
```

12. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double average, t1, t2, t3;

  System.out.print("Enter 1st temperature: ");
  t1 = Double.parseDouble(cin.readLine());
  System.out.print("Enter 2nd temperature: ");
  t2 = Double.parseDouble(cin.readLine());
  System.out.print("Enter 3rd temperature: ");
  t3 = Double.parseDouble(cin.readLine());

  average = (t1 + t2 + t3) / 3;

  if (average > 60) {
    System.out.println("Heat Wave");
  }
}
```

Chapter 17

17.2 Answers of Review Questions: True/False

1. false
2. true
3. true
4. false
5. false
6. false

17.3 Answers of Review Questions: Multiple Choice

1. b
2. c
3. c

17.4 Answers of Review Exercises

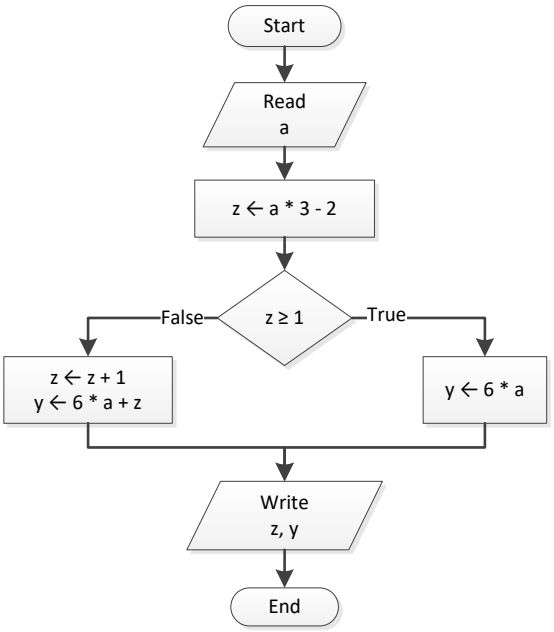
1. Solution

For input value of 3

Step	Statement	a	y	z
1	`a = Double.parseDouble(cin.readLine())`	**3**	?	?
2	`z = a * 3 - 2`	3	?	**7**
3	`if (z >= 1)`		True	
4	`y = 6 * a`	3	**18**	7
5	`System.out.println(z + ", " + y)`	7, 18 is displayed		

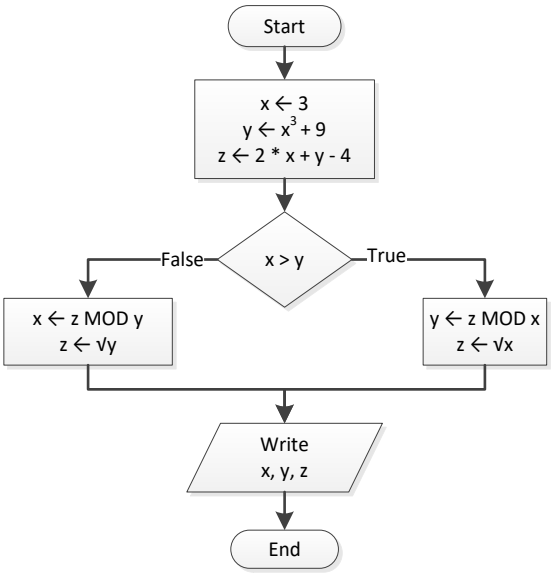
For input value of 0.5

Step	Statement	a	y	z
1	`a = Double.parseDouble(cin.readLine())`	**0.5**	?	?
2	`z = a * 3 - 2`	0.5	?	**-0.5**
3	`if (z >= 1)`		False	
4	`z++`	0.5	?	**0.5**
5	`y = 6 * a + z`	0.5	**3.5**	0.5
6	`System.out.println(z + ", " + y)`	0.5, 3.5 is displayed		



2. Solution

Step	Statement	x	y	z
1	`x = 3`	**3**	?	?
2	`y = Math.pow(x, 3) + 9`	3	**36**	?
3	`z = 2 * x + y - 4`	3	36	**38**
4	`if (x > y)`		False	
5	`x = z % y`	**2**	36	38
6	`z = Math.sqrt(y)`	2	36	**6**
7	`System.out.println(x + ", " + y + ", " + z)`	2, 36, 6 is displayed		



3. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double w, x, y, z;

  x = Double.parseDouble(cin.readLine());
  w = x * 3 - 15;
  z = (w + 7) * (x + 4) - 10;
  if (w > x && z > x) {
    x++;
    y = x / 2 + 4;
  }
  else {
    y = x / 4 + 2;
  }
  System.out.println(y);
}
```

For input value of 10

Step	Statement	x	y	w	z
1	`x = Double.parseDouble(cin.readLine())`	**10**	?	?	?
2	`w = x * 3 - 15`	10	?	**15**	?
3	`z = (w + 7) * (x + 4) - 10`	10	?	15	**298**
4	`if (w > x && z > x)`	True			
5	`x++`	**11**	?	15	298
6	`y = x / 2 + 4`	11	**9.5**	15	298
7	`System.out.println(y)`	9.5 is displayed			

For input value of 2

Step	Statement	x	y	w	z
1	`x = Double.parseDouble(cin.readLine())`	**2**	?	?	?
2	`w = x * 3 - 15`	2	?	**-9**	?
3	`z = (w + 7) * (x + 4) - 10`	2	?	-9	**-22**
4	`if (w > x && z > x)`	False			
5	`y = x / 4 + 2`	2	**2.5**	-9	-22
6	`System.out.println(y)`	2.5 is displayed			

4. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int x;

  x = Integer.parseInt(cin.readLine());
  if (x % 6 == 0) {
    System.out.println(x + " is a multiple of 6");
  }
  else {
    System.out.println(x + " is not a multiple of 6");
  }
}
```

5. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int x;

  x = Integer.parseInt(cin.readLine());
  if (x % 6 == 0 || x % 7 == 0) {
    System.out.println(x + " is a multiple of 6 or a multiple of 7");
  }
  else {
    System.out.println(x + " is neither a multiple of 6 nor a multiple of 7");
  }
}
```

6. Solution

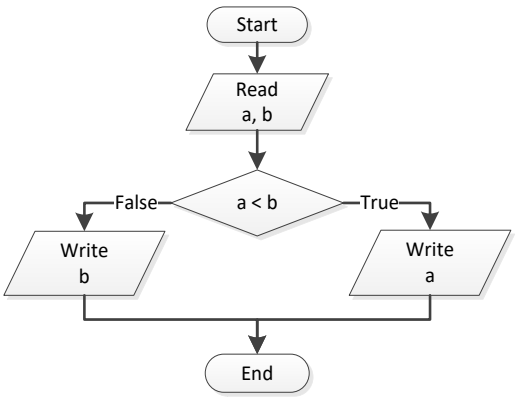
```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int x, y;

  x = Integer.parseInt(cin.readLine());

  y = x % 4;
  if (y == 0) {
    System.out.println(x + " is a multiple of 4");
```

```
  }
  else {
    System.out.println(x + " is not a multiple of 4");
  }

  System.out.println("The structure is: " + x + " = " + (int)(x / 4) + " x 4 + " + y);
}
```

7. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int x;

  x = Integer.parseInt(cin.readLine());

  if (x >= 1000 && x <= 9999) {
    System.out.println(x + " is a four-digit integer");
  }
  else {
    System.out.println(x + " is not a four-digit integer");
  }
}
```

8. Solution




```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double a, b;

  a = Double.parseDouble(cin.readLine());
  b = Double.parseDouble(cin.readLine());

  if (a < b) {
    System.out.println(a);
  }
  else {
    System.out.println(b);
  }
}
```

9. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double a, b, c;

  a = Double.parseDouble(cin.readLine());
  b = Double.parseDouble(cin.readLine());
  c = Double.parseDouble(cin.readLine());

  if (a < b + c && b < a + c && c < a + b) {
    System.out.println("Given numbers can be lengths of the three sides of a triangle");
  }
  else {
    System.out.println("Given numbers cannot be lengths of the three sides of a triangle");
  }
}
```

10. Solution

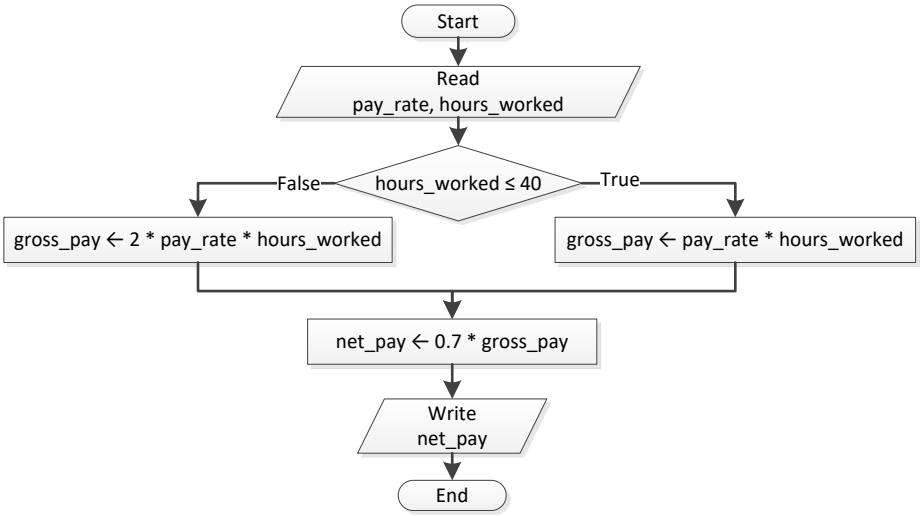
```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double a, b, c;

  a = Double.parseDouble(cin.readLine());
  b = Double.parseDouble(cin.readLine());
  c = Double.parseDouble(cin.readLine());

  if (Math.pow(a, 2) == Math.pow(b, 2) + Math.pow(c, 2) ||
      Math.pow(b, 2) == Math.pow(a, 2) + Math.pow(c, 2) ||
      Math.pow(c, 2) == Math.pow(a, 2) + Math.pow(b, 2)) {
    System.out.println("Given numbers can be lengths of the three sides of a right triangle");
  }
  else {
    System.out.println("Given numbers cannot be lengths of the three sides of a right triangle");
  }
}
```

11. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double a, average, b, c;

  System.out.print("Enter 1st jump in meters: ");
  a = Double.parseDouble(cin.readLine());
  System.out.print("Enter 2nd jump in meters: ");
  b = Double.parseDouble(cin.readLine());
  System.out.print("Enter 3rd jump in meters: ");
  c = Double.parseDouble(cin.readLine());

  average = (a + b + c) / 3;
```

```
  if (average < 8) {
    System.out.println("Disqualified");
  }
  else {
    System.out.println("Qualified");
  }
}
```

12. Solution




```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double gross_pay, net_pay, pay_rate;
  int hours_worked;

  pay_rate = Double.parseDouble(cin.readLine());
  hours_worked = Integer.parseInt(cin.readLine());

  if (hours_worked <= 40) {
    gross_pay = pay_rate * hours_worked;
  }
  else {
    gross_pay = 2 * pay_rate * hours_worked;
  }

  net_pay = 0.7 * gross_pay;
  System.out.println("Net Pay: " + net_pay);
}
```

13. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int miles, miles_left, r;

  System.out.print("Enter miles traveled: ");
  miles = Integer.parseInt(cin.readLine());
```

```
  r = miles % 12000;

  if (r > 6000) {
    miles_left = 12000 - r;
    System.out.println("Your car needs a major service in " + miles_left + " miles");
  }
  else {
    miles_left = 6000 - r;
    System.out.println("Your car needs a minor service in " + miles_left + " miles");
  }
}
```

14. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double a1, a2, s1, s2, t;

  System.out.print("Enter the time the two cars traveled: ");
  t = Double.parseDouble(cin.readLine());
  System.out.print("Enter the accelaration for car A: ");
  a1 = Double.parseDouble(cin.readLine());
  System.out.print("Enter the accelaration for car B: ");
  a2 = Double.parseDouble(cin.readLine());

  s1 = 0.5 * a1 * t;
  s2 = 0.5 * a2 * t;

  if (s1 > s2) {
    System.out.println("Car A is first");
  }
  else {
    System.out.println("Car B is first");
  }
}
```

Chapter 18

18.2 Answers of Review Questions: True/False

1. true
2. false
3. false
4. false
5. false
6. true
7. false

18.3 Answers of Review Exercises

1. Solution

For input value of 5

Step	Statement	q	b
1	`q = Integer.parseInt(cin.readLine())`	**5**	?
2	`if (q > 0 && q <= 50)`	True	
3	`b = 1`	5	**1**
4	`System.out.println(b)`	1 is displayed	

For input value of 150

Step	Statement	q	b
1	`q = Integer.parseInt(cin.readLine())`	**150**	?
2	`if (q > 0 && q <= 50)`	False	
3	`else if (q > 50 && q <= 100)`	False	
4	`else if (q > 100 && q <= 200)`	True	
5	`b = 3`	150	**3**
6	`System.out.println(b)`	3 is displayed	

For input value of 250

Step	Statement	q	b
1	`q = Integer.parseInt(cin.readLine())`	**250**	?
2	`if (q > 0 && q <= 50)`	False	
3	`else if (q > 50 && q <= 100)`	False	
4	`else if (q > 100 && q <= 200)`	False	
5	`b = 4`	250	**4**
6	`System.out.println(b)`	4 is displayed	

For input value of -1

Step	Statement	q	b
1	`q = Integer.parseInt(cin.readLine())`	**-1**	?
2	`if (q > 0 && q <= 50)`	False	

3	`else if (q > 50 && q <= 100)`	False	
4	`else if (q > 100 && q <= 200)`	False	
5	`b = 4`	-1	**4**
6	`System.out.println(b)`	4 is displayed	

2. *Solution*

For input value of 5

Step	Statement	amount	discount	payment
1	`amount = Double.parseDouble(cin.readLine())`	**5**	?	?
2	`discount = 0`	5	**0**	?
3	`if (amount < 20)`	True		
4	`discount = 0`	5	**0**	?
5	`payment = amount - amount * discount / 100`	5	0	**5**
6	`System.out.println(discount + ", " + payment)`	0, 5 is displayed.		

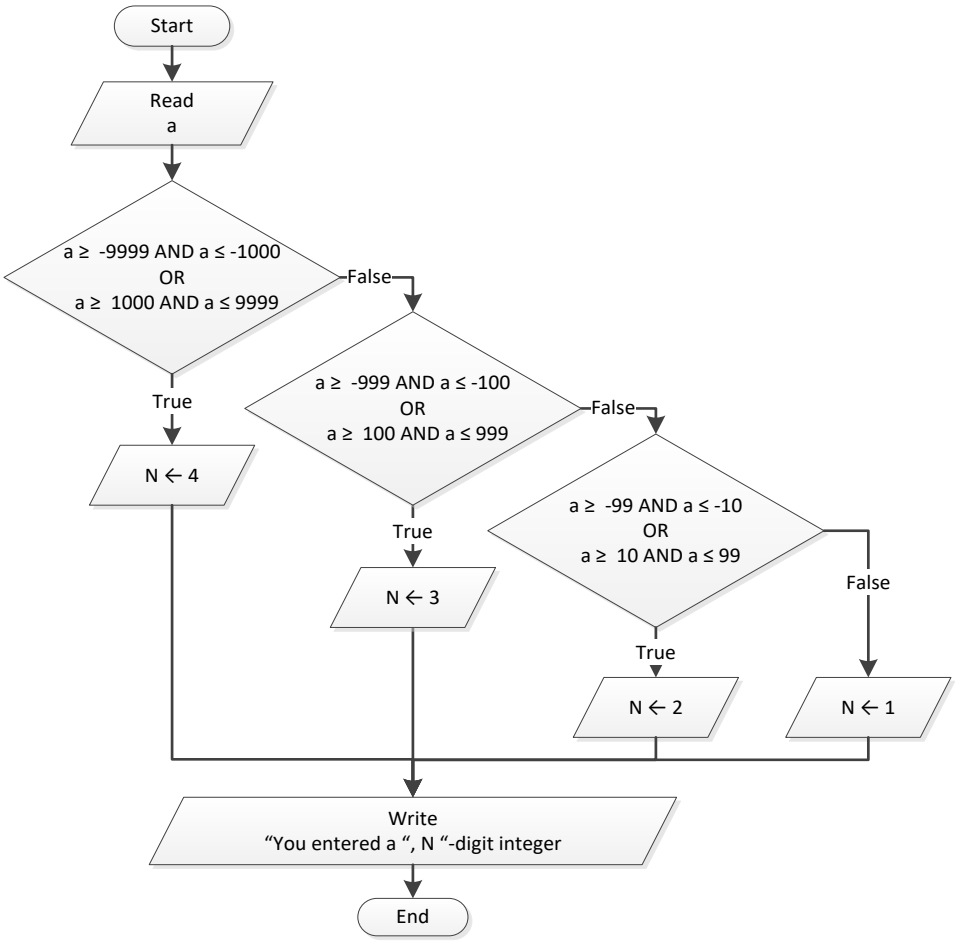
For input value of 150

Step	Statement	amount	discount	payment
1	`amount = Double.parseDouble(cin.readLine())`	**150**	?	?
2	`discount = 0`	150	**0**	?
3	`if (amount < 20)`	False		
4	`else if (amount >=20 && amount < 60)`	False		
5	`else if (amount >= 60 && amount < 100)`	False		
6	`else if (amount >= 100)`	True		
7	`discount = 15`	150	**15**	?
8	`payment = amount - amount * discount / 100`	150	15	**5**
9	`System.out.println(discount + ", " + payment)`	15, 127.5 is displayed.		

For input value of -1

Step	Statement	amount	discount	payment
1	`amount = Double.parseDouble(cin.readLine())`	**-1**	?	?
2	`discount = 0`	-1	**0**	?
3	`if (amount < 20)`	True		
4	`discount = 0`	-1	**0**	?
5	`payment = amount - amount * discount / 100`	-1	0	**-1**
6	`System.out.println(discount + ", " + payment)`	0, -1 is displayed.		

3. Solution




```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int a, n;

  a = Integer.parseInt(cin.readLine());

  if (a >= -9999 && a <= -1000 || a >= 1000 && a <= 9999) {
    n = 4;
  }
  else if (a >= -999 && a <= -100 || a >= 100 && a <= 999) {
    n = 3;
  }
  else if (a >= -99 && a <= -10 || a >= 10 && a <= 99) {
    n = 2;
  }
  else {
    n = 1;
  }

  System.out.println("You entered a " + n + "-digit integer");
}
```

4. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double cad, eur, gbp, jpy, usd;
  int ch;

  System.out.println("1. Convert USD to Euro (EUR)");
  System.out.println("2. Convert USD to British Pound Sterling (GBP)");
  System.out.println("3. Convert USD to Japanese Yen (JPY)");
  System.out.println("4. Convert USD to Canadian Dollar (CAD)");

  System.out.print("Enter a choice: ");
  ch = Integer.parseInt(cin.readLine());

  System.out.print("Enter an amount in US dollars: ");
  usd = Double.parseDouble(cin.readLine());

  if (ch == 1) {
    eur = usd / 0.72;
    System.out.println("$" + usd + " = " + eur + " EUR");
  }
  else if (ch == 2) {
    gbp = usd / 0.60;
    System.out.println("$" + usd + " = " + gbp + " GBP");
  }
  else if (ch == 3) {
    jpy = usd / 102.15;
    System.out.println("$" + usd + " = " + jpy + " JPY");
  }
  else {
    cad = usd / 1.10;
    System.out.println("$" + usd + " = " + cad + " CAD");
  }
}
```

5. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int m;

  System.out.print("Enter the number of a month between 1 and 12: ");
  m = Integer.parseInt(cin.readLine());

  if (m <= 2 || m == 12) {
    System.out.println("Winter");
  }
  else if (m <= 5) {
    System.out.println("Spring");
  }
  else if (m <= 8) {
    System.out.println("Summer");
```

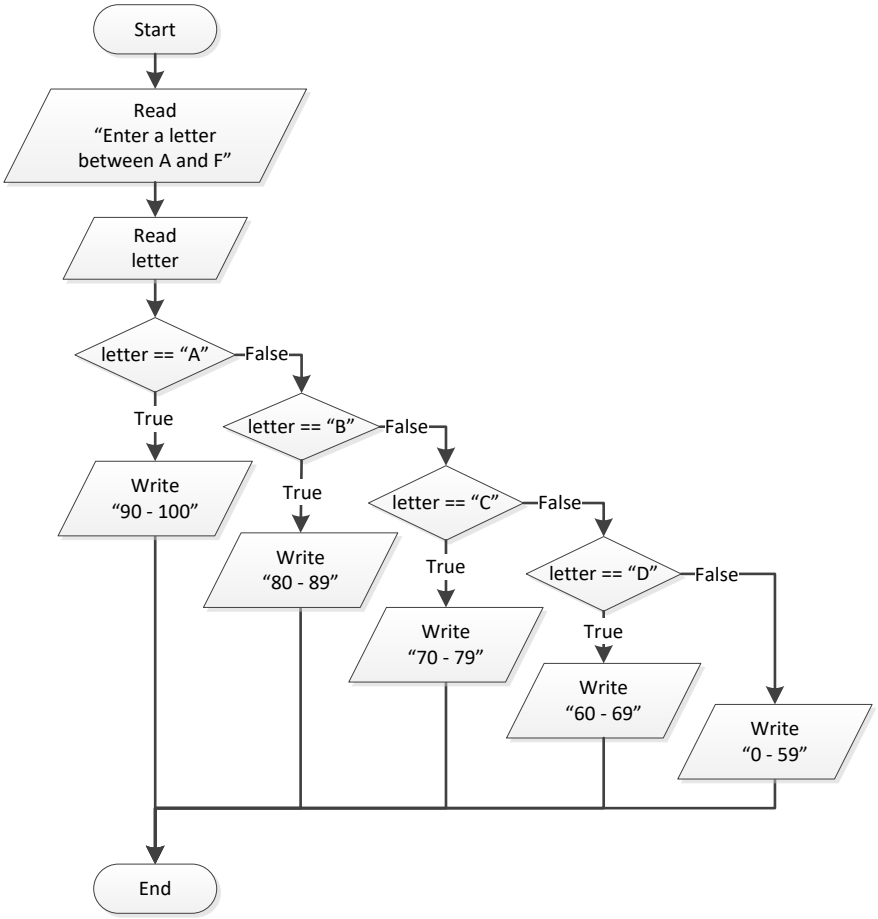
```
  }
  else {
    System.out.println("Fall (Autumn)");
  }
}
```

6. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double n;
  int x, y;

  System.out.print("Enter a number between 1.0 and 4.9: ");
  n = Double.parseDouble(cin.readLine());

  x = (int)(n);
  y = (int)(n * 10) % 10;

  if (x == 1) {
    System.out.print("One");
  }
  else if (x == 2) {
    System.out.print("Two");
  }
  else if (x == 3) {
    System.out.print("Three");
  }
  else if (x == 4) {
    System.out.print("Four");
  }

  System.out.print(" point ");

  if (y == 1) {
    System.out.println("one");
  }
  else if (y == 2) {
    System.out.println("two");
  }
  else if (y == 3) {
    System.out.println("three");
  }
  else if (y == 4) {
    System.out.println("four");
  }
  else if (y == 5) {
    System.out.println("five");
  }
  else if (y == 6) {
    System.out.println("six");
  }
  else if (y == 7) {
    System.out.println("seven");
```

```
  }
  else if (y == 8) {
    System.out.println("eight");
  }
  else if (y == 9) {
    System.out.println("nine");
  }
  else if (y == 0) {
    System.out.println("zero");
  }
}
```

7. Solution




```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  String letter;

  System.out.print("Enter a letter between A and F: ");
  letter = cin.readLine();

  if (letter.equals("A") == true) {
    System.out.println("90 - 100");
  }
```

```
  else if (letter.equals("B") == true) {
    System.out.println("80 - 89");
  }
  else if (letter.equals("C") == true) {
    System.out.println("70 - 79");
  }
  else if (letter.equals("D") == true) {
    System.out.println("60 - 69");
  }
  else {
    System.out.println("0 - 59");
  }
}
```

Chapter 19

19.2 Answers of Review Questions: True/False

1. true
2. false
3. true
4. false
5. true
6. false
7. true

19.3 Answers of Review Exercises

1. Solution

For input value of 1

Step	Statement	a	x	y
1	`a = Integer.parseInt(cin.readLine())`	**1**	?	?
2	`x = 0`	1	**0**	?
3	`y = 0`	1	0	**0**
4	`case a == 1`		True	
5	`x = x + 5`	1	**5**	0
6	`y = y + 5`	1	5	**5**
7	`System.out.println(x + ", " + y)`	5, 5 is displayed		

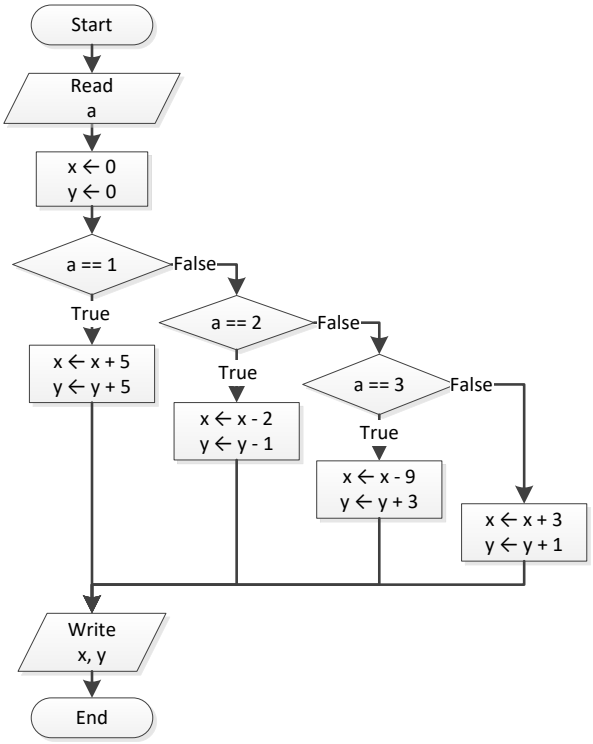
For input value of 3

Step	Statement	a	x	y
1	`a = Integer.parseInt(cin.readLine())`	**3**	?	?
2	`x = 0`	3	**0**	?
3	`y = 0`	3	0	**0**
4	`case a == 1`		False	
5	`case a == 2`		False	
6	`case a == 3`		True	
7	`x = x - 9`	3	-9	0
8	`y = y + 3`	3	-9	3
9	`System.out.println(x + ", " + y)`	-9, 3 is displayed		

For input value of 250

Step	Statement	a	x	y
1	`a = Integer.parseInt(cin.readLine())`	**250**	?	?
2	`x = 0`	250	**0**	?
3	`y = 0`	250	0	**0**
4	`case a == 1`		False	

5	`case a == 2`	False		
6	`case a == 3`	False		
7	`x = x + 3`	250	3	0
8	`y++`	250	3	1
9	`System.out.println(x + ", " + y)`	3, 1 is displayed		



2. *Solution*

For input values of 10, 2, 5

Step	Statement	a	x	y
1	`a = Integer.parseInt(cin.readLine())`	**10**	?	?
2	`x = Integer.parseInt(cin.readLine())`	10	**2**	?
3	`y = Double.parseDouble(cin.readLine())`	10	2	**5**
4	`case a == 10`	True		
5	`x = x % 2`	10	**0**	5
6	`y = pow(y, 2)`	10	0	**25**
7	`System.out.println(x + ", " + y)`	0, 25 is displayed		

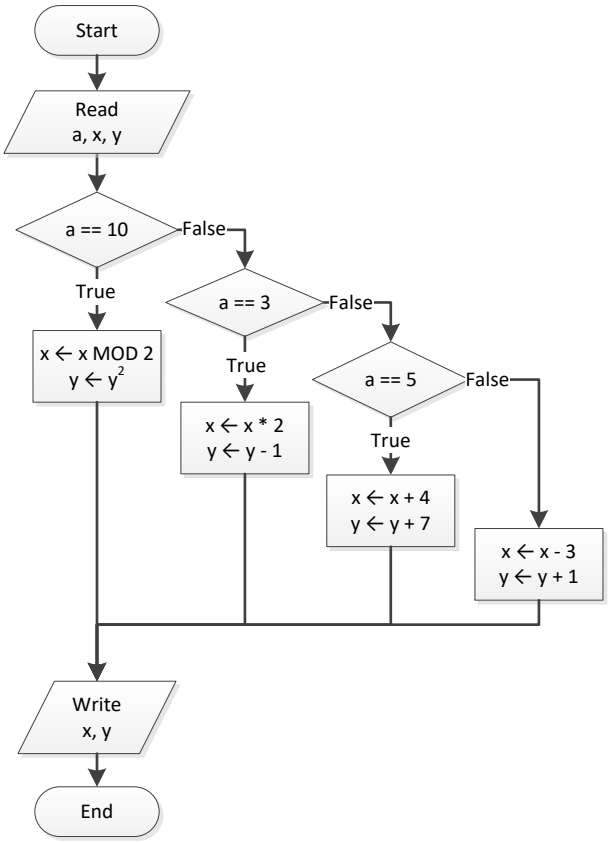
For input values of 5, 2, 3

Step	Statement	a	x	y
1	`a = Integer.parseInt(cin.readLine())`	**5**	?	?
2	`x = Integer.parseInt(cin.readLine())`	5	**2**	?

3	`y = Double.parseDouble(cin.readLine())`	5	2	**3**
4	`case a == 10`		False	
5	`case a == 3`		False	
6	`case a == 5`		True	
7	`x = x + 4`	5	**6**	3
8	`y += 7`	5	6	**10**
9	`System.out.println(x + ", " + y)`	6, 10 is displayed		

For input values of 4, 6, 2

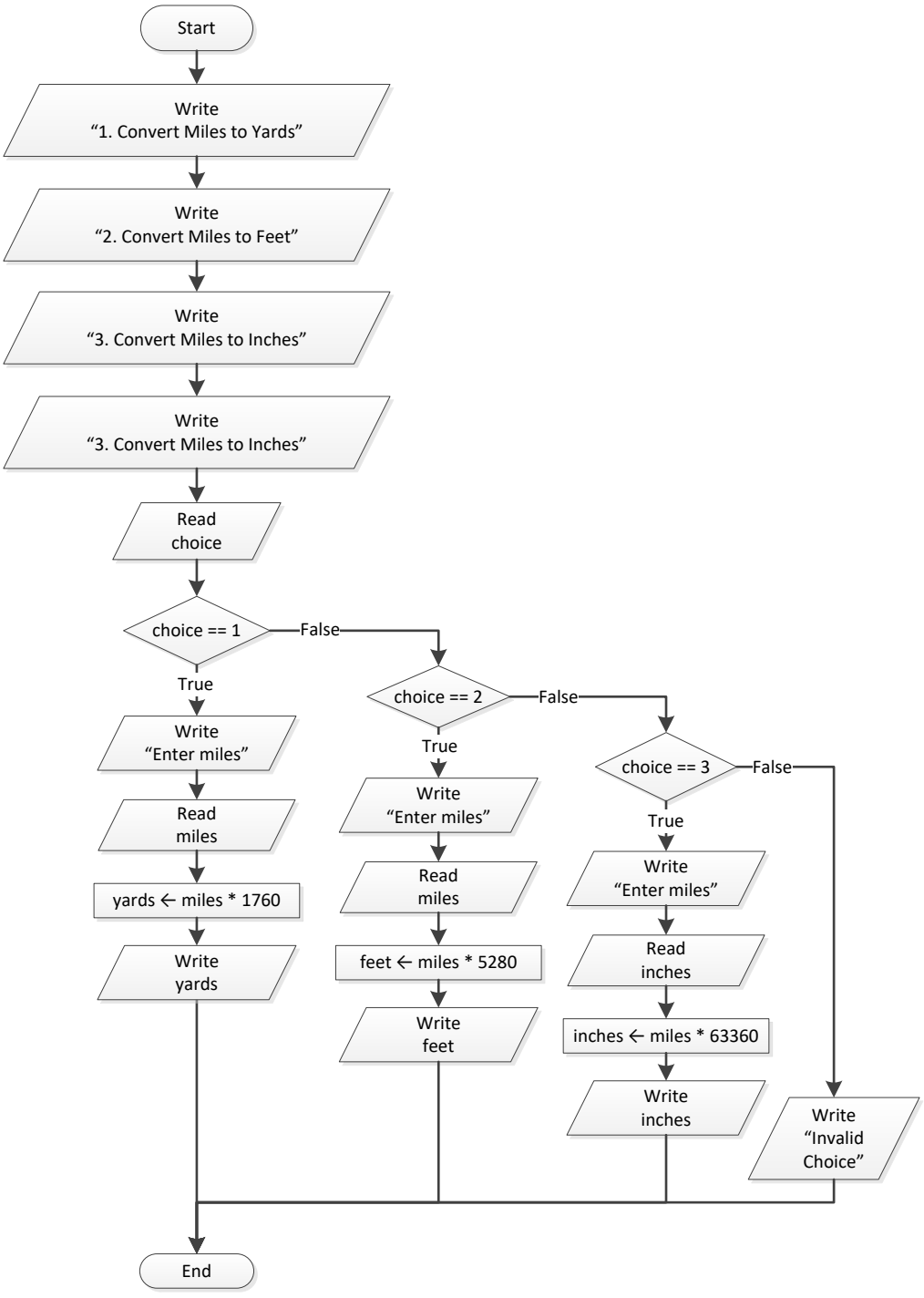
Step	Statement	a	x	y
1	`a = Integer.parseInt(cin.readLine())`	**4**	?	?
2	`x = Integer.parseInt(cin.readLine())`	4	**6**	?
3	`y = Double.parseDouble(cin.readLine())`	4	6	**2**
4	`case a == 10`		False	
5	`case a == 3`		False	
6	`case a == 5`		False	
7	`x -= 3`	4	**3**	2
8	`y++`	4	3	**3**
9	`System.out.println(x + ", " + y)`	3, 3 is displayed		



3. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  String name;

  System.out.print("Enter the name of a month: ");
  name = cin.readLine();

  switch (name.toUpperCase())) {
    case "JANUARY":
      System.out.println("1");
      break;
    case "FEBRUARY":
      System.out.println("2");
      break;
    case "MARCH":
      System.out.println("3");
      break;
    case "APRIL":
      System.out.println("4");
      break;
    case "MAY":
      System.out.println("5");
      break;
    case "JUNE":
      System.out.println("6");
      break;
    case "JULY":
      System.out.println("7");
      break;
    case "AUGUST":
      System.out.println("8");
      break;
    case "SEPTEMBER":
      System.out.println("9");
      break;
    case "OCTOBER":
      System.out.println("10");
      break;
    case "NOVEMBER":
      System.out.println("11");
      break;
    case "DECEMBER":
      System.out.println("12");
      break;
    default:
      System.out.println("Error");
  }
}
```

4. Solution




```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int choice;
  double feet, inches, miles, yards;
```

```
  System.out.println("1. Convert Miles to Yards");
  System.out.println("2. Convert Miles to Feet");
  System.out.println("3. Convert Miles to Inches");

  System.out.print("Enter a choice: ");
  choice = Integer.parseInt(cin.readLine());

  switch (choice) {
    case 1:
      System.out.print("Enter miles: ");
      miles = Double.parseDouble(cin.readLine());
      yards = miles * 1760;
      System.out.println(miles + " miles = " + yards + " yards");
      break;
    case 2:
      System.out.print("Enter miles: ");
      miles = Double.parseDouble(cin.readLine());
      feet = miles * 5280;
      System.out.println(miles + " miles = " + feet + " feet");
      break;
    case 3:
      System.out.print("Enter miles: ");
      miles = Double.parseDouble(cin.readLine());
      inches = miles * 63360;
      System.out.println(miles + " miles = " + inches + " inches");
      break;
    default:
      System.out.println("Invalid choice!");
  }
}
```

5. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  String roman;

  System.out.print("Enter a Roman numeral between I and X: ");
  roman = cin.readLine();

  switch (roman.toUpperCase()) {
    case "I":
      System.out.println("1");
      break;
    case "II":
      System.out.println("2");
      break;
    case "III":
      System.out.println("3");
      break;
    case "IV":
      System.out.println("4");
      break;
    case "V":
```

```
      System.out.println("5");
      break;
    case "VI":
      System.out.println("6");
      break;
    case "VII":
      System.out.println("7");
      break;
    case "VIII":
      System.out.println("8");
      break;
    case "IX":
      System.out.println("9");
      break;
    case "X":
      System.out.println("10");
      break;
    default:
      System.out.println("Error");
  }
}
```

6. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int total;

  System.out.print("Enter the total number of CDs purchased in a month: ");
  total = Integer.parseInt(cin.readLine());

  switch (total) {
    case 1:
      System.out.println("You are awarded 3 points");
      break;
    case 2:
      System.out.println("You are awarded 10 points");
      break;
    case 3:
      System.out.println("You are awarded 20 points");
      break;
    default:
      System.out.println("You are awarded 45 points");
  }
}
```

7. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i;
  String name;
```

```
  System.out.print("Enter your name: ");
  name = cin.readLine();

  i = (int)(Math.random() * 3);

  switch (i) {
    case 0:
      System.out.println("Good morning " + name);
      break;
    case 1:
      System.out.println("Good evening " + name);
      break;
    case 2:
      System.out.println("Good night " + name);
      break;
  }
}
```

8. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  String num_string;

  num_string = cin.readLine();

  switch (num_string.toUpperCase()) {
    case "ZERO":
      System.out.println(0);
      break;
    case "ONE":
      System.out.println(1);
      break;
    case "TWO":
      System.out.println(2);
      break;
    case "THREE":
      System.out.println(3);
      break;
    case "FOUR":
      System.out.println(4);
      break;
    case "FIVE":
      System.out.println(5);
      break;
    case "SIX":
      System.out.println(6);
      break;
    case "SEVEN":
      System.out.println(7);
      break;
    case "EIGHT":
      System.out.println(8);
      break;
```

```
    case "NINE":
      System.out.println(9);
      break;
    default:
      System.out.println("I don't know this number!");
  }
}
```

9. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int b;

  System.out.print("Enter Beaufort number: ");
  b = Integer.parseInt(cin.readLine());

  switch (b) {
    case 0:
      System.out.println("Calm");
      break;
    case 1:
      System.out.println("Light Air");
      break;
    case 2:
      System.out.println("Light breeze");
      break;
    case 3:
      System.out.println("Gentle breeze");
      break;
    case 4:
      System.out.println("Moderate breeze");
      break;
    case 5:
      System.out.println("Fresh breeze");
      break;
    case 6:
      System.out.println("Strong breeze");
      break;
    case 7:
      System.out.println("Moderate gale");
      break;
    case 8:
      System.out.println("Gale");
      break;
    case 9:
      System.out.println("Strong gale");
      break;
    case 10:
      System.out.println("Storm");
      break;
    case 11:
      System.out.println("Violent storm");
      break;
```

```
    case 12:
      System.out.println("Hurricane force");
      break;
    default:
      System.out.println("Invalid Beaufort number!");
  }
}
```

Chapter 20

20.3 Answers of Review Questions: True/False

1. true
2. true
3. false
4. false
5. true

20.4 Answers of Review Exercises

1. Solution

For input values of 20, 1

Step	Statement	x	y
1	`x = Integer.parseInt(cin.readLine())`	**20**	?
2	`y = Integer.parseInt(cin.readLine())`	20	**1**
3	`if (x < 30)`	True	
4	`case y == 1`	True	
5	`x = x % 3`	**2**	1
6	`y = 5`	2	**5**
7	`System.out.println(x + ", " + y)`	2, 5 is displayed	

For input values of 20, 3

Step	Statement	x	y
1	`x = Integer.parseInt(cin.readLine())`	**20**	?
2	`y = Integer.parseInt(cin.readLine())`	20	**3**
3	`if (x < 30)`	True	
4	`case y == 1`	False	
5	`case y == 2`	False	
6	`case y == 3`	True	
7	`x = x + 5`	**25**	3
8	`y += 3`	25	**6**
9	`System.out.println(x + ", " + y)`	25, 6 is displayed	

For input values of 12, 8

Step	Statement	x	y
1	`x = Integer.parseInt(cin.readLine())`	**12**	?
2	`y = Integer.parseInt(cin.readLine())`	12	**8**
3	`if (x < 30)`	True	
4	`case y == 1`	False	
5	`case y == 2`	False	

6	`case y == 3`	False	
7	`x -= 2`	**10**	8
8	`y++`	10	**9**
9	`System.out.println(x + ", " + y)`	10, 9 is displayed	

For input values of 50, 0

Step	Statement	x	y
1	`x = Integer.parseInt(cin.readLine())`	**50**	?
2	`y = Integer.parseInt(cin.readLine())`	50	**0**
3	`y++`	50	**1**
4	`System.out.println(x + ", " + y)`	50, 1 is displayed	

2. Solution

For input values of 60, 25

Step	Statement	x	y
1	`x = Integer.parseInt(cin.readLine())`	**60**	?
2	`y = Integer.parseInt(cin.readLine())`	60	25
3	`if ((x + y) / 2 <= 20)`	False	
4	`if (y < 15)`	False	
5	`else if (y < 23)`	False	
6	`x = 2 * x + 5`	**125**	25
7	`y += 1`	125	**26**
8	`System.out.println(x + ", " + y)`	125, 26 is displayed	

For input values of 50, 8

Step	Statement	x	y
1	`x = Integer.parseInt(cin.readLine())`	**50**	?
2	`y = Integer.parseInt(cin.readLine())`	50	8
3	`if ((x + y) / 2 <= 20)`	False	
4	`if (y < 15)`	True	
5	`x = x % 4`	**2**	8
6	`y = 2`	2	**2**
7	`System.out.println(x + ", " + y)`	2, 2 is displayed	

For input values of 20, 15

Step	Statement	x	y
1	`x = Integer.parseInt(cin.readLine())`	**20**	?
2	`y = Integer.parseInt(cin.readLine())`	20	15
3	`if ((x + y) / 2 <= 20)`	True	

4	`if (y < 10)`	False	
5	`else if (y < 20)`	True	
6	`x = x * 5`	**100**	15
7	`y += 2`	100	**17**
8	`System.out.println(x + ", " + y)`	100, 17 is displayed	

For input values of 10, 30

Step	Statement	x	y
1	`x = Integer.parseInt(cin.readLine())`	**10**	?
2	`y = Integer.parseInt(cin.readLine())`	10	30
3	`if ((x + y) / 2 <= 20)`	True	
4	`if (y < 10)`	False	
5	`else if (y < 20)`	False	
6	`x = x - 2`	**8**	30
7	`y += 3`	8	**33**
8	`System.out.println(x + ", " + y)`	8, 33 is displayed	

3. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double a, b, c;

  System.out.print("Enter the three sides of a triangle: ");
  a = Double.parseDouble(cin.readLine());
  b = Double.parseDouble(cin.readLine());
  c = Double.parseDouble(cin.readLine());

  if (a >= b + c || b >= a + c || c >= a + b) {
    System.out.println("Given numbers cannot be lengths of the three sides of a triangle");
  }
  else {
    if (a == b && b == c) {
      System.out.println("Equilateral");
    }
    else if (Math.pow(a, 2) == Math.pow(b, 2) + Math.pow(c, 2) ||
            Math.pow(b, 2) == Math.pow(a, 2) + Math.pow(c, 2) ||
            Math.pow(c, 2) == Math.pow(a, 2) + Math.pow(b, 2)) {

      System.out.println("Right (or right-angled)");
    }
    else {
      System.out.println("Not special");
    }
  }
}
```

4. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int amount, pin, r, usd1, usd10, usd5;

  System.out.print("Enter your four-digit PIN : ");
  pin= Integer.parseInt(cin.readLine());
  if (pin != 1234) {
    System.out.print("Wrong PIN. Enter your four-digit PIN : ");
    pin = Integer.parseInt(cin.readLine());
    if (pin != 1234) {
      System.out.print("Wrong PIN. Enter your four-digit PIN : ");
      pin = Integer.parseInt(cin.readLine());
    }
  }

  if (pin != 1234) {
    System.out.println("PIN locked!");
  }
  else {
    System.out.print("Enter the amount of money (an integer value) that you want to withdraw: ");
    amount = Integer.parseInt(cin.readLine());
    usd10 = (int)(amount / 10);
    r = amount % 10;
    usd5 = (int)(r / 5);
    usd1 = r % 5;
    System.out.print(usd10 + " notes of $10 " + usd5 + " notes of $5 ");
    System.out.println("and " + usd1 + " notes of $1");
  }
}
```

5. Solution

First Approach

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double t, w;

  System.out.print("Enter temperature (in Fahrenheit): ");
  t = Double.parseDouble(cin.readLine());
  System.out.print("Enter wind speed (in miles/hour): ");
  w = Double.parseDouble(cin.readLine());

  if (t > 75) {
    if (w > 12) {
      System.out.println("The day is hot and windy");
    }
    else {
      System.out.println("The day is hot and not windy");
    }
  }
  else {
```

```
    if (w > 12) {
      System.out.println("The day is cold and windy");
    }
    else {
      System.out.println("The day is cold and not windy");
    }
  }
}
```

Second Approach

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double t, w;
  String message1, message2;

  System.out.print("Enter temperature (in Fahrenheit): ");
  t = Double.parseDouble(cin.readLine());
  System.out.print("Enter wind speed (in miles/hour): ");
  w = Double.parseDouble(cin.readLine());

  if (t > 75) {
    message1 = "hot";
  }
  else {
    message1 = "cold";
  }

  if (w > 12) {
    message2 = "windy";
  }
  else {
    message2 = "not windy";
  }

  System.out.println("The day is " + message1 + " and " + message2);
}
```

Chapter 21

21.13 Answers of Review Questions: True/False

1. false
2. true
3. false
4. true
5. true
6. false
7. true
8. false
9. true
10. false
11. true
12. false
13. false

21.14 Answers of Review Questions: Multiple Choice

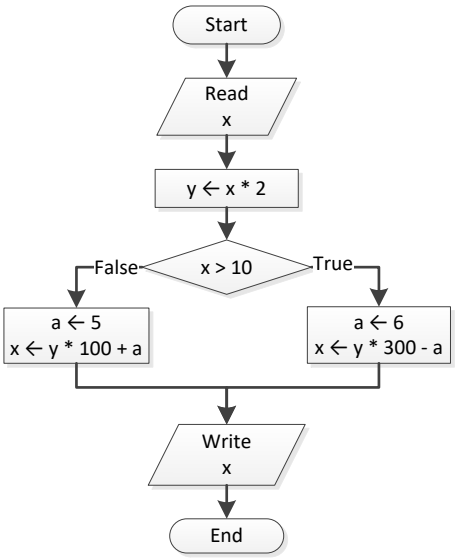
1. c
2. b
3. a
4. a
5. b
6. c
7. c
8. d

21.15 Answers of Review Exercises

1. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int a, x, y;

  y = Integer.parseInt(cin.readLine());
  x = Integer.parseInt(cin.readLine());

  if (y > 0) {
    a = x * 4 * y + 1;
  }
  else {
    a = x * 2 * y + 6;
  }
  System.out.println(y);
  System.out.println(a);
}
```

2. Solution



3. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double a, y;

  a = Double.parseDouble(cin.readLine());

  if (a >= 10) {
    System.out.println("Error!");
  }
  else {
    if (a < 1) {
      y = 5 + a;
    }
    else if (a < 5) {
      y = 23 / a;
    }
    else {
      y = 5 * a;
    }
    System.out.println(y);
  }
}
```

4. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int day, month;
  String name;
```

```
  day = Integer.parseInt(cin.readLine());
  month = Integer.parseInt(cin.readLine());
  name = cin.readLine();

  if (day == 16 && month == 2 && name.equals("Loukia") == true) {
    System.out.println("Happy Birthday!!!");
  }
  else {
    System.out.println("No match!");
  }
}
```

5. Solution

It does not operate the same way when a is less than or equal to 10. The correct program is

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double a, b, c, d;

  a = Double.parseDouble(cin.readLine());
  b = Double.parseDouble(cin.readLine());
  c = Double.parseDouble(cin.readLine());

  if (a > 10) {
    if (c < 2000) {
      d = (a + b + c) / 12;
      System.out.println("The result is: " + d);
    }
    else {
      System.out.println("Error!");
    }
  }
  else {
    System.out.println("Error!");
  }
}
```

6. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double a, b, c, d;

  a = Double.parseDouble(cin.readLine());
  b = Double.parseDouble(cin.readLine());
  c = Double.parseDouble(cin.readLine());

  if (a > 10 && b < 2000 && c != 10) {
    d = (a + b + c)/12;
    System.out.println("The result is: " + d);
  }

  if (a <= 10) {
```

```
    System.out.println("Error!");
  }
}
```

7. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int a, b, y;

  a = Integer.parseInt(cin.readLine());
  b = Integer.parseInt(cin.readLine());

  y = 3;
  if (a > 0) {
    y = y * a;
    System.out.println("Hello Zeus");
  }

  System.out.println(y + ", " + b);
}
```

8. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double a, b, y;

  a = Double.parseDouble(cin.readLine());
  b = Double.parseDouble(cin.readLine());

  y = 0;
  if (a > 0) {
    y = y + 7;
  }
  else {
    System.out.println("Hello Zeus");
    System.out.println(Math.abs(a));
  }
  System.out.println(y);
}
```

9. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  String os;

  System.out.print("What is your tablet's OS? ");
  os = cin.readLine();

  if (os.equals("iOS") == true) {
    System.out.println("Apple");
```

```
  }
  else if (os.equals("Android") == true) {
    System.out.println("Google");
  }
  else if (os.equals("Windows") == true) {
    System.out.println("Microsoft");
  }
}
```

10. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int a;
  double x, y;

  a = Integer.parseInt(cin.readLine());
  x = Double.parseDouble(cin.readLine());
  y = Double.parseDouble(cin.readLine());

  if (a == 3) {
    x = x / 4;
    y = Math.pow(y, 5);
  }
  else if (a == 7) {
    x = x * 3;
    y++;
  }
  else if (a == 22) {
    x = x % 4;
    y += 9;
  }
  else {
    x -= 9;
    y++;
  }

  System.out.println(x + ", " + y);
}
```

11. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int a;
  double x, y;

  a = Integer.parseInt(cin.readLine());
  x = Double.parseDouble(cin.readLine());
  y = Double.parseDouble(cin.readLine());

  if (a == 3) {
    x = x / 4;
```

```
    y = Math.pow(y, 5);
  }
  else {
    if (a == 7) {
      x = x * 3;
      y++;
    }
    else {
      if (a == 22) {
        x = x % 4;
        y += 9;
      }
      else {
        x -= 9;
        y++;
      }
    }
  }

  System.out.println(x + ", " + y);
}
```

12. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int color;

  System.out.println("1. Red");
  System.out.println("2. Green");
  System.out.println("3. Blue");
  System.out.println("4. White");
  System.out.println("5. Black");
  System.out.println("6. Gray");
  System.out.print("Select a color: ");
  color = Integer.parseInt(cin.readLine());

  System.out.print("Your color in hexadecimal is: ");

  switch (color) {
    case 1:
      System.out.println("FF0000");
      break;
    case 2:
      System.out.println("00FF00");
      break;
    case 3:
      System.out.println("0000FF ");
      break;
    case 4:
      System.out.println("FFFFFF ");
      break;
    case 4:
      System.out.println("000000");
```

```
      break;
    case 6:
      System.out.println("7F7F7F ");
      break;
    default:
      System.out.println("Unknown color!");
  }
}
```

13. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int color;

  System.out.println("1. Red");
  System.out.println("2. Green");
  System.out.println("3. Blue");
  System.out.println("4. White");
  System.out.println("5. Black");
  System.out.println("6. Gray");
  System.out.print("Select a color: ");
  color = Integer.parseInt(cin.readLine());

  System.out.print("Your color in hexadecimal is: ");

  if (color == 1) {
    System.out.println("FF0000");
  }
  else {
    if (color == 2) {
      System.out.println("00FF00");
    }
    else {
      if (color == 3) {
        System.out.println("0000FF ");
      }
      else {
        if (color == 4) {
          System.out.println("FFFFFF ");
        }
        else {
          if (color == 5) {
            System.out.println("000000");
          }
          else {
            if (color == 6) {
              System.out.println("7F7F7F ");
            }
            else {
              System.out.println("Unknown color!");
            }
          }
        }
```

```
      }
    }
  }
}
```

14. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int a;

  a = Integer.parseInt(cin.readLine());

  if (a > 1000)
    System.out.println("Big Positive");
  else {
    if (a > 0)
      System.out.println("Positive");
    else {
      if (a < -1000)
        System.out.println("Big Negative");
      else {
        if (a < 0)
          System.out.println("Negative");
        else
          System.out.println("Zero");
      }
    }
  }
}
```

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int a;

  a = Integer.parseInt(cin.readLine());

  if (a > 1000)
    System.out.println("Big Positive");
  else if (a > 0)
    System.out.println("Positive");
  else if (a < -1000)
    System.out.println("Big Negative");
  else if (a < 0)
    System.out.println("Negative");
  else
    System.out.println("Zero");
}
```

15. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
```

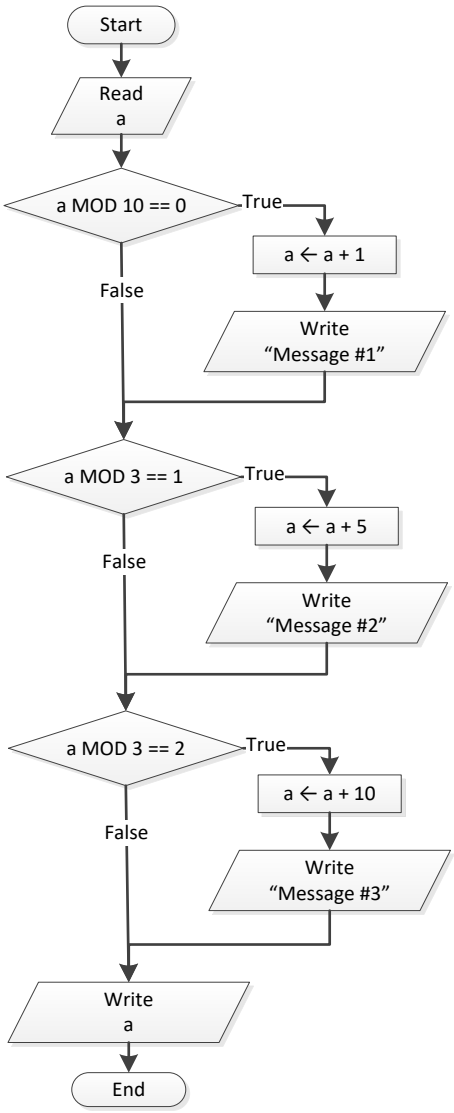
```
  double a, y;

  a = Double.parseDouble(cin.readLine());

  if (a < 1) {
    y = 5 + a;
    System.out.println(y);
  }
  else if (a < 5) {
    y = 23 / a;
    System.out.println(y);
  }
  else if (a < 10) {
    y = 5 * a;
    System.out.println(y);
  }
  else {
    System.out.println("Error!");
  }
}
```

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double a, y;

  a = Double.parseDouble(cin.readLine());

  if (a < 1) {
    y = 5 + a;
    System.out.println(y);
  }
  else {
    if (a < 5) {
      y = 23 / a;
      System.out.println(y);
    }
    else {
      if (a < 10) {
        y = 5 * a;
        System.out.println(y);
      }
      else {
        System.out.println("Error!");
      }
    }
  }
}
```

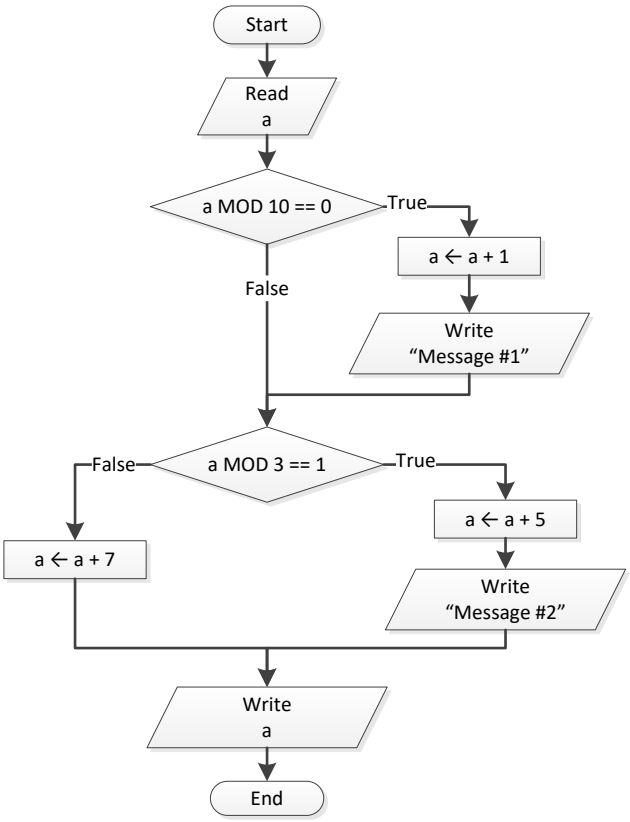
Chapter 22

22.4 Answers of Review Exercises

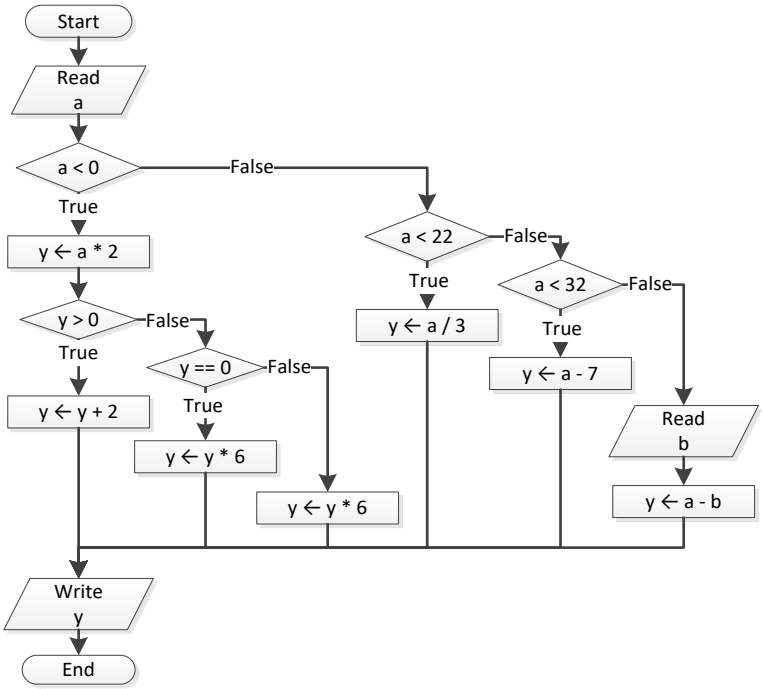
1. Solution



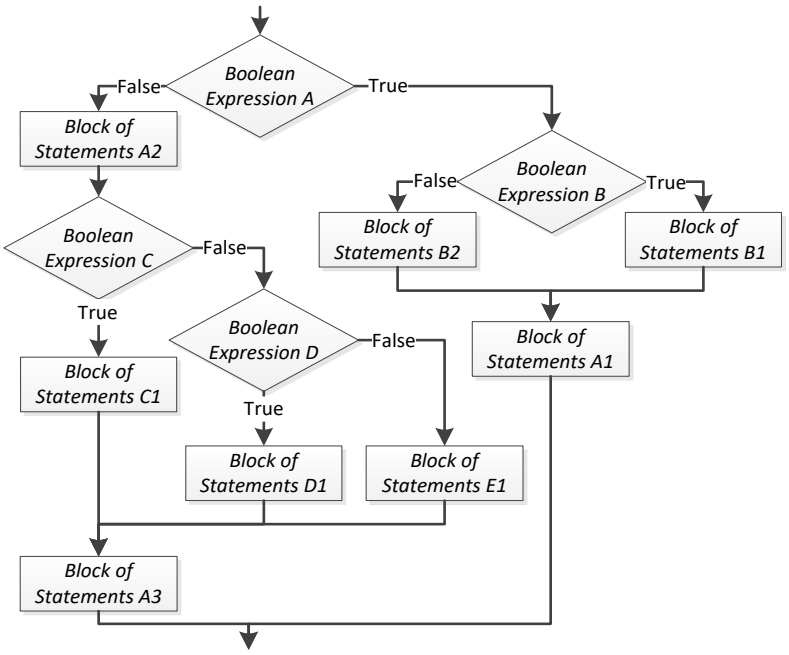
2. Solution



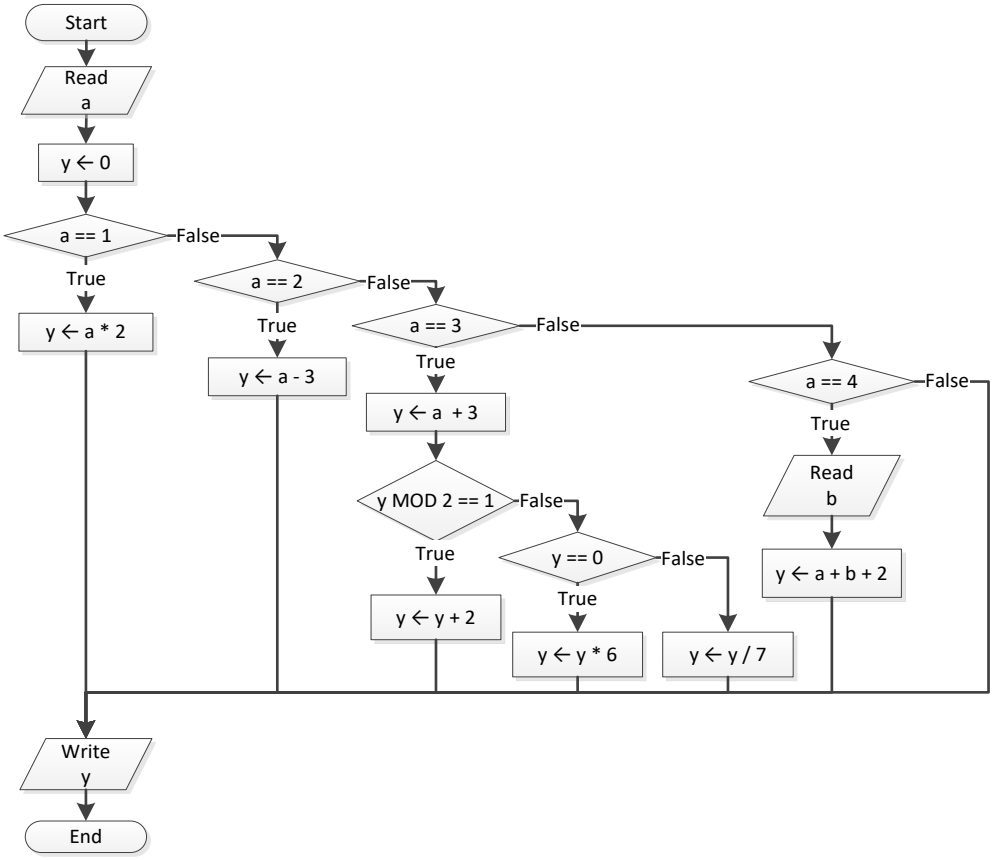
3. Solution



4. Solution



5. Solution



6. Solution

```
public static void main(String[] args) throws java.io.IOException {
  double x, y, z;

  x = Double.parseDouble(cin.readLine());
  y = Double.parseDouble(cin.readLine());

  if (x != 100 || y <= 10) {
    z = Double.parseDouble(cin.readLine());
    if (z <= x + y) {
      x -= 3;
      y = x + 4;
    }
  }
  System.out.println(x + ", " + y);
}
```

7. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int x;

  x = Integer.parseInt(cin.readLine());

  if (x == 1) {
    System.out.println("Good Morning");
    System.out.println("How do you do?");
    System.out.println("Is everything okay?");
  }
  else if (x == 2) {
    System.out.println("Good Evening");
    System.out.println("How do you do?");
    System.out.println("Is everything okay?");
  }
  else if (x == 3) {
    System.out.println("Good Afternoon");
    System.out.println("Is everything okay?");
  }
  else {
    System.out.println("Good Night");
  }
}
```

8. Solution

```
static final String IS_NUMERIC = "[+-]?\\d+(\\.\\d+)?";

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int x;
  String x_str;
```

```
  x_str = cin.readLine();

  if (x_str.matches(IS_NUMERIC) == true) {
    x = Integer.parseInt(x_str);
    if (x % 10 == 0) {
      System.out.println("Last digit equal to 0");
    }
    else if (x % 10 == 1) {
      System.out.println("Last digit equal to 1");
    }
    else {
      System.out.println("None");
    }
  }
  else {
    if (x_str.equals("Exit") == true) {
      System.out.println("Bye");
    }
    else {
      System.out.println("Invalid Number");
    }
  }
}
```

9. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double a, b, y;

  a = Double.parseDouble(cin.readLine());
  b = Double.parseDouble(cin.readLine());

  y = a * b;

  if (y > 0) {
    y--;
    y /= 2;
  }
  else {
    y +=10;
    if (y > 0) {
      y /= 2;
    }
    else {
      y *= 2;
    }
  }
}
```

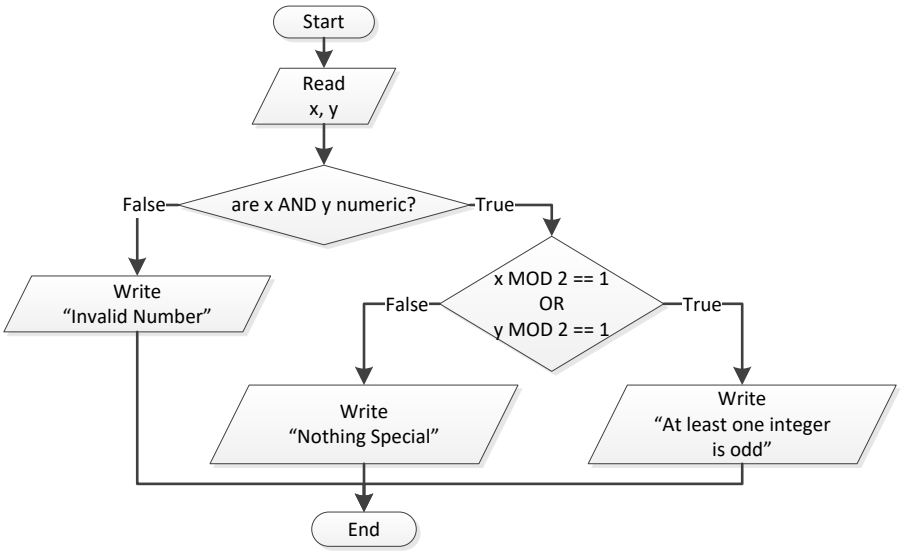
10. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double a, b, c;

  a = Double.parseDouble(cin.readLine());
  b = Double.parseDouble(cin.readLine());
  c = Double.parseDouble(cin.readLine());

  c = a * b + c;
  if (c > 0) {
    c /= 2;
    if (a > b) {
      a *= 2;
      b *= 2;
    }
    else {
      c /= 20;
      if (c <= 10) {
        b *= 2;
      }
    }
  }
  else {
    c /= 3;
    c /= 20;
    if (c <= 10) {
      b *= 2;
    }
  }
  System.out.println(a + ", " + b  + ", " + c);
}
```

Chapter 23

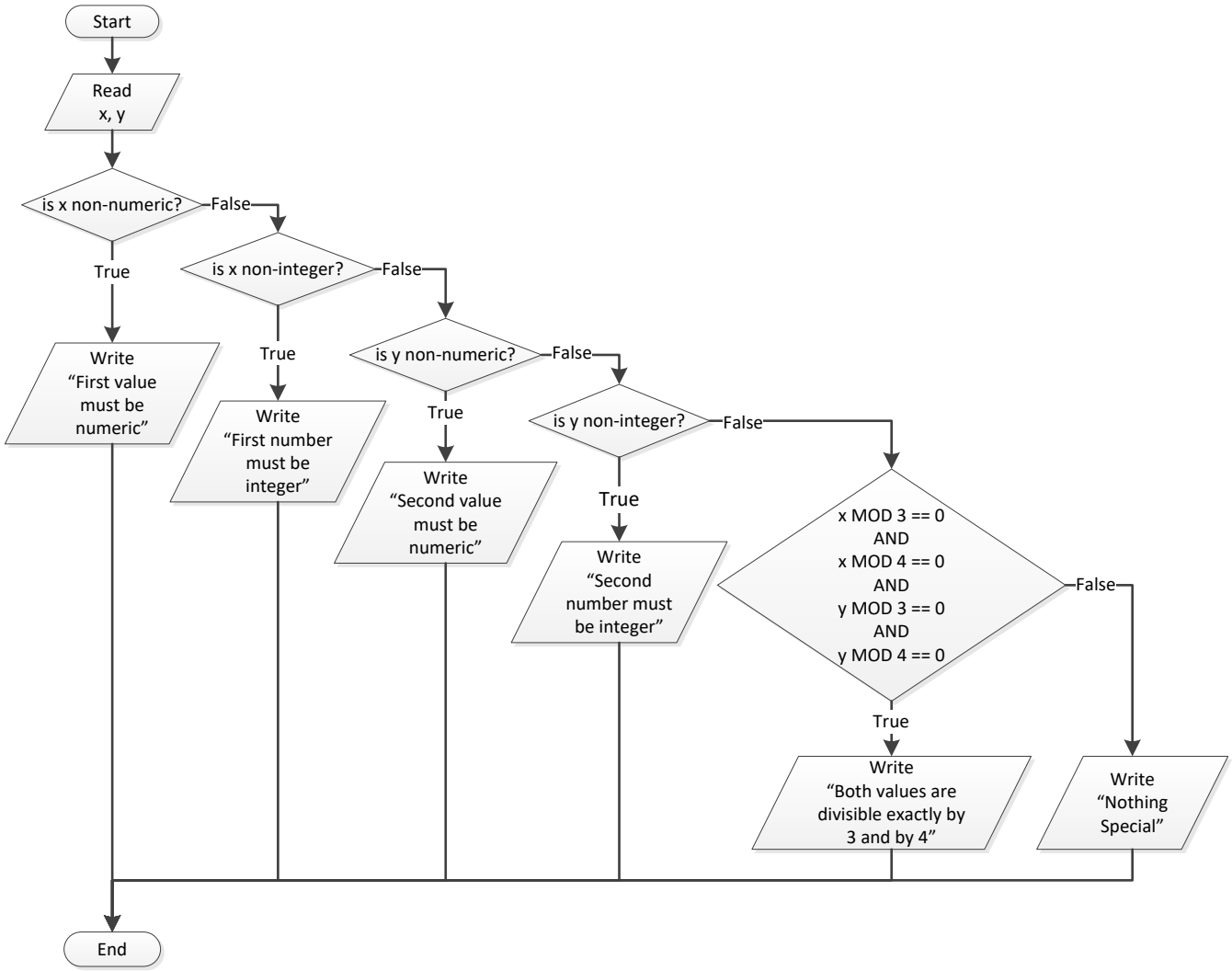
23.6 Answers of Review Exercises

1. Solution




```
static final String IS_NUMERIC = "[+-]?\\d+(\\.\\d+)?";

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int x, y;
  String x_str, y_str;

  x_str = cin.readLine();
  y_str = cin.readLine();

  if (x_str.matches(IS_NUMERIC) == true && y_str.matches(IS_NUMERIC) == true) {
    x = Integer.parseInt(x_str);
    y = Integer.parseInt(y_str);

    if (x % 2 == 1 || y % 2 == 1) {
      System.out.println("At least one integer is odd");
    }
    else {
      System.out.println("Nothing Special");
    }
  }
  else {
    System.out.println("Invalid Number");
  }
}
```

2. Solution




```
static final String IS_NUMERIC = "[+-]?\\d+(\\.\\d+)?";

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int x, y;
  String x_str, y_str;

  x_str = cin.readLine();
  y_str = cin.readLine();

  if (x_str.matches(IS_NUMERIC) != true) {
    System.out.println("First value must be numeric");
  }
  else if (Double.parseDouble(x_str) != (int)Double.parseDouble(x_str)) {
    System.out.println("First number must be integer");
  }
  else if (y_str.matches(IS_NUMERIC) != true) {
    System.out.println("Second value must be numeric");
```

```
  }
  else if (Double.parseDouble(y_str) != (int)Double.parseDouble(y_str)) {
    System.out.println("Second number must be integer");
  }
  else {
    x = Integer.parseInt(x_str);
    y = Integer.parseInt(y_str);

    if (x % 3 == 0 && x % 4 == 0 && y % 3 == 0 && y % 4 == 0 ) {
      System.out.println("Both values are divisible exactly by 3 and by 4");
    }
    else {
      System.out.println("Nothing Special");
    }
  }
}
```

3. Solution

```
static final String IS_NUMERIC = "[+-]?\\d+(\\.\\d+)?";

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int choice;
  double t;
  String t_str;

  System.out.println("1. Convert Kelvin to Fahrenheit");
  System.out.println("2. Convert Fahrenheit to Kelvin");
  System.out.println("3. Convert Fahrenheit to Celsius");
  System.out.println("4. Convert Celsius to Fahrenheit");

  System.out.print("Enter a choice: ");
  choice = Integer.parseInt(cin.readLine());
  System.out.print("Enter a temperature: ");
  t_str = cin.readLine();

  if (choice < 1 || choice > 4) {
    System.out.println("Wrong choice");
  }
  else if (t_str.matches(IS_NUMERIC) != true) {
    System.out.println("Wrong temperature");
  }
  else {
    t = Double.parseDouble(t_str);
    switch (choice) {
      case 1:
        System.out.println(1.8 * t - 459.67);
        break;
      case 2:
        System.out.println((t + 459.57) / 1.8);
        break;
      case 3:
        System.out.println(5 / 9 * (t - 32));
```

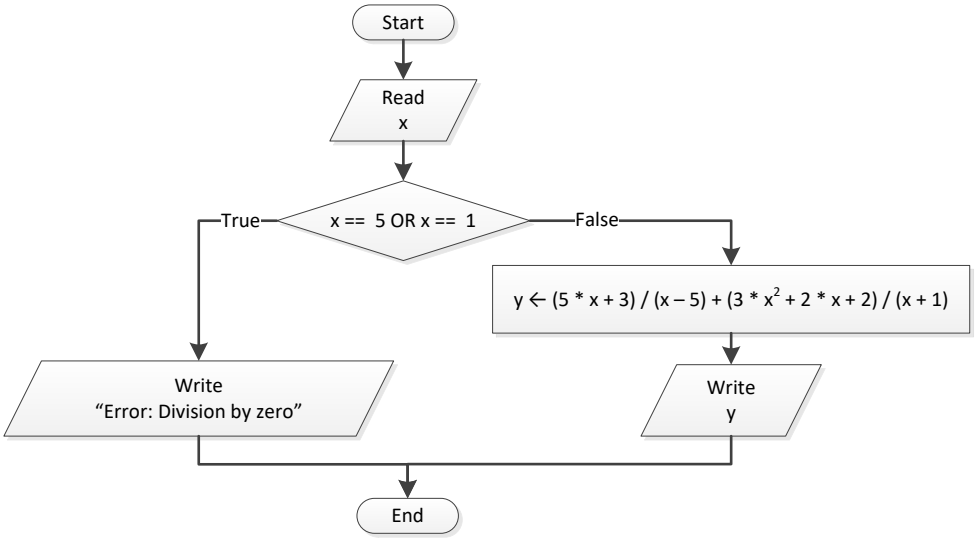
```
        break;
      case 4:
        System.out.println(9 / 5 * t + 32);
        break;
    }
  }
}
```

4. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int a, b;
  String op;

  System.out.print("Enter 1st integer: ");
  a = Integer.parseInt(cin.readLine());
  System.out.print("Enter type of operation: ");
  op = cin.readLine();
  System.out.print("Enter 2nd integer: ");
  b = Integer.parseInt(cin.readLine());

  switch (op) {
    case "+":
      System.out.println(a + b);
      break;
    case "-":
      System.out.println(a - b);
      break;
    case "*":
      System.out.println(a * b);
      break;
    case "/":
      if (b == 0) {
        System.out.println("Error: Division by zero");
      }
      else {
        System.out.println(a / (double)b);
      }
      break;
    case "DIV":
      if (b == 0) {
        System.out.println("Error: Division by zero");
      }
      else {
        System.out.println((int)(a / b));
      }
      break;
    case "MOD":
      if (b == 0) {
        System.out.println("Error: Division by zero");
      }
      else {
        System.out.println(a % b);
```

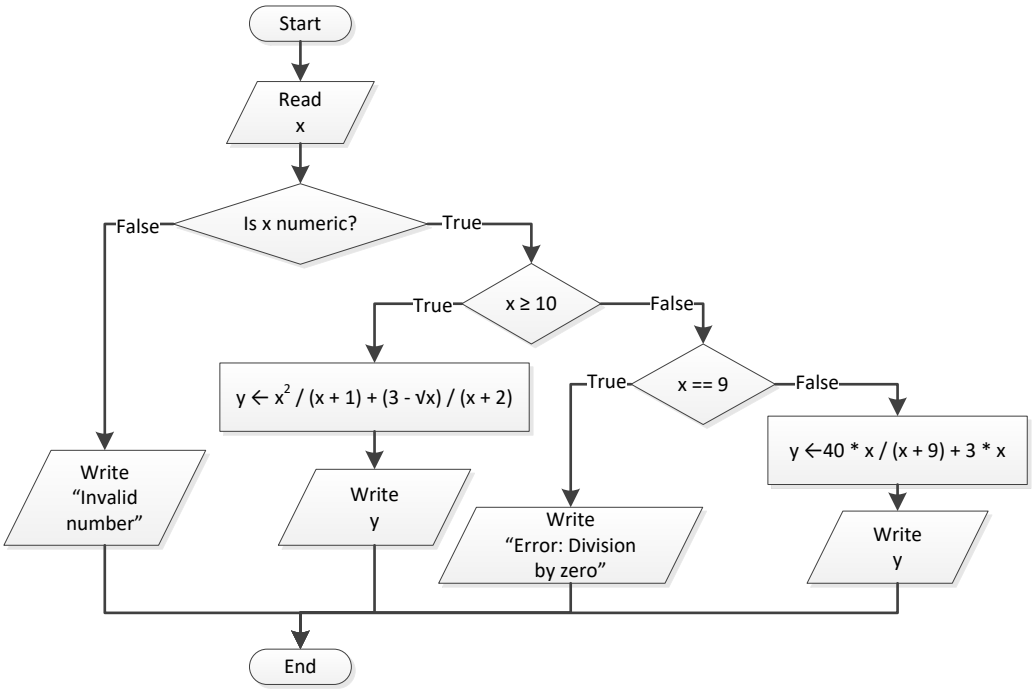
```
      }
      break;
    case "POWER":
      System.out.println(Math.pow(a, b));
      break;
  }
}
```

5. Solution




```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double x, y;

  x = Double.parseDouble(cin.readLine());

  if (x == 5 || x == 1) {
    System.out.println("Error: Division by zero");
  }
  else {
    y = (5 * x + 3) / (x - 5) + (3 * Math.pow(x, 2) + 2 * x + 2) / (x + 1);
    System.out.println(y);
  }
}
```

6. Solution




```
static final String IS_NUMERIC = "[+-]?\\d+(\\.\\d+)?";

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double x, y;
  String x_str;

  x_str = cin.readLine();

  if (x_str.matches(IS_NUMERIC) == true) {
    x = Double.parseDouble(x_str);
    if (x >= 10) {
      y = Math.pow(x, 2) / (x + 1) + (3 - Math.sqrt(x)) / (x + 2);
      System.out.println(y);
    }
    else {
      if (x == 9) {
        System.out.println("Error: Division by zero");
      }
      else {
        y = 40 * x / (x + 9) + 3 * x;
        System.out.println(y);
      }
    }
  }
  else {
    System.out.println("Invalid number");
  }
}
```

7. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double x, y;

  x = Double.parseDouble(cin.readLine());

  if (x <= -15 || x > 25) {
    y = x - 1;
    System.out.println(y);
  }
  else if (x <= -10) {
    y = x / Math.sqrt(x + 30) + Math.pow(8 + x, 2) / (x + 1);
    System.out.println(y);
  }
  else if (x <= 0) {
    y = Math.abs(40 * x) / (x - 8);
    System.out.println(y);
  }
  else {
    if (x == 9) {
      System.out.println("Error: Division by zero");
    }
    else if (x < 9) {
      System.out.println("Error: Invalid square root");
    }
    else {
      y = 3 * x / Math.sqrt(x - 9);
      System.out.println(y);
    }
  }
}
```

8. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int age1, age2, age3, max, middle, min;

  System.out.print("Enter age for person No1:");
  age1 = Integer.parseInt(cin.readLine());
  System.out.print("Enter age for person No2:");
  age2 = Integer.parseInt(cin.readLine());
  System.out.print("Enter age for person No3:");
  age3 = Integer.parseInt(cin.readLine());

  min = age1;
  if (age2 < min) {
    min = age2;
  }
  if (age3 < min) {
    min = age3;
```

```
  }
  max = age1;
  if (age2 > max) {
    max = age2;
  }
  if (age3 > max) {
    max = age3;
  }

  middle = age1 + age2 + age3 - min - max;
  System.out.println(middle);
}
```

9. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int a1, a2, a3, max, middle, min;
  String max_name, min_name, n1, n2, n3;

  System.out.print("Enter the age of the first person: ");
  a1 = Integer.parseInt(cin.readLine());
  System.out.print("Enter the name of the first person: ");
  n1 = cin.readLine();
  System.out.print("Enter the age of the second person: ");
  a2 = Integer.parseInt(cin.readLine());
  System.out.print("Enter the name of the second person: ");
  n2 = cin.readLine();
  System.out.print("Enter the age of the third person: ");
  a3 = Integer.parseInt(cin.readLine());
  System.out.print("Enter the name of the third person: ");
  n3 = cin.readLine();

  min = a1;
  min_name = n1;
  if (a2 > min) {
    min = a2;
    min_name = n2;
  }
  if (a3 > min) {
    min = a3;
    min_name = n3;
  }

  max = a1;
  max_name = n1;
  if (a2 > max) {
    max = a2;
    max_name = n2;
  }
  if (a3 > max) {
    max = a3;
    max_name = n3;
  }
```

```
  middle = a1 + a2 + a3 - min - max;

  if (Math.abs(max - middle) < Math.abs(min - middle)) {
    System.out.println(max_name);
  }
  else {
    System.out.println(min_name);
  }
}
```

10. Solution

```
static final String IS_NUMERIC = "[+-]?\\d+(\\.\\d+)?";

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int digit1, digit2, digit3, r, x, sum;
  String x_str;

  System.out.print("Enter a three-digit integer: ");
  x_str = cin.readLine();

  if (x_str.matches(IS_NUMERIC) != true) {
    System.out.println("Entered value contains non-numeric characters");
  }
  else if (Integer.parseInt(x_str) < 100 || Integer.parseInt(x_str) > 999) {
    System.out.println("Entered integer is not a three-digit integer");
  }
  else {
    x = Integer.parseInt(x_str);
    digit1 = (int)(x / 100);
    r = x % 100;

    digit2 = (int)(r / 10);
    digit3 = r % 10;

    sum = (int)(Math.pow(digit1, 3) + Math.pow(digit2, 3) + Math.pow(digit3, 3));

    if (sum == x) {
      System.out.println("You entered an Armstrong number!");
    }
    else {
      System.out.println("You entered a non-Armstrong number!");
    }
  }
}
```

11. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int d, m, y;
```

```
  System.out.print("Enter day 1 - 31: ");
  d = Integer.parseInt(cin.readLine());
  System.out.print("Enter month 1 - 12: ");
  m = Integer.parseInt(cin.readLine());
  System.out.print("Enter year: ");
  y = Integer.parseInt(cin.readLine());

  if (m == 2) {
    if (y % 4 == 0 && y % 100 != 0 || y % 400 == 0) {
      System.out.println(29 - d);
    }
    else {
      System.out.println(28 - d);
    }
  }
  else if (m == 4 || m == 6 || m == 9 || m == 11) {
    System.out.println(30 - d);
  }
  else {
    System.out.println(31 - d);
  }
}
```

12. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  String word, word1, word2;

  word = cin.readLine();

  //Using substring() instead of charAt() method
  //is more convenient in this case
  word1 = word.substring(0, 1).toUpperCase() +
          word.substring(1, 2).toLowerCase() +
          word.substring(2, 3).toUpperCase() +
          word.substring(3, 4).toLowerCase() +
          word.substring(4, 5).toUpperCase() +
          word.substring(5, 6).toLowerCase();

  word2 = word.substring(0, 1).toLowerCase() +
          word.substring(1, 2).toUpperCase() +
          word.substring(2, 3).toLowerCase() +
          word.substring(3, 4).toUpperCase() +
          word.substring(4, 5).toLowerCase() +
          word.substring(5, 6).toUpperCase();

  if (word.equals(word1) == true || word.equals(word2) == true) {
    System.out.println("Word is okay!");
  }
  else {
    System.out.println("Word is not okay");
  }
```

```
}
```

13. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int q;
  double discount, payment;

  System.out.print("Enter quantity: ");
  q = Integer.parseInt(cin.readLine());

  if (q < 3) {
    discount = 0;
  }
  else if (q < 6) {
    discount = 10;
  }
  else if (q < 10) {
    discount = 15;
  }
  else if (q < 14) {
    discount = 20;
  }
  else if (q < 20) {
    discount = 27;
  }
  else {
    discount = 30;
  }

  payment = q * 10 - q * 10 * discount / 100.0;

  System.out.println("You got a discount of " + discount + "%");
  System.out.println("You must pay $" + payment);
}
```

14. Solution

```
static final String IS_NUMERIC = "[+-]?\\d+(\\.\\d+)?";
static final double VAT = 0.19;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double amount, discount, payment;
  String amount_str;

  System.out.print("Enter total amount: ");
  amount_str = cin.readLine();

  if (amount_str.matches(IS_NUMERIC) != true) {
    System.out.println("Entered value contains non-numeric characters");
  }
```

```
  else if (Double.parseDouble(amount_str) < 0) {
    System.out.println("Entered non-negative value");
  }
  else {
    amount = Double.parseDouble(amount_str);
    if (amount < 50) {
      discount = 0;
    }
    else if (amount < 100) {
      discount = 1;
    }
    else if (amount < 250) {
      discount = 2;
    }
    else {
      discount = 3;
    }

    payment = amount + amount * VAT;
    payment = payment - payment * discount / 100;

    System.out.println("You got a discount of " + discount + "%");
    System.out.println("You must pay $" + payment);
  }
}
```

15. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int a, h, w;
  double bmi;

  System.out.print("Enter age: ");
  a = Integer.parseInt(cin.readLine());
  if (a < 18) {
    System.out.println("Invalid age");
  }
  else {
    System.out.print("Enter weight in pounds: ");
    w = Integer.parseInt(cin.readLine());
    System.out.print("Enter height in inches: ");
    h = Integer.parseInt(cin.readLine());

    bmi = w * 703 / Math.pow(h ,2);

    if (bmi < 15) {
      System.out.println("Very severely underweight");
    }
    else if (bmi < 16) {
      System.out.println("Severely underweight");
    }
    else if (bmi < 18.5) {
      System.out.println("Underweight");
```

```
    }
    else if (bmi < 25) {
      System.out.println("Normal");
    }
    else if (bmi < 30) {
      System.out.println("Overweight");
    }
    else if (bmi < 35) {
      System.out.println("Severely overweight");
    }
    else {
      System.out.println("Very severely overweight");
    }
  }
}
```

16. Solution

```
static final String IS_NUMERIC = "[+-]?\\d+(\\.\\d+)?";
static final double TAX_RATE = 0.10;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int water;
  String water_str;
  double total;

  System.out.print("Enter water consumption (in cubic feet): ");
  water_str = cin.readLine();

  if (water_str.matches(IS_NUMERIC) != true) {
    System.out.println("Entered value contains non-numeric characters");
  }
  else if (Integer.parseInt(water_str) < 0) {
    System.out.println("Entered value is negative");
  }
  else {
    water = Integer.parseInt(water_str);
    if (water <= 10) {
      total = water * 3;
    }
    else if (water <= 20) {
      total = 10 * 3 + (water - 10) * 5;
    }
    else if (water <= 35) {
      total = 10 * 3 + 10 * 5 + (water - 20) * 7;
    }
    else {
      total = 10 * 3 + 10 * 5 + 15 * 7 + (water - 35) * 9;
    }

    total = total + total * TAX_RATE;
    System.out.println("Total amount to pay (taxes included): " + total);
  }
```

```
}
```

17. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int children;
  double income, tax;

  System.out.print("Enter taxable income: ");
  income = Double.parseDouble(cin.readLine());
  System.out.print("Enter number of children: ");
  children = Integer.parseInt(cin.readLine());

  if (income <= 8000) {
    tax = income * 0.10;
  }
  else if (income <= 30000) {
    tax = 8000 * 0.10 + (income - 8000) * 0.15;
  }
  else if (income <= 70000) {
    tax = 8000 * 0.10 + 22000 * 0.15 + (income - 30000) * 0.25;
  }
  else {
    tax = 8000 * 0.10 + 22000 * 0.15 + 40000 * 0.25 + (income - 70000) * 0.30;
  }

  if (children > 0) {
    tax = tax - tax * 0.02;
  }
  System.out.println("Tax: " + tax);
}
```

18. Solution

```
static final String IS_NUMERIC = "[+-]?\\d+(\\.\\d+)?";

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double wind;
  String wind_str;

  System.out.print("Enter wind speed (in miles/hour): ");
  wind_str = cin.readLine();

  if (wind_str.matches(IS_NUMERIC) != true) {
    System.out.println("Entered value contains non-numeric characters");
  }
  else {
    wind  = Double.parseDouble(wind_str);
    if (wind < 0) {
      System.out.println("Entered value is negative");
    }
```

```
    else {
      if (wind < 1) {
        System.out.println("Beaufort: 0\nCalm");
      }
      else if (wind < 4) {
        System.out.println("Beaufort: 1\nLight air");
      }
      else if (wind < 8) {
        System.out.println("Beaufort: 2\nLight breeze");
      }
      else if (wind < 13) {
        System.out.println("Beaufort: 3\nGentle breeze");
      }
      else if (wind < 18) {
        System.out.println("Beaufort: 4\nModerate breeze");
      }
      else if (wind < 25) {
        System.out.println("Beaufort: 5\nFresh breeze");
      }
      else if (wind < 31) {
        System.out.println("Beaufort: 6\nStrong breeze");
      }
      else if (wind < 39) {
        System.out.println("Beaufort: 7\nModerate gale");
      }
      else if (wind < 47) {
        System.out.println("Beaufort: 8\nGale");
      }
      else if (wind < 55) {
        System.out.println("Beaufort: 9\nStrong gale");
      }
      else if (wind < 64) {
        System.out.println("Beaufort: 10\nStorm");
      }
      else if (wind < 74) {
        System.out.println("Beaufort: 11\nViolent storm");
      }
      else {
        System.out.println("Beaufort: 12\nHurricane force");
      }

      if (wind < 13) {
        System.out.println("It's Fishing Day!!!");
      }
    }
  }
}
```

Chapter 24

24.3 Answers of Review Questions: True/False

1. true
2. true
3. false
4. false
5. true

Chapter 25

25.2 Answers of Review Questions: True/False

1. true
2. false
3. false
4. false
5. false
6. true
7. true

25.3 Answers of Review Questions: Multiple Choice

1. c
2. b
3. d
4. b
5. c
6. b

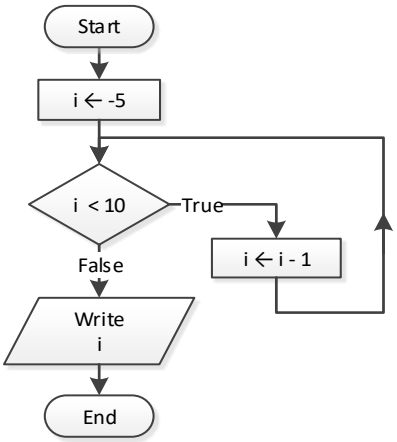
25.4 Answers of Review Exercises

1. Solution

Step	Statement	i	x
1	`i = 3`	**3**	?
2	`x = 0`	3	**0**
3	`while (i >= 0)`	True	
4	`i--`	**2**	0
5	`x += i`	2	**2**
6	`while (i >= 0)`	True	
7	`i--`	**1**	2
8	`x += i`	1	**3**
9	`while (i >= 0)`	True	
10	`i--`	**0**	3
11	`x += i`	0	**3**
12	`while (i >= 0)`	True	
13	`i--`	**-1**	3
14	`x += i`	-1	**2**
15	`while (i >= 0)`	False	
16	`System.out.println(x)`	2 is displayed	

It performs 3 iterations

2. Solution



Step	Statement	Notes	i
1	`i = -5`		**-5**
2	`while (i < 10)`	True	
3	`i--`		**-6**
4	`while (i < 10)`	True	
5	`i--`		**-7**
6	`while (i < 10)`	True	
7	`i--`		**-8**
8	…	**…**	**…**
9	…	**…**	**…**

It performs an infinite number of iterations

3. Solution

Step	Statement	a	b	c	d
1	`a = 2`	**2**	?	?	?
2	`while (a <= 10)`	True			
3	`b = a + 1`	2	**3**	?	?
4	`c = b * 2`	2	3	**6**	?
5	`d = c - b + 1`	2	3	6	**4**
6	`d == 4`	True			
7	`System.out.println(b + ", " + c)`	3, 6 is displayed			
8	`a += 4`	**6**	3	6	4
9	`while (a <= 10)`	True			
10	`b = a + 1`	6	**7**	6	4
11	`c = b * 2`	6	7	**14**	4

12	`d = c - b + 1`	6	7	14	**8**
13	`d == 4`	False			
14	`d == 5`	False			
15	`d == 8`	True			
16	`System.out.println(a + ", " + b)`	6, 7 is displayed			
17	`a += 4`	**10**	7	14	8
18	`while (a <= 10)`	True			
19	`b = a + 1`	10	**11**	14	8
20	`c = b * 2`	10	11	**22**	8
21	`d = c - b + 1`	10	11	22	**12**
22	`d == 4`	False			
23	`d == 5`	False			
24	`d == 8`	False			
25	`System.out.println(a + ", " + b + ", " + d)`	10, 11, 12 is displayed			
26	`a += 4`	**14**	11	22	12
27	`while (a <= 10)`	False			

4. Solution

Step	Statement	a	b	c	d	x
1	`a = 1`	**1**	?	?	?	?
2	`b = 1`	1	**1**	?	?	?
3	`c = 0`	1	1	**0**	?	?
4	`d = 0`	1	1	0	**0**	?
5	`while (b < 2)`	True				
6	`x = a + b`	1	1	0	0	**2**
7	`if (x % 2 != 0)`	False				
8	`d = d + 1`	1	1	0	**1**	2
9	`a = b`	**1**	1	0	1	2
10	`b = c`	1	**0**	0	1	2
11	`c = d`	1	0	**1**	1	2
12	`while (b < 2)`	True				
13	`x = a + b`	1	0	1	1	**1**
14	`if (x % 2 != 0)`	True				
15	`c = c + 1`	1	0	**2**	1	1
16	`a = b`	**0**	0	2	1	1
17	`b = c`	0	**2**	2	1	1

18	`c = d`	0	2	**1**	1	1
19	`while (b < 2)`	False				

5. Solution

i. -1
ii. 9
iii. 0.25
iv. -7
v. Any value between 17 and 32
vi. 1.4

6. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double a, sum;
  int i, n;

  n = Integer.parseInt(cin.readLine());
  sum = 0;

  i = 1;
  while (i <= n) {
    a = Double.parseDouble(cin.readLine());
    sum = sum + a;
    i++;
  }

  System.out.println(sum);
  if (n > 0) {
    System.out.println(sum / n);
  }
}
```

7. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int a, i, n, p;

  n = Integer.parseInt(cin.readLine());
  p = 1;

  i = 1;
  while (i <= n) {
    a = Integer.parseInt(cin.readLine());
    if (a % 2 == 0) {
      p = p * a;
    }
    i++;
```

```
  }
  System.out.println(p);
}
```

8. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int a, i, sum;

  sum = 0;

  i = 1;
  while (i <= 100) {
    a = Integer.parseInt(cin.readLine());
    if (a % 10 == 0) {
      sum = sum + a;
    }
    i++;
  }
  System.out.println(sum);
}
```

9. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int a, i, sum;

  sum = 0;

  i = 1;
  while (i <= 20) {
    a = Integer.parseInt(cin.readLine());
    if (a >= 100 && a <= 999) {
      sum = sum + a;
    }
    i++;
  }
  System.out.println(sum);
}
```

10. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double a, p;

  p = 1;

  a = Double.parseDouble(cin.readLine());
  while (a != 0) {
    p = p * a;
```

```
    a = Double.parseDouble(cin.readLine());
  }
  System.out.println(p);
}
```

Step	Statement	a	p
1	`p = 1`	?	**1**
2	`a = Double.parseDouble(cin.readLine())`	**3**	1
3	`while (a != 0)`	True	
4	`p = p * a`	3	**3**
5	`a = Double.parseDouble(cin.readLine())`	**2**	3
6	`while (a != 0)`	True	
7	`p = p * a`	2	**6**
8	`a = Double.parseDouble(cin.readLine())`	**9**	6
9	`while (a != 0)`	True	
10	`p = p * a`	9	**54**
11	`a = Double.parseDouble(cin.readLine())`	**0**	54
12	`while (a != 0)`	False	
13	`System.out.println(p)`	54 is displayed	

11. Solution

```
public static void main(String[] args) throws java.io.IOException {
  int years;
  double population;

  population = 30000;

  years = 0;
  while (population <= 100000) {
    population += population * 0.03;
    years++;
  }
  System.out.println(years);
}
```

Chapter 26

26.2 Answers of Review Questions: True/False

1. false
2. true
3. true
4. false
5. false
6. false
7. true

26.3 Answers of Review Questions: Multiple Choice

1. c
2. a
3. b
4. c
5. a

26.4 Answers of Review Exercises

1. Solution

```
public static void main(String[] args) throws java.io.IOException {
  int i;

  i = 3;
  do {
    i--;
  } while (i > 0);
  System.out.println("The end");
}
```

2. Solution

Step	Statement	x	y
1	`y = 5`	?	**5**
2	`x = 38`	**38**	5
3	`y *= 2`	38	**10**
4	`x++`	**39**	10
5	`System.out.println(y)`	10 is displayed	
6	`while (y < x)`	True	
7	`y *= 2`	39	**20**
8	`x++`	**40**	20
9	`System.out.println(y)`	20 is displayed	
10	`while (y < x)`	True	
11	`y *= 2`	40	**40**
12	`x++`	**41**	40
13	`System.out.println(y)`	40 is displayed	

14	`while (y < x)`	True	
15	`y *= 2`	41	**80**
16	`x++`	**42**	80
17	`System.out.println(y)`	80 is displayed	
18	`while (y < x)`	False	

3. Solution

Step	Statement	Notes	x
1	`x = 1`		**1**
2	`if (x % 2 == 0)`	False	
3	`x += 3`		**4**
4	`System.out.println(x)`	4 is displayed	
5	`while (x < 12)`	True	
6	`if (x % 2 == 0)`	True	
7	`x++`		**5**
8	`System.out.println(x)`	5 is displayed	
9	`while (x < 12)`	True	
10	`if (x % 2 == 0)`	False	
11	`x += 3`		**8**
12	`System.out.println(x)`	8 is displayed	
13	`while (x < 12)`	True	
14	`if (x % 2 == 0)`	True	
15	`x++`		**9**
16	`System.out.println(x)`	9 is displayed	
17	`while (x < 12)`	True	
18	`if (x % 2 == 0)`	False	
19	`x += 3`		**12**
20	`System.out.println(x)`	12 is displayed	
21	`while (x < 12)`	False	

4. Solution

Step	Statement	x	y
1	`y = 2`	?	**2**
2	`x = 0`	**0**	2
3	`y = Math.pow (y, 2)`	0	**4**
4	`if (x < 256)`	True	

5	`x = x + y`	**4**	
6	`System.out.println(x + ", " + y)`	4, 4 is displayed	
7	`while (y < 65535)`	True	
8	`y = Math.pow (y, 2)`	4	**16**
9	`if (x < 256)`	True	
10	`x = x + y`	**20**	16
11	`System.out.println(x + ", " + y)`	20, 16 is displayed	
12	`while (y < 65535)`	True	
13	`y = Math.pow (y, 2)`	20	**256**
14	`if (x < 256)`	True	
15	`x = x + y`	**276**	256
16	`System.out.println(x + ", " + y)`	276, 256 is displayed	
17	`while (y < 65535)`	True	
18	`y = Math.pow (y, 2)`	276	**65536**
19	`if (x < 256)`	False	
20	`System.out.println(x + ", " + y)`	276, 65536 is displayed	
21	`while (y < 65535)`	False	

5. Solution

Step	Statement	a	b	c	d	x
1	`a = 2`	**2**	?	?	?	?
2	`b = 4`	2	**4**	?	?	?
3	`c = 0`	2	4	**0**	?	?
4	`d = 0`	2	4	0	**0**	?
5	`x = a + b`	2	4	0	0	**6**
6	`if (x % 2 != 0)`	False				
7	`else if (d % 2 == 0)`	True				
8	`d = d + 5`	2	4	0	**5**	6
9	`a = b`	**4**	4	0	5	6
10	`b = d`	4	**5**	0	5	6
11	`while (c < 11)`	True				
12	`x = a + b`	4	5	0	5	**9**
13	`if (x % 2 != 0)`	True				

14	`c = c + 5`	4	5	**5**	5	9
15	`a = b`	**b**	5	5	5	9
16	`b = d`	5	**5**	5	5	9
17	`while (c < 11)`			True		
18	`x = a + b`	5	5	5	5	**10**
19	`if (x % 2 != 0)`			False		
20	`else if (d % 2 == 0)`			False		
21	`c = c + 3`	5	5	**8**	5	10
22	`a = b`	**5**	5	8	5	10
23	`b = d`	5	**5**	8	5	10
24	`x = a + b`	5	5	8	5	**10**
25	`c = c + 3`	5	5	**11**	5	10
26	`a = b`	**5**	5	11	5	10
27	`b = d`	5	**5**	11	5	10
28	`while (c < 11)`			False		

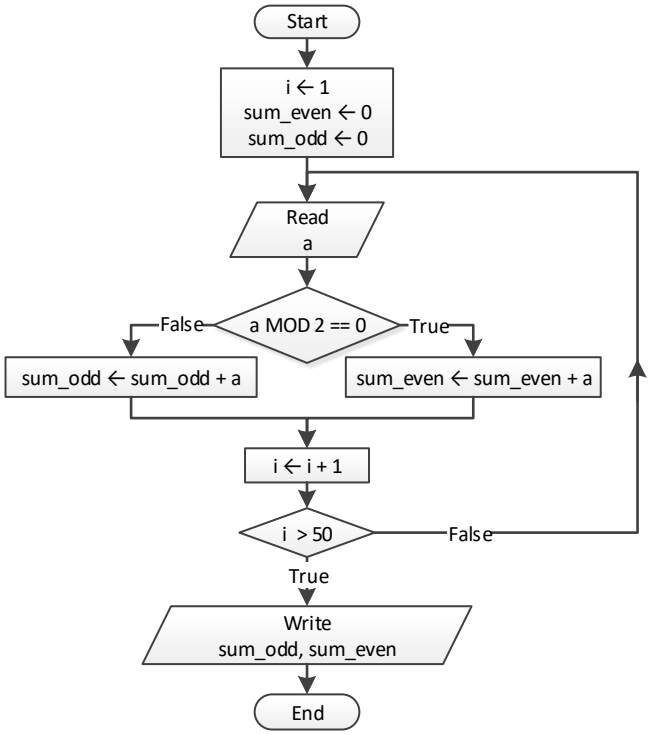
6. Solution

i. -1
ii. 18
iii. 0.5
iv. -20
v. 128
vi. 11.25

7. Solution

i. 4
ii. -2
iii. 2
iv. 10

8. Solution




```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int a, i, sum_even, sum_odd;

  i = 1;
  sum_even = 0;
  sum_odd = 0;
  do {
    a = Integer.parseInt(cin.readLine());
    if (a % 2 == 0) {
      sum_even += a;
    }
    else {
      sum_odd += a;
    }
    i++;
  } while (i <= 50);
  System.out.println(sum_even + ", " + sum_odd);
}
```

9. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int a, i, n, p;

  n = Integer.parseInt(cin.readLine());
  i = 1;
```

```
  p = 1;
  do {
    a = Integer.parseInt(cin.readLine());
    if (a < 0) {
      p *= a;
    }
    i++;
  } while (i <= n);
  System.out.println(Math.abs(p));
}
```

10. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int a, i, p;

  i = 1;
  p = 1;
  do {
    System.out.print("Enter an integer: ");
    a = Integer.parseInt(cin.readLine());
    if (a >= 500 && a <= 599) {
      p *= a;
    }
    i++;
  } while (i <= 5);
  System.out.println(p);
}
```

11. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int a, sum;

  sum = 0;

  a = Integer.parseInt(cin.readLine());
  if (a > 0) {
    do {
      sum = sum + a;
      a = Integer.parseInt(cin.readLine());
    } while (a > 0);
  }
  System.out.println(sum);
}
```

Step	Statement	a	sum
1	`sum = 0`	?	**0**
2	`a = Integer.parseInt(cin.readLine())`	**5**	0
3	`if (a > 0)`	True	

4	sum = sum + a	5	**5**
5	a = Integer.parseInt(cin.readLine())	**2**	5
6	while (a > 0)	True	
7	sum = sum + a	2	**7**
8	a = Integer.parseInt(cin.readLine())	**3**	7
9	while (a > 0)	True	
10	sum = sum + a	3	**10**
11	a = Integer.parseInt(cin.readLine())	**0**	10
12	while (a > 0)	False	

12. Solution

```
public static void main(String[] args) throws java.io.IOException {
  double population;
  int years;

  population = 50000;

  years = 0;
  while (population >= 20000) {
    population -= population * 0.10;
    years++;
  }
  System.out.println(years);
}
```

Chapter 27

27.3 Answers of Review Questions: True/False

1. true
2. true
3. false
4. false
5. false
6. true
7. false
8. true
9. false
10. false
11. false
12. false

27.4 Answers of Review Questions: Multiple Choice

1. c
2. d
3. d
4. b
5. c
6. b
7. a
8. b
9. c
10. b
11. d
12. d
13. d
14. c

27.5 Answers of Review Exercises

1. Solution

Step	Statement	a	b	j
1	`a = 0`	**0**	?	?
2	`b = 0`	0	**0**	?
3	`j = 0`	0	0	**0**
4	`j <= 8`		True	
5	`if (j < 5)`		True	
6	`b++`	0	**1**	0
7	`j += 2`	0	1	**2**
8	`j <= 8`		True	
9	`if (j < 5)`		True	
10	`b++`	0	**2**	2
11	`j += 2`	0	2	**4**
12	`j <= 8`		True	
13	`if (j < 5)`		True	
14	`b++`	0	**3**	4
15	`j += 2`	0	3	**6**
16	`j <= 8`		True	
17	`if (j < 5)`		False	

18	`a += j - 1`	**5**	3	6
19	`j += 2`	5	3	**8**
20	`j <= 8`	True		
21	`if (j < 5)`	False		
22	`a += j - 1`	**12**	3	8
23	`j += 2`	12	3	**10**
24	`j <= 8`	False		
25	`System.out.println(a + ", " + b)`	12, 3 is displayed		

2. *Solution*

For input value of 10

Step	Statement	a	b	j
1	`a = Integer.parseInt(cin.readLine())`	**10**	?	?
2	`b = a`	10	**10**	?
3	`j = a - 5`	10	10	**5**
4	`j <= a`	True		
5	`if (j % 2 != 0)`	True		
6	`b = a + j + 5`	10	**20**	5
7	`j += 2`	10	20	**7**
8	`j <= a`	True		
9	`if (j % 2 != 0)`	True		
10	`b = a + j + 5`	10	**22**	7
11	`j += 2`	10	22	**9**
12	`j <= a`	True		
13	`if (j % 2 != 0)`	True		
14	`b = a + j + 5`	10	**24**	9
15	`j += 2`	10	24	**11**
16	`j <= a`	False		
17	`System.out.println(b)`	24 is displayed		

For input value of 21

Step	Statement	a	b	j
1	`a = Integer.parseInt(cin.readLine())`	**21**	?	?
2	`b = a`	21	**21**	?
3	`j = a - 5`	21	21	**16**
4	`j <= a`	True		
5	`if (j % 2 != 0)`	False		

6	`b = a + j + 5`	21	**5**	16
7	`j += 2`	21	5	**18**
8	`j <= a`		True	
9	`if (j % 2 != 0)`		False	
10	`b = a + j + 5`	21	**3**	18
11	`j += 2`	21	3	**20**
12	`j <= a`		True	
13	`if (j % 2 != 0)`		False	
14	`b = a + j + 5`	21	**1**	20
15	`j += 2`	21	1	**22**
16	`j <= a`		False	
17	`System.out.println(b)`	1 is displayed		

3. Solution

For input value of 12

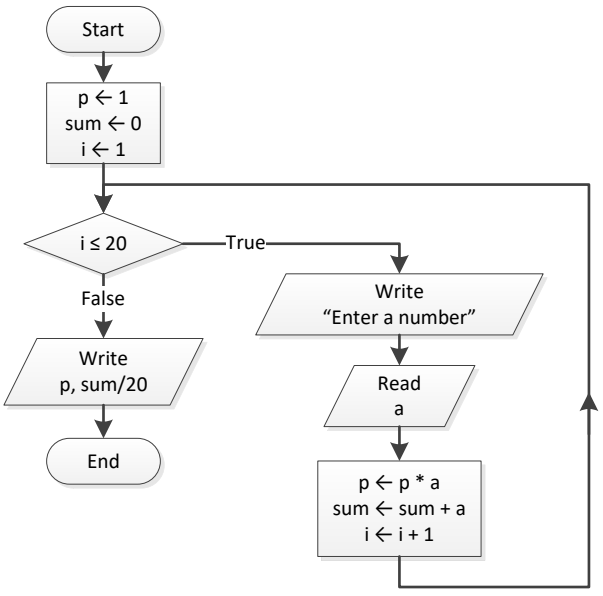
Step	Statement	a	x	y	j
1	`a = Integer.parseInt(cin.readLine())`	**12**	?	?	?
2	`j = 2`	12	?	?	**2**
3	`j <= a - 1`		True		
4	`x = j * 3 + 3`	12	**9**	?	2
5	`y = j * 2 + 10`	12	9	**14**	2
6	`if (y - x > 0 || x > 30)`		True		
7	`y *= 2`	12	9	**28**	2
8	`x += 4`	12	**13**	28	2
9	`System.out.println(x + ", " + y)`	13, 28 is displayed			
10	`j += 3`	12	13	28	**5**
11	`j <= a - 1`		True		
12	`x = j * 3 + 3`	12	**18**	28	5
13	`y = j * 2 + 10`	12	18	**20**	5
14	`if (y - x > 0 || x > 30)`		True		
15	`y *= 2`	12	18	**40**	5
16	`x += 4`	12	**22**	40	5
17	`System.out.println(x + ", " + y)`	22, 40 is displayed			
18	`j += 3`	12	22	40	**8**
19	`j <= a - 1`		True		
20	`x = j * 3 + 3`	12	**27**	40	8

21	`y = j * 2 + 10`	12	27	**26**	8
22	`if (y - x > 0 || x > 30)`	False			
23	`x += 4`	12	**31**	26	8
24	`System.out.println(x + ", " + y)`	31, 26 is displayed			
25	`j += 3`	12	31	26	**11**
26	`j <= a - 1`	True			
27	`x = j * 3 + 3`	12	**36**	26	11
28	`y = j * 2 + 10`	12	36	**32**	11
29	`if (y - x > 0 || x > 30)`	True			
30	`y *= 2`	12	36	**64**	11
31	`x += 4`	12	**40**	64	11
32	`System.out.println(x + ", " + y)`	40, 64 is displayed			
33	`j += 3`	12	40	64	**14**
34	`j <= a - 1`	False			

4. Solution

i. 9
ii. 2
iii. -7
iv. -1

5. Solution



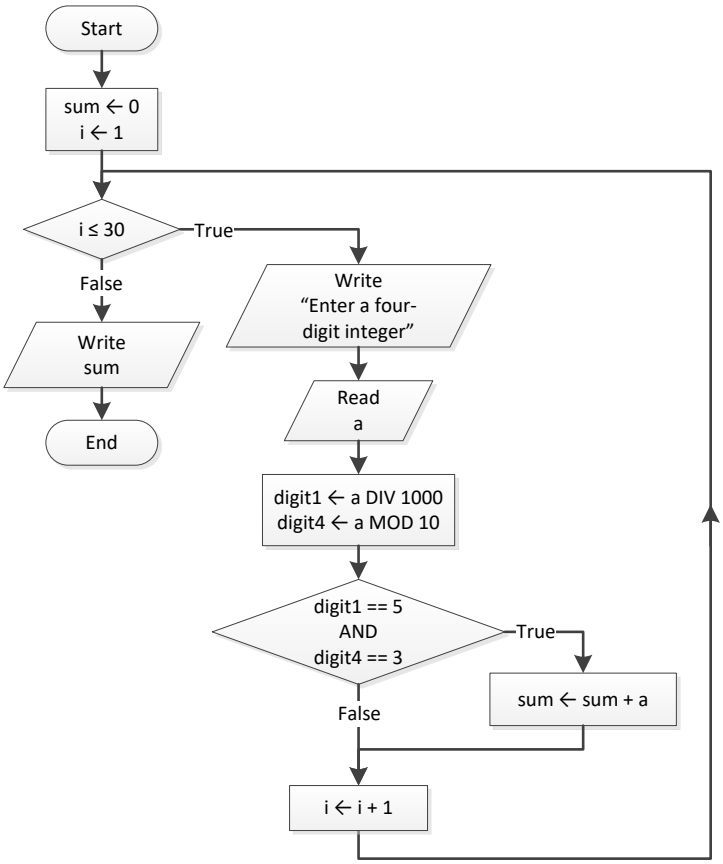

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double a, p, sum;
```

```
  int i;

  p = 1;
  sum = 0;
  for (i = 1 ; i <= 20; i++) {
    System.out.print("Enter a number: ");
    a = Double.parseDouble(cin.readLine());
    p = p * a;
    sum = sum + a;
  }
  System.out.println(p);
  System.out.println(sum / 20);
}
```

6. Solution

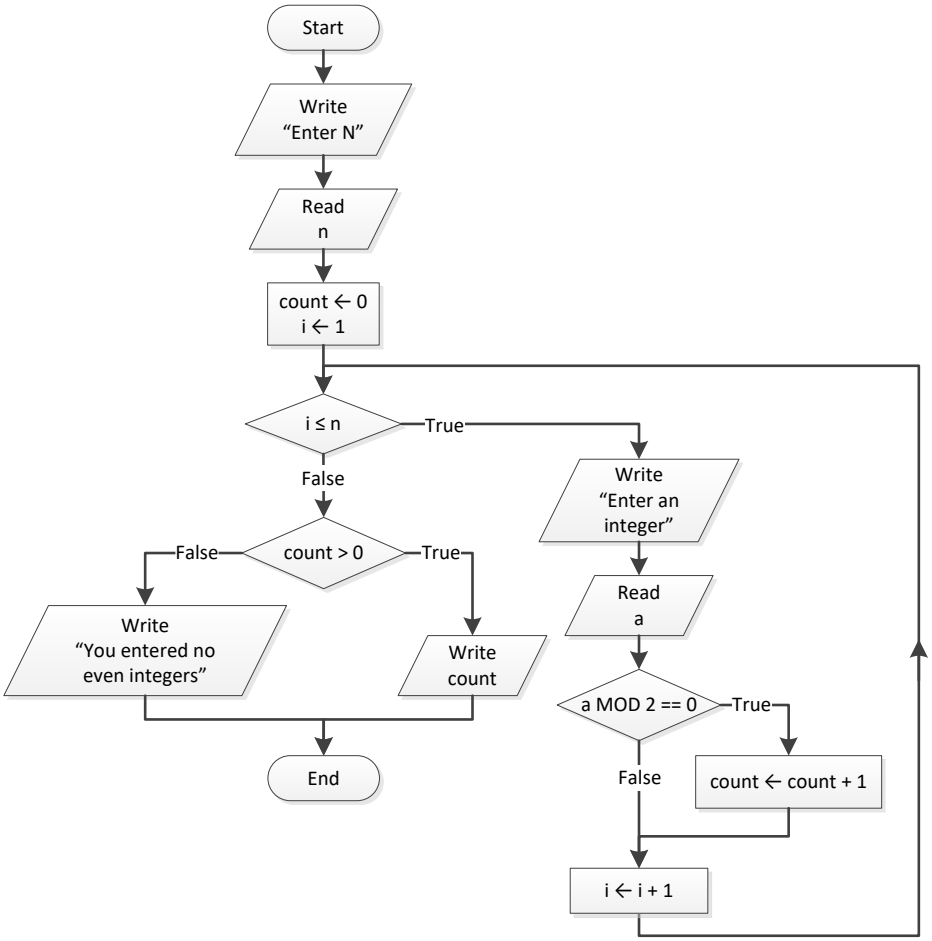
```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double deg, i;

  System.out.print("Enter degrees: ");
  deg = Double.parseDouble(cin.readLine());
  for (i = 0 ; i <= deg; i += 0.5) {
    System.out.println(Math.sin(i * Math.PI / 180));
  }
}
```

7. Solution



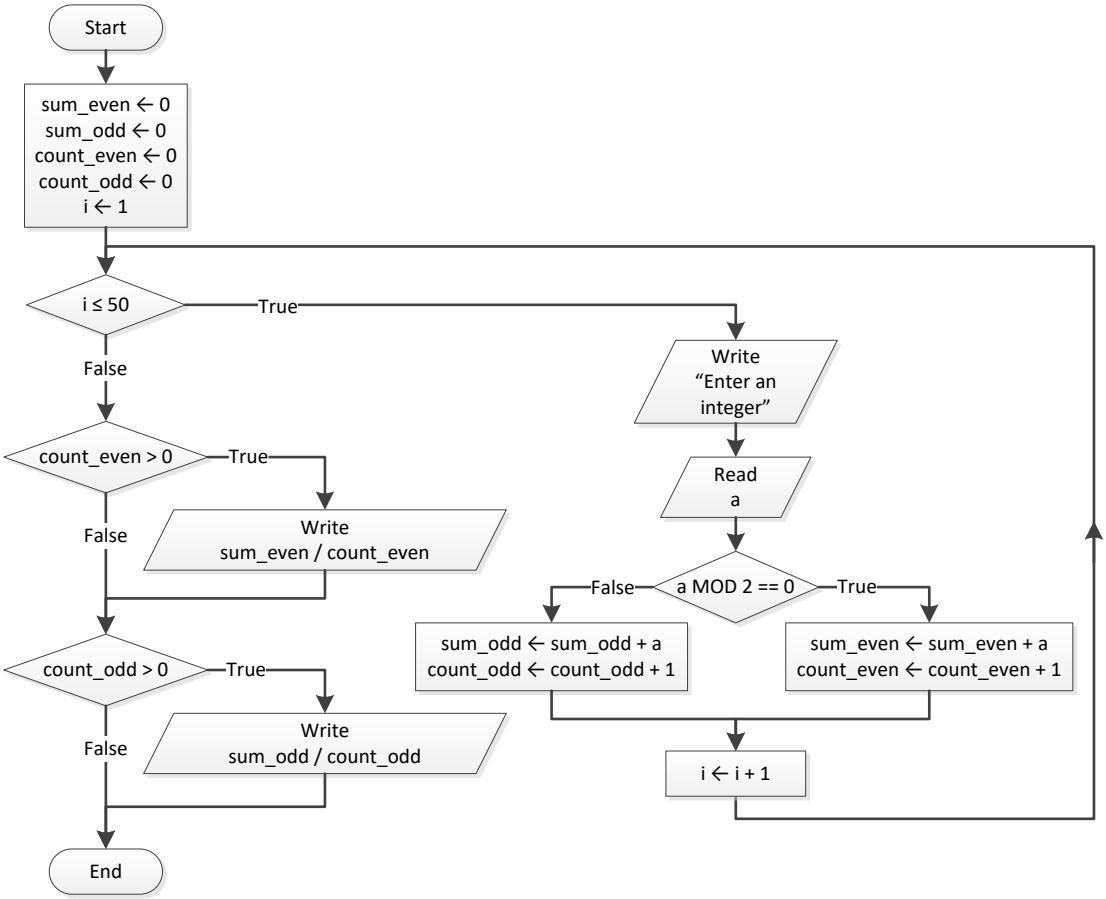

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int a, digit1, digit4, i, sum;

  sum = 0;
  for (i = 1; i <= 30; i++) {
    System.out.print("Enter a four-digit integer: ");
    a = Integer.parseInt(cin.readLine());
    digit1 = (int)(a / 1000);
    digit4 = a % 10;
    if (digit1 == 5 && digit4 == 3) {
      sum += a;
    }
  }
  System.out.println(sum);
}
```

8. Solution




```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int a, count, i, n;

  System.out.print("Enter N: ");
  n = Integer.parseInt(cin.readLine());
  count = 0;
  for (i = 0 ; i <= n; i++) {
    System.out.print("Enter an integer: ");
    a = Integer.parseInt(cin.readLine());
    if (a % 2 == 0) {
      count++;
    }
  }
  if (count > 0) {
    System.out.println(count);
  }
  else {
    System.out.println("You entered no even integers");
  }
}
```

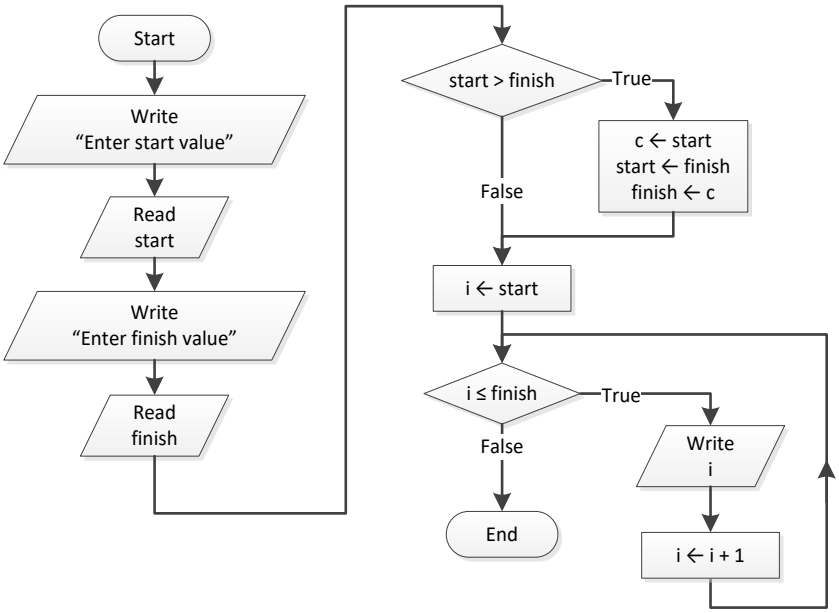
9. Solution




```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int a, count_even, count_odd, i, sum_even, sum_odd;

  sum_even = 0;
  sum_odd = 0;
  count_even = 0;
  count_odd = 0;
  for (i = 1; i <= 50; i++) {
    System.out.print("Enter an integer: ");
    a = Integer.parseInt(cin.readLine());
    if (a % 2 == 0) {
      sum_even += a;
      count_even++;
    }
    else {
      sum_odd += a;
      count_odd++;
    }
  }
  if (count_even > 0) {
    System.out.println(sum_even / (double)count_even);
  }
```

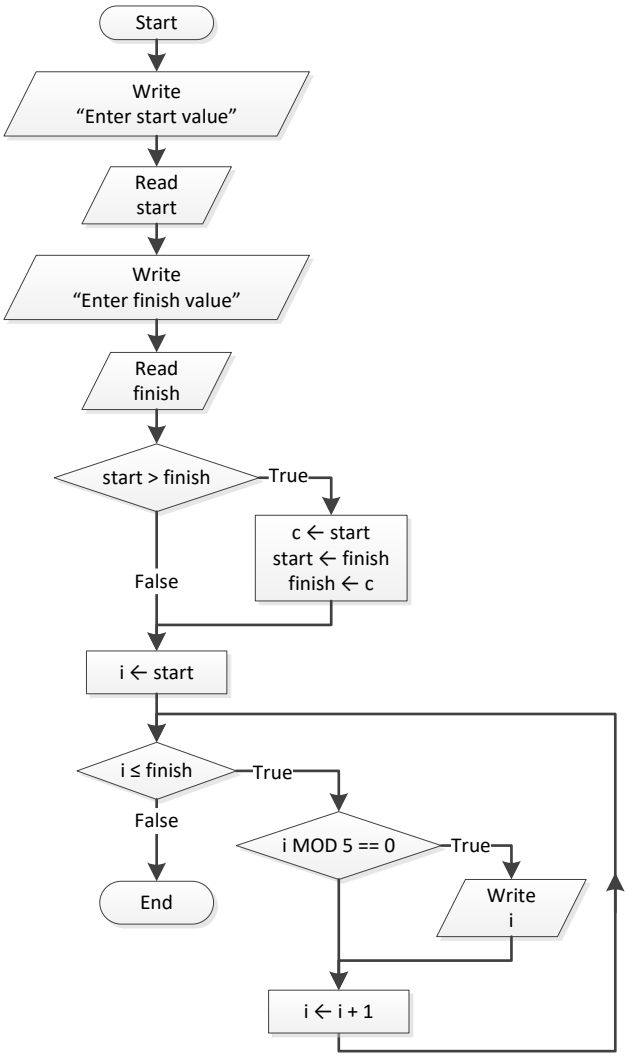
```
  if (count_odd > 0) {
    System.out.println(sum_odd / (double)count_odd);
  }
}
```

10. Solution




```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int c, finish, i, start;

  System.out.print("Enter start value: ");
  start = Integer.parseInt(cin.readLine());
  System.out.print("Enter finish value: ");
  finish = Integer.parseInt(cin.readLine());

  if (start > finish) {
    c = start;
    start = finish;
    finish = c;
  }

  for (i = start; i <= finish; i++) {
    System.out.println(i);
  }
}
```

11. Solution




```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int c, finish, i, start;

  System.out.print("Enter start value: ");
  start = Integer.parseInt(cin.readLine());
  System.out.print("Enter finish value: ");
  finish = Integer.parseInt(cin.readLine());

  if (start > finish) {
    c = start;
    start = finish;
    finish = c;
  }

  for (i = start; i <= finish; i++) {
    if (i % 5 == 0) {
```

```
      System.out.println(i);
    }
  }
}
```

12. Solution

First Approach

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int exp, i;
  double p, base;

  System.out.print("Enter a value for base: ");
  base = Double.parseDouble(cin.readLine());
  System.out.print("Enter an integer for exponent: ");
  exp = Integer.parseInt(cin.readLine());

  p = 1;
  if (exp >= 0) {
    for (i = 1; i <= exp; i++) {
      p *= base;
    }
  }
  else {
    for (i = 1; i <= -exp; i++) {
      p *= 1 / base;
    }
  }
  System.out.println(p);
}
```

Second Approach

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int exp, i;
  double p, base;

  System.out.print("Enter a value for base: ");
  base = Double.parseDouble(cin.readLine());
  System.out.print("Enter an integer for exponent: ");
  exp = Integer.parseInt(cin.readLine());

  p = 1;
  for (i = 1; i <= Math.abs(exp); i++) {
    p *= base;
  }
  if (exp < 0) {
    p = 1 / p;
  }
  System.out.println(p);
}
```

13. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int characters, count, i, words;
  String msg, character;

  System.out.print("Enter a message: ");
  msg = cin.readLine();

  characters = msg.length();
  count = 0;
  for (i = 0; i <= characters - 1; i++) {
    character = "" + msg.charAt(i);
    if (character.equals(" ") == true) {
      count++;
    }
  }
  words = count + 1;

  System.out.println("The message entered contains " + words + " words");
}
```

14. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int characters, count, i, words;
  String msg, character;

  System.out.print("Enter a message: ");
  msg = cin.readLine();

  characters = msg.length();
  count = 0;
  for (i = 0; i <= characters - 1; i++) {
    character = "" + msg.charAt(i);
    if (character.equals(" ") == true) {
      count++;
    }
  }
  words = count + 1;
  System.out.print("The average number of letters in each word is ");
  System.out.println((characters - count) / (double)words);
}
```

Chapter 28

28.3 Answers of Review Questions: True/False

1. true
2. false
3. true
4. true
5. false
6. true
7. true
8. true

28.4 Answers of Review Questions: Multiple Choice

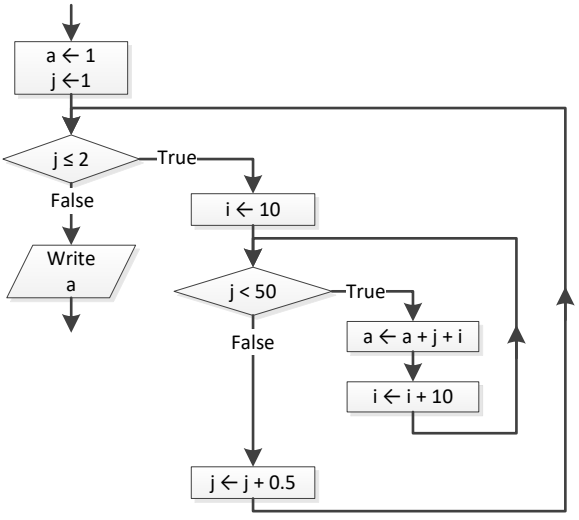
1. b
2. a
3. c
4. a
5. b

28.5 Answers of Review Exercises

1. Solution

i. 10
ii. 4.5
iii. -7
iv. 138

2. Solution



Step	Statement	a	i	j
1	`a = 1`	**1**	?	?
2	`j = 1`	1	?	**1**
3	`j <= 2`		True	
4	`i = 10`	1	**10**	1
5	`i < 30`		True	

6	`a = a + j + i`	**12**	10	1
7	`i += 10`	12	**20**	1
8	`i < 30`	True		
9	`a = a * j + i`	**33**	20	1
10	`i += 10`	33	**30**	1
11	`i < 30`	False		
12	`j += 0.5`	33	30	**1.5**
13	`j <= 2`	True		
14	`i = 10`	33	**10**	1.5
15	`i < 30`	True		
16	`a = a + j + i`	**44.5**	10	1.5
17	`i += 10`	44.5	**20**	1.5
18	`i < 30`	True		
19	`a = a * j + i`	**66**	20	1.5
20	`i += 10`	66	**30**	1.5
21	`i < 30`	False		
22	`j += 0.5`	66	30	**2**
23	`j <= 2`	True		
24	`i = 10`	66	**10**	2
25	`i < 30`	True		
26	`a = a + j + i`	**78**	10	2
27	`i += 10`	78	**20**	2
28	`i < 30`	True		
29	`a = a * j + i`	**100**	20	2
30	`i += 10`	100	**30**	2
31	`i < 30`	False		
32	`j += 0.5`	100	30	**2.5**
33	`j <= 2`	False		
34	`System.out.println(a)`	100 is displayed		

3. Solution

Step	Statement	s	i	j
1	`s = 0`	**0**	?	?
2	`i = 1`	0	**1**	?
3	`i <= 4`	True		
4	`j = 3`	0	1	**3**

5	`j >= i`		True	
6	`s = s + i * j`	**3**	1	3
7	`j--`	3	1	**2**
8	`j >= i`		True	
9	`s = s + i * j`	**5**	1	2
10	`j--`	5	1	**1**
11	`j >= i`		True	
12	`s = s + i * j`	**6**	1	1
13	`j--`	6	1	**0**
14	`j >= i`		True	
15	`i++`	6	**2**	0
16	`i <= 4`		True	
17	`j = 3`	6	2	**3**
18	`j >= i`		True	
19	`s = s + i * j`	**12**	2	3
20	`j--`	12	2	**2**
21	`j >= i`		True	
22	`s = s + i * j`	**16**	2	2
23	`j--`	16	2	**1**
24	`j >= i`		False	
25	`i++`	16	**3**	1
26	`i <= 4`		True	
27	`j = 3`	16	3	**3**
28	`j >= i`		True	
29	`s = s + i * j`	**25**	3	3
30	`j--`	25	3	**2**
31	`j >= i`		False	
32	`i++`	25	**4**	2
33	`i <= 4`		True	
34	`j = 3`	25	4	**3**
35	`j >= i`		False	
36	`i++`	25	**5**	3
37	`i <= 4`		False	
38	`System.out.println(s)`	25 is displayed		

The statement `s = s + i * j` is executed 6 times

4. Solution

For input value of "NO"

Step	Statement	s	y	i	ans
1	`s = 1`	**1**	?	?	?
2	`y = 25`	1	**25**	?	?
3	`i = 1`	1	25	**1**	?
4	`i <= 3`	True			
5	`s = s + y`	**26**	25	1	?
6	`y -= 5`	26	**20**	1	?
7	`i++`	26	20	**2**	?
8	`i <= 3`	True			
9	`s = s + y`	**46**	20	2	?
10	`y -= 5`	46	**15**	2	?
11	`i++`	46	15	**3**	?
12	`i <= 3`	True			
13	`s = s + y`	**61**	15	3	?
14	`y -= 5`	61	**10**	3	?
15	`i++`	61	10	**4**	?
16	`i <= 3`	False			
17	`ans = cin.readLine()`	61	10	4	**"NO"**
18	`while (ans.equals("YES") == true)`	False			
19	`System.out.println(s)`	61 is displayed			

For input values of "YES", "NO"

Step	Statement	s	y	i	ans
1	`s = 1`	**1**	?	?	?
2	`y = 25`	1	**25**	?	?
3	`i = 1`	1	25	**1**	?
4	`i <= 3`	True			
5	`s = s + y`	**26**	25	1	?
6	`y -= 5`	26	**20**	1	?
7	`i++`	26	20	**2**	?
8	`i <= 3`	True			
9	`s = s + y`	**46**	20	2	?
10	`y -= 5`	46	**15**	2	?
11	`i++`	46	15	**3**	?

12	`i <= 3`	True			
13	`s = s + y`	**61**	15	3	?
14	`y -= 5`	61	**10**	3	?
15	`i++`	61	10	**4**	?
16	`i <= 3`	False			
17	`ans = cin.readLine()`	61	10	4	**"YES"**
18	`while (ans.equals("YES") == true)`	True			
19	`i = 1`	61	10	**1**	"YES"
20	`i <= 3`	True			
21	`s = s + y`	**71**	10	1	"YES"
22	`y -= 5`	71	**5**	1	"YES"
23	`i++`	71	5	**2**	"YES"
24	`i <= 3`	True			
25	`s = s + y`	**76**	5	2	"YES"
26	`y -= 5`	76	**0**	2	"YES"
27	`i++`	76	0	**3**	"YES"
28	`i <= 3`	True			
29	`s = s + y`	**76**	0	3	"YES"
30	`y -= 5`	76	**-5**	3	"YES"
31	`i++`	76	-5	**4**	"YES"
32	`i <= 3`	False			
33	`ans = cin.readLine()`	76	-5	4	**"NO"**
34	`while (ans.equals("YES") == true)`	False			
35	`System.out.println(s)`	76 is displayed			

For input values of "YES", "YES", "NO"

Step	Statement	s	y	i	ans
1	`s = 1`	**1**	?	?	?
2	`y = 25`	1	**25**	?	?
3	`i = 1`	1	25	**1**	?
4	`i <= 3`	True			
5	`s = s + y`	**26**	25	1	?
6	`y -= 5`	26	**20**	1	?
7	`i++`	26	20	**2**	?
8	`i <= 3`	True			
9	`s = s + y`	**46**	20	2	?
10	`y -= 5`	46	**15**	2	?

11	i++	46	15	**3**	?
12	i <= 3		True		
13	s = s + y	**61**	15	3	?
14	y -= 5	61	**10**	3	?
15	i++	61	10	**4**	?
16	i <= 3		False		
17	ans = cin.readLine()	61	10	4	**“YES”**
18	while (ans.equals("YES") == true)		True		
19	i = 1	61	10	**1**	“YES”
20	i <= 3		True		
21	s = s + y	**71**	10	1	“YES”
22	y -= 5	71	**5**	1	“YES”
23	i++	71	5	**2**	“YES”
24	i <= 3		True		
25	s = s + y	**76**	5	2	“YES”
26	y -= 5	76	**0**	2	“YES”
27	i++	76	0	**3**	“YES”
28	i <= 3		True		
29	s = s + y	**76**	0	3	“YES”
30	y -= 5	76	**-5**	3	“YES”
31	i++	76	-5	**4**	“YES”
32	i <= 3		False		
33	ans = cin.readLine()	76	-5	4	**“YES”**
34	while (ans.equals("YES") == true)		True		
35	i = 1	76	-5	**1**	“YES”
36	i <= 3		True		
37	s = s + y	**71**	-5	1	“YES”
38	y -= 5	71	**-10**	1	“YES”
39	i++	71	-10	**2**	“YES”
40	i <= 3	True			
41	s = s + y	**61**	-10	2	“YES”
42	y -= 5	61	**-15**	2	“YES”
43	i++	61	-15	**3**	“YES”
44	i <= 3	True			
45	s = s + y	**46**	-15	3	“YES”
46	y -= 5	46	**-20**	3	“YES”

47	i++	46	-20	**4**	"YES"
48	i <= 3	False			
49	ans = cin.readLine()	46	-20	4	**"NO"**
50	while (ans.equals("YES") == true)	False			
51	System.out.println(s)	46 is displayed			

5. Solution

```
public static void main(String[] args) throws java.io.IOException {
  int hour, minutes;

  for (hour = 0; hour <= 23; hour++) {
    for (minutes = 0; minutes <= 59; minutes++) {
      System.out.println(hour + "\t" + minutes);
    }
  }
}
```

6. Solution

```
public static void main(String[] args) throws java.io.IOException {
  int i, j;

  for (i = 5; i >= 1; i--) {
    for (j = 1; j <= i; j++) {
      System.out.print(i + " ");
    }
    System.out.println();
  }
}
```

7. Solution

```
public static void main(String[] args) throws java.io.IOException {
  int i, j;

  for (i = 0; i <= 5; i++) {
    for (j = 0; j <= i; j++) {
      System.out.print(j + " ");
    }
    System.out.println();
  }
}
```

8. Solution

```
public static void main(String[] args) throws java.io.IOException {
  int i, j;

  for (i = 1; i <= 4; i++) {
    for (j = 1; j <= 10; j++) {
```

```
      System.out.print("* ");
    }
    System.out.println();
  }
}
```

9. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j, n;

  System.out.print("Enter an integer between 3 and 20: ");
  n = Integer.parseInt(cin.readLine());

  for (i = 1; i <= n; i++) {
    for (j = 1; j <= n; j++) {
      System.out.print("* ");
    }
    System.out.println();
  }
}
```

10. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j, n;

  System.out.print("Enter an integer between 3 and 20: ");
  n = Integer.parseInt(cin.readLine());

  for (j = 1; j <= n; j++) {
    System.out.print("* ");
  }
  System.out.println();

  for (i = 1; i <= n - 2; i++) {
    System.out.print("* ");
    for (j = 1; j <= n - 2; j++) {
      System.out.print("  ");
    }
    System.out.println("* ");
  }

  for (j = 1; j <= n; j++) {
    System.out.print("* ");
  }
}
```

11. Solution

```
public static void main(String[] args) throws java.io.IOException {
```

```
  int i, j;

  for (i = 1; i <= 5; i++) {
    for (j = 1; j <= i; j++) {
      System.out.print("* ");
    }
    System.out.println();
  }

  for (i = 4; i >= 1; i--) {
    for (j = 1; j <= i; j++) {
      System.out.print("* ");
    }
    System.out.println();
  }
}
```

Chapter 29

29.14 Answers of Review Questions: True/False

1. false
2. false
3. false
4. true
5. true
6. true
7. false
8. false
9. true
10. true
11. false
12. false
13. false
14. true
15. false
16. false
17. true
18. true
19. true

29.15 Answers of Review Questions: Multiple Choice

1. c
2. d
3. b
4. a
5. a
6. c
7. d
8. b
9. a
10. b
11. b
12. b
13. a

29.16 Answers of Review Exercises

1. Solution

```
s = 0;
for (i = 1; i <= 100; i++) {
  number = Double.parseDouble(cin.readLine());
  s = s + number;
}
average = s / 100;
System.out.println(average);
```

2. Solution

```
public static void main(String[] args) throws java.io.IOException {
  int denom, i;
  double s;

  s = 0;

  denom = 1;
  for (i = 1; i <= 100; i++) {
    denom *= i;
  }
```

```
  for (i = 1; i <= 100; i++) {
    s += i / (double)denom;
  }
  System.out.println(s);
}
```

3. Solution

```
s = 10;
i = 1;
while (i <= 10) {
  s += Math.sqrt(i);
  i++;
}
System.out.println(s);
```

4. Solution

```
start = Integer.parseInt(cin.readLine());
end = Integer.parseInt(cin.readLine());
i = start;
while (i <= end) {
  System.out.println(i);
  i++;
}
```

5. Solution

```
s = 0;
for (i = 100; i >= 5; i -= 5) {
  s = s + Math.sqrt(i);
}
System.out.println(s);
```

6. Solution

```
s = 0;
y = 0;
for (i = 1; i <= 10;  i++) {
  s = s + Math.sqrt(y + i + 1);
  y = y + (i + 1) * 2;
}
System.out.println(s);
```

7. Solution

```
y = 0;
for (i = 1; i <= 9; i += 2) {
  a = Integer.parseInt(cin.readLine());
  a += i;
  y = y + Math.pow(a + i + 2, 3);
}
System.out.println(y);
```

8. Solution

This conversion should not be carried out.

9. Solution

```
s = 0;
a = Integer.parseInt(cin.readLine());
s += a;
a = Integer.parseInt(cin.readLine());
while (a <= s) {
  s += a;
  a = Integer.parseInt(cin.readLine());
}
System.out.println(s);
```

10. Solution

```
a = 100;
count = 0;
System.out.println(a);
b = Integer.parseInt(cin.readLine());
count++;
a -= Math.sqrt(b);
while (a >= 0) {
  System.out.println(a);
  b = Integer.parseInt(cin.readLine());
  count++;
  a -= Math.sqrt(b);
}
System.out.println(count);
```

11. Solution

```
a = Integer.parseInt(cin.readLine());
b = Integer.parseInt(cin.readLine());
if (b <= 1000) {
  do {
    a += 2;
    b = b * a;
    System.out.println(b);
  } while (b <= 1000);
}
```

12. Solution

```
s = 0;
a = Integer.parseInt(cin.readLine());
if (a != -99) {
  do {
    s = s + Math.pow(a, 2);
    a = Integer.parseInt(cin.readLine());
  } while (a != -99);
```

```
}
System.out.println(s);
```

13. Solution

```
x = 0;
y = -10;
do {
  x = x + Math.pow(2, y);
  y = y + 1;
} while (y < 10);
System.out.println(x);
```

14. Solution

```
start = Integer.parseInt(cin.readLine());
x = 1;
i = start;
while (i <= start * 2) {
  x = Math.pow(x, 1.1) + i;
  i++;
}
System.out.println(x);
```

15. Solution

```
x = 42;
i = 1;
while (i <= 100) {
  x = Math.sqrt(x) + i;
  System.out.println(x);
  i++;
}
```

16. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int a, i;
  double p;

  p = 1;
  a = Integer.parseInt(cin.readLine());
  i = a;
  p = p * Math.pow(i, 2);
  i = i + 5;
  p = p + i;
  for (i = a + 5; i <= 19; i += 5) {
    p = p * Math.pow(i, 2);
    p = p + i + 5;
  }
  System.out.println(p);
}
```

17. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int end, i, start;
  double x;

  start = Integer.parseInt(cin.readLine());
  end = Integer.parseInt(cin.readLine());
  x = 1000;

  for (i = start; i <= end; i+=2) {
    x = Math.sqrt(x);
  }
  System.out.println(x);
}
```

18. Solution

```
public static void main(String[] args) throws java.io.IOException {
  int i, j;

  for (i = 1; i <= 4; i++) {
    for (j = 1; j <= 4; j++) {
      System.out.println(i + " x " + j + " = " + (i * j));
    }
  }
}
```

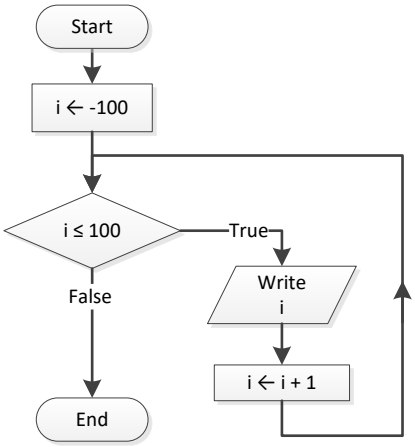
19. Solution

```
public static void main(String[] args) throws java.io.IOException {
  int i, j;

  System.out.print("\t|\t");
  for (i = 1; i <= 12; i++) {
    System.out.print(i + "\t");
  }
  System.out.println();

  for (i = 1; i <= 12; i++) {
    System.out.print("---------");
  }
  System.out.println();

  for (i = 1; i <= 12; i++) {
    System.out.print(i + "\t|\t");
    for (j = 1; j <= 12; j++) {
      System.out.print(i * j + "\t");
    }
    System.out.println();
  }
}
```

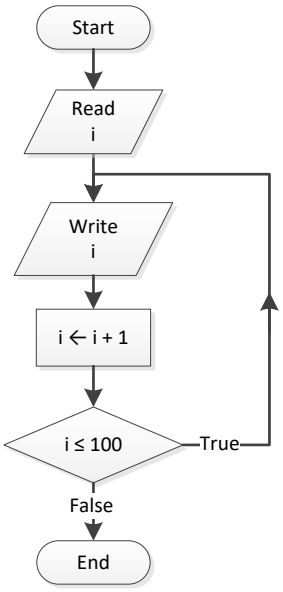
Chapter 30

30.4 Answers of Review Exercises

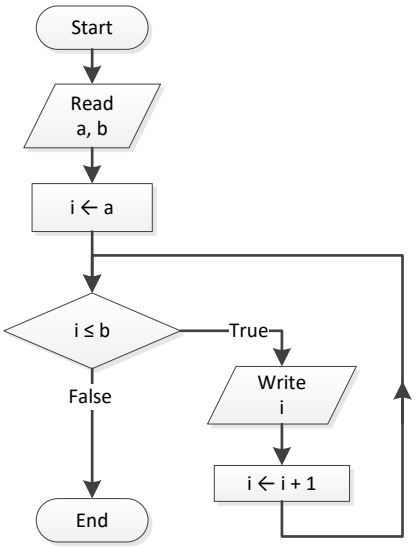
1. Solution



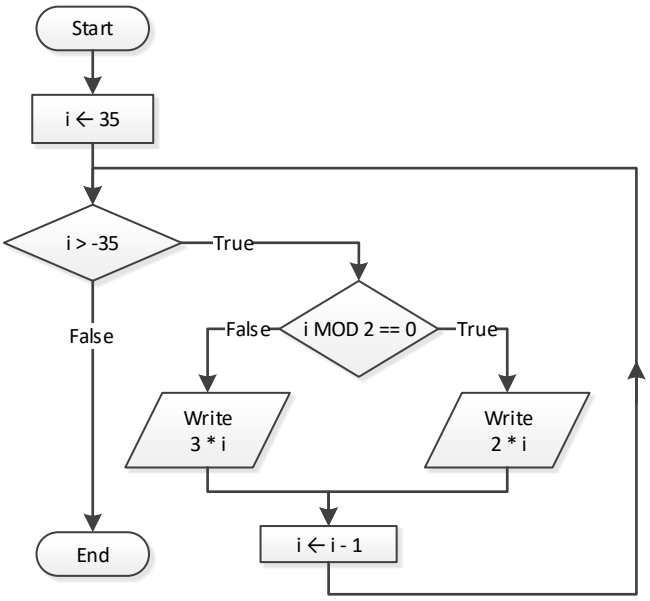
2. Solution



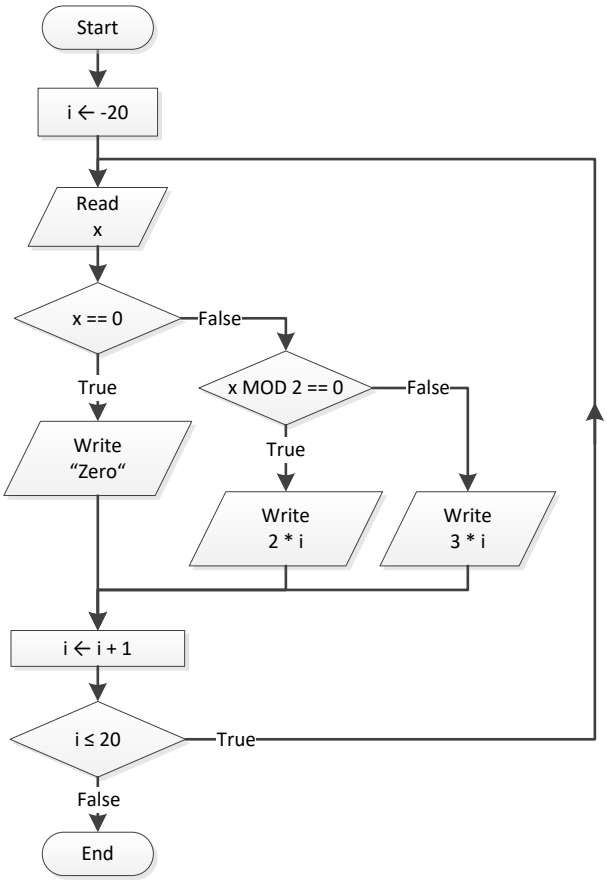
3. Solution



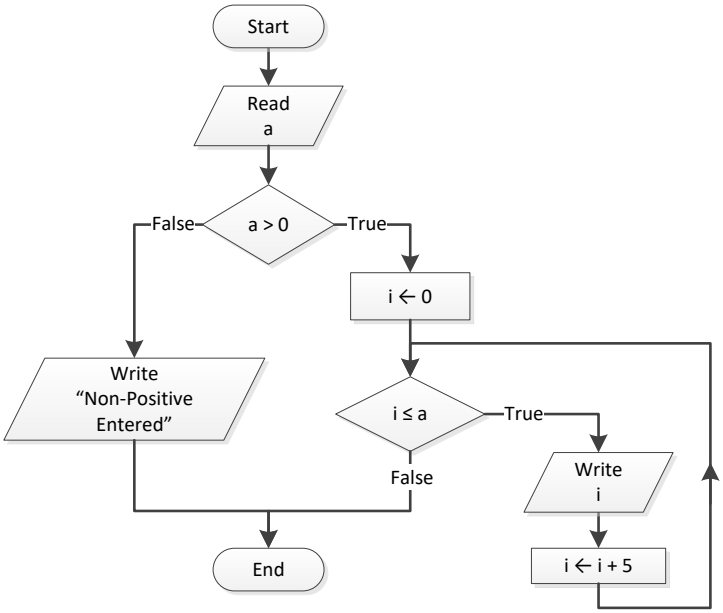
4. Solution



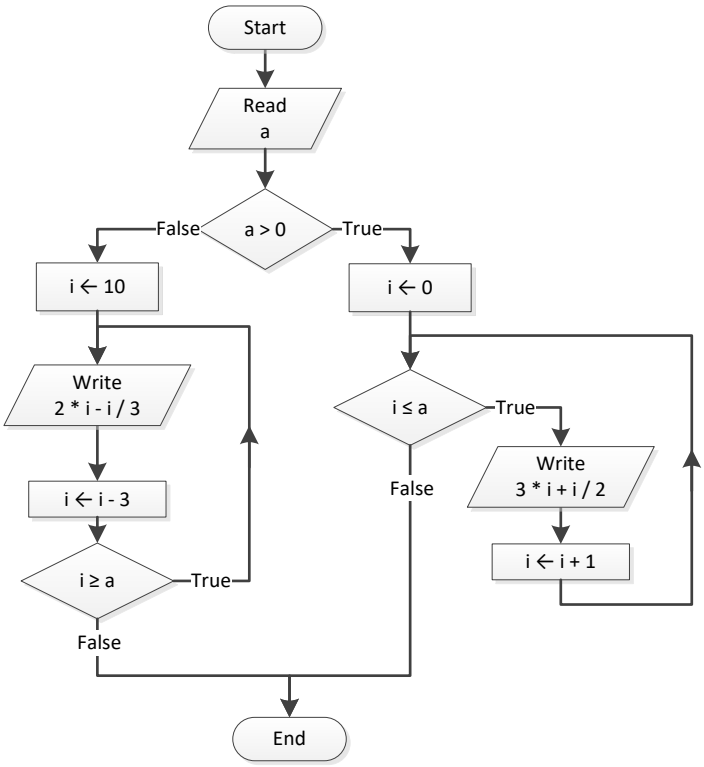
5. Solution



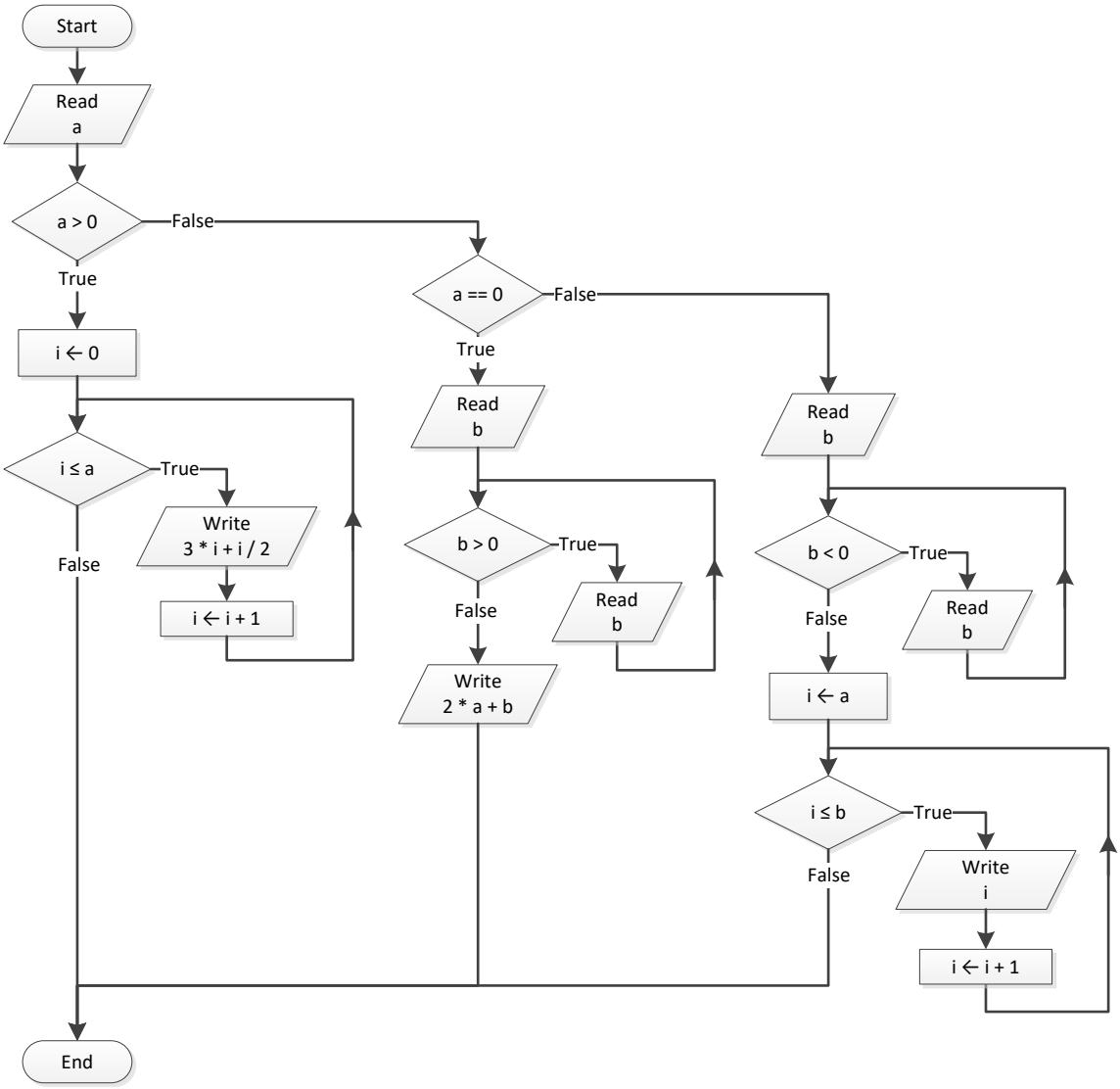
6. Solution



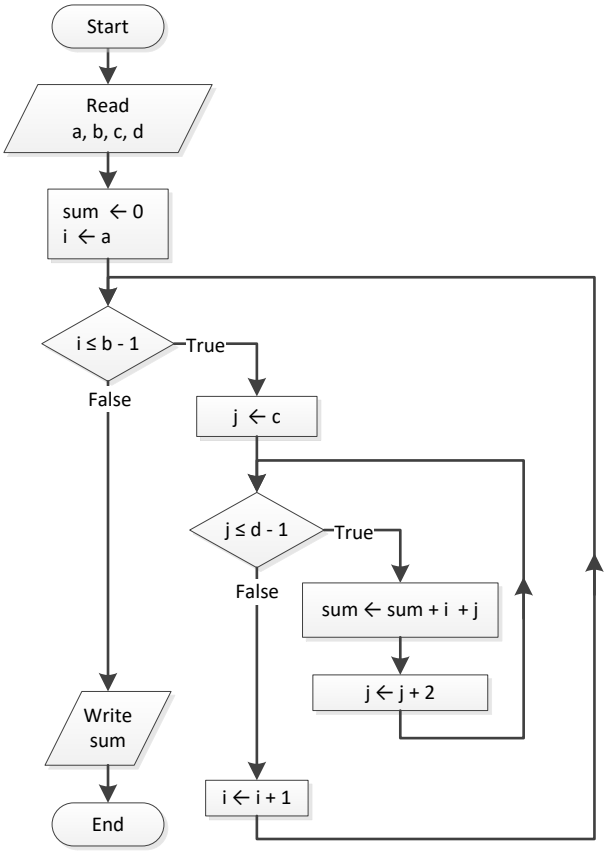
7. Solution


Start
Read
a
a > 0
False
True
i ← 10
i ← 0
Write
2 * i - i / 3
i ← i - 3
i ≥ a
True
False
i ≤ a
True
False
Write
3 * i + i / 2
i ← i + 1
End

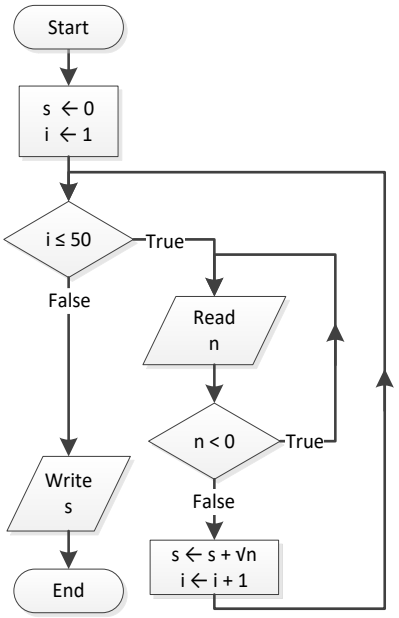
8. Solution


Start
Read a
a > 0
False
True
i ← 0
i ≤ a
True
Write 3 * i + i / 2
i ← i + 1
False
a == 0
False
True
Read b
b > 0
True
Read b
False
Write 2 * a + b
Read b
b < 0
True
Read b
False
i ← a
i ≤ b
True
Write i
i ← i + 1
False
End

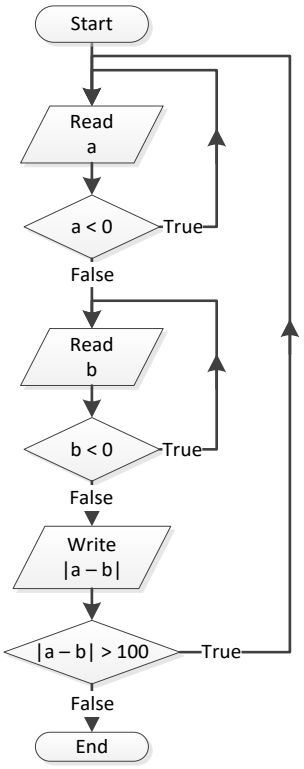
9. Solution



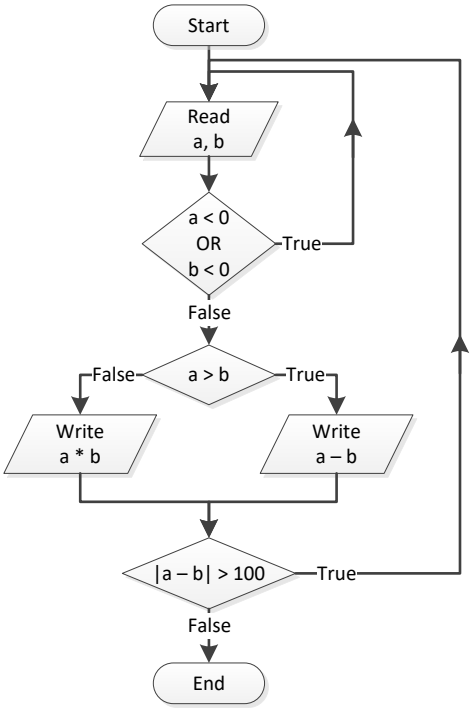
10. Solution



11. Solution



12. Solution



13. Solution

```
i = 1;
do {
  System.out.println(i);
  i += 5;
} while (i <= 500);
System.out.println("The End");
```

14. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int a, i;

  i = 0;
  a = Integer.parseInt(cin.readLine());
  do {
    if (i % 2 != 0) {
      System.out.println(i);
    }
    i += 5;
  } while (i < a);
}
```

15. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int a, b, i;

  a = Integer.parseInt(cin.readLine());
  while (a != -1) {
    do {
      b = Integer.parseInt(cin.readLine());
    } while (b <= a);
    for (i = a; i <= b; i++) {
      System.out.println(i);
    }
    a = Integer.parseInt(cin.readLine());
  }
}
```

16. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i;
  double P, S, a;

  i = 1;
  S = 0;
  P = 1;
```

```
  a = 0;
  if (i < 45) {
    S += a;
  }
  else {
    P *= a;
  }
  i++;
  while (i < 90) {
    a = Double.parseDouble(cin.readLine());
    if (i < 45) {
      S += a;
    }
    else {
      P *= a;
    }
    i++;
  }
  System.out.println(S + ", " + P);
}
```

Chapter 31

31.7 Answers of Review Questions: True/False

1. true
2. false
3. false
4. true
5. false
6. false
7. false
8. true

31.8 Answers of Review Exercises

1. Solution

```
public static void main(String[] args) throws java.io.IOException {
  int i, s;

  s = 0;
  for (i = 1; i <= 99; i += 2) {
    s += i;
  }
  System.out.println(s);
}
```

2. Solution

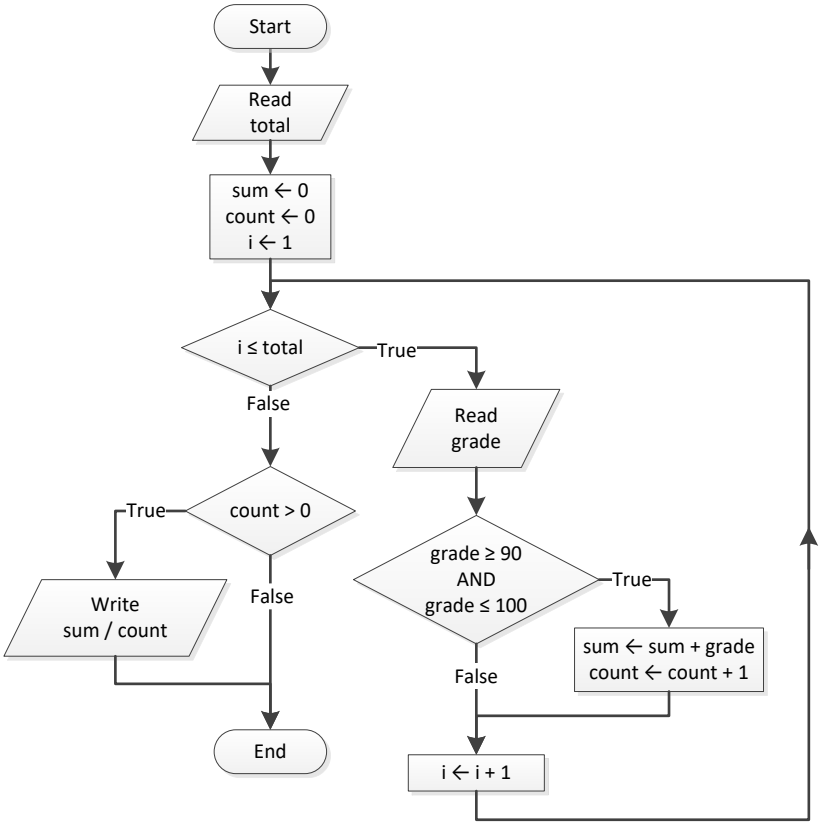
```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, n;
  double p;

  n = Integer.parseInt(cin.readLine());
  p = 1;
  for (i = 2; i <= 2 * n; i += 2) {
    p *= Math.pow(i, i - 1);
  }
  System.out.println(p);
}
```

3. Solution

```
public static void main(String[] args) throws java.io.IOException {
  int i, offset, s;

  s = 0;
  i = 1;
  offset = 0;
  while (i <= 191) {
    s += i;
    offset++;
    i += offset;
  }
  System.out.println(s);
```

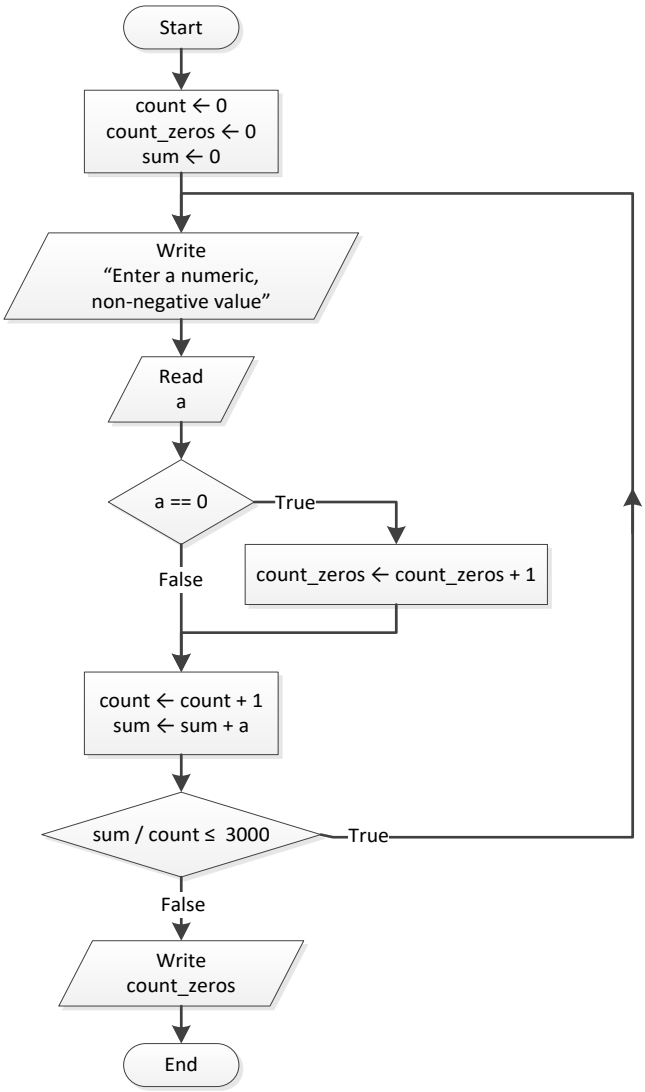
```
}
```

4. Solution




```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int count, grade, i, sum, total;

  total = Integer.parseInt(cin.readLine());
  sum = 0;
  count = 0;
  for (i = 1; i <= total; i++) {
    grade = Integer.parseInt(cin.readLine());
    if (grade >= 90 && grade <= 100) {
      sum += grade;
      count++;
    }
  }
  if (count > 0) {
    System.out.println(sum / (double)count);
  }
}
```

5. Solution




```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int count, count_zeros;
  double a, sum;

  count = 0;
  count_zeros = 0;
  sum = 0;
  do {
    System.out.print("Enter a numeric, non-negative value: ");
    a = Double.parseDouble(cin.readLine());
    if (a == 0) {
      count_zeros++;
    }
    count++;
    sum += a;
  } while (sum / count <= 3000);
```

```
  System.out.println(count_zeros);
}
```

6. Solution

First Approach

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int a, d1, d2, d3, d4, i, r;

  System.out.print("Enter an integer between 1 and 20: ");
  a = Integer.parseInt(cin.readLine());
  for (i = 1000; i <= 9999; i++) {
    d4 = i % 10;
    r = (int)(i / 10);
    d3 = r % 10;
    r = (int)(r / 10);
    d2 = r % 10;
    d1 = (int)(r / 10);
    if (d1 + d2 + d3 + d4 < a) {
      System.out.println(i);
    }
  }
}
```

Second Approach

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int a, d1, d2, d3, d4;

  System.out.print("Enter an integer between 1 and 20: ");
  a = Integer.parseInt(cin.readLine());
  for (d1 = 1; d1 <= 9; d1++) {
    for (d2 = 0; d2 <= 9; d2++) {
      for (d3 = 0; d3 <= 9; d3++) {
        for (d4 = 0; d4 <= 9; d4++) {
          if (d1 + d2 + d3 + d4 < a) {
            System.out.println(d1 * 1000 + d2 * 100 + d3 * 10 + d4);
          }
        }
      }
    }
  }
}
```

7. Solution

First Approach

```
public static void main(String[] args) throws java.io.IOException {
  int d1, d2, d3, d4, i, r;

  for (i = 1000; i <= 9999; i++) {
    d4 = i % 10;
```

```
    r = (int)(i / 10);
    d3 = r % 10;
    r = (int)(r / 10);
    d2 = r % 10;
    d1 = (int)(r / 10);
    if (d1 > d2 && d2 == d3 && d3 < d4) {
      System.out.println(i);
    }
  }
}
```

Second Approach

```
public static void main(String[] args) throws java.io.IOException {
  int d1, d2, d3, d4;

  for (d1 = 1; d1 <= 9; d1++) {
    for (d2 = 0; d2 <= 9; d2++) {
      for (d3 = 0; d3 <= 9; d3++) {
        for (d4 = 0; d4 <= 9; d4++) {
          if (d1 > d2 && d2 == d3 && d3 < d4) {
            System.out.println(d1 * 1000 + d2 * 100 + d3 * 10 + d4);
          }
        }
      }
    }
  }
}
```

8. Solution

```
in = cin.readLine();
while (in.matches(IS_NUMERIC) != true || Integer.parseInt(in) != 1 && Integer.parseInt(in) != 0) {
    System.out.println("Error");
    in = cin.readLine();
}
```

9. Solution

```
do {
  sex = cin.readLine().toUpperCase();
} while (sex.equals("M") == false && sex.equals("F") == false);
```

10. Solution

```
static final String IS_NUMERIC = "[+-]?\\d+(\\.\\d+)?";

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int count, x;
  double y;
  String x_str;

  System.out.print("Enter a non-negative number: ");
```

```
  x_str = cin.readLine();
  count = 1;
  while (count < 3 && (x_str.matches(IS_NUMERIC) != true || Integer.parseInt(x_str) < 0)) {
    System.out.println("Error: Invalid number!");
    System.out.print("Enter a non-negative number: ");
    x_str = cin.readLine();
    if (x_str.matches(IS_NUMERIC) != true || Integer.parseInt(x_str) < 0) {
      count++;
    }
  }

  if (count < 3) {
    y = Math.sqrt(Integer.parseInt(x_str));
    System.out.println(y);
  }
  else {
    System.out.println("Dude, you are dumb!");
  }
}
```

11. Solution

```
static final String IS_NUMERIC = "[+-]?\\d+(\\.\\d+)?";

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  String answer;
  double area, r;

  do {
    System.out.print("Enter the length of a radius: ");
    r = Double.parseDouble(cin.readLine());
    while (r <= 0) {
      System.out.print("Invalid radius. Enter the length of a radius: ");
      r = Double.parseDouble(cin.readLine());
    }

    area = Math.PI * Math.pow(r, 2);
    System.out.println("The area is: " + area);

    System.out.print("Would you like to repeat? ");
    answer = cin.readLine();
  } while (answer.toUpperCase().equals("YES") == true);
}
```

12. Solution

```
public static void main(String[] args) throws java.io.IOException {
  int x, y;

  for (x = -100; x <= 100; x++) {
    for (y = -100; y <= 100; y++) {
      if (5 * x + 3 * Math.pow(y, 2) == 0) {
```

```
        System.out.println(x + ", " + y);
      }
    }
  }
}
```

13. Solution

```
public static void main(String[] args) throws java.io.IOException {
  int x, y, z;

  for (x = -10; x <= 10; x++) {
    for (y = -10; y <= 10; y++) {
      for (z = -10; z <= 10; z++) {
        if ((x + y) / 2.0 + 3.0 * Math.pow(z, 2) / (x + 3 * y + 45) == x / 3.0) {
          System.out.println(x + ", " + y + ", " + z);
        }
      }
    }
  }
}
```

14. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int m1, m2, m3, s;

  m1 = Integer.parseInt(cin.readLine());
  m2 = Integer.parseInt(cin.readLine());
  m3 = Integer.parseInt(cin.readLine());

  s = 0;
  while (m2 != 0) {
    if (m2 % 2 != 0) {
      s += m1;
    }
    m1 *= 2;
    m2 = (int)(m2 / 2);
  }

  m1 = s;
  m2 = m3;

  s = 0;
  while (m2 != 0) {
    if (m2 % 2 != 0) {
      s += m1;
    }
    m1 *= 2;
    m2 = (int)(m2 / 2);
  }
```

```
  System.out.println(s);
}
```

15. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int a, b, c, i, number_of_divisors, x;

  System.out.print("Enter an integer greater than 1: ");
  a = Integer.parseInt(cin.readLine());
  while (a < 2) {
    System.out.print("Wrong number. Please enter an integer greater than 1: ");
    a = Integer.parseInt(cin.readLine());
  }

  System.out.print("Enter a second integer greater than 1: ");
  b = Integer.parseInt(cin.readLine());
  while (b < 2) {
    System.out.print("Wrong number. Please enter a second integer greater than 1: ");
    b = Integer.parseInt(cin.readLine());
  }

  if (a > b) {
    c = a;
    a = b;
    b = c;
  }

  for (x = a; x <= b; x++) {
    number_of_divisors = 2;
    i = 2;
    while (i <= (int)(x / 2) && number_of_divisors == 2) {
      if (x % i == 0) {
        number_of_divisors++;
      }
      i++;
    }
    if (number_of_divisors == 2) {
      System.out.println("Number " + x + " is prime");
    }
  }
}
```

16. Solution

```
static final String IS_NUMERIC = "[+-]?\\d+(\\.\\d+)?";

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int a, b, c, d1, d2, d3, d4, r, x;
  String in;
```

```
  System.out.print("Enter a four-digit integer: ");
  in = cin.readLine();
  while (in.matches(IS_NUMERIC) != true ||
         Integer.parseInt(in) < 1000 || Integer.parseInt(in) > 9999) {

    System.out.print("Wrong number. Please enter a four-digit integer: ");
    in = cin.readLine();
  }
  a = Integer.parseInt(in);

  System.out.print("Enter a second four-digit integer: ");
  in = cin.readLine();
  while (in.matches(IS_NUMERIC) != true ||
         Integer.parseInt(in) < 1000 || Integer.parseInt(in) > 9999) {
    System.out.print("Wrong number. Please enter a second four-digit integer: ");
    in = cin.readLine();
  }
  b = Integer.parseInt(in);

  if (a > b) {
    c = a;
    a = b;
    b = c;
  }

  for (x = a; x <= b; x++) {
    d4 = x % 10;
    r = (int)(x / 10);
    d3 = r % 10;
    r = (int)(r / 10);
    d2 = r % 10;
    d1 = (int)(r / 10);

    if (d1 == d4 && d2 == d3) {
      System.out.println(x);
    }

  }
}
```

17. Solution

```
public static void main(String[] args) throws java.io.IOException {
  int i;

  for (i = 0; i <= 30; i++) {
    System.out.println(Math.pow(2, i));
  }
}
```

18. Solution

```
public static void main(String[] args) throws java.io.IOException {
```

```
  int i, offset;

  offset = 10;
  i = 1;
  while (i <= 401) {
    System.out.println(i);
    i += offset;
    offset += 2;
  }
}
```

19. Solution

```
public static void main(String[] args) throws java.io.IOException {
  int i;

  for (i = 1; i <= 100; i++) {
    System.out.println(-i + "\n" + i);
  }
}
```

20. Solution

First Approach

```
public static void main(String[] args) throws java.io.IOException {
  int i, offset, value;

  value = 0;
  for (i = 1; i <= 8; i++) {
    offset = (int)Math.pow(10, i - 1);
    value += offset;
    System.out.println(value);
  }
}
```

Second Approach

```
public static void main(String[] args) throws java.io.IOException {
  int i;
  String value;

  value = "1";
  for (i = 1; i <= 8; i++) {
    System.out.println(value);
    value += "1";
  }
}
```

21. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int a, fib, fib_prev, fib_prev_prev, i;
```

```
  a = Integer.parseInt(cin.readLine());

  fib_prev_prev = 0;
  fib_prev = 1;
  fib = 1;
  for(i = 1;i <= a; i++) {
    System.out.println(fib);
    fib = fib_prev + fib_prev_prev;
    fib_prev_prev = fib_prev;
    fib_prev = fib;
  }
}
```

22. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int a, fib, fib_prev, fib_prev_prev;

  a = Integer.parseInt(cin.readLine());

  fib_prev_prev = 0;
  fib_prev = 1;
  fib = 1;
  while (fib < a) {
    System.out.println(fib);
    fib = fib_prev + fib_prev_prev;
    fib_prev_prev = fib_prev;
    fib_prev = fib;
  }
}
```

23. Solution

```
static final String IS_NUMERIC = "[+-]?\\d+(\\.\\d+)?";

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int denominator, i, n, nominator;
  String in;
  double y;

  System.out.print("Enter a positive integer: ");
  in = cin.readLine();
  while (in.matches(IS_NUMERIC) != true || Integer.parseInt(in) < 1) {
    System.out.print("Wrong number. Please enter a positive integer: ");
    in = cin.readLine();
  }
  n = Integer.parseInt(in);

  nominator = 0;
  for (i = 2; i <= 2 * n; i += 2) {
    nominator += i;
```

```
  }

  denominator = 1;
  for (i = 1; i <= n; i++) {
    denominator *= i;
  }

  y = nominator / (double)denominator;
  System.out.println(y);
}
```

24. Solution

```
static final String IS_NUMERIC = "[+-]?\\d+(\\.\\d+)?";

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, n, nominator, sign;
  double y;
  String in;

  System.out.print("Enter a positive integer: ");
  in = cin.readLine();
  while (in.matches(IS_NUMERIC) != true || Integer.parseInt(in) < 1) {
    System.out.print("Wrong number. Please enter a positive integer: ");
    in = cin.readLine();
  }
  n = Integer.parseInt(in);

  nominator = 0;
  sign = 1;
  for (i = 1; i <= 2 * n + 1; i += 2) {
    nominator += sign * i;
    sign = -sign;
  }

  y = nominator / (double)n;
  System.out.println(y);
}
```

25. Solution

```
static final String IS_NUMERIC = "[+-]?\\d+(\\.\\d+)?";

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, n, sign;
  double y;
  String in;

  System.out.print("Enter a positive integer: ");
  in = cin.readLine();
  while (in.matches(IS_NUMERIC) != true || Integer.parseInt(in) < 1) {
```

```
    System.out.print("Wrong number. Please enter a positive integer: ");
    in = cin.readLine();
  }
  n = Integer.parseInt(in);

  y = 0.5;  //This is equal to the first two terms: 1 - 1 / 2

  sign = 1;
  for (i = 3; i <= n; i += 2) {
    y += sign / (double)i;
    sign = -sign;
  }

  System.out.println(y);
}
```

26. Solution

```
static final String IS_NUMERIC = "[+-]?\\d+(\\.\\d+)?";

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, n;
  double y;
  String in;

  System.out.print("Enter a positive integer: ");
  in = cin.readLine();
  while (in.matches(IS_NUMERIC) != true || Integer.parseInt(in) < 1) {
    System.out.print("Wrong number. Please enter a positive integer: ");
    in = cin.readLine();
  }
  n = Integer.parseInt(in);

  y = 0;
  for (i = 1; i <= n; i++) {
    y += 1 / Math.pow(i, n - i + 1);
  }

  System.out.println(y);
}
```

27. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int factorial, i, n;

  System.out.print("Enter a non-negative integer: ");
  n = Integer.parseInt(cin.readLine());

  factorial = 1;
  for (i = 1; i <= n; i++) {
```

```
    factorial *= i;
  }

  System.out.println(factorial);
}
```

***Notice**: Please note that this Java code operates properly for all non-negative integers, including zero.*

28. Solution

First Approach

```
static final double ACCURACY = 0.00001;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j;
  double factorial, exponential_previous, exponential, x;

  x = Double.parseDouble(cin.readLine());

  exponential = 0;
  i = 0;
  do {
    exponential_previous = exponential;

    factorial = 1;
    for (j = 1; j <= i; j++) {
      factorial *= j;
    }

    exponential += Math.pow(x, i) / factorial;

    i++;
  } while (Math.abs(exponential - exponential_previous) > ACCURACY);

  System.out.println("e(" + x  +") ~= " + exponential);
}
```

Second Approach

```
static final double ACCURACY = 0.00001;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j;
  double factorial, exponential_previous, exponential, x;

  x = Double.parseDouble(cin.readLine());

  exponential = 1;
  i = 1;
  factorial = 1;
  do {
    exponential_previous = exponential;
```

```
    factorial *= i;

    exponential += Math.pow(x, i) / factorial;

    i++;
  } while (Math.abs(exponential - exponential_previous) > ACCURACY);

  System.out.println("e(" + x + ") ~= " + exponential);
}
```

29. Solution

First Approach

```
static final double ACCURACY = 0.00001;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j, sign;
  double factorial;
  double sinus, sinus_previous, x;

  x = Double.parseDouble(cin.readLine());

  sign = 1;
  sinus = 0;
  i = 1;
  do {
    sinus_previous = sinus;

    factorial = 1;
    for (j = 1; j <= i; j++) {
      factorial *= j;
    }

    sinus += sign * Math.pow(x, i) / factorial;

    sign = -sign;
    i += 2;
  } while (Math.abs(sinus - sinus_previous) > ACCURACY);

  System.out.println("sin(" + x + ") ~= " + sinus);
}
```

Second Approach

```
static final double ACCURACY = 0.00001;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j, sign;
  double factorial;
  double sinus, sinus_previous, x;

  x = Double.parseDouble(cin.readLine());
```

```
  sign = -1;
  sinus = x;
  i = 3;
  factorial = 1;
  do {
    sinus_previous = sinus;

    factorial *= i * (i - 1);

    sinus += sign * Math.pow(x, i) / factorial;

    sign = -sign;
    i += 2;
  } while (Math.abs(sinus - sinus_previous) > ACCURACY);

  System.out.println("sin(" + x + ") ~= " + sinus);
}
```

30. Solution

First Approach

```
static final double ACCURACY = 0.00001;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j, sign;
  double factorial;
  double cosinus, cosinus_previous, x;

  x = Double.parseDouble(cin.readLine());

  sign = 1;
  cosinus = 0;
  i = 0;
  do {
    cosinus_previous = cosinus;

    factorial = 1;
    for (j = 1; j <= i; j++) {
      factorial *= j;
    }

    cosinus += sign * Math.pow(x, i) / factorial;

    sign = -sign;
    i += 2;
  } while (Math.abs(cosinus - cosinus_previous) > ACCURACY);

  System.out.println("cos(" + x + ") ~= " + cosinus);
}
```

Second Approach

```
static final double ACCURACY = 0.00001;
```

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j, sign;
  double factorial;
  double cosinus, cosinus_previous, x;

  x = Double.parseDouble(cin.readLine());

  sign = -1;
  cosinus = 1;
  i = 2;
  factorial = 1;
  do {
    cosinus_previous = cosinus;

    factorial *= i * (i - 1);

    cosinus += sign * Math.pow(x, i) / factorial;

    sign = -sign;
    i += 2;
  } while (Math.abs(cosinus - cosinus_previous) > ACCURACY);

  System.out.println("cos(" + x + ") ~= " + cosinus);
}
```

31. Solution

```
static final String IS_NUMERIC = "[+-]?\\d+(\\.\\d+)?";

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i;
  double max, sum, t;
  String t_str;
  boolean failure;

  max = -460;
  sum = 0;
  for (i = 1; i <= 31; i++) {
    do {
      System.out.print("Enter temperature for day " + i + ": ");
      t_str = cin.readLine();

      failure = false;
      if (t_str.matches(IS_NUMERIC) != true) {
        System.out.println("Please enter numeric values!");
        failure = true;
      }
      else if (Double.parseDouble(t_str) < -459.67) {
        System.out.println("Please enter a value greater than 459.67");
        failure = true;
      }
```

```
    } while (failure == true);
    t = Double.parseDouble(t_str);

    sum += t;
    if (t > max) {
      max = t;
    }
  }

  System.out.println(sum / 31 + ", " + max);
}
```

32. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int hour, max_hour, max_minutes, min_hour, min_minutes, minutes;
  double level, max, min;

  level = Double.parseDouble(cin.readLine());
  if (level != 9999) {
    hour = Integer.parseInt(cin.readLine());
    minutes = Integer.parseInt(cin.readLine());

    max = level;
    max_hour = hour;
    max_minutes = minutes;

    min = level;
    min_hour = hour;
    min_minutes = minutes;

    level = Double.parseDouble(cin.readLine());
    while (level != 9999) {
      hour = Integer.parseInt(cin.readLine());
      minutes = Integer.parseInt(cin.readLine());

      if (level > max) {
        max = level;
        max_hour = hour;
        max_minutes = minutes;
      }

      if (level < min) {
        min = level;
        min_hour = hour;
        min_minutes = minutes;
      }

      level = Double.parseDouble(cin.readLine());
    }

    System.out.println(max + ", " + max_hour + ", " + max_minutes);
    System.out.println(min + ", " + min_hour + ", " + min_minutes);
```

```
  }
}
```

33. Solution

```
static final String IS_NUMERIC = "[+-]?\\d+(\\.\\d+)?";

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int a, b, c, i;
  String in, alphabet;
  boolean failure;

  alphabet = "abcdefghijklmnopqrstuvwxyz";

  do {
    System.out.print("Enter an integer between 1 and 26: ");
    in = cin.readLine();

    failure = false;
    if (in.matches(IS_NUMERIC) != true) {
      System.out.println("Please enter numeric values!");
      failure = true;
    }
    else if (Integer.parseInt(in) < 1) {
      System.out.println("Please enter positive integers!");
      failure = true;
    }
    else if (Integer.parseInt(in) > 26) {
      System.out.println("Please enter a value less than or equal to 26!");
      failure = true;
    }
  } while (failure == true);
  a = Integer.parseInt(in);

  do {
    System.out.print("Enter an integer between 1 and 26: ");
    in = cin.readLine();

    failure = false;
    if (in.matches(IS_NUMERIC) != true) {
      System.out.println("Please enter numeric values!");
      failure = true;
    }
    else if (Integer.parseInt(in) < 1) {
      System.out.println("Please enter positive integers!");
      failure = true;
    }
    else if (Integer.parseInt(in) > 26) {
      System.out.println("Please enter a value less than or equal to 26!");
      failure = true;
    }
  } while (failure == true);
  b = Integer.parseInt(in);
```

```
  if (a > b) {
    c = a;
    a = b;
    b = c;
  }

  for (i = a; i <= b; i++) {
    System.out.print(alphabet.charAt(i - 1));
  }
}
```

34. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int attempts, guess, secret_number;

  secret_number = 1 + (int)(Math.random() * 100);

  attempts = 1;
  System.out.print("Enter a guess: ");
  guess = Integer.parseInt(cin.readLine());
  while (guess != secret_number) {
    if (guess > secret_number) {
      System.out.println("Your guess is bigger than my secret number. Try again.");
    }
    else {
      System.out.println("Your guess is smaller than my secret number. Try again.");
    }
    attempts++;
    System.out.print("Enter a guess: ");
    guess = Integer.parseInt(cin.readLine());
  }
  System.out.println("You found it!");
  System.out.println("Attempts: " + attempts);
}
```

35. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int attempts = 0, first_player_attempts = 0, guess, i, secret_number;

  for (i = 1; i <= 2; i++) {
    secret_number = 1 + (int)(Math.random() * 100);

    attempts = 1;
    System.out.print("Enter a guess: ");
    guess = Integer.parseInt(cin.readLine());
    while (guess != secret_number) {
      if (guess > secret_number) {
        System.out.println("Your guess is bigger than my secret number. Try again.");
```

```
      }
      else {
        System.out.println("Your guess is smaller than my secret number. Try again.");
      }
      attempts++;
      System.out.print("Enter a guess: ");
      guess = Integer.parseInt(cin.readLine());
    }
    System.out.println("You found it!");
    System.out.println("Attempts: " + attempts);

    if (i == 1) {
      first_player_attempts = attempts;
    }
  }

  if (first_player_attempts < attempts) {
    System.out.println("First player wins!");
  }
  else if (first_player_attempts > attempts) {
    System.out.println("Second player wins!");
  }
  else {
    System.out.println("It's a draw");
  }
}
```

36. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int choice, diagonal;

  do {
    System.out.println("1. 4/3 TV Screen");
    System.out.println("2. 16/9 TV Screen");
    System.out.println("3. Exit");
    System.out.print("Enter a choice: ");
    choice = Integer.parseInt(cin.readLine());

    if (choice == 1) {
      System.out.println("Enter diagonal: ");
      diagonal = Integer.parseInt(cin.readLine());
      System.out.println("Width: " + (diagonal * 0.8));
      System.out.println("Height: " + (diagonal * 0.6));
    }
    else if (choice == 2) {
      System.out.println("Enter diagonal: ");
      diagonal = Integer.parseInt(cin.readLine());
      System.out.println("Width: " + (diagonal * 0.87));
      System.out.println("Height: " + (diagonal * 0.49));
    }
  } while (choice != 3);
```

```
}
```

37. Solution

```
static final String IS_NUMERIC = "[+-]?\\d+(\\.\\d+)?";

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int count_a, count_a_boys, count_b, count_cdef_girls, grade;
  int i, max, min, n, sum, sum_a, sum_a_boys, sum_b;
  String in, sex;

  System.out.print("Enter total number of students: ");
  in = cin.readLine();
  while (in.matches(IS_NUMERIC) != true || Integer.parseInt(in) < 1) {
    System.out.print("Wrong number. Please enter total number of students: ");
    in = cin.readLine();
  }
  n = Integer.parseInt(in);

  sum = 0;
  sum_a = 0;
  count_a = 0;
  sum_b = 0;
  count_b = 0;
  sum_a_boys = 0;
  count_a_boys = 0;
  count_cdef_girls = 0;

  max = -1;
  min = 101;

  for (i = 1; i <= n; i++) {
    System.out.print("Enter grade for student No " + i + ": ");
    in = cin.readLine();
    while (in.matches(IS_NUMERIC) != true || Integer.parseInt(in) < 0 || Integer.parseInt(in) > 100) {
      System.out.print("Wrong grade. Please enter grade for student No " + i + ": ");
      in = cin.readLine();
    }
    grade = Integer.parseInt(in);

    System.out.print("Enter sex for student No " + i + ": ");
    sex = cin.readLine().toUpperCase();
    while (sex.equals("M") != true && sex.equals("F") != true) {
      System.out.print("Wrong sex. Please enter sex for student No " + i + ": ");
      sex = cin.readLine().toUpperCase();
    }

    if (grade >= 90 && grade <= 100) {
      sum_a += grade;
      count_a++;
      if (sex.equals("M") == true) {
        sum_a_boys += grade;
        count_a_boys++;
```

```
      }
    }
    else if (grade >= 80 && grade <= 89) {
      sum_b += grade;
      count_b++;
    }
    else {
      if (sex.equals("F") == true) {
        count_cdef_girls++;
      }
    }

    if (grade > max) {
      max = grade;
    }

    if (grade < min) {
      min = grade;
    }

    sum += grade;
  }

  if (count_a > 0) {
    System.out.print("The average value of those who got an 'A' is: ");
    System.out.println(sum_a / (double)count_a);
  }
  if (count_b > 0) {
    System.out.print("The average value of those who got a 'B' is: ");
    System.out.println(sum_b / (double)count_b);
  }
  if (count_a_boys > 0) {
    System.out.print("The average value of boys who got an 'A' is: ");
    System.out.println(sum_a_boys / (double)count_a_boys);
  }
  System.out.println("The total number of girls that got less than 'B' is: " + count_cdef_girls);
  System.out.println("The highest grade is: " + max);
  System.out.println("The lowest grade is: " + min);
  System.out.println("The average grade of the whole class is: " + sum / (double)n);
}
```

38. Solution

```
static final String IS_NUMERIC = "[+-]?\\d+(\\.\\d+)?";

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double amount, discount;
  String in, answer;

  do {
    System.out.print("Enter amount: ");
    in = cin.readLine();
    while (in.matches(IS_NUMERIC) != true || Double.parseDouble(in) < 0) {
```

```
      System.out.println("Wrong amount. Please enter amount: ");
      in = cin.readLine();
    }
    amount = Double.parseDouble(in);

    if (amount < 20) {
      discount = 0;
    }
    else if (amount < 50) {
      discount = 3;
    }
    else if (amount < 100) {
      discount = 5;
    }
    else {
      discount = 10;
    }

    System.out.println("Discount: " + discount + "%");
    System.out.println("Amount to pay (discount included): " + (amount - amount * discount / 100));

    System.out.print("Would you like to repeat? ");
    answer = cin.readLine().toUpperCase();
  } while (answer.equals("YES") == true);
}
```

39. Solution

```
static final String IS_NUMERIC = "[+-]?\\d+(\\.\\d+)?";
static final double TAX_RATE = 0.25;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int kwh;
  double t;
  String in;

  System.out.print("Enter number of Kilowatt-hours consumed: ");
  in = cin.readLine();
  while (in.matches(IS_NUMERIC) != true || Integer.parseInt(in) < 0 && Integer.parseInt(in) != -1) {
    System.out.print("Wrong value. Please enter number of Kilowatt-hours consumed: ");
    in = cin.readLine();
  }
  kwh = Integer.parseInt(in);

  while (kwh != -1) {
    if (kwh <= 400) {
      t = kwh * 0.11;
    }
    else if (kwh <= 1500) {
      t = 400 * 0.11 + (kwh - 400) * 0.22;
    }
    else if (kwh <= 3500) {
      t = 400 * 0.11 + 1100 * 0.22 + (kwh - 1500) * 0.25;
```

```
    }
    else {
      t = 400 * 0.11 + 1100 * 0.22 + 2000 * 0.25 + (kwh - 3500) * 0.50;
    }

    t += t * TAX_RATE;
    System.out.println("Total amount to pay (taxes included): " + t);

    System.out.print("Enter number of Kilowatt-hours consumed: ");
    in = cin.readLine();
    while (in.matches(IS_NUMERIC) != true || Integer.parseInt(in) < 0 && Integer.parseInt(in) != -1) {
      System.out.print("Wrong value. Please enter number of Kilowatt-hours consumed: ");
      in = cin.readLine();
    }
    kwh = Integer.parseInt(in);
  }
}
```

Chapter 32

32.3 Answers of Review Questions: True/False

1. true
2. true
3. false
4. false
5. false
6. true
7. true
8. false
9. true

32.4 Answers of Review Exercises

1. Solution

Weights =

170	*0*
190	*1*
193	*2*
165	*3*
200	*4*

People

2. Solution

Names =

John Thompson
Ava Brown
Ryan Miller
Antony Harris
Alexander Lewis
Samantha Clark
Chloe Parker

Weights =

170	*0*
190	*1*
193	*2*
165	*3*
200	*4*
170	*5*
172	*6*

People

3. Solution

Months

0 *1* *2*

Names =

Toba
Issyk Kul
Baikal
Crater
Karakul

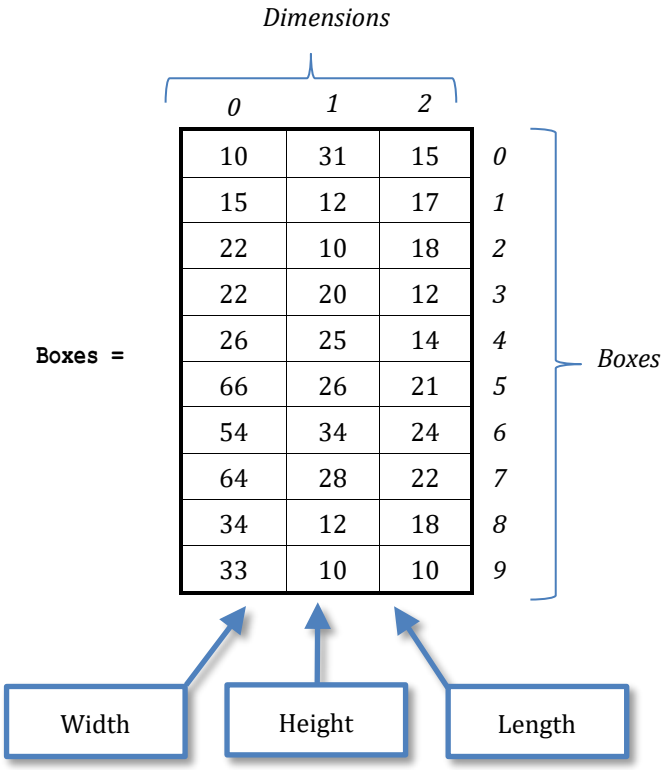
Areas =

440	438	437	*0*
2408	2405	2402	*1*
12248	12247	12240	*2*
21	20	18	*3*
150	145	142	*4*

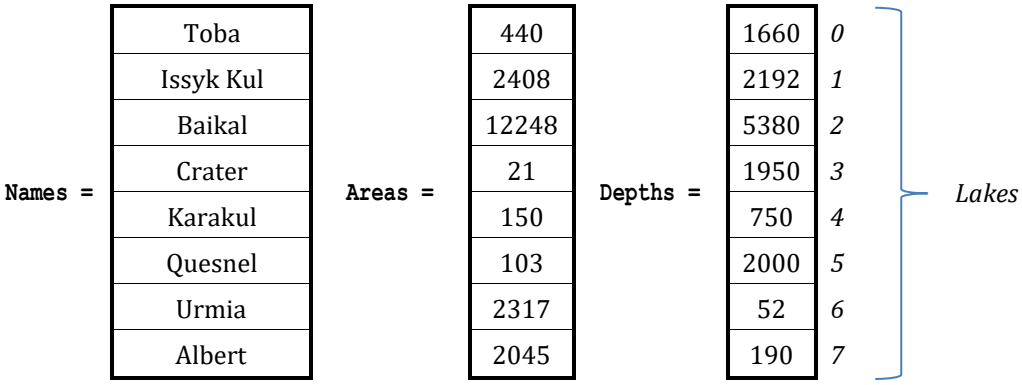
Lakes

June July August

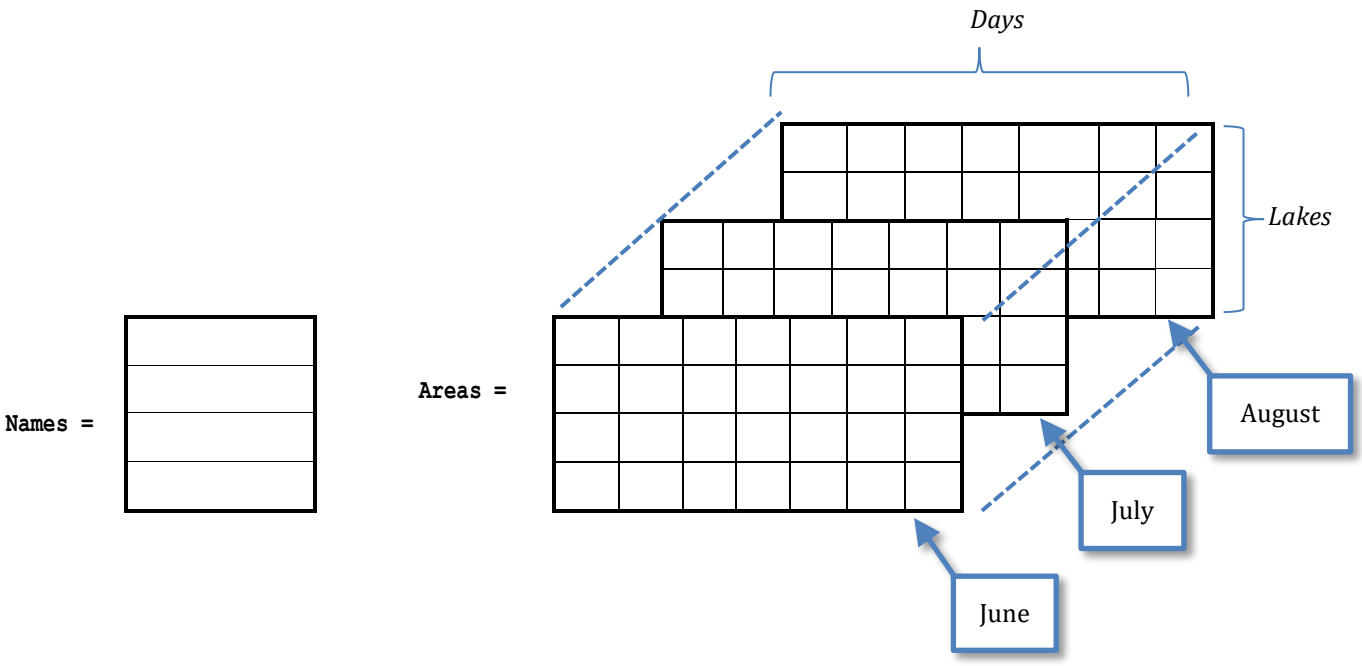
4. Solution



5. Solution



6. Solution



Chapter 33

33.5 Answers of Review Questions: True/False

1. true
2. true
3. false
4. false
5. true
6. true
7. false
8. true
9. false
10. true
11. false
12. true
13. false
14. false
15. true
16. false
17. true
18. true
19. false
20. false
21. true
22. true
23. false

33.6 Answers of Review Questions: Multiple Choice

1. d
2. a
3. c
4. b
5. d
6. b
7. d
8. d
9. a

33.7 Answers of Review Exercises

1. Solution

Step	Statement	x	a[0]	a[1]	a[2]
1	`int[] a = new int[3]`	?	?	?	?
2	`a[2] = 1`	?	?	?	**1**
3	`x = 0`	**0**	?	?	1
4	`a[x + a[2]] = 4`	0	?	**4**	1
5	`a[x] = a[x + 1] * 4`	0	**16**	4	1

2. Solution

Step	Statement	x	a[0]	a[1]	a[2]	a[3]	a[4]
1	`int[] a = new int[5]`	?	?	?	?	?	?
2	`a[1] = 5`	?	?	5	?	?	?
3	`x = 0`	0	?	5	?	?	?
4	`a[x] = 4`	0	4	5	?	?	?
5	`a[a[0]] = a[x + 1] % 3`	0	4	5	?	?	2

6	a[a[0] / 2] = 10	0	4	5	10	?	2
7	x += 2	2	4	5	10	?	2
8	a[x + 1] = a[x] + 9	2	4	5	10	19	2

3. Solution

For input value of 3

Step	Statement	x	a[0]	a[1]	a[2]	a[3]
1	int[] a = new int[4]	?	?	?	?	?
2	a[1] = Integer.parseInt(cin.readLine())	?	?	**3**	?	?
3	x = 0	**0**	?	3	?	?
4	a[x] = 3	0	**3**	3	?	?
5	a[a[0]] = a[x + 1] % 2	0	3	3	?	**1**
6	a[a[0] % 2] = 10	0	3	**10**	?	1
7	x++	**1**	3	10	?	1
8	a[x + 1] = a[x] + 9	1	3	10	**19**	1

For input value of 4

Step	Statement	x	a[0]	a[1]	a[2]	a[3]
1	int[] a = new int[4]	?	?	?	?	?
2	a[1] = Integer.parseInt(cin.readLine())	?	?	**4**	?	?
3	x = 0	**0**	?	4	?	?
4	a[x] = 3	0	**3**	4	?	?
5	a[a[0]] = a[x + 1] % 2	0	3	4	?	**0**
6	a[a[0] % 2] = 10	0	3	**10**	?	0
7	x++	**1**	3	10	?	0
8	a[x + 1] = a[x] + 9	1	3	10	**19**	0

For input value of 1

Step	Statement	x	a[0]	a[1]	a[2]	a[3]
1	int[] a = new int[4]	?	?	?	?	?
2	a[1] = Integer.parseInt(cin.readLine())	?	?	**1**	?	?
3	x = 0	**0**	?	1	?	?
4	a[x] = 3	0	**3**	1	?	?
5	a[a[0]] = a[x + 1] % 2	0	3	1	?	**3**
6	a[a[0] % 2] = 10	0	3	**10**	?	3
7	x++	**1**	3	10	?	3
8	a[x + 1] = a[x] + 9	1	3	10	**19**	3

4. Solution

For input value of 100

Step	Statement	x	a[0]	a[1]	a[2]	a[3]
1	`int[] a = new int[4]`	?	?	?	?	?
2	`a[1] = Integer.parseInt(cin.readLine())`	?	?	**100**	?	?
3	`x = 0`	**0**	?	100	?	?
4	`a[x] = 3`	0	**3**	100	?	?
5	`a[a[0]] = a[x + 1] % 10`	0	3	100	?	**0**
6	`if (a[3] > 5)`			False		
7	`a[2] = 3`	0	3	100	**3**	0

For input value of 108

Step	Statement	x	a[0]	a[1]	a[2]	a[3]
1	`int[] a = new int[4]`	?	?	?	?	?
2	`a[1] = Integer.parseInt(cin.readLine())`	?	?	**108**	?	?
3	`x = 0`	**0**	?	108	?	?
4	`a[x] = 3`	0	**3**	108	?	?
5	`a[a[0]] = a[x + 1] % 10`	0	3	108	?	**8**
6	`if (a[3] > 5)`			True		
7	`a[a[0] % 2] = 9`	0	3	**9**	?	8
8	`x += 1`	**1**	3	9	?	8
9	`a[x + 1] = a[x] + 9`	1	3	9	**18**	8

For input value of 1

Step	Statement	x	a[0]	a[1]	a[2]	a[3]
1	`int[] a = new int[4]`	?	?	?	?	?
2	`a[1] = Integer.parseInt(cin.readLine())`	?	?	**1**	?	?
3	`x = 0`	**0**	?	1	?	?
4	`a[x] = 3`	0	**3**	1	?	?
5	`a[a[0]] = a[x + 1] % 10`	0	3	1	?	**1**
6	`if (a[3] > 5)`			False		
7	`a[2] = 3`	0	3	1	**3**	1

5. Solution

Step	Statement	x	y	a[0]	a[1]	a[2]
1	`int[] a = new int[3]`	?	?	?	?	?
2	`x = 4`	**4**	?	?	?	?
3	`y = x - 1`	4	**3**	?	?	?
4, 5	`if (x > y)`	4	3	**1**	?	?

	a[0] = 1;
	else
	a[0] = y;					

6	a[1] = x + 3	4	3	1	**7**	?
7	y = y - 1	4	**2**	1	7	?
8	a[y] = (x + 5) % 2	4	2	1	7	**1**

6. *Solution*

Step	Statement	i	a[0]	a[1]	a[2]	a[3]	a[4]	a[5]
1	int[] a = {17, 12, 45, 12, 12, 49}	?	**17**	**12**	**45**	**12**	**12**	**49**
2	i = 0;	**0**	17	12	45	12	12	49
3	i <= 5				True			
4	if (a[i] == 12)				False			
5	a[i]++	0	**18**	12	45	12	12	49
6	i++	**1**	18	12	45	12	12	49
7	i <= 5				True			
8	if (a[i] == 12)				True			
9	a[i]--	1	18	**11**	45	12	12	49
10	i++	**2**	18	11	45	12	12	49
11	i <= 5				True			
12	if (a[i] == 12)				False			
13	a[i]++	2	18	11	**46**	12	12	49
14	i++	**3**	18	11	46	12	12	49
15	i <= 5				True			
16	if (a[i] == 12)				True			
17	a[i]--	3	18	11	46	**11**	12	49
18	i++	**4**	18	11	46	11	12	49
19	i <= 5				True			
20	if (a[i] == 12)				True			
21	a[i]--	4	18	11	46	11	**11**	49
22	i++	**5**	18	11	46	11	11	49
23	i <= 5				True			
24	if (a[i] == 12)				False			
25	a[i]++	5	18	11	46	11	11	**50**
26	i++	**6**	18	11	46	11	11	50
27	i <= 5				False			

7. Solution

Step	Statement	i	a[0]	a[1]	a[2]	a[3]	a[4]	a[5]
1	`int[] a = {10, 15, 12, 23, 22, 19}`	?	**10**	**15**	**12**	**23**	**22**	**19**
2	`i = 1`	**1**	10	15	12	23	22	19
3	`i <= 4`				True			
4	`a[i] = a[i + 1] + a[i - 1]`	1	10	**22**	12	23	22	19
5	`i++`	**2**	10	22	12	23	22	19
6	`i <= 4`				True			
7	`a[i] = a[i + 1] + a[i - 1]`	2	10	22	**45**	23	22	19
8	`i++`	**3**	10	22	45	23	22	19
9	`i <= 4`				True			
10	`a[i] = a[i + 1] + a[i - 1]`	3	10	22	45	**67**	22	19
11	`i++`	**4**	10	22	45	67	22	19
12	`i <= 4`				True			
13	`a[i] = a[i + 1] + a[i - 1]`	4	10	22	45	67	**86**	19
14	`i++`	**5**	10	22	45	67	86	19
15	`i <= 4`				False			

8. Solution

```
static final int ELEMENTS = 100;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i;

  double[] a = new double[ELEMENTS];
  for (i = 0; i <= ELEMENTS - 1; i++) {
    a[i] = Double.parseDouble(cin.readLine());
  }

  for (i = 0; i <= ELEMENTS - 1; i++) {
    System.out.println(Math.pow(a[i], 3));
  }
}
```

9. Solution

```
static final int ELEMENTS = 80;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i;

  double[] a = new double[ELEMENTS];
  for (i = 0; i <= ELEMENTS - 1; i++) {
    a[i] = Double.parseDouble(cin.readLine());
```

```
  }

  for (i = ELEMENTS - 1; i >= 0; i--) {
    System.out.println(Math.pow(a[i], 2));
  }
}
```

10. Solution

```
static final int ELEMENTS = 90;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i;

  int[] a = new int[ELEMENTS];
  for (i = 0; i <= ELEMENTS - 1; i++) {
    a[i] = Integer.parseInt(cin.readLine());
  }

  for (i = ELEMENTS - 1; i >= 0; i--) {
    if (a[i] % 5 == 0) {
      System.out.println(a[i]);
    }
  }
}
```

11. Solution

```
static final int ELEMENTS = 50;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i;

  int[] a = new int[ELEMENTS];
  for (i = 0; i <= ELEMENTS - 1; i++) {
    a[i] = Integer.parseInt(cin.readLine());
  }

  for (i = 0; i <= ELEMENTS - 1; i++) {
    if (a[i] % 2 == 0 || a[i] > 10) {
      System.out.println(a[i]);
    }
  }
}
```

12. Solution

```
static final int ELEMENTS = 30;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i;
  double sum;
```

```
  double[] a = new double[ELEMENTS];
  for (i = 0; i <= ELEMENTS - 1; i++) {
    a[i] = Double.parseDouble(cin.readLine());
  }

  sum = 0;
  for (i = 0; i <= ELEMENTS - 1; i++) {
    if (a[i] > 0) {
      sum += a[i];
    }
  }
  System.out.println(sum);
}
```

13. Solution

```
static final int ELEMENTS = 50;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, sum;

  int[] a = new int[ELEMENTS];
  for (i = 0; i <= ELEMENTS - 1; i++) {
    a[i] = Integer.parseInt(cin.readLine());
  }

  sum = 0;
  for (i = 0; i <= ELEMENTS - 1; i++) {
    if (a[i] >= 10 && a[i] <= 99) {
      sum += a[i];
    }
  }
  System.out.println(sum);
}
```

14. Solution

```
static final int ELEMENTS = 40;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i;
  double sum_neg, sum_pos;

  double[] a = new double[ELEMENTS];
  for (i = 0; i <= ELEMENTS - 1; i++) {
    a[i] = Double.parseDouble(cin.readLine());
  }

  sum_pos = 0;
  sum_neg = 0;
  for (i = 0; i <= ELEMENTS - 1; i++) {
    if (a[i] > 0 ) {
      sum_pos += a[i];
    }
```

```
    else if (a[i] < 0) {
      sum_neg += a[i];
    }
  }
  System.out.println(sum_pos + ", " + sum_neg);
}
```

15. Solution

```
static final int ELEMENTS = 20;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i;
  double sum;

  double[] a = new double[ELEMENTS];
  for (i = 0; i <= ELEMENTS - 1; i++) {
    a[i] = Double.parseDouble(cin.readLine());
  }

  sum = 0;
  for (i = 0; i <= ELEMENTS - 1; i++) {
    sum += a[i];
  }
  System.out.println(sum / ELEMENTS);
}
```

16. Solution

```
static final int WORDS = 50;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i;

  String[] a = new String[WORDS];
  for (i = 0; i <= WORDS - 1; i++) {
    a[i] = cin.readLine();
  }

  for (i = 0; i <= WORDS - 1; i++) {
    if (a[i].length() >= 10 ) {
      System.out.println(a[i]);
    }
  }
}
```

17. Solution

```
static final int WORDS = 40;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int count, i, j;
```

```
  String[] a = new String[WORDS];
  for (i = 0; i <= WORDS - 1; i++) {
    a[i] = cin.readLine();
  }

  for (i = 0; i <= WORDS - 1; i++) {
    count = 0;
    for (j = 0; j <= a[i].length() - 1; j++) {
      if (a[i].substring(j, j + 1).equals("w") == true) {
        count++;
      }
    }
    if (count >= 2) {
      System.out.println(a[i]);
    }
  }
}
```

Chapter 34

34.7 Answers of Review Questions: True/False

1. false
2. true
3. false
4. false
5. false
6. true
7. false
8. true
9. true
10. true
11. true
12. true
13. false
14. true
15. true
16. true
17. true
18. true
19. false
20. true
21. true
22. true
23. false
24. true
25. true
26. true
27. false

34.8 Answers of Review Questions: Multiple Choice

1. b
2. c
3. d
4. a
5. d
6. a
7. d
8. c
9. c
10. c
11. b

34.9 Answers of Review Exercises

1. Solution

Step	Statement	x	a
1	`int[][] a = new int[2][3]`	?	? ? ? ? ? ?
2	`a[0][2] = 1`	?	? ? **1** ? ? ?
3	`x = 0`	**0**	? ? 1 ? ? ?
4	`a[0][x] = 9`	0	**9** ? 1 ? ? ?

5	a[0][x + a[0][2]] = 4	0	9 **4** 1 ? ? ?
6	a[a[0][2]][2] = 19	0	9 4 1 ? ? **19**
7	a[a[0][2]][x + 1] = 13	0	9 4 1 ? **13** 19
8	a[a[0][2]][x] = 15	0	9 4 1 **15** 13 19

2. Solution

Step	Statement	i	j	a
1	int[][] a = new int[2][3]	?	?	? ? ? ? ? ?
2	i = 0	**0**	?	? ? ? ? ? ?
3	i <= 1			True
4	j = 0	0	**0**	? ? ? ? ? ?
5	j <= 2			True
6	a[i][j] = (i + 1) * 5 + j	0	0	**5** ? ? ? ? ?
7	j++	0	**1**	5 ? ? ? ? ?
8	j <= 2			True
9	a[i][j] = (i + 1) * 5 + j	0	1	5 **6** ? ? ? ?
10	j++	0	**2**	5 6 ? ? ? ?
11	j <= 2			True

12	`a[i][j] = (i + 1) * 5 + j`	0	2	5 6 **7** ? ? ?
13	`j++`	0	**3**	5 6 7 ? ? ?
14	`j <= 2`			False
15	`i++`	**1**	3	5 6 7 ? ? ?
16	`i <= 1`			True
17	`j = 0`	1	**0**	5 6 7 ? ? ?
18	`j <= 2`			True
19	`a[i][j] = (i + 1) * 5 + j`	1	0	5 6 7 **10** ? ?
20	`j++`	1	**1**	5 6 7 10 ? ?
21	`j <= 2`			True
22	`a[i][j] = (i + 1) * 5 + j`	1	1	5 6 7 10 **11** ?
23	`j++`	1	**2**	5 6 ? 10 11 ?
24	`j <= 2`			True
25	`a[i][j] = (i + 1) * 5 + j`	1	2	5 6 ? 10 11 **12**
26	`j++`	1	**3**	5 6 7 10 11 12
27	`j <= 2`			False

3. Solution

Step	Statement	i	j	a
1	`int[][] a = new int[3][3]`	?	?	? ? ? ? ? ? ? ? ?
2	`j = 0`	?	**0**	? ? ? ? ? ? ? ? ?
3	`j <= 2`			True
4	`i = 0`	0	**0**	? ? ? ? ? ? ? ? ?
5	`i <= 2`			True
6	`a[i][j] = (i + 1) * 2 + j * 4`	0	0	**2** ? ? ? ? ? ? ? ?
7	`i++`	**1**	0	2 ? ? ? ? ? ? ? ?
8	`i <= 2`			True
9	`a[i][j] = (i + 1) * 2 + j * 4`	1	0	2 ? ? **4** ? ? 6 ? ?
10	`i++`	**2**	0	2 ? ? 4 ? ? 6 ? ?
11	`i <= 2`			True
12	`a[i][j] = (i + 1) * 2 + j * 4`	2	0	2 ? ? 4 ? ? **6** ? ?
13	`i++`	**3**	0	2 ? ? 4 ? ? 6 ? ?
14	`i <= 2`			False

15	`j++`	3	**1**	2 ? ? 4 ? ? 6 ? ?
16	`j <= 2`			True
17	`i = 0`	**0**	1	2 ? ? 4 ? ? 6 ? ?
18	`i <= 2`			True
19	`a[i][j] = (i + 1) * 2 + j * 4`	0	1	2 **6** ? 4 ? ? 6 ? ?
20	`i++`	**1**	1	2 6 ? 4 ? ? 6 ? ?
21	`i <= 2`			True
22	`a[i][j] = (i + 1) * 2 + j * 4`	1	1	2 6 ? 4 **8** ? 6 ? ?
23	`i++`	**2**	1	2 6 ? 4 8 ? 6 ? ?
24	`i <= 2`			True
25	`a[i][j] = (i + 1) * 2 + j * 4`	2	1	2 6 ? 4 8 ? 6 **10** ?
26	`i++`	**3**	1	2 6 ? 4 8 ? 6 10 ?
27	`i <= 2`			False
28	`j++`	3	**2**	2 6 ? 4 8 ? 6 10 ?

29	`j <= 2`			True
30	`i = 0`	**0**	2	2 6 ? 4 8 ? 6 10 ?
31	`i <= 2`			True
32	`a[i][j] = (i + 1) * 2 + j * 4`	0	2	2 6 **10** 4 8 ? 6 10 ?
33	`i++`	**1**	2	2 6 10 4 8 ? 6 10 ?
34	`i <= 2`			True
35	`a[i][j] = (i + 1) * 2 + j * 4`	1	2	2 6 10 4 8 **12** 6 10 ?
36	`i++`	**2**	2	2 6 10 4 8 12 6 10 ?
37	`i <= 2`			True
38	`a[i][j] = (i + 1) * 2 + j * 4`	2	2	2 6 10 4 8 12 6 10 **14**
39	`i++`	**3**	2	2 6 10 4 8 12 6 10 14
40	`i <= 2`			False
41	`j++`	3	**3**	2 6 10 4 8 12 6 10 14
42	`j <= 2`			False

4. Solution

For input value of 5

0	5	10
0	6	12

For input value of 9

0	9	18
0	10	20

For input value of 3

0	3	6
0	4	8

5. Solution

For input value of 13

0	3	3
0	17	18

For input value of 10

0	10	3
0	11	15

For input value of 8

3	3	3
11	12	13

6. Solution

19	5	31
28	6	20

7. Solution

26	29
37	34
59	49

8. Solution

i. -1 15 22 25 12 16 7 9 1
ii. 7 9 1 25 12 16 -1 15 22
iii. 22 15 -1 16 12 25 1 9 7
iv. 1 9 7 16 12 25 22 15 -1
v. -1 25 7 15 12 9 22 16 1
vi. 7 25 -1 9 12 15 1 16 22
vii. 22 16 1 15 12 9 -1 25 7
viii. 1 16 22 9 12 15 7 25 -1

9. Solution

```
static final int ROWS = 10;
static final int COLUMNS = 15;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j;

  int[][] a = new int[ROWS][COLUMNS];
  for (i = 0; i <= ROWS - 1; i++) {
    for (j = 0; j <= COLUMNS - 1; j++) {
      a[i][j] = Integer.parseInt(cin.readLine());
    }
  }

  for (i = 0; i <= ROWS - 1; i++) {
    for (j = 0; j <= COLUMNS - 1; j++) {
      if (a[i][j] % 2 != 0) {
        System.out.println(i + ", " + j);
      }
    }
  }
}
```

10. Solution

```
static final int ROWS = 10;
static final int COLUMNS = 6;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j;

  double[][] a = new double[ROWS][COLUMNS];
  for (i = 0; i <= ROWS - 1; i++) {
    for (j = 0; j <= COLUMNS - 1; j++) {
      a[i][j] = Double.parseDouble(cin.readLine());
    }
  }

  for (i = 0; i <= ROWS - 1; i++) {
    for (j = 0; j <= COLUMNS - 1; j += 2) {
      System.out.println(a[i][j]);
    }
  }
}
```

11. Solution

```
static final int ROWS = 12;
static final int COLUMNS = 8;
```

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j;
  double sum;

  double[][] a = new double[ROWS][COLUMNS];
  for (i = 0; i <= ROWS - 1; i++) {
    for (j = 0; j <= COLUMNS - 1; j++) {
      a[i][j] = Double.parseDouble(cin.readLine());
    }
  }

  sum = 0;
  for (i = 1; i <= ROWS - 1; i += 2) {
    for (j = 0; j <= COLUMNS - 1; j += 2) {
      sum += a[i][j];
    }
  }
  System.out.println(sum);
}
```

12. Solution

```
static final int N = 8 ;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j, k;
  double sum_antidiagonal, sum_diagonal;

  double[][] a = new double[N][N];
  for (i = 0; i <= N - 1; i++) {
    for (j = 0; j <= N - 1; j++) {
      a[i][j] = Double.parseDouble(cin.readLine());
    }
  }

  sum_diagonal = 0;
  sum_antidiagonal = 0;
  for (k = 0; k <= N - 1; k++) {
    sum_diagonal += a[k][k];
    sum_antidiagonal += a[k][N - k - 1];
  }
  System.out.println(sum_diagonal / N + ", " + sum_antidiagonal / N);
}
```

13. Solution

```
static final int N = 5;

public static void main(String[] args) throws java.io.IOException {
  int i, j;
```

```
  int[][] a = new int[N][N];
  for (i = 0; i <= N - 1; i++) {
    for (j = 0; j <= N - 1; j++) {
      if (i == N - j - 1) {
        a[i][j] = 5;
      }
      else if (i > N - j - 1) {
        a[i][j] = 88;
      }
      else {
        a[i][j] = 11;
      }
    }
  }

  for (i = 0; i <= N - 1; i++) {
    for (j = 0; j <= N - 1; j++) {
      System.out.print(a[i][j] + "\t");
    }
    System.out.println();
  }
}
```

14. Solution

```
static final int N = 5;

public static void main(String[] args) throws java.io.IOException {
  int i, j;

  int[][] a = new int[N][N];
  for (i = 0; i <= N - 1; i++) {
    for (j = 0; j <= N - 1; j++) {
      if (i == N - j - 1) {
        a[i][j] = 5;
      }
      else if (i > N - j - 1) {
        a[i][j] = 88;
      }
      else {
        a[i][j] = 11;
      }
      if (i == j) {
        a[i][j] = 0;
      }
    }
  }

  for (i = 0; i <= N - 1; i++) {
    for (j = 0; j <= N - 1; j++) {
      System.out.print(a[i][j] + "\t");
    }
    System.out.println();
  }
```

```
}
```

15. Solution

```
static final int ROWS = 5;
static final int COLUMNS = 4;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j;

  double[][] a = new double[ROWS][COLUMNS];
  for (i = 0; i <= ROWS - 1; i++) {
    for (j = 0; j <= COLUMNS - 1; j++) {
      a[i][j] = Double.parseDouble(cin.readLine());
    }
  }

  for (i = 0; i <= ROWS - 1; i++) {
    for (j = 0; j <= COLUMNS - 1; j++) {
      if (a[i][j] == (int)(a[i][j])) {
        System.out.println(i + ", " + j);
      }
    }
  }
}
```

16. Solution

```
static final int ROWS = 10;
static final int COLUMNS = 4;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int count, i, j;

  double[][] a = new double[ROWS][COLUMNS];
  for (i = 0; i <= ROWS - 1; i++) {
    for (j = 0; j <= COLUMNS - 1; j++) {
      a[i][j] = Double.parseDouble(cin.readLine());
    }
  }

  count = 0;
  for (i = 0; i <= ROWS - 1; i++) {
    for (j = 0; j <= COLUMNS - 1; j++) {
      if (a[i][j] < 0) {
        count++;
      }
    }
  }
  System.out.println(count);
}
```

17. Solution

```
static final int ROWS = 3;
static final int COLUMNS = 4;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j;

  String[][] a = new String[ROWS][COLUMNS];
  for (i = 0; i <= ROWS - 1; i++) {
    for (j = 0; j <= COLUMNS - 1; j++) {
      a[i][j] = cin.readLine();
    }
  }

  for (i = 0; i <= ROWS - 1; i++) {
    for (j = 0; j <= COLUMNS - 1; j++) {
      System.out.print(a[i][j] + " ");
    }
  }
}
```

18. Solution

```
static final int ROWS = 20;
static final int COLUMNS = 14;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j;

  String[][] a = new String[ROWS][COLUMNS];
  for (i = 0; i <= ROWS - 1; i++) {
    for (j = 0; j <= COLUMNS - 1; j++) {
      a[i][j] = cin.readLine();
    }
  }

  for (i = 0; i <= ROWS - 1; i++) {
    for (j = 0; j <= COLUMNS - 1; j++) {
      if (a[i][j].length() < 5) {
        System.out.println(a[i][j]);
      }
    }
  }
}
```

19. Solution

First Approach

```
static final int ROWS = 20;
static final int COLUMNS = 14;
```

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j, k, length_limits;

  String[][] a = new String[ROWS][COLUMNS];
  for (i = 0; i <= ROWS - 1; i++) {
    for (j = 0; j <= COLUMNS - 1; j++) {
      a[i][j] = cin.readLine();
    }
  }

  int[] length_limits = {5, 10, 20};

  for (k = 0; k <= 2; k++) {
    for (i = 0; i <= ROWS - 1; i++) {
      for (j = 0; j <= COLUMNS - 1; j++) {
        if (a[i][j].length() < length_limits[k]) {
          System.out.println(a[i][j]);
        }
      }
    }
  }
}
```

Second Approach

```
static final int ROWS = 20;
static final int COLUMNS = 14;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j, k;

  String[][] a = new String[ROWS][ COLUMNS];
  for (i = 0; i <= ROWS - 1; i++) {
    for (j = 0; j <= COLUMNS - 1; j++) {
      a[i][j] = cin.readLine();
    }
  }

  for (k = 0; k <= 2; k++) {
    for (i = 0; i <= ROWS - 1; i++) {
      for (j = 0; j <= COLUMNS - 1; j++) {
        if (a[i][j].length() < 5 * Math.pow(2, k)) {
          System.out.println(a[i][j]);
        }
      }
    }
  }
}
```

Chapter 35

35.7 Answers of Review Questions: True/False

1. true
2. false
3. true
4. false
5. false
6. false
7. true

35.8 Answers of Review Questions: Multiple Choice

1. a
2. b
3. c
4. b

35.9 Answers of Review Exercises

1. Solution

```
static final int STUDENTS = 15;
static final int TESTS = 5;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j;

  int[][] grades = new int[STUDENTS][TESTS];
  for (i = 0; i <= STUDENTS - 1; i++) {
    for (j = 0; j <= TESTS - 1; j++) {
      grades[i][j] = Integer.parseInt(cin.readLine());
    }
  }

  double[] average = new double[STUDENTS];
  for (i = 0; i <= STUDENTS - 1; i++) {
    average[i] = 0;
    for (j = 0; j <= TESTS - 1; j++) {
      average[i] += grades[i][j];
    }
    average[i] /= TESTS;
  }

  for (i = 0; i <= STUDENTS - 1; i++) {
    System.out.print("Student No " + (i + 1) + ": ");

    if (average[i] < 60) {
      System.out.println("E/F");
    }
    else if (average[i] < 70) {
      System.out.println("D");
    }
    else if (average[i] < 80) {
```

```
      System.out.println("C");
    }
    else if (average[i] < 90) {
      System.out.println("B");
    }
    else {
      System.out.println("A");
    }
  }
}
```

2. Solution

```
static final int OBJECTS = 5;
static final int FALLS = 10;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j, sum;

  int[][] g = new int[OBJECTS][FALLS];
  for (i = 0; i <= OBJECTS - 1; i++) {
    for (j = 0; j <= FALLS - 1; j++) {
      g[i][j] = Integer.parseInt(cin.readLine());
    }
  }

  for (i = 0; i <= OBJECTS - 1; i++) {
    sum = 0;
    for (j = 0; j <= FALLS - 1; j++) {
      sum += g[i][j];
    }
    System.out.println("Average g for object No " + (i + 1) + ": " + (sum / (double)FALLS));
  }

  for (j = 0; j <= FALLS - 1; j++) {
    sum = 0;
    for (i = 0; i <= OBJECTS - 1; i++) {
      sum += g[i][j];
    }
    System.out.println("Average g for fall No " + (j + 1) + ": " + (sum / (double)OBJECTS));
  }

  sum = 0;
  for (i = 0; i <= OBJECTS - 1; i++) {
    for (j = 0; j <= FALLS - 1; j++) {
      sum += g[i][j];
    }
  }
  System.out.println("Overall average g: " + (sum / (double)(OBJECTS * FALLS)));
}
```

3. Solution

```
static final int PLAYERS = 15;
static final int MATCHES = 12;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j, sum;

  int[][] points = new int[PLAYERS][MATCHES];
  for (i = 0; i <= PLAYERS - 1; i++) {
    for (j = 0; j <= MATCHES - 1; j++) {
      points[i][j] = Integer.parseInt(cin.readLine());
    }
  }

  for (i = 0; i <= PLAYERS - 1; i++) {
    sum = 0;
    for (j = 0; j <= MATCHES - 1; j++) {
      sum += points[i][j];
    }
    System.out.println("Total number of points for player No " +(i + 1) + ": " + sum);
  }

  for (j = 0; j <= MATCHES - 1; j++) {
    sum = 0;
    for (i = 0; i <= PLAYERS - 1; i++) {
      sum += points[i][j];
    }
    System.out.println("Total number of points for match No " + (j + 1) + ": " + sum);
  }
}
```

4. Solution

```
static final int CITIES = 20;
static final int HOURS = 24;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j;
  double sum;

  double[][] temperatures = new double[CITIES][HOURS];
  for (i = 0; i <= CITIES - 1; i++) {
    for (j = 0; j <= HOURS - 1; j++) {
      temperatures[i][j] = Integer.parseInt(cin.readLine());
    }
  }

  for (j = 0; j <= HOURS - 1; j++) {
    sum = 0;
    for (i = 0; i <= CITIES - 1; i++) {
```

```
      sum += temperatures[i][j];
    }
    if (sum / CITIES < 10) {
      System.out.println("Hour: " + (j + 1));
    }
  }
}
```

5. Solution

```
static final int PLAYERS = 24;
static final int MATCHES = 10;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j, sum;

  String[] names = new String[PLAYERS];
  int[][] goals = new int[PLAYERS][MATCHES];
  for (i = 0; i <= PLAYERS - 1; i++) {
    names[i] = cin.readLine();
    for (j = 0; j <= MATCHES - 1; j++) {
      goals[i][j] = Integer.parseInt(cin.readLine());
    }
  }

  for (i = 0; i <= PLAYERS - 1; i++) {
    sum = 0;
    for (j = 0; j <= MATCHES - 1; j++) {
      sum += goals[i][j];
    }
    System.out.println(names[i] + ": " + (sum / (double)MATCHES));
  }

  for (j = 0; j <= MATCHES - 1; j++) {
    sum = 0;
    for (i = 0; i <= PLAYERS - 1; i++) {
      sum += goals[i][j];
    }
    System.out.println("Match No " + (j + 1) + ": " + sum);
  }
}
```

6. Solution

```
static final int STUDENTS = 24;
static final int LESSONS = 10;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j, sum;

  String[] names = new String[STUDENTS];
```

```
  int[][] grades = new int[STUDENTS][LESSONS];
  for (i = 0; i <= STUDENTS - 1; i++) {
    names[i] = cin.readLine();
    for (j = 0; j <= LESSONS - 1; j++) {
      grades[i][j] = Integer.parseInt(cin.readLine());
    }
  }

  double[] average = new double[STUDENTS];
  for (i = 0; i <= STUDENTS - 1; i++) {
    sum = 0;
    for (j = 0; j <= LESSONS - 1; j++) {
      sum += grades[i][j];
    }
    average[i] = sum / (double)LESSONS;
    System.out.println(names[i] + ": " + average[i]);
  }

  for (j = 0; j <= LESSONS - 1; j++) {
    sum = 0;
    for (i = 0; i <= STUDENTS - 1; i++) {
      sum += grades[i][j];
    }
    System.out.println(sum / (double)STUDENTS);
  }

  for (i = 0; i <= STUDENTS - 1; i++) {
    if (average[i] < 60) {
      System.out.println(names[i]);
    }
  }

  for (i = 0; i <= STUDENTS - 1; i++) {
    if (average[i] > 89) {
      System.out.println(names[i] + " Bravo!");
    }
  }
}
```

7. Solution

```
static final int ARTISTS = 15;
static final int JUDGES = 5;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j, sum;

  String[] judge_names = new String[JUDGES];
  for (j = 0; j <= JUDGES - 1; j++) {
    System.out.print("Enter name for judge No " + (j + 1) + ": ");
    judge_names[j] = cin.readLine();
  }
```

```
  String[] artist_names = new String[ARTISTS];
  String[] song_titles = new String[ARTISTS];
  int[][] score = new int[ARTISTS][JUDGES];
  for (i = 0; i <= ARTISTS - 1; i++) {
    System.out.print("Enter name for artist No " + (i + 1) + ": ");
    artist_names[i] = cin.readLine();
    System.out.print("Enter song title for artist " + artist_names[i] + ": ");
    song_titles[i] = cin.readLine();
    for (j = 0; j <= JUDGES - 1; j++) {
      System.out.print("Enter score for artist: " + artist_names[i]);
      System.out.print(" gotten from judge " + judge_names[j] + ": ");
      score[i][j] = Integer.parseInt(cin.readLine());
    }
  }

  for (i = 0; i <= ARTISTS - 1; i++) {
    sum = 0;
    for (j = 0; j <= JUDGES - 1; j++) {
      sum += score[i][j];
    }
    System.out.println(artist_names[i] + ", " + song_titles[i] + ": " + sum);
  }

  for (j = 0; j <= JUDGES - 1; j++) {
    sum = 0;
    for (i = 0; i <= ARTISTS - 1; i++) {
      sum += score[i][j];
    }
    System.out.println(judge_names[j] + ": " + sum / (double)ARTISTS);
  }
}
```

8. Solution

```
static final int PEOPLE = 30;
static final int MONTHS = 12;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j, sum_heights, sum_weights;
  double average_height, average_weight;

  int[][] weights = new int[PEOPLE][MONTHS];
  int[][] heights = new int[PEOPLE][MONTHS];
  for (i = 0; i <= PEOPLE - 1; i++) {
    for (j = 0; j <= MONTHS - 1; j++) {
      weights[i][j] = Integer.parseInt(cin.readLine());
      heights[i][j] = Integer.parseInt(cin.readLine());
    }
  }

  for (i = 0; i <= PEOPLE - 1; i++) {
    sum_weights = 0;
    sum_heights = 0;
```

```
    for (j = 0; j <= MONTHS - 1; j++) {
      sum_weights += weights[i][j];
      sum_heights += heights[i][j];
    }
    average_weight = sum_weights / (double)MONTHS;
    average_height = sum_heights / (double)MONTHS;
    System.out.println(average_weight + ", " + average_height);
    System.out.println(average_weight * 702 / Math.pow(average_height, 2));
  }

  for (i = 0; i <= PEOPLE - 1; i++) {
    System.out.println(weights[i][4] * 702 / Math.pow(heights[i][4], 2));
    System.out.println(weights[i][7] * 702 / Math.pow(heights[i][7], 2));
  }
}
```

9. Solution

```
static final double VAT = 0.19;
static final int CONSUMERS = 1000;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int consumed, i;
  double payment, sum;


  int[][] meter_reading = new int[CONSUMERS][2];
  for (i = 0; i <= CONSUMERS - 1; i++) {
    meter_reading[i][0] = Integer.parseInt(cin.readLine());
    meter_reading[i][1] = Integer.parseInt(cin.readLine());
  }

  sum = 0;
  for (i = 0; i <= CONSUMERS - 1; i++) {
    consumed = meter_reading[i][1] - meter_reading[i][0];
    System.out.println(consumed);
    payment = consumed * 0.07;
    payment += VAT * payment;
    System.out.println(payment);

    sum += consumed;
  }

  System.out.println(sum + ", " + (sum * 0.07 + sum * 0.07 * VAT));
}
```

10. Solution

```
static final int CURRENCIES = 4;
static final int DAYS = 5;

public static void main(String[] args) throws java.io.IOException {
```

```
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j;
  double average, sum, usd;

  System.out.print("Enter an amount in US dollars: ");
  usd = Double.parseDouble(cin.readLine());

  String[] currency = {"British Pound Sterling", "Euro", "Canadian Dollar", "Australian Dollar"};

  double[][] rate = { {1.579, 1.577, 1.572, 1.580, 1.584},
                      {1.269, 1.270, 1.265, 1.240, 1.255},
                      {0.895, 0.899, 0.884, 0.888, 0.863},
                      {0.811, 0.815, 0.822, 0.829, 0.819}
                    };

  for (i = 0; i <= CURRENCIES - 1; i++) {
    sum = 0;
    for (j = 0; j <= DAYS - 1; j++) {
      sum += rate[i][j];
    }
    average = sum / DAYS;
    System.out.println(usd + " US dollars = " + (usd / average) + " " + currency[i] + "s");
  }
}
```

11. Solution

```
static final int EMPLOYEES = 10;
static final int DAYS = 5;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j;
  double gross_pay, pay_rate, sum;


  String[] days = {"Monday", "Tuesday", "Wednesday", "Thursday", "Friday"};

  pay_rate = Double.parseDouble(cin.readLine());

  String[] names = new String[EMPLOYEES];
  int[][] hours_worked_per_day = new int[EMPLOYEES][DAYS];
  for (i = 0; i <= EMPLOYEES - 1; i++) {
    names[i] = cin.readLine();
    for (j = 0; j <= DAYS - 1; j++) {
      hours_worked_per_day[i][j] = Integer.parseInt(cin.readLine());
    }
  }

  int[] hours_worked_per_week = new int[EMPLOYEES];
  for (i = 0; i <= EMPLOYEES - 1; i++) {
    hours_worked_per_week[i] = 0;
    for (j = 0; j <= DAYS - 1; j++) {
      hours_worked_per_week[i] += hours_worked_per_day[i][j];
```

```
    }
    if (hours_worked_per_week[i] > 40) {
      System.out.println(names[i]);
    }
  }

  for (i = 0; i <= EMPLOYEES - 1; i++) {
    if (hours_worked_per_week[i] <= 40) {
      gross_pay = pay_rate * hours_worked_per_week[i];
    }
    else {
      gross_pay = pay_rate * 40 + 1.5 * pay_rate * (hours_worked_per_week[i] - 40);
    }
    System.out.println(names[i] + ", " + gross_pay);
  }

  for (i = 0; i <= EMPLOYEES - 1; i++) {
    if (hours_worked_per_week[i] > 40) {
      for (j = 0; j <= DAYS - 1; j++) {
        if (hours_worked_per_day[i][j] > 8) {
          System.out.println(names[i] + ", " + days[j] + " Overtime!");
        }
      }
    }
  }

  for (j = 0; j <= DAYS - 1; j++) {
    sum = 0;
    for (i = 0; i <= EMPLOYEES - 1; i++) {
      if (hours_worked_per_day[i][j] <= 8) {
        gross_pay = pay_rate * hours_worked_per_day[i][j];
      }
      else {
        gross_pay = pay_rate * 8 + 1.5 * pay_rate * (hours_worked_per_day[i][j] - 8);
      }
      sum += gross_pay;
    }
    System.out.println(days[j] + ", " + sum);
  }
}
```

12. Solution

```
static final int ROWS = 3;
static final int COLUMNS = 4;
static final int ELEMENTS = ROWS * COLUMNS;

public static void main(String[] args) throws java.io.IOException {
  int i, j, k;

  int[][] a = { {9, 9, 2, 6},
                {4, 1, 10, 11},
                {12, 15, 7, 3}
              };
```

```
  int[] b = new int[ELEMENTS];
  k = 0;
  for (i = 0; i <= ROWS - 1; i++) {
    for (j = 0; j <= COLUMNS - 1; j++) {
      b[k] = a[i][j];
      k++;
    }
  }

  for (k = 0; k <= ELEMENTS - 1; k++) {
    System.out.print(b[k] + " ");
  }
}
```

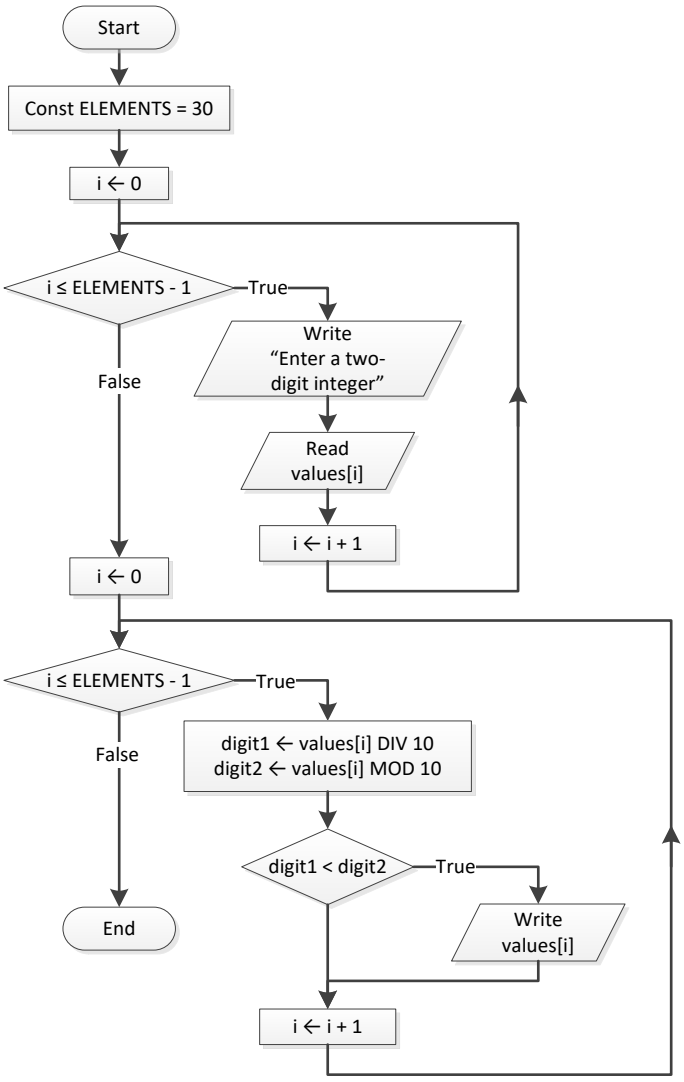
13. Solution

```
static final int ROWS = 3;
static final int COLUMNS = 3;

public static void main(String[] args) throws java.io.IOException {
  int i, j, k;

  int[] a = {16, 12, 3, 5, 6, 9, 18, 19, 20};

  int[][] b = new int[ROWS][COLUMNS];
  k = 0;
  for (i = ROWS - 1; i >= 0; i--) {
    for (j = 0; j <= COLUMNS - 1; j++) {
      b[i][j] = a[k];
      k++;
    }
  }

  for (i = 0; i <= ROWS - 1; i++) {
    for (j = 0; j <= COLUMNS - 1; j++) {
      System.out.print(b[i][j] + "\t");
    }
    System.out.println();
  }
}
```

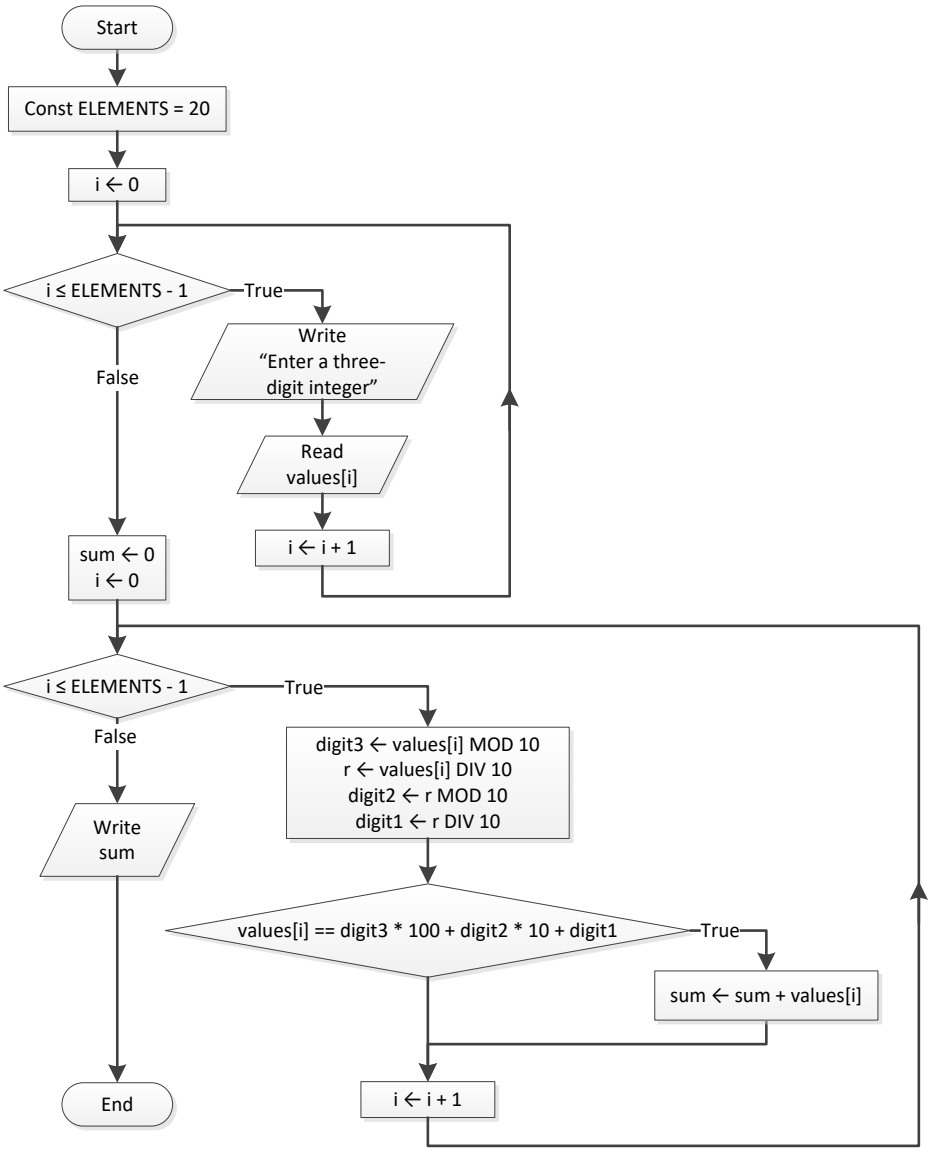
Chapter 36

36.4 Answers of Review Exercises

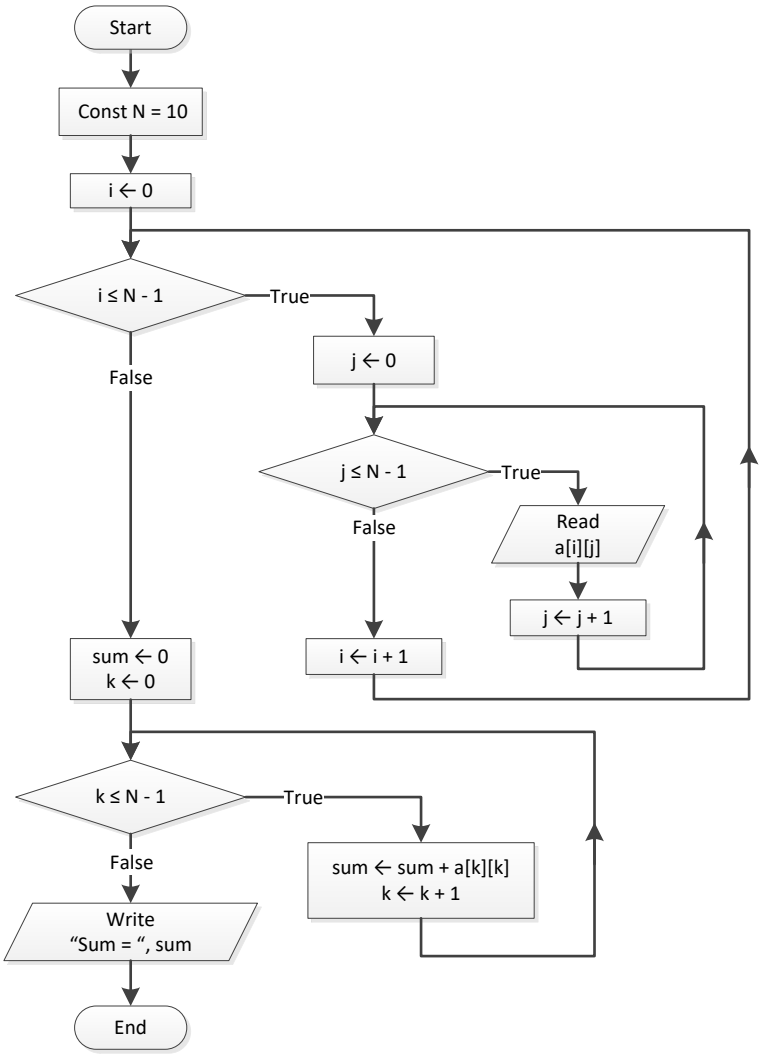
1. Solution



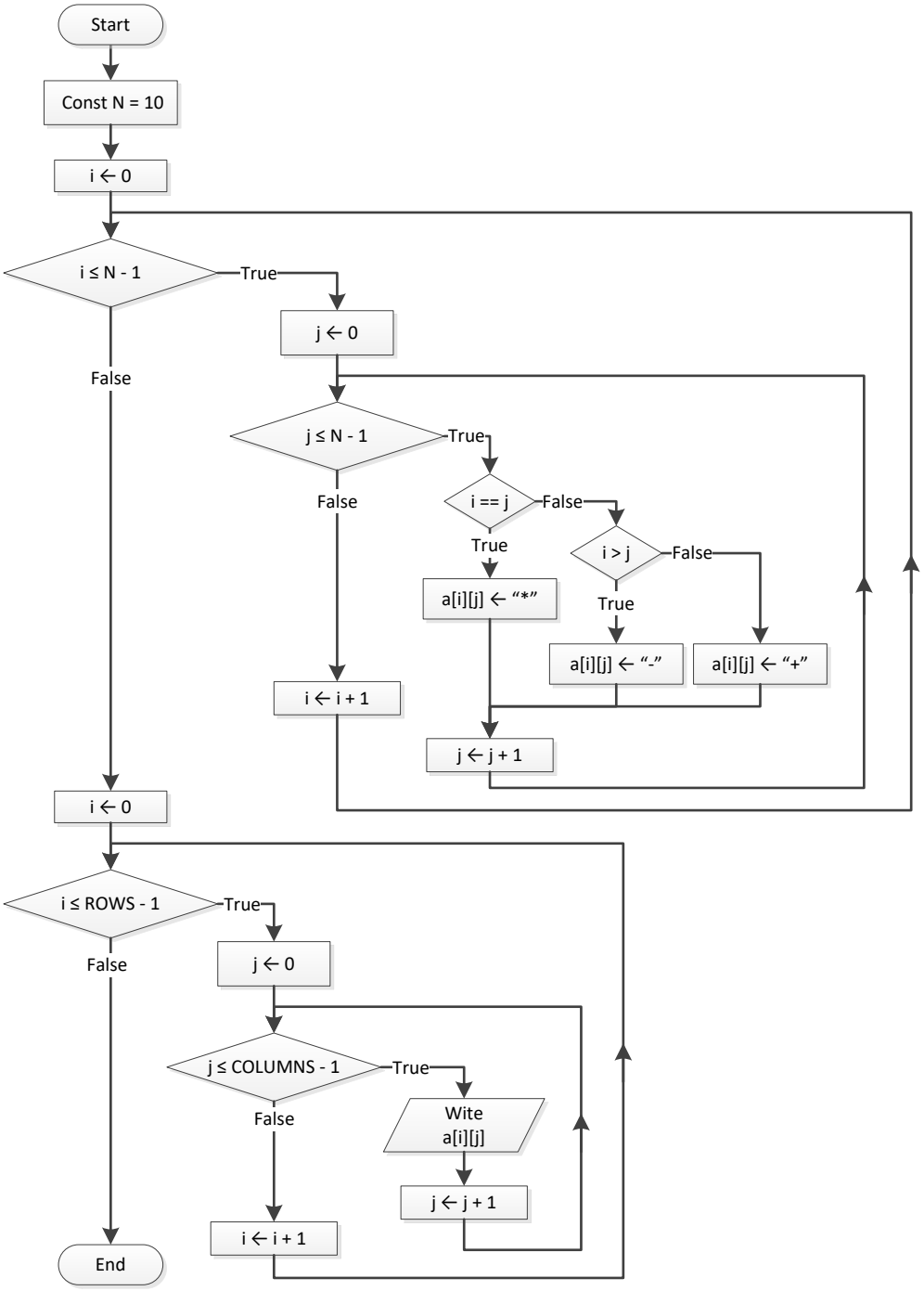
2. Solution


Start
Const ELEMENTS = 20
i ← 0
i ≤ ELEMENTS - 1
True
False
Write
"Enter a three-
digit integer"
Read
values[i]
i ← i + 1
sum ← 0
i ← 0
i ≤ ELEMENTS - 1
True
False
digit3 ← values[i] MOD 10
r ← values[i] DIV 10
digit2 ← r MOD 10
digit1 ← r DIV 10
Write
sum
values[i] == digit3 * 100 + digit2 * 10 + digit1
True
sum ← sum + values[i]
End
i ← i + 1

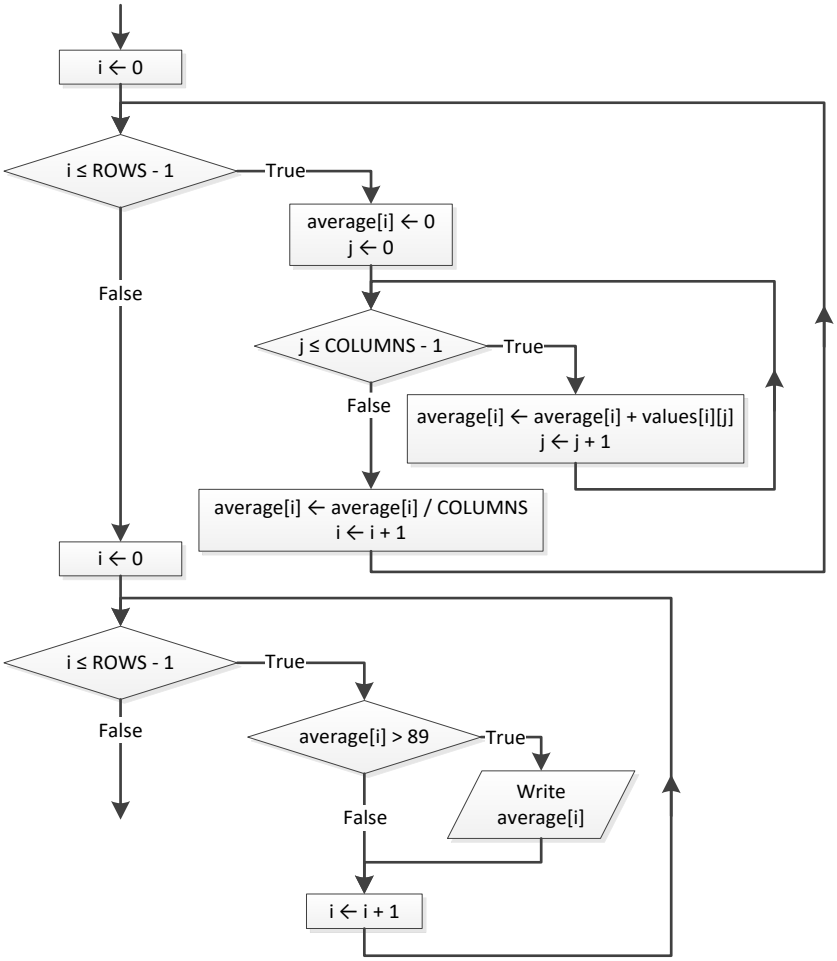
3. Solution


Start
Const N = 10
i ← 0
i ≤ N - 1
True
False
j ← 0
j ≤ N - 1
True
False
Read
a[i][j]
j ← j + 1
i ← i + 1
sum ← 0
k ← 0
k ≤ N - 1
True
False
sum ← sum + a[k][k]
k ← k + 1
Write
“Sum = “, sum
End

4. Solution


Start
Const N = 10
i ← 0
i ≤ N - 1
True
False
j ← 0
j ≤ N - 1
True
False
i == j
False
True
i > j
False
True
a[i][j] ← "*"
a[i][j] ← "-"
a[i][j] ← "+"
i ← i + 1
j ← j + 1
i ← 0
i ≤ ROWS - 1
True
False
j ← 0
j ≤ COLUMNS - 1
True
False
Wite
a[i][j]
j ← j + 1
i ← i + 1
End

5. Solution



6. Solution

```
for (i = 0; i <= PEOPLE - 1; i++) {
  do {
    a[i] = Integer.parseInt(cin.readLine());
  } while (a[i] % 2 == 2);
}
```

7. Solution

```
for (i = 0; i <= ELEMENTS - 1; i++) {
  a[i] = Double.parseDouble(cin.readLine());
  while (a[i] < 0) {
    System.out.println("Error");
    a[i] = Double.parseDouble(cin.readLine());
  }
}
```

8. Solution

```
i = 0;
S = 0;
a[i] = Double.parseDouble(cin.readLine());
i++;
while (i < 90) {
  S += a[i - 1] * i;
  a[i] = Double.parseDouble(cin.readLine());
  i++;
}
System.out.println(S);
while (i >= 0) {
  System.out.println(a[i]);
  i -= 5;
}
```

9. Solution

```
for (i = 0; i <= ROWS - 1; i++) {
  max = a[i][0];
  for (j = 1; j <= COLUMNS - 1; j++) {
    if (a[i][j] > max) {
      max = a[i][j];
    }
  }
  System.out.println(max);
}
```

10. Solution

```
for (i = 0; i <= ROWS - 1; i++) {
  for (j = 0; j <= COLUMNS - 1; j++) {
    a[i][j] = Double.parseDouble(cin.readLine());
    while (a[i][j] == 0) {
      System.out.println("Error");
      a[i][j] = Double.parseDouble(cin.readLine());
    }
  }
}
```

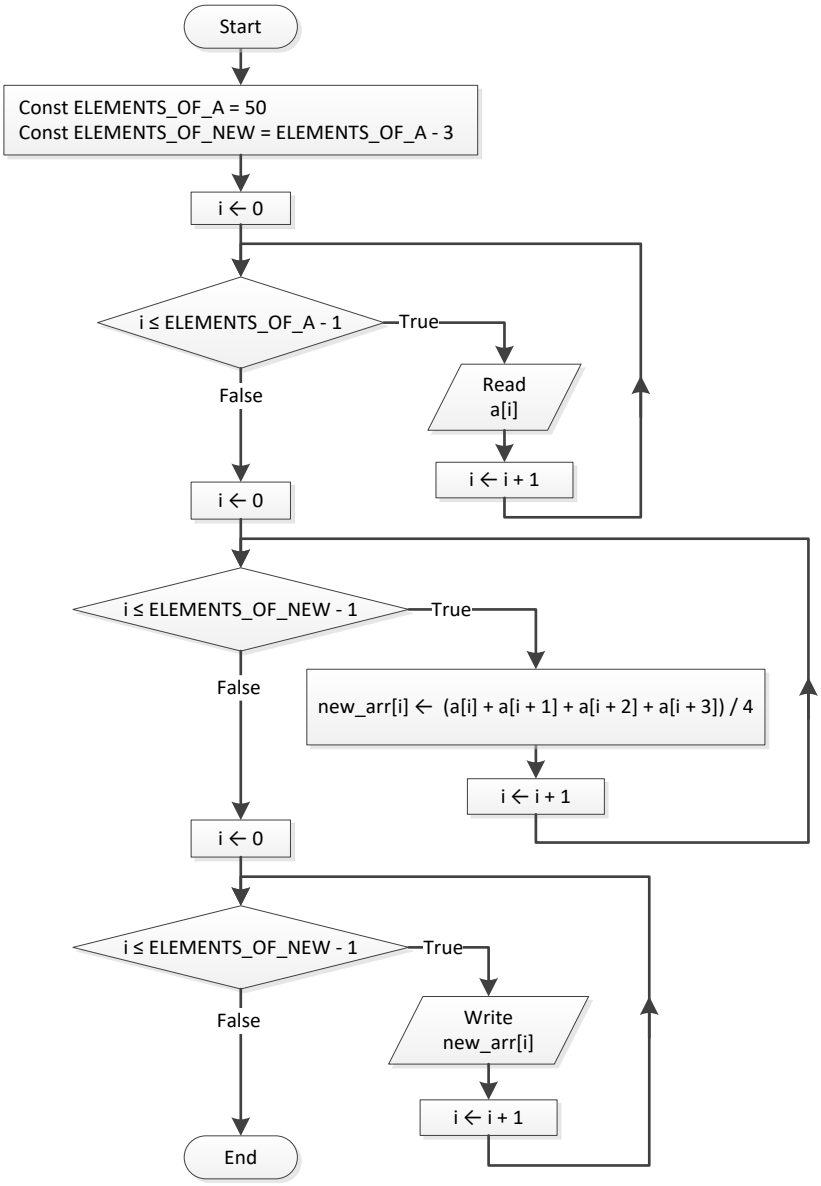
Chapter 37

37.7 Answers of Review Questions: True/False

1. true
2. false
3. true
4. true
5. true
6. true
7. true
8. false
9. true
10. false
11. false
12. true
13. false
14. false
15. false
16. true
17. true
18. true
19. false
20. false
21. true
22. true
23. true
24. false
25. true
26. false
27. true
28. false
29. true
30. true
31. true
32. false
33. true
34. true
35. true
36. true
37. false
38. true
39. true
40. true

37.8 Answers of Review Exercises

1. Solution

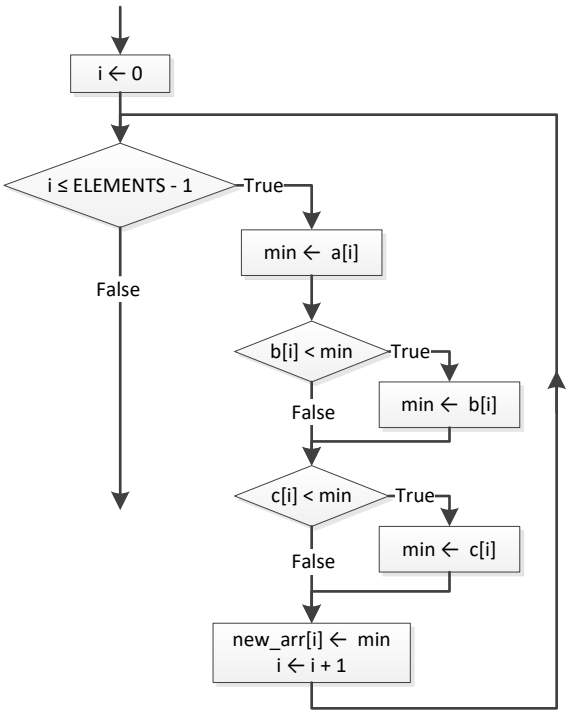



```
static final int ELEMENTS_OF_A = 50;
static final int ELEMENTS_OF_NEW = ELEMENTS_OF_A - 3;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i;

  double[] a = new double[ELEMENTS_OF_A];
  for (i = 0; i <= ELEMENTS_OF_A - 1; i++) {
    a[i] = Double.parseDouble(cin.readLine());
  }
```

```
  double[] new_arr = new double[ELEMENTS_OF_NEW];
  for (i = 0; i <= ELEMENTS_OF_NEW - 1; i++) {
    new_arr[i] = (a[i] + a[i + 1] + a[i + 2] + a[i + 3]) / 4;
  }

  for (i = 0; i <= ELEMENTS_OF_NEW - 1; i++) {
    System.out.println(new_arr[i] + "\t");
  }
}
```

2. Solution

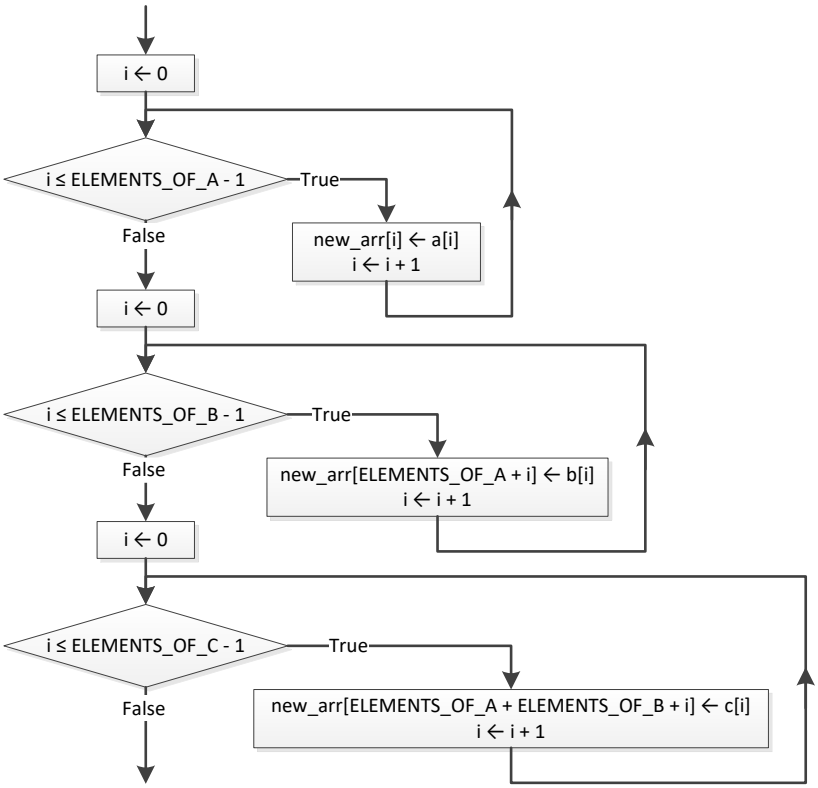
```
static final int ELEMENTS = 15;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i;
  double min;

  double[] a = new double[ELEMENTS];
  for (i = 0; i <= ELEMENTS - 1; i++) {
    a[i] = Double.parseDouble(cin.readLine());
  }
  double[] b = new double[ELEMENTS];
  for (i = 0; i <= ELEMENTS - 1; i++) {
    b[i] = Double.parseDouble(cin.readLine());
  }
  double[] c = new double[ELEMENTS];
  for (i = 0; i <= ELEMENTS - 1; i++) {
    c[i] = Double.parseDouble(cin.readLine());
  }

  double[] new_arr = new double[ELEMENTS];
  for (i = 0; i <= ELEMENTS - 1; i++) {
    min = a[i];
    if (b[i] < min) {
      min = b[i];
    }
    if (c[i] < min) {
      min = c[i];
    }
    new_arr[i] = min;
  }

  for (i = 0; i <= ELEMENTS - 1; i++) {
    System.out.println(new_arr[i]);
  }
}
```



3. Solution

```
static final int ELEMENTS_OF_A = 10;
static final int ELEMENTS_OF_B = 5;
static final int ELEMENTS_OF_C = 15;
static final int ELEMENTS_OF_NEW = ELEMENTS_OF_A + ELEMENTS_OF_B + ELEMENTS_OF_C;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i;

  double[] a = new double[ELEMENTS_OF_A];
  for (i = 0; i <= ELEMENTS_OF_A - 1; i++) {
    a[i] = Double.parseDouble(cin.readLine());
  }
  double[] b = new double[ELEMENTS_OF_B];
  for (i = 0; i <= ELEMENTS_OF_B - 1; i++) {
    b[i] = Double.parseDouble(cin.readLine());
  }
  double[] c = new double[ELEMENTS_OF_C];
  for (i = 0; i <= ELEMENTS_OF_C - 1; i++) {
    c[i] = Double.parseDouble(cin.readLine());
  }

  double[] new_arr = new double[ELEMENTS_OF_NEW];
  for (i = 0; i <= ELEMENTS_OF_C - 1; i++) {
    new_arr[i] = c[i];
  }
  for (i = 0; i <= ELEMENTS_OF_B - 1; i++) {
```

```
    new_arr[ELEMENTS_OF_C + i] = b[i];
  }
  for (i = 0; i <= ELEMENTS_OF_A - 1; i++) {
    new_arr[ELEMENTS_OF_B + ELEMENTS_OF_C + i] = a[i];
  }

  //Display array new
  for (i = 0; i <= ELEMENTS_OF_NEW - 1; i++) {
    System.out.print(new_arr[i] + "\t");
  }
}
```



4. Solution

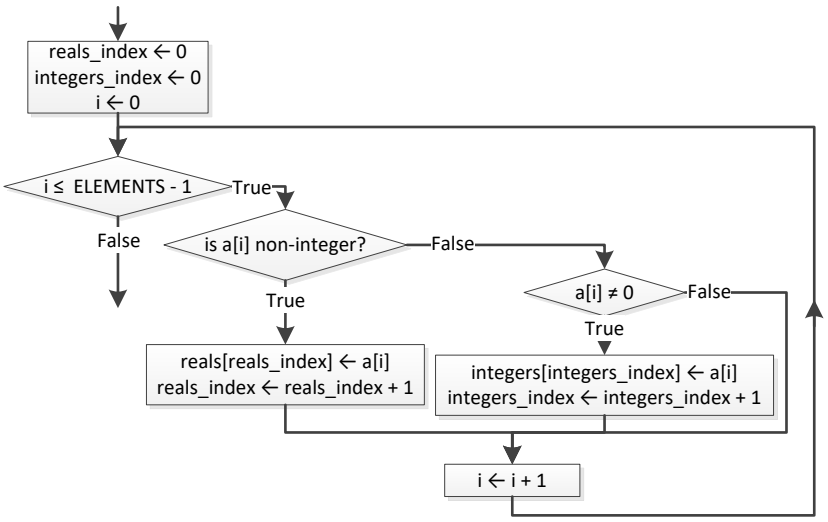
```
static final int COLUMNS_OF_A = 10;
static final int COLUMNS_OF_B = 15;
static final int COLUMNS_OF_C = 20;
static final int ROWS = 5;
static final int COLUMNS = COLUMNS_OF_A + COLUMNS_OF_B + COLUMNS_OF_C;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j;

  double[][] a = new double[ROWS][COLUMNS_OF_A];
  for (i = 0; i <= ROWS - 1; i++) {
    for (j = 0; j <= COLUMNS_OF_A - 1; j++) {
```

```
      a[i][j] = Double.parseDouble(cin.readLine());
    }
  }

  double[][] b = new double[ROWS][COLUMNS_OF_B];
  for (i = 0; i <= ROWS - 1; i++) {
    for (j = 0; j <= COLUMNS_OF_B - 1; j++) {
      b[i][j] = Double.parseDouble(cin.readLine());
    }
  }

  double[][] c = new double[ROWS][COLUMNS_OF_C];
  for (i = 0; i <= ROWS - 1; i++) {
    for (j = 0; j <= COLUMNS_OF_C - 1; j++) {
      c[i][j] = Double.parseDouble(cin.readLine());
    }
  }

  double[][] new_arr = new double[ROWS][COLUMNS];
  for (i = 0; i <= ROWS - 1; i++) {
    for (j = 0; j <= COLUMNS_OF_A - 1; j++) {
      new_arr[i][j] = a[i][j];
    }
  }
  for (i = 0; i <= ROWS - 1; i++) {
    for (j = 0; j <= COLUMNS_OF_B - 1; j++) {
      new_arr[i][COLUMNS_OF_A + j] = b[i][j];
    }
  }
  for (i = 0; i <= ROWS - 1; i++) {
    for (j = 0; j <= COLUMNS_OF_C - 1; j++) {
      new_arr[i][COLUMNS_OF_A + COLUMNS_OF_B + j] = c[i][j];
    }
  }

  for (i = 0; i <= ROWS - 1; i++) {
    for (j = 0; j <= COLUMNS - 1; j++) {
      System.out.print(new_arr[i][j] + "\t");
    }
    System.out.println();
  }
}
```

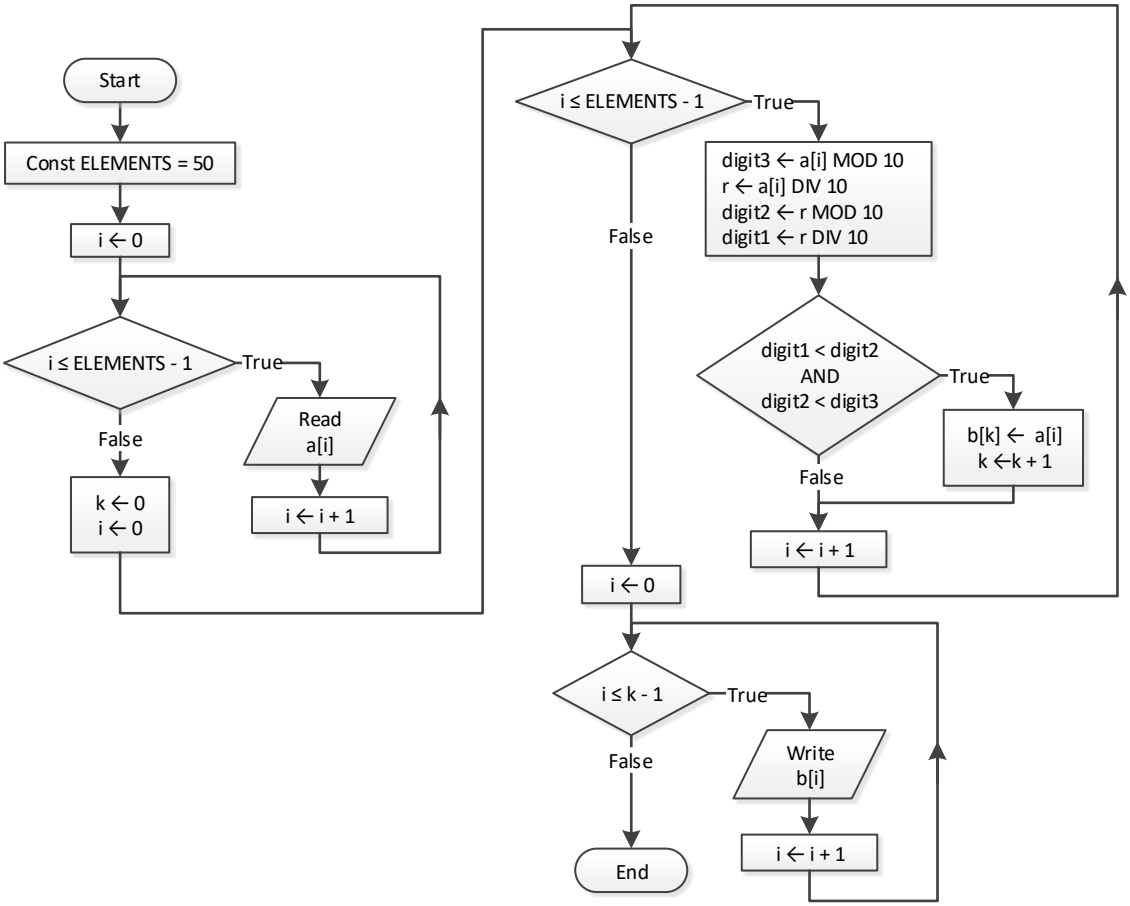
5. Solution

```
static final int ELEMENTS = 50;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, integers_index, reals_index;

  double[] a = new double[ELEMENTS];
  for (i = 0; i <= ELEMENTS - 1; i++) {
    a[i] = Double.parseDouble(cin.readLine());
```

```
  }

  double[] reals = new double[ELEMENTS];
  int[] integers = new int[ELEMENTS];
  reals_index = 0;
  integers_index = 0;
  for (i = 0; i <= ELEMENTS - 1; i++) {
    if (a[i] != (int)(a[i])) {
      reals[reals_index] = a[i];
      reals_index++;
    }
    else if (a[i] != 0) {
      integers[integers_index] = (int)a[i];
      integers_index++;
    }
  }

  for (i = 0; i <= reals_index - 1; i++) {
    System.out.print(reals[i] + "\t");
  }

  System.out.println();
  for (i = 0; i <= integers_index - 1; i++) {
    System.out.print(integers[i] + "\t");
  }
}
```



6. Solution




```
static final int ELEMENTS = 50;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int digit1, digit2, digit3, i, k, r;

  int[] a = new int[ELEMENTS];
  for (i = 0; i <= ELEMENTS - 1; i++) {
    a[i] = Integer.parseInt(cin.readLine());
  }

  int[] b = new int[ELEMENTS];
  k = 0;
  for (i = 0; i <= ELEMENTS - 1; i++) {
    digit3 = a[i] % 10;
    r = (int)(a[i] / 10);
    digit2 = r % 10;
    digit1 = (int)(r / 10);

    if (digit1 < digit2 && digit2 < digit3) {
      b[k] = a[i];
      k++;
```

```
    }
  }

  for (i = 0; i <= k - 1; i++) {
    System.out.print(b[i] + "\t");
  }
}
```

7. Solution

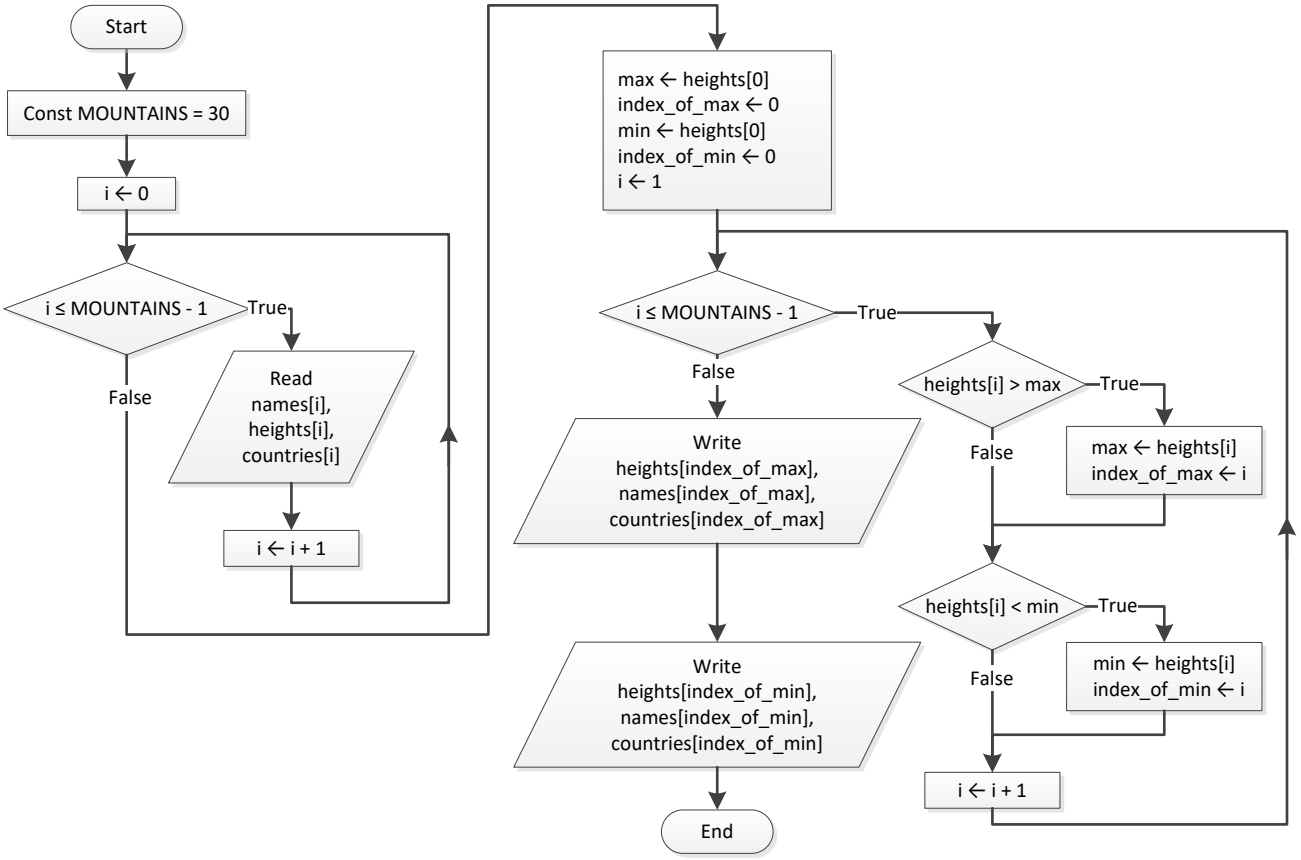
```
static final int PRODUCTS = 10;
static final int CITIZENS = 1000;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int count_B, i, j, max;

  String[] prod_names = new String[PRODUCTS];
  String[][] answers = new String[PRODUCTS][CITIZENS];
  for (i = 0; i <= PRODUCTS - 1; i++) {
    prod_names[i] = cin.readLine();
    for (j = 0; j <= CITIZENS - 1; j++) {
      answers[i][j] = cin.readLine();
      while (answers[i][j].compareTo("A") < 0 || answers[i][j].compareTo("D") > 0) {
        System.out.println("Error! ");
        answers[i][j] = cin.readLine();
      }
    }
  }

  int[] count_A = new int[PRODUCTS];
  for (i = 0; i <= PRODUCTS - 1; i++) {
    count_A[i] = 0;
    for (j = 0; j <= CITIZENS - 1; j++) {
      if (answers[i][j].equals("A") == true) {
        count_A[i]++;
      }
    }
    System.out.println(prod_names[i] + ", " + count_A[i]);
  }

  for (j = 0; j <= CITIZENS - 1; j++) {
    count_B = 0;
    for (i = 0; i <= PRODUCTS - 1; i++) {
      if (answers[i][j].equals("B") == true) {
        count_B++;
      }
    }
    System.out.println(count_B);
  }

  max = count_A[0];
  for (i = 1; i <= PRODUCTS - 1; i++) {
    if (count_A[i] > max) {
```

```
      max = count_A[i];
    }
  }
  for (i = 0; i <= PRODUCTS - 1; i++) {
    if (count_A[i] == max) {
      System.out.println(prod_names[i]);
    }
  }
}
```

8. Solution

```
static final int US_CITIES = 20;
static final int CANADIAN_CITIES = 20;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j, min_j;
  double min;

  String[] us_names = new String[US_CITIES];
  for (i = 0; i <= US_CITIES - 1; i++) {
    System.out.println("Enter name for US city No " + (i + 1) + ": ");
    us_names[i] = cin.readLine();
  }

  String[] canadian_names = new String[CANADIAN_CITIES];
  for (j = 0; j <= CANADIAN_CITIES - 1; j++) {
    System.out.println("Enter name for Canadian city No " + (j + 1) + ": ");
    canadian_names[j] = cin.readLine();
  }

  double[][] distances = new double[US_CITIES][CANADIAN_CITIES];
  for (i = 0; i <= US_CITIES - 1; i++) {
    for (j = 0; j <= CANADIAN_CITIES - 1; j++) {
      System.out.println("Enter distance between " + us_names[i] + " and " + canadian_names[j] + ": ");
      distances[i][j] = Double.parseDouble(cin.readLine());
    }
  }

  for (i = 0; i <= US_CITIES - 1; i++) {
    min = distances[i][0];
    min_j = 0;
    for (j = 1; j <= CANADIAN_CITIES - 1; j++) {
      if (distances[i][j] < min) {
        min = distances[i][j];
        min_j = j;
      }
    }
    System.out.println("Closest Canadian city to " + us_names[i] + " is " + canadian_names[min_j]);
  }
}
```

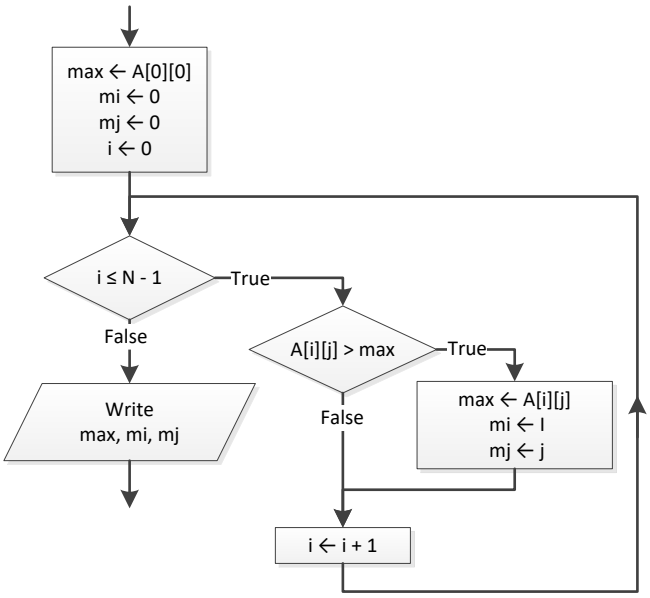
9. Solution




```
static final int MOUNTAINS = 30;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, index_of_max, index_of_min;
  double max, min;

  String[] names = new String[MOUNTAINS];
  double[] heights = new double[MOUNTAINS];
  string[] countries = new string[MOUNTAINS];
  for (i = 0; i <= MOUNTAINS - 1; i++) {
    names[i] = cin.readLine();
    heights[i] = Double.parseDouble(cin.readLine());
    countries[i] = cin.readLine();
  }

  max = heights[0];
  index_of_max = 0;
  min = heights[0];
  index_of_min = 0;
  for (i = 1; i <= MOUNTAINS - 1; i++) {
    if (heights[i] > max) {
```

```
      max = heights[i];
      index_of_max = i;
    }
    if (heights[i] < min) {
      min = heights[i];
      index_of_min = i;
    }
  }

  System.out.println(heights[index_of_max] +", "+ names[index_of_max] +", "+ countries[index_of_max]);
  System.out.println(heights[index_of_min] +", "+ names[index_of_min] +", "+ countries[index_of_min]);
}
```

10. Solution



11. Solution

```
static final int TEAMS = 26;
static final int GAMES = 15;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j, m_i, max;

  String[] names = new String[TEAMS];
  String[][] results = new String[TEAMS][GAMES];
  for (i = 0; i <= TEAMS - 1; i++) {
    names[i] = cin.readLine();
    for (j = 0; j <= GAMES - 1; j++) {
      results[i][j] = cin.readLine();
    }
  }
```

```
  int[] points = new int[TEAMS];
  for (i = 0; i <= TEAMS - 1; i++) {
    points[i] = 0;
    for (j = 0; j <= GAMES - 1; j++) {
      if (results[i][j].equals("W") == true) {
        points[i] += 3;
      }
      else if (results[i][j].equals("T") == true) {
        points[i] += 1;
      }
    }
  }

  max = points[0];
  m_i = 0;
  for (i = 1; i <= TEAMS - 1; i++) {
    if (points[i] > max) {
      max = points[i];
      m_i = i;
    }
  }

  System.out.println(names[m_i]);
}
```

12. Solution

```
static final int OBJECTS = 10;
static final int FALLS = 20;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j;
  double maximum, minimum;

  double[][] heights = new double[OBJECTS][FALLS];
  double[][] times = new double[OBJECTS][FALLS];
  for (i = 0; i <= OBJECTS - 1; i++) {
    for (j = 0; j <= FALLS - 1; j++) {
      heights[i][j] = Double.parseDouble(cin.readLine());
      times[i][j] = Double.parseDouble(cin.readLine());
    }
  }

  double[][] g = new double[OBJECTS][FALLS];
  for (i = 0; i <= OBJECTS - 1; i++) {
    for (j = 0; j <= FALLS - 1; j++) {
      g[i][j] = 2 * heights[i][j] / Math.pow(times[i][j], 2);
    }
  }

  double[] min = new double[OBJECTS];
  double[] max = new double[OBJECTS];
  for (i = 0; i <= OBJECTS - 1; i++) {
```

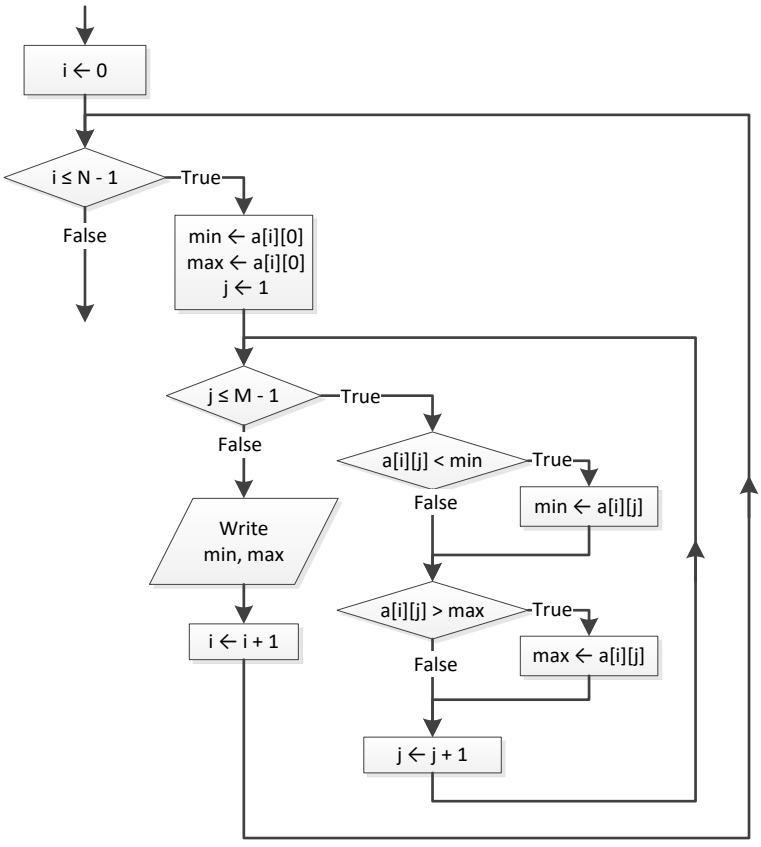
```
    min[i] = g[i][0];
    max[i] = g[i][0];
    for (j = 1; j <= FALLS - 1; j++) {
      if (g[i][j] < min[i]) {
        min[i] = g[i][j];
      }
      if (g[i][j] > max[i]) {
        max[i] = g[i][j];
      }
    }
  }

  for (i = 0; i <= OBJECTS - 1; i++) {
    System.out.println(min[i] + ", " + max[i]);
  }

  maximum = max[0];
  minimum = min[0];
  for (i = 1; i <= OBJECTS - 1; i++) {
    if (max[i] > maximum) {
      maximum = max[i];
    }
    if (min[i] < minimum) {
      minimum = min[i];
    }
  }

  System.out.println(minimum + ", " + maximum);
}
```

13. Solution

```
static final int STATIONS = 10;
static final int DAYS = 365;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j, m_i;
  double min;

  String[] names = new String[STATIONS];
  double[][] co2 = new double[STATIONS][DAYS];
  for (i = 0; i <= STATIONS - 1; i++) {
    names[i] = cin.readLine();
    for (j = 0; j <= DAYS - 1; j++) {
      co2[i][j] = Double.parseDouble(cin.readLine());
    }
  }

  double[] average = new double[STATIONS];
  for (i = 0; i <= STATIONS - 1; i++) {
    average[i] = 0;
    for (j = 0; j <= DAYS - 1; j++) {
      average[i] += co2[i][j];
```

```
    }
    average[i] /= DAYS;
  }

  min = average[0];
  m_i = 0;
  for (i = 1; i <= STATIONS - 1; i++) {
    if (average[i] < min) {
      min = average[i];
      m_i = i;
    }
  }
  System.out.println(names[m_i]);
}
```

14. Solution



15. Solution

```
static final int TEAMS = 20;
static final int GAMES = 10;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j, m, n, temp;
```

```
boolean swaps;
String temp_str;

String[] names = new String[TEAMS];
String[][] results = new String[TEAMS][GAMES];
for (i = 0; i <= TEAMS - 1; i++) {
  System.out.print("Enter team name: ");
  names[i] =cin.readLine();
  for (j = 0; j <= GAMES - 1; j++) {
    System.out.println("Enter result for team " + names[i] + " for game No " + (j + 1) + ": ");
    results[i][j] = cin.readLine();
    while (results[i][j].equals("W") != true && results[i][j].equals("L") != true &&
           results[i][j].equals("T") != true) {

      System.out.print("Error! Enter only value W, L, or T: ");
      results[i][j] = cin.readLine();
    }
  }
}

int[] points = new int[TEAMS];
for (i = 0; i <= TEAMS - 1; i++) {
  points[i] = 0;
  for (j = 0; j <= GAMES - 1; j++) {
    if (results[i][j].equals("W") == true) {
      points[i] += 3;
    }
    else if (results[i][j].equals("T") == true) {
      points[i] += 1;
    }
  }
}

for (m = 1; m <= TEAMS - 1; m++) {
  swaps = false;
  for (n = TEAMS - 1; n >= m; n--) {
    if (points[n] > points[n - 1]) {
      temp = points[n];
      points[n] = points[n - 1];
      points[n - 1] = temp;

      temp_str = names[n];
      names[n] = names[n - 1];
      names[n - 1] = temp_str;

      swaps = true;
    }
  }
  if (swaps == false) break;
}

System.out.println("Gold: " + names[0]);
System.out.println("Silver: " + names[1]);
System.out.println("Bronze: " + names[2]);
```

```
}
```

16. Solution

```
static final int PEOPLE = 50;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, m, n;
  double temp;
  String temp_str;

  String[] names = new String[PEOPLE];
  double[] heights = new double[PEOPLE];
  for (i = 0; i <= PEOPLE - 1; i++) {
    System.out.print("Enter name for person No. " + (i + 1) + ": ");
    names[i] = cin.readLine();
    System.out.print("Enter height for person No. " + (i + 1) + ": ");
    heights[i] = Double.parseDouble(cin.readLine());
  }

  for (m = 1; m <= PEOPLE - 1; m++) {
    for (n = PEOPLE - 1; n >= m; n--) {
      if (heights[n] > heights[n - 1]) {
        temp = heights[n];
        heights[n] = heights[n - 1];
        heights[n - 1] = temp;

        temp_str = names[n];
        names[n] = names[n - 1];
        names[n - 1] = temp_str;
      }
      else if (heights[n] == heights[n - 1]) {
        if (names[n].compareTo(names[n - 1]) < 0) {
          temp_str = names[n];
          names[n] = names[n - 1];
          names[n - 1] = temp_str;
        }
      }
    }
  }

  for (i = 0; i <= PEOPLE - 1; i++) {
    System.out.println(heights[i] + "\t" + names[i]);
  }
}
```

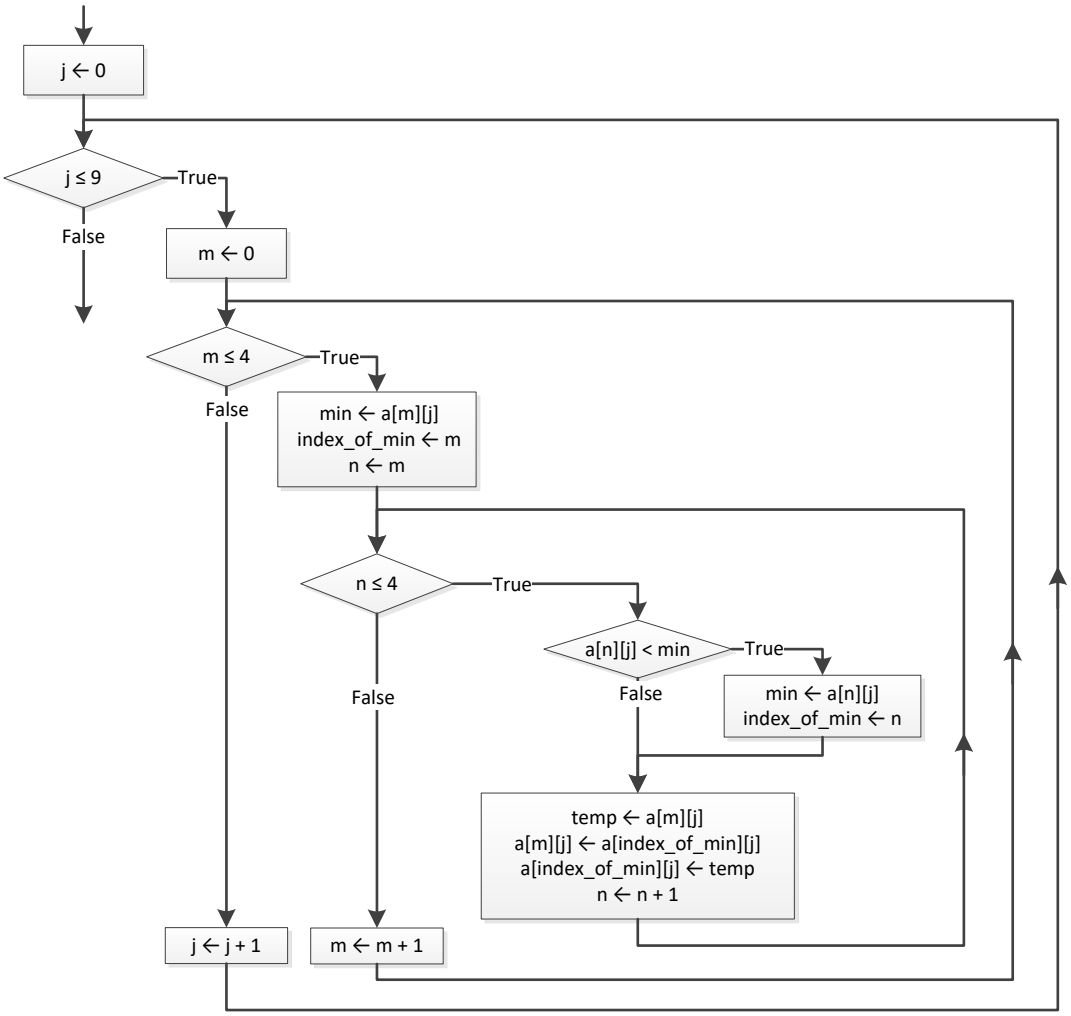
17. Solution

```
static final int ARTISTS = 12;
static final int JUDGES = 10;

public static void main(String[] args) throws java.io.IOException {
```

```
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j, m, max, min, n, temp;
  String temp_str;

  String[] artist_names = new String[ARTISTS];
  int[][] score = new int[ARTISTS][JUDGES];
  for (i = 0; i <= ARTISTS - 1; i++) {
    System.out.println("Enter name for artist No " + (i + 1) + ": ");
    artist_names[i] = cin.readLine();
    for (j = 0; j <= JUDGES - 1; j++) {
      System.out.println("Enter score for artist: " + artist_names[i] + " gotten from judge No " + (j +
1) + ": ");
      score[i][j] = Integer.parseInt(cin.readLine());
    }
  }

  int[] sum = new int[ARTISTS];
  for (i = 0; i <= ARTISTS - 1; i++) {
    sum[i] = 0;
    for (j = 1; j <= JUDGES - 1; j++) {
      sum[i] += score[i][j];
    }
  }

  for (i = 0; i <= ARTISTS - 1; i++) {
    min = score[i][0];
    max = score[i][0];
    for (j = 1; j <= JUDGES - 1; j++) {
      if (score[i][j] < min) {
        min = score[i][j];
      }
      if (score[i][j] > max) {
        max = score[i][j];
      }
    }
    sum[i] = sum[i] - min - max;
    System.out.println(sum[i]);
  }

  for (m = 1; m <= ARTISTS - 1; m++) {
    for (n = ARTISTS - 1; n >= m; n--) {
      if (sum[n] > sum[n - 1]) {
        temp = sum[n];
        sum[n] = sum[n - 1];
        sum[n - 1] = temp;

        temp_str = artist_names[n];
        artist_names[n] = artist_names[n - 1];
        artist_names[n - 1] = temp_str;
      }
      else if (sum[n] == sum[n - 1]) {
        if (artist_names[n].compareTo(artist_names[n - 1]) < 0) {
          temp_str = artist_names[n];
          artist_names[n] = artist_names[n - 1];
```

```
          artist_names[n - 1] = temp_str;
        }
      }
    }
  }

  for (i = 0; i <= ARTISTS - 1; i++) {
    System.out.println(artist_names[i] + ", " + sum[i]);
  }
}
```

18. Solution



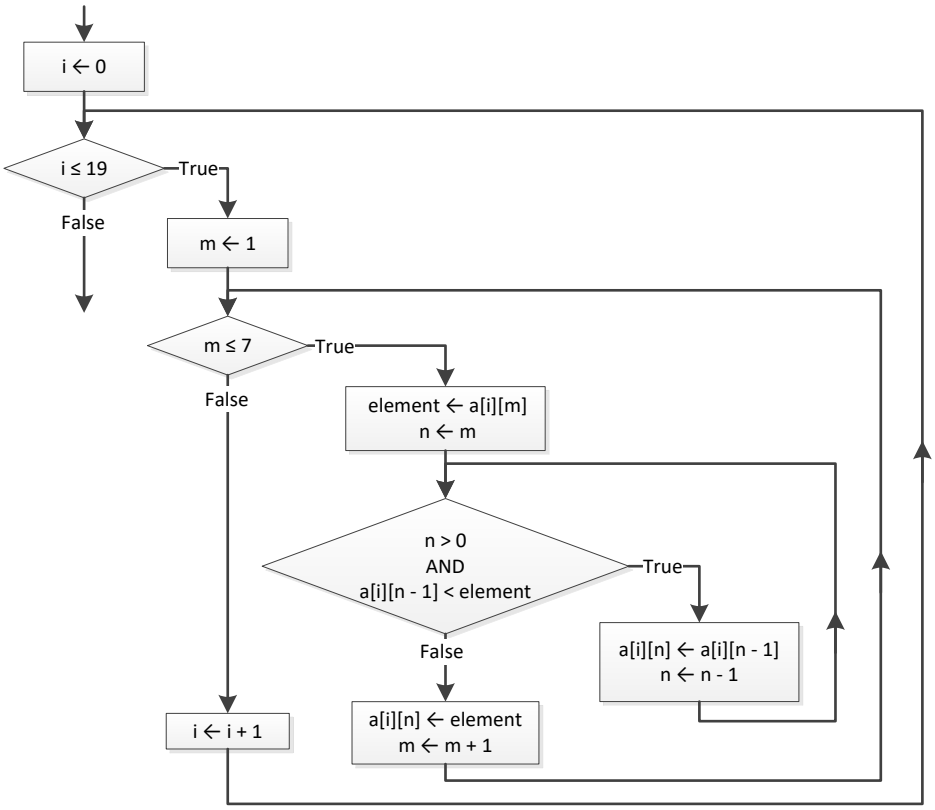
19. Solution

```
static final int PEOPLE = 10;
static final int PUZZLES = 8;

public static void main(String[] args) throws java.io.IOException {
```

```
java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
int i, index_of_min, j, m, n;
double min, temp;
String temp_str;

String[] names = new String[PEOPLE];
double[][] times = new double[PEOPLE][PUZZLES];
for (i = 0; i <= PEOPLE - 1; i++) {
  names[i] = cin.readLine();
  for (j = 0; j <= PUZZLES - 1; j++) {
    times[i][j] = Double.parseDouble(cin.readLine());
  }
}

for (i = 0; i <= PEOPLE - 1; i++) {
  for (m = 0; m <= PUZZLES - 1; m++) {
    min = times[i][m];
    index_of_min = m;
    for (n = m; n <= PUZZLES - 1; n++) {
      if (times[i][n] < min) {
        min = times[i][n];
        index_of_min = n;
      }
    }
    temp = times[i][m];
    times[i][m] = times[i][index_of_min];
    times[i][index_of_min] = temp;
  }
}

for (i = 0; i <= PEOPLE - 1; i++) {
  System.out.println(names[i]);
  for (j = 0; j <= 2; j++) {
    System.out.println(times[i][j]);
  }
}

double[] average = new double[PEOPLE];
for (i = 0; i <= PEOPLE - 1; i++) {
  average[i] = 0;
  for (j = 0; j <= PUZZLES - 1; j++) {
    average[i] += times[i][j];
  }
  average[i] /= PUZZLES;
}

for (m = 0; m <= PEOPLE - 1; m++) {
  min = average[m];
  index_of_min = m;
  for (n = m; n <= PEOPLE - 1; n++) {
    if (average[n] < min) {
      min = average[n];
      index_of_min = n;
    }
```

```
    }
    temp = average[m];
    average[m] = average[index_of_min];
    average[index_of_min] = temp;

    temp_str = names[m];
    names[m] = names[index_of_min];
    names[index_of_min] = temp_str;
  }

  System.out.println(names[0] + ", " + names[1] + ", " + names[2]);
}
```

20. Solution



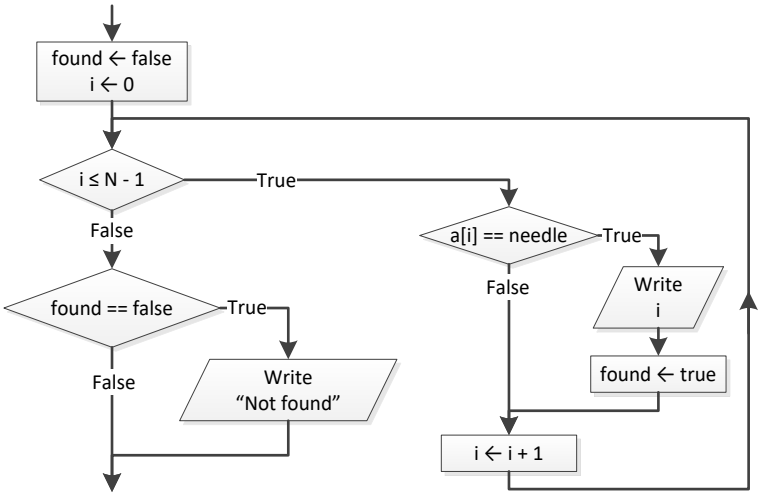
21. Solution

```
static final int CITIES = 5;
static final int HOURS = 48;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j, m, m_i, m_j, n;
  double max, element_1;
  String element_2;
```

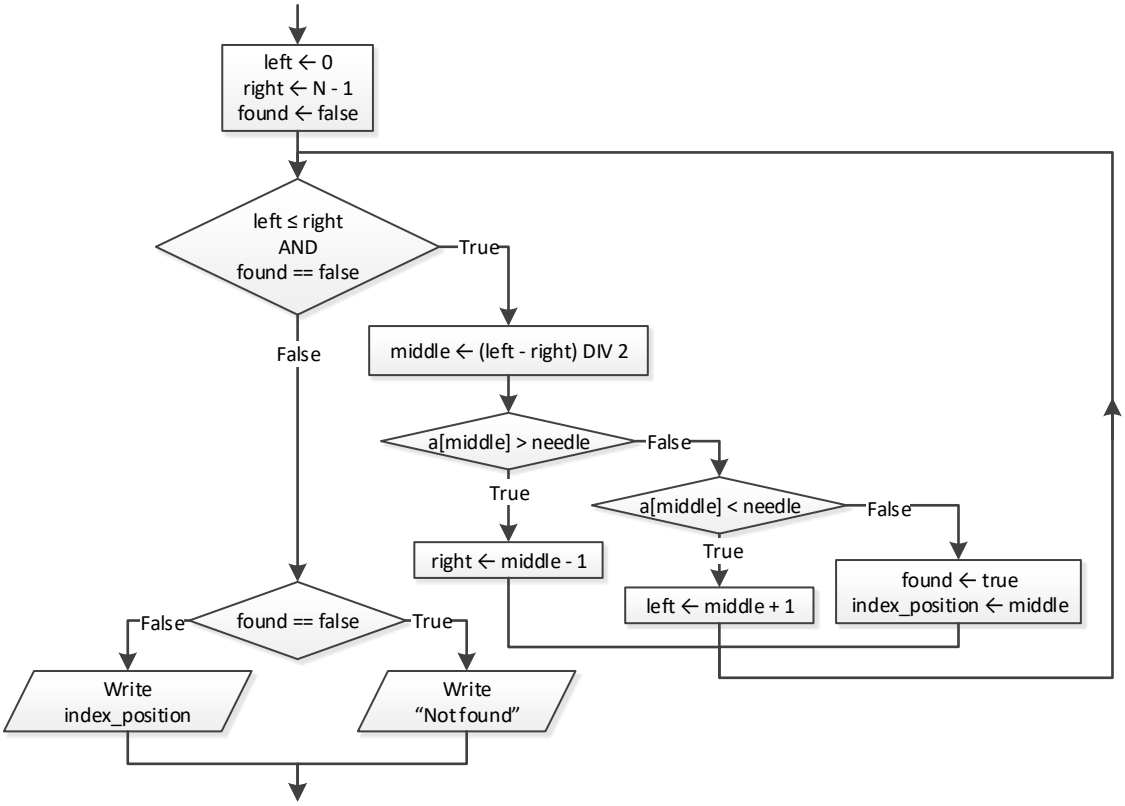
```
String[] names = new String[CITIES];
double[][] CO2 = new double[CITIES][HOURS];
for (i = 0; i <= CITIES - 1; i++) {
  names[i] = cin.readLine();
  for (j = 0; j <= HOURS - 1; j++) {
    CO2[i][j] = Double.parseDouble(cin.readLine());
  }
}

double[] average_per_hour = new double[CITIES];
for (i = 0; i <= CITIES - 1; i++) {
  average_per_hour[i] = 0;
  for (j = 0; j <= HOURS - 1; j++) {
    average_per_hour[i] += CO2[i][j];
  }
  average_per_hour[i] /= HOURS;
}

for (i = 0; i <= CITIES - 1; i++) {
  System.out.println(names[i] + ", " + average_per_hour[i]);
}

double[] average_per_city = new double[HOURS];
for (j = 0; j <= HOURS - 1; j++) {
  average_per_city[j] = 0;
  for (i = 0; i <= CITIES - 1; i++) {
    average_per_city[j] += CO2[i][j];
  }
  average_per_city[j] /= CITIES;
}

for (j = 0; j <= HOURS - 1; j++) {
  System.out.println(average_per_city[j]);
}

max = average_per_city[0];
m_j = 0;
for (j = 1; j <= HOURS - 1; j++) {
  if (average_per_city[j] > max) {
    max = average_per_city[j];
    m_j = j;
  }
}
System.out.println(m_j);

max = CO2[0][0];
m_i = 0;
m_j = 0;
for (i = 0; i <= CITIES - 1; i++) {
  for (j = 0; j <= HOURS - 1; j++) {
    if (CO2[i][j] > max) {
      max = CO2[i][j];
      m_i = i;
      m_j = j;
```

```
      }
    }
  }
  System.out.println(m_j + ", " + names[m_i]);

  for (m = 1; m <= CITIES - 1; m++) {
    element_1 = average_per_hour[m];
    element_2 = names[m];

    n = m;
    while (n > 0 && average_per_hour[n - 1] < element_1) {
      average_per_hour[n] = average_per_hour[n - 1];
      names[n] = names[n - 1];
      n--;
    }

    average_per_hour[n] = element_1;
    names[n] = element_2;
  }

  System.out.println(names[0] + ", " + names[1]  + ", " +  names[2]);
}
```

22. Solution



23. Solution



24. Solution

```
static final String IS_NUMERIC = "[+-]?\\d+(\\.\\d+)?";
static final int TEAMS = 10;
static final int GAMES = 16;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j, sum;
  String needle, in;

  String[] names = new String[TEAMS];
  int[][] goals_scored = new int[TEAMS][GAMES];
  int[][] goals_let_in = new int[TEAMS][GAMES];
  for (i = 0; i <= TEAMS - 1; i++) {
    System.out.print("Enter team name: ");
    names[i] = cin.readLine();
    for (j = 0; j <= GAMES - 1; j++) {
      System.out.print("Enter goals scored: ");
      in = cin.readLine();
      while (in.matches(IS_NUMERIC) != true || Integer.parseInt(in) < 0) {
        System.out.print("Error! Enter goals scored: ");
        in = cin.readLine();
      }
```

```
      goals_scored[i][j] = Integer.parseInt(in);

      System.out.print("Enter goals let in: ");
      in = cin.readLine();
      while (in.matches(IS_NUMERIC) != true || Integer.parseInt(in) < 0) {
        System.out.print("Error! Enter goals let in: ");
        in = cin.readLine();
      }
      goals_let_in[i][j] = Integer.parseInt(in);
    }
  }

  System.out.print("Enter a team to search: ");
  needle = cin.readLine();

  i = 0;
  while (i < TEAMS - 1 && names[i].equals(needle) == false) {
    i++;
  }

  if (names[i].equals(needle) == false) {
    System.out.println("This team does not exist");
  }
  else {
    sum = 0;
    for (j = 0; j <= GAMES - 1; j++) {
      if (goals_scored[i][j] > goals_let_in[i][j]) {
        sum += 3;
      }
      else if (goals_scored[i][j] == goals_let_in[i][j]) {
        sum += 1;
      }
    }
    System.out.println(sum);
  }
}
```

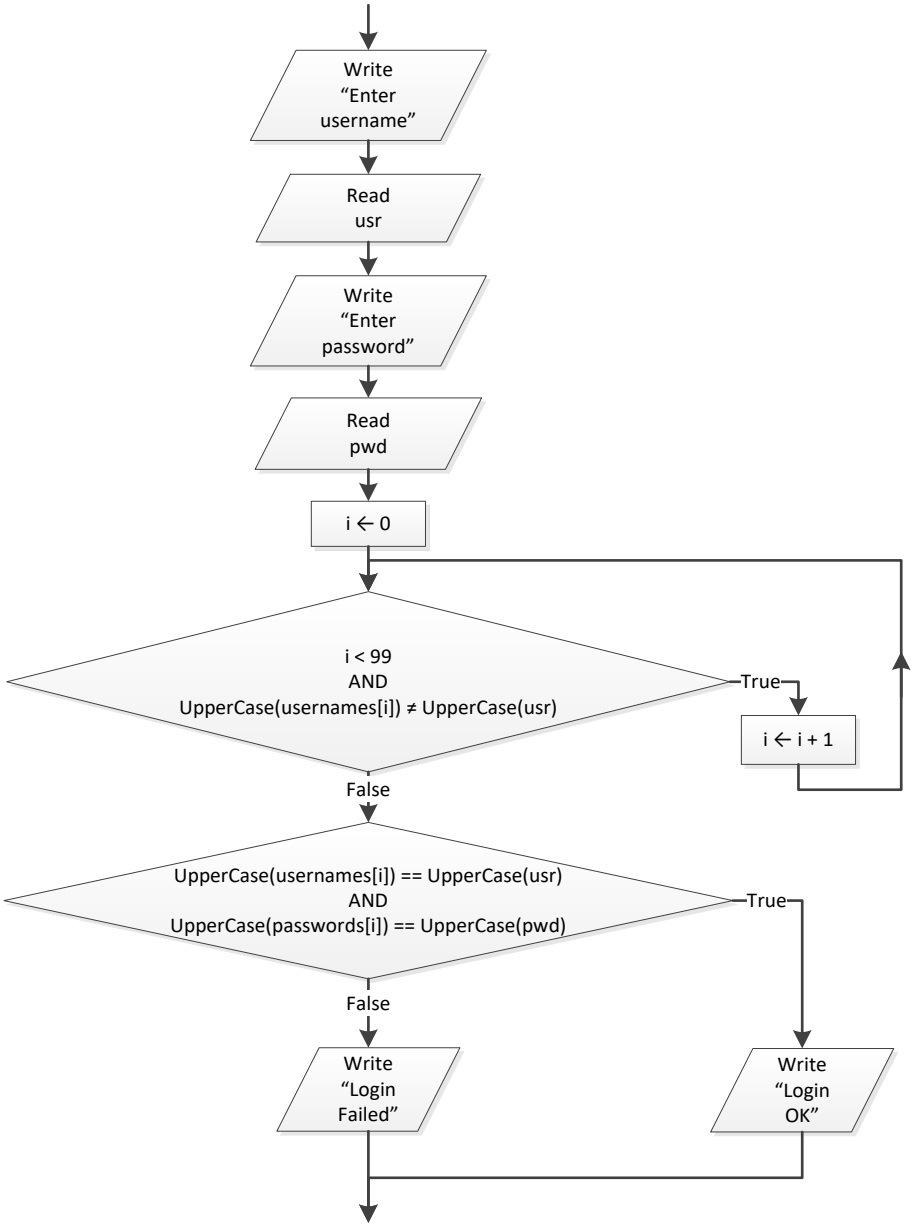
25. Solution

```
static final int CLASS1 = 20;
static final int CLASS2 = 25;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, left, m, middle, n, right;
  String element, needle;
  boolean found;

  System.out.println("Class A");
  String[] names1 = new String[CLASS1];
  for (i = 0; i <= CLASS1 - 1; i++) {
    System.out.print("Enter name: ");
    names1[i] = cin.readLine();
  }
```

```
System.out.println("Class B");
String[] names2 = new String[CLASS2];
for (i = 0; i <= CLASS2 - 1; i++) {
  System.out.print("Enter name: ");
  names2[i] = cin.readLine();
}

//Insertion sort algorithm
for (m = 1; m <= CLASS1 - 1; m++) {
  element = names1[m];
  n = m;
  while (n > 0 && names1[n - 1].compareTo(element) > 0) {
    names1[n] = names1[n - 1];
    n--;
  }
  names1[n] = element;
}
for (m = 1; m <= CLASS2 - 1; m++) {
  element = names2[m];
  n = m;
  while (n > 0 && names2[n - 1].compareTo(element) > 0) {
    names2[n] = names2[n - 1];
    n--;
  }
  names2[n] = element;
}

System.out.println("\nClass A");
for (i = 0; i <= CLASS1 - 1; i++) {
  System.out.println(names1[i]);
}
System.out.println("\nClass B");
for (i = 0; i <= CLASS2 - 1; i++) {
  System.out.println(names2[i]);
}

System.out.print("Enter a name to search: ");
needle = cin.readLine();

left = 0;
right = CLASS1 - 1;
found = false;
while (left <= right && found == false) {
  middle = (int)((left + right) / 2);

  if (names1[middle].compareTo(needle) > 0) {
    right = middle - 1;
  }
  else if (names1[middle].compareTo(needle) < 0) {
    left = middle + 1;
  }
  else {
    found = true;
  }
```

```
  }

  if (found == true) {
    System.out.println("Student found in class No 1");
  }
  else {
    left = 0;
    right = CLASS2 - 1;
    while (left <= right && found == false) {
      middle = (int)((left + right) / 2);

      if (names2[middle].compareTo(needle) > 0) {
        right = middle - 1;
      }
      else if (names2[middle].compareTo(needle) < 0) {
        left = middle + 1;
      }
      else {
        found = true;
      }
    }

    if (found == true) {
      System.out.println("Student found in class No 2");
    }
    else {
      System.out.println("Student not found in either class");
    }
  }
}
```

26. Solution




```
System.out.print("Enter username: ");
usr = cin.readLine();
System.out.print("Enter password: ");
pwd = cin.readLine();

i = 0;
while (i < 99 && usernames[i].toUpperCase().equals(usr.toUpperCase()) != true) {
  i++;
}
```

```
if (usernames[i].toUpperCase().equals(usr.toUpperCase()) == true &&
    passwords[i].toUpperCase().equals(pwd.toUpperCase()) == true) {

  System.out.println("Login OK!");
}
else {
  System.out.println("Login Failed!");
}
```

27. Solution

```
System.out.print("Enter a value to search: ");
value = cin.readLine();

found = false;

//Check if entered value is a valid nine-digit SSN
if (value.matches(IS_NUMERIC) == true &&
    Long.parseLong(value) >= 100000000 && Long.parseLong(value) <= 999999999) {

  i = 0;
  while (i < 999 && SSNs[i].equals(value) != true) {
    i++;
  }

  if (SSNs[i].equals(value) == true) {
    found = true;
    System.out.println(names[i]);
  }
}
else {
  for (i = 0; i <= 999; i++) {
    if (names[i].equals(value) == true) {
      System.out.println(names[i]);
      found = true;
    }
  }
}

if (found == false) {
  System.out.println("This value does not exist");
}
```

28. Solution

```
static final int STUDENTS = 12;
static final int LESSONS = 6;

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j;
  boolean found;
```

```
  int[][] grades = new int[STUDENTS][LESSONS];
  for (i = 0; i <= STUDENTS - 1; i++) {
    for (j = 0; j <= LESSONS - 1; j++) {
      grades[i][j] = Integer.parseInt(cin.readLine());
    }
  }

  double[] average = new double[STUDENTS];
  for (i = 0; i <= STUDENTS - 1; i++) {
    average[i] = 0;
    for (j = 0; j <= LESSONS - 1; j++) {
      average[i] += grades[i][j];
    }
    average[i] /= LESSONS;
  }

  found = false;
  for (i = 0; i <= STUDENTS - 1; i++) {
    if (average[i] < 70) {
      found = true;
    }
  }

  if (found == true) {
    System.out.println("There is at least one student that has an average value below 70");
  }
}
```

Chapter 38

38.4 Review Questions: True/False

1. false
2. true
3. true
4. true
5. false
6. true
7. true
8. false
9. true
10. true
11. false
12. true
13. false

Chapter 39

39.5 Review Questions: True/False

1. true
2. true
3. false
4. true
5. true
6. false
7. true
8. false
9. true
10. false
11. true
12. true
13. true
14. true
15. true
16. false
17. true
18. true
19. false
20. true
21. true
22. true

39.6 Review Exercises

1. Solution

```
static int find_max(int a, int b) {
  int max;
  if (a > b) {
    max = a;
  }
  else {
    max = b;
  }
  return max;
}
```

2. Solution

Step	Statement	Main Code		Function sum_digits()		
		s	i	a	d1	d2
1	s = 0	**0**	?			
2	i = 25	0	**25**			
3	i <= 27	True				
4	s += sum_digits(i)			**25**	?	?
5	d1 = a % 10			25	**5**	?
6	d2 = (int)(a / 10)			25	5	**2**
7	return d1 + d2	**7**	25			
8	i++	7	**26**			
9	i <= 27	True				
10	s += sum_digits(i)			**26**	?	?

11	`d1 = a % 10`			26	**6**	?
12	`d2 = (int)(a / 10)`			26	6	**2**
13	`return d1 + d2`	**15**	26			
14	`i++`	15	**27**			
15	`i <= 27`	True				
16	`s += sum_digits(i)`			**27**	?	?
17	`d1 = a % 10`			27	**7**	?
18	`d2 = (int)(a / 10)`			27	7	**2**
19	`return d1 + d2`	**24**	27			
20	`i++`	24	**28**			
21	`i <= 27`	False				
22	`System.out.println(s)`	24 is displayed				

3. Solution

Step	Statement	Main Code		Function sss()		
		s	i	a	sum	k
1	`i = 1`	?	**1**			
2	`s = 0`	**0**	1			
3	`while(i < 6)`	True				
4	`if (i % 2 == 1)`	True				
5	`s += 1`	**1**	1			
6	`i++`	1	**2**			
7	`while(i < 6)`	True				
8	`if (i % 2 == 1)`	False				
9	`s += sss(i)`			**2**	?	?
10	`sum = 0`			2	**0**	?
11	`k = 1`			2	0	**1**
12	`k <= a`			True		
13	`sum += k`			2	**1**	1
14	`k++`			2	1	**2**
15	`k <= a`			True		
16	`sum += k`			2	**3**	2
17	`k++`			2	3	**3**
18	`k <= a`			False		
19	`return sum`	**4**	2			
20	`i++`	4	**3**			

21	`while(i < 6)`	True				
22	`if (i % 2 == 1)`	True				
23	`s += 1`	**5**	3			
24	`i++`	5	**4**			
25	`while(i < 6)`	True				
26	`if (i % 2 == 1)`	False				
27	`s += sss(i)`			**4**	?	?
28	`sum = 0`			4	**0**	?
29	`k = 1`			4	0	**1**
30	`k <= a`			True		
31	`sum += k`			4	**1**	1
32	`k++`			4	1	**2**
33	`k <= a`			True		
34	`sum += k`			4	**3**	2
35	`k++`			4	3	**3**
36	`k <= a`			True		
37	`sum += k`			4	**6**	4
38	`k++`			4	6	**4**
39	`k <= a`			True		
40	`sum += k`			4	**10**	4
41	`k++`			4	10	**5**
42	`k <= a`			False		
43	`return sum`	**15**	4			
44	`i++`	15	**5**			
45	`while(i < 6)`	True				
46	`if (i % 2 == 1)`	True				
47	`s += 1`	**16**	5			
48	`i++`	16	**6**			
49	`while(i < 6)`	False				
50	`System.out.println(s)`	16 is displayed				

4. Solution

Step	Statement	Main Code	Function `custom_div()`

		k	m	a	x	b	d
1	k = Integer.parseInt(cin.readLine())	**12**	?	?	?		
2	m = 2	12	**2**	?	?		
3	a = 1	12	2	**1**	?		
4	while (a < 6)	True					
5	if (k % m != 0)	False					
6	x = a + m + custom_div(m, a)					2	1
7	return (int)((b + d) / 2)	12	2	1	**4**		
8	System.out.println(m + " " + a + " " + x)	2 1 4 is displayed					
9	a += 2	12	2	**3**	4		
10	m++	12	**3**	3	4		
11	while (a < 6)	True					
12	if (k % m != 0)	False					
13	x = a + m + custom_div(m, a)					3	3
14	return (int)((b + d) / 2)	12	3	3	**9**		
15	System.out.println(m + " " + a + " " + x)	3 3 9 is displayed					
16	a += 2	12	3	**5**	9		
17	m++	12	**4**	5	9		
18	while (a < 6)	True					
19	if (k % m != 0)	False					
20	x = a + m + custom_div(m, a)					4	5
21	return (int)((b + d) / 2)	12	4	5	**13**		
22	System.out.println(m + " " + a + " " + x)	4 5 13 is displayed					
23	a += 2	12	4	**7**	13		
24	m++	12	**5**	7	13		
25	while (a < 6)	False					

5. Solution

```
static double my_round(double x) {
  int digit_to_check;
  double return_value;

  digit_to_check = (int)(x * 1000) % 10;
  if (digit_to_check >= 5) {
    return_value = ((int)(x * 100) + 1) / 100.0;
  }
  else {
    return_value = ((int)(x * 100)) / 100.0;
  }
```

```
  return return_value;
}
```

6. Solution

```
static double find_min(double a, double b) {
  double min;

  min = a;
  if (b < min) {
    min = b;
  }
  return min;
}

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double temp1, temp2, x1, x2, x3, x4;

  System.out.print("Enter four numbers: ");
  x1 = Double.parseDouble(cin.readLine());
  x2 = Double.parseDouble(cin.readLine());
  x3 = Double.parseDouble(cin.readLine());
  x4 = Double.parseDouble(cin.readLine());

  //First approach
  temp1 = find_min(x1, x2);
  temp2 = find_min(x3, x4);
  System.out.println(find_min(temp1, temp2));

  //Second approach
  System.out.println(find_min(find_min(x1, x2), find_min(x3, x4)));
}
```

7. Solution

```
static double Kelvin_to_Fahrenheit(double kelvin) {
  return 1.8 * kelvin - 459.67;
}

static double Kelvin_to_Celsius(double kelvin) {
  return kelvin - 273.15;
}

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double k;

  System.out.print("Enter a temperature in degrees Kelvin: ");
  k = Double.parseDouble(cin.readLine());
  System.out.println("Fahrenheit: " + Kelvin_to_Fahrenheit(k));
  System.out.println("Celsius: " + Kelvin_to_Celsius(k));
```

```
}
```

8. Solution

```
static final String IS_NUMERIC = "[+-]?\\d+(\\.\\d+)?";

static String bmi(double w, double h) {
  double b;
  String return_value;

  b = w * 703 / Math.pow(h ,2);
  if (b < 16) {
    return_value = "You must add weight.";
  }
  else if (b < 18.5) {
    return_value = "You should add some weight.";
  }
  else if (b < 25) {
    return_value = "Maintain your weight.";
  }
  else if (b < 30) {
    return_value = "You should lose some weight.";
  }
  else {
    return_value = "You must lose weight.";
  }

  return return_value;
}

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double height, weight;
  int age;
  String in;

  System.out.print("Enter your weight (in pounds): ");
  in = cin.readLine();
  while (in.matches(IS_NUMERIC) != true || Double.parseDouble(in) < 0) {
    System.out.print("Error! Enter your weight (in pounds): ");
    in = cin.readLine();
  }
  weight = Double.parseDouble(in);

  System.out.println("Enter your age: ");
  in = cin.readLine();
  while (in.matches(IS_NUMERIC) != true || Integer.parseInt(in) < 18) {
    System.out.print("Error! Enter your age: ");
    in = cin.readLine();
  }
  age = Integer.parseInt(in);

  System.out.println("Enter your height (in inches): ");
  in = cin.readLine();
```

```
  while (in.matches(IS_NUMERIC) != true || Double.parseDouble(in) < 0) {
    System.out.println("Error! Enter your height (in inches): ");
    in = cin.readLine();
  }
  height = Double.parseDouble(in);

  System.out.println(bmi(weight, height));
}
```

Chapter 40

40.5 Review Questions: True/False

1. true
2. true
3. false
4. true
5. true
6. false
7. true
8. false
9. true
10. true
11. true
12. true
13. false

40. 6 Review Exercises

1. Solution

Step	Statement	Main Code		Function display()
		i	x	a
1	`i = 1`	**1**	?	
2	`i <= 5`	True		
3	`x = Integer.parseInt(cin.readLine())`	1	**3**	
4	`display(x)`			**3**
5	`if (a % 2 == 0)`			False
6	`System.out.println(a + " is odd")`	The message “3 is odd” is displayed		
7	`i++`	**2**	3	
8	`i <= 5`	True		
9	`x = Integer.parseInt(cin.readLine())`	2	**7**	
10	`display(x)`			**7**
11	`if (a % 2 == 0)`			False
12	`System.out.println(a + " is odd")`	The message “7 is odd” is displayed		
13	`i++`	**3**	7	
14	`i <= 5`	True		
15	`x = Integer.parseInt(cin.readLine())`	3	**9**	
16	`display(x)`			**9**
17	`if (a % 2 == 0)`			False
18	`System.out.println(a + " is odd")`	The message “9 is odd” is displayed		
19	`i++`	**4**	9	
20	`i <= 5`	True		
21	`x = Integer.parseInt(cin.readLine())`	4	**2**	

22	`display(x)`			**2**
23	`if (a % 2 == 0)`			True
24	`System.out.println(a + " is even")`	The message “2 is even” is displayed		
25	`i++`	**5**	2	
26	`i <= 5`	True		
27	`x = Integer.parseInt(cin.readLine())`	5	**4**	
28	`display(x)`			**4**
29	`if (a % 2 == 0)`			True
30	`System.out.println(a + " is even")`	The message “4 is even” is displayed		
31	`i++`	**6**	4	
32	`i <= 5`	False		

2. *Solution*

Step	Statement	Main Code		Function `division()`	
		x	y	a	b
1	`x = 20`	**20**	?		
2	`y = 30`	20	**30**		
3	`while (x % y < 30)`	True			
4	`division(y, x)`			**30**	**20**
5	`b = (int)(b / a)`			30	**0**
6	`System.out.println(a * b)`	0 is displayed			
7	`x = 4 * y`	**120**	30		
8	`y++`	120	**31**		
9	`while (x % y < 30)`	True			
10	`division(y, x)`			**31**	**120**
11	`b = (int)(b / a)`			31	**3**
12	`System.out.println(a * b)`	93 is displayed			
13	`x = 4 * y`	**124**	31		
14	`y++`	124	**32**		
15	`while (x % y < 30)`	True			
16	`division(y, x)`			**32**	**124**
17	`b = (int)(b / a)`			32	**3**
18	`System.out.println(a * b)`	96 is displayed			
19	`x = 4 * y`	**128**	32		

20	`y++`	128	**33**		
21	`while (x % y < 30)`	True			
22	`division(y, x)`			**33**	**128**
23	`b = (int)(b / a)`			33	**3**
24	`System.out.println(a * b)`	99 is displayed			
25	`x = 4 * y`	**132**	33		
26	`y++`	132	**34**		
27	`while (x % y < 30)`	False			

3. *Solution*

Step	Statement	Main Code		Function `calculate()`		
		i	m	n	s	j
1	`i = 1`	**1**	?			
2	`i <= 3`	True				
3	`m = Integer.parseInt(cin.readLine())`	1	**2**			
4	`calculate(m)`			**2**	?	?
5	`s = 0`			2	**0**	?
6	`j = 2`			2	0	**2**
7	`j <= 2 * n`			True		
8	`s = s + pow(j, 2)`			2	**4**	2
9	`j += 2`			2	4	**4**
10	`j <= 2 * n`			True		
11	`s = s + pow(j, 2)`			2	**20**	4
12	`j += 2`			2	20	**6**
13	`j <= 2 * n`			False		
14	`System.out.println(s)`	20 is displayed				
15	`i++`	**2**	2			
16	`i <= 3`	True				
17	`m = Integer.parseInt(cin.readLine())`	2	**3**			
18	`calculate(m)`			**3**	?	?
19	`s = 0`			3	**0**	?
20	`j = 2`			3	0	**2**
21	`j <= 2 * n`			True		
22	`s = s + pow(j, 2)`			3	**4**	2
23	`j += 2`			3	4	**4**

24	`j <= 2 * n`				True	
25	`s = s + pow(j, 2)`			3	**20**	4
26	`j += 2`			3	20	**6**
27	`j <= 2 * n`				True	
28	`s = s + pow(j, 2)`			3	**56**	6
29	`j += 2`			3	56	**8**
30	`j <= 2 * n`				False	
31	`System.out.println(s)`	56 is displayed				
32	`i++`	**3**	3			
33	`i <= 3`	True				
34	`m = Integer.parseInt(cin.readLine())`	3	**4**			
35	`calculate(m)`			**4**	?	?
36	`s = 0`			4	**0**	?
37	`j = 2`			4	0	**2**
38	`j <= 2 * n`				True	
39	`s = s + pow(j, 2)`			4	**4**	2
40	`j += 2`			4	4	**4**
41	`j <= 2 * n`				True	
42	`s = s + pow(j, 2)`			4	**20**	4
43	`j += 2`			4	20	**6**
44	`j <= 2 * n`				True	
45	`s = s + pow(j, 2)`			4	**56**	6
46	`j += 2`			4	56	**8**
47	`j <= 2 * n`				True	
48	`s = s + pow(j, 2)`			4	**120**	8
49	`j += 2`			4	120	**10**
50	`j <= 2 * n`				False	
51	`System.out.println(s)`	120 is displayed				
52	`i++`	**4**	4			
53	`i <= 3`	False				

4. Solution

```
static void maximum(double a, double b, double c, double d, double e) {
  double max;

  max = a;
```

```
  if (b > max) {
    max = b;
  }
  if (c > max) {
    max = c;
  }
  if (d > max) {
    max = d;
  }
  if (e > max) {
    max = e;
  }
  System.out.println(max);
}
```

5. Solution

```
static void num_of_days(int year, int month) {
  int days;

  switch (month) {
    case 4:
    case 6:
    case 9:
    case 11:
      days = 30;
      break;
    case 2:
      if (year % 4 == 0 && year % 100 != 0 || year % 400 == 0) {
        days = 29;
      }
      else {
        days = 28;
      }
      break;
    default:
      days = 31;
  }

  System.out.println(days);
}

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int m, y;

  System.out.print("Enter a year: ");
  y = Integer.parseInt(cin.readLine());
  for (m = 1; m <= 12; m++) {
    num_of_days(y, m);
  }
}
```

6. Solution

```
static void display_menu() {
  System.out.println();
  System.out.println("1. Convert meters to miles");
  System.out.println("2. Convert miles to meters");
  System.out.println("3. Exit");
  System.out.print("Enter a choice: ");
}

static void meters_to_miles(double meters) {
  System.out.println(meters + " meters equals " + (meters / 1609.344) + " miles");
}

static void miles_to_meters(double miles) {
  System.out.println(miles + " miles equals " + (miles * 1609.344) + " meters");
}

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int choice;
  double distance;

  do {
    display_menu();

    choice = Integer.parseInt(cin.readLine());

    if (choice == 3) {
      System.out.println("Bye!");
    }
    else {
      System.out.println("Enter distance: ");
      distance = Integer.parseInt(cin.readLine());
      if (choice == 1) {
        meters_to_miles(distance);
      }
      else {
        miles_to_meters(distance);
      }
    }
  } while (choice != 3);
}
```

7. Solution

```
static void amount_to_pay(int seconds) {
  double extra, tax, total, total_without_tax;

  if (seconds <= 600) {
    extra = 0;
  }
  else if (seconds <= 1200) {
```

```
    extra = (seconds - 600) * 0.01;
  }
  else {
    extra = 600 * 0.01 + (seconds - 1200) * 0.02;
  }

  total_without_tax = 10 + extra;
  tax = total_without_tax * 11 / 100;
  total = total_without_tax + tax;

  System.out.println("Total amount to pay: " + total);
}

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int seconds;

  System.out.print("Enter number of seconds: ");
  seconds = Integer.parseInt(cin.readLine());
  amount_to_pay(seconds);
}
```

Chapter 41

41.9 Review Questions: True/False

1. true
2. true
3. true
4. false
5. true
6. false
7. false
8. false
9. true
10. false
11. true
12. true
13. true
14. false
15. true
16. true
17. false
18. false
19. false
20. false
21. true
22. true
23. false
24. true
25. true
26. true

41.10 Review Exercises

1. Solution

The value 5 is displayed

2. Solution

The value 14 is displayed

3. Solution

The value 14 is displayed

4. Solution

Step	Statement	Global		Main Code		Function swap()		
		arr[0]	arr[1]	k	x	x	y	temp
1	`k = Integer.parseInt(cin.readLine())`	?	?	**12**	?			
2	`arr[1] = 1`	?	**1**	12	?			
3	`arr[0] = 1`	**1**	1	12	?			
4	`while (arr[0] < 8)`	1	1	True				
5	`if (k % arr[1] != 0)`	1	1	False				
6	`x = arr[0] + arr[1] + (int)(arr[0] - arr[1])`	1	1	12	**2**			
7	`System.out.println(arr[1] + " " + arr[0] + " " + x)`	1 1 2 is displayed						

8	`arr[0] += 2`	**3**	1	12	2			
9	`arr[1]++`	3	**2**	12	2			
10	`swap(arr[0], arr[1])`					**3**	**2**	?
11	`temp = x`					3	2	**3**
12	`x = y`					**2**	2	3
13	`y = temp`					2	**3**	3
14	`while (arr[0] < 8)`	**2**	**3**	12	2			
		2	3	True				
15	`if (k % arr[1] != 0)`	2	3	False				
16	`x = arr[0] + arr[1] + (int)(arr[0] - arr[1])`	2	3	12	**4**			
17	`System.out.println(arr[1] + " " + arr[0] + " " + x)`	3 2 4 is displayed						
18	`arr[0] += 2`	**4**	3	12	4			
19	`arr[1]++`	4	**4**	12	4			
20	`swap(arr[0], arr[1])`					**4**	**4**	?
21	`temp = x`					4	4	**4**
22	`x = y`					**4**	4	4
23	`y = temp`					4	**4**	4
24	`while (arr[0] < 8)`	**4**	**4**	12	4			
		4	4	True				
25	`if (k % arr[1] != 0)`	4	4	False				
26	`x = arr[0] + arr[1] + (int)(arr[0] - arr[1])`	4	4	12	**8**			
27	`System.out.println(arr[1] + " " + arr[0] + " " + x)`	4 4 8 is displayed						
28	`arr[0] += 2`	**6**	4	12	8			
29	`arr[1]++`	6	**5**	12	8			
30	`swap(arr[0], arr[1])`					**6**	**5**	?
31	`temp = x`					6	5	**6**
32	`x = y`					**5**	5	6
33	`y = temp`					5	**6**	5
34	`while (arr[0] < 8)`	**5**	**6**	12	8			
		5	6	True				
35	`if (k % arr[1] != 0)`	5	6	False				
36	`x = arr[0] + arr[1] + (int)(arr[0] - arr[1])`	5	6	12	**10**			

37	`System.out.println(arr[1] + " " + arr[0] + " " + x)`	6 5 10 is displayed						
38	`arr[0] += 2`	**7**	6	12	10			
39	`arr[1]++`	7	**7**	12	10			
40	`swap(arr[0], arr[1])`					**7**	**7**	?
41	`temp = x`					7	7	**7**
42	`x = y`					**7**	7	7
43	`y = temp`					7	**7**	7
44	`while (arr[0] < 8)`	**7**	**7**	12	10			
		7	7	True				
45	`if (k % arr[1] != 0)`	7	7	True				
46	`x = arr[0] % arr[1]`	7	7	12	**0**			
47	`swap(arr[1], arr[0])`					**7**	**7**	?
48	`temp = x`					7	7	**7**
49	`x = y`					**7**	7	7
50	`y = temp`					7	**7**	7
51	`System.out.println(arr[1] + " " + arr[0] + " " + x)`	7	7	12	0			
		7 7 0 is displayed						
52	`arr[0] += 2`	**9**	7	12	0			
53	`arr[1]++`	9	**8**	12	0			
54	`swap(arr[0], arr[1])`					**9**	**8**	?
55	`temp = x`					9	8	**9**
56	`x = y`					**8**	8	9
57	`y = temp`					8	**9**	9
58	`while (arr[0] < 8)`	**8**	**9**	12	0			
		False						

5. Solution

"hellohellohello" is displayed

6. Solution

The value 15 is displayed

7. Solution

11 4 is displayed

8. Solution

```
static final int STUDENTS = 10;
static final int LESSONS = 5;

static void part1(String[] names, int[][] grades) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j;

  for (i = 0; i <= STUDENTS - 1; i++) {
    System.out.print("Enter name for student No. " + (i + 1) + ": ");
    names[i] = cin.readLine();
    for (j = 0; j <= LESSONS - 1; j++) {
      System.out.print("Enter grade for lesson No. " + (j + 1) + ": ");
      grades[i][j] = Integer.parseInt(cin.readLine());
    }
  }
}

static double[] part2(int[][] grades) {
  double[] average = new double[STUDENTS];
  int i, j;

  for (i = 0; i <= STUDENTS - 1; i++) {
    average[i] = 0;
    for (j = 0; j <= LESSONS - 1; j++) {
      average[i] += grades[i][j];
    }
    average[i] /= LESSONS;
  }
  return average;
}

static void part3(double[] average, String[] names) {
  int m, n;
  double temp;
  String temp_str;

  for (m = 1; m <= STUDENTS - 1; m++) {
    for (n = STUDENTS - 1; n >= m; n--) {
      if (average[n] > average[n - 1]) {
        temp = average[n];
        average[n] = average[n - 1];
        average[n - 1] = temp;

        temp_str = names[n];
        names[n] = names[n - 1];
        names[n - 1] = temp_str;
      }
      else if (average[n] == average[n - 1]) {
        if (names[n].compareTo(names[n - 1]) < 0) {
          temp_str = names[n];
          names[n] = names[n - 1];
```

```
          names[n - 1] = temp_str;
        }
      }
    }
  }
}

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i;

  String[] names = new String[STUDENTS];
  int[][] grades = new int[STUDENTS][LESSONS];
  double[] average = new double[STUDENTS];

  part1(names, grades);

  average = part2(grades);

  part3(average, names);

  for (i = 0; i <= STUDENTS - 1; i++) {
    System.out.println(names[i] + "\t" + average[i]);
  }
}
```

9. Solution

```
static String part1() throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));

  String message;
  System.out.print("Enter a message: ");
  message = cin.readLine().toLowerCase();
  return message;
}

static int part2(String message) {
  int last_pos = message.length() - 1;
  return last_pos;
}

static String part3(String message, int last_pos) {
  String letter, message_clean;
  int i;

  message_clean = "";
  for (i = 0; i <= last_pos; i++) {
    letter = "" + message.charAt(i);
    if (letter.equals(" ") == false && letter.equals(",") == false &&
        letter.equals(".") == false && letter.equals("?") == false) {

      message_clean += letter;
    }
```

```
  }
  return message_clean;
}

static boolean part4(String message_clean) {
  int middle_pos, i, j;
  boolean palindrome;
  String left_letter, right_letter;

  middle_pos = (int)((message_clean.length() - 1) / 2);
  j = message_clean.length() - 1; //or you can write  j = part2(message_clean);
  palindrome = true;
  for (i = 0; i <= middle_pos; i++) {
    left_letter = "" + message_clean.charAt(i);
    right_letter = "" + message_clean.charAt(j);
    if (left_letter.equals(right_letter) == false) {
      palindrome = false;
      break;
    }
    j--;
  }
  return palindrome;
}

static boolean part5(String message) {
  int last_pos;
  String message_clean;
  boolean palindrome;

  last_pos = part2(message);
  message_clean = part3(message, last_pos);
  palindrome = part4(message_clean);
  return palindrome;
}

public static void main(String[] args) throws java.io.IOException {
  String message;
  boolean palindrome;

  message = part1();
  palindrome = part5(message);
  if (palindrome == true) {
    System.out.println("The message is palindrome");
  }
}
```

10. Solution

```
public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int a, b, c, max;

  a = Integer.parseInt(cin.readLine());
  b = Integer.parseInt(cin.readLine());
```

```
  c = Integer.parseInt(cin.readLine());
  d = Integer.parseInt(cin.readLine());

  max = a;
  if (b > max) {
    max = b;
  }
  if (c > max) {
    max = c;
  }
  if (d > max) {
    max = d;
  }

  System.out.println(max);
}
```

11. Solution

```
static void f1(double a, double b, double c, double[] results) {
  results[0] = a + b + c;
  results[1] = results[0] / 3;
}
```

12. Solution

```
static double my_round(double x, int decimal_places) {
  double return_value;

  int digit_to_check = (int)((x * Math.pow(10, decimal_places + 1))) % 10;
  if (digit_to_check >= 5) {
    return_value = ((int)((x * Math.pow(10, decimal_places))) + 1) / Math.pow(10, decimal_places);
  }
  else {
    return_value = ((int)(x * Math.pow(10, decimal_places))) / Math.pow(10, decimal_places);
  }
  return return_value;
}

static double my_round(double x) {
  return my_round(x, 2);
}
```

13. Solution

```
static String get_input() throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  String answer;

  do {
    System.out.print("Enter Yes or No: ");
    answer = cin.readLine().toUpperCase();
  } while (answer.equals("YES") != true && answer.equals("NO") != true);
```

```
  return answer;
}

static double find_area(double base, double height) {
  return base * height;
}

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  double base, height;

  do {
    System.out.print("Enter the base of the parallelogram: ");
    base = Double.parseDouble(cin.readLine());
    System.out.print("Enter the height of the parallelogram: ");
    height = Double.parseDouble(cin.readLine());

    System.out.println("Area = " + find_area(base, height));

    System.out.println("Would you like to repeat? ");
  } while (get_input().equals("YES") == true) ;
}
```

14. Solution

```
static final int STUDENTS = 100;

static void get_arrays(String[] names, int[] grades) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i;

  for (i = 0; i <= STUDENTS - 1; i++) {
    System.out.print("Enter name: ");
    names[i] = cin.readLine();
    System.out.print("Enter grade: ");
    grades[i] = Integer.parseInt(cin.readLine());
  }
}

static double get_average(int[] grades) {
  int i, sum = 0;
  for (i = 0; i <= STUDENTS - 1; i++) {
    sum += grades[i];
  }
  return sum / (double)STUDENTS;
}

static void sort_arrays(int[] grades, String[] names) {
  int m, n, element_grds;
  String element_nms;

  for (m = 1; m <= STUDENTS - 1; m++) {
    element_grds = grades[m];
    element_nms = names[m];
```

```
    n = m;
    while (n > 0 && grades[n - 1] < element_grds) {
        grades[n] = grades[n - 1];
        names[n] = names[n - 1];
        n--;
    }

    grades[n] = element_grds;
    names[n] = element_nms;
  }
}

public static void main(String[] args) throws java.io.IOException {

  int i;
  double average;

  String[] names = new String[STUDENTS];
  int[] grades = new int[STUDENTS];

  get_arrays(names, grades);
  average = get_average(grades);
  sort_arrays(grades, names);
  for (i = 0; i <= STUDENTS - 1; i++) {
    if (grades[i] < average) {
      System.out.println(names[i]);
    }
  }
}
```

15. Solution

```
static final int JUDGES = 10;

static int[] get_array() throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int[] score = new int[JUDGES];
  int i;

  for (i = 0; i <= JUDGES - 1; i++) {
    System.out.print("Judge No " + (i + 1) + ". Enter score: ");
    score[i] = Integer.parseInt(cin.readLine());
  }
  return score;
}

static void find_min_max(int[] score, int[] results) {
  int i;

  int min = score[0];
  int max = score[0];
  for (i = 1; i <= JUDGES - 1; i++) {
    if (score[i] > max) {
```

```
      max = score[i];
    }
    if (score[i] < min) {
      min = score[i];
    }
  }
  results[0] = min;
  results[1] = max;
}

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  String name;
  int[] results = new int[2];
  int sum, i, points;

  System.out.print("Enter artist's name: ");
  name = cin.readLine();
  int[] score = get_array();
  find_min_max(score, results);

  sum = 0;
  for (i = 0; i <= JUDGES - 1; i++) {
    sum += score[i];
  }

  points = sum - results[0] - results[1];
  System.out.println("Artist " + name + " got " + points + " points");
}
```

16. Solution

```
static double woc(int index) {
  double return_value;

  if (index == 1) {
    return_value = 1;
  }
  else {
    return_value = 2 * woc(index - 1);
  }
  return return_value;
}

public static void main(String[] args) throws java.io.IOException {
  double sum;
  int i;

  sum = 0;
  for (i = 1; i <= 64; i++) {
    sum += woc(i);
  }
  System.out.println(sum);
```

```
}
```

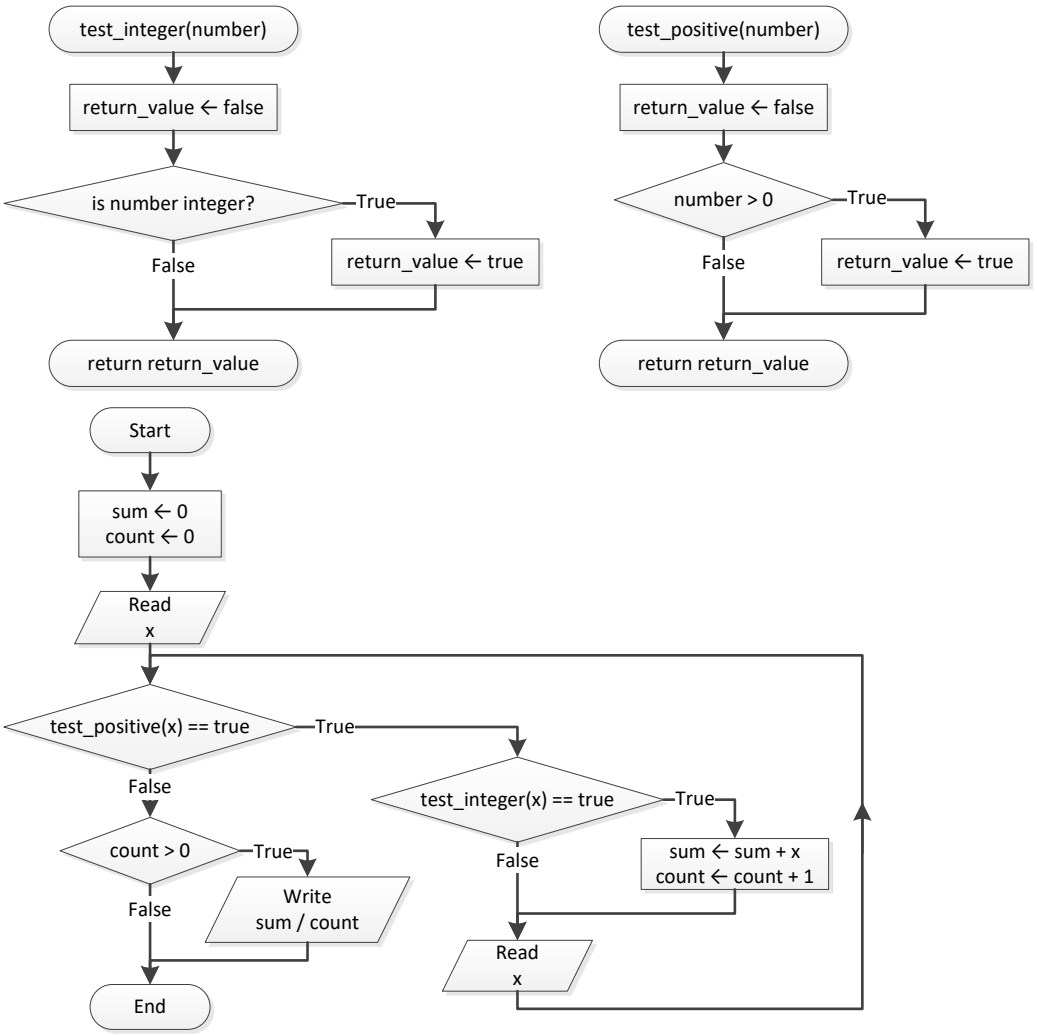
17. Solution

```
static double fact(int value) {
  double return_value;

  if (value == 1) {
    return_value = 1;
  }
  else {
    return_value = value * fact(value - 1);
  }

  return return_value;
}

static double my_cos(double x, int i) {
  double return_value;

  if (i == 0) {
    return_value = 1;
  }
  else {
    return_value = my_cos(x, i - 4) + Math.pow(x, i) / fact(i) - Math.pow(x, i - 2) / fact(i - 2);
  }

  return return_value;
}

//overload
static double my_cos(double x) {
  return my_cos(x, 40);
}

public static void main(String[] args) throws java.io.IOException {
  System.out.println(my_cos(Math.PI / 4));
}
```

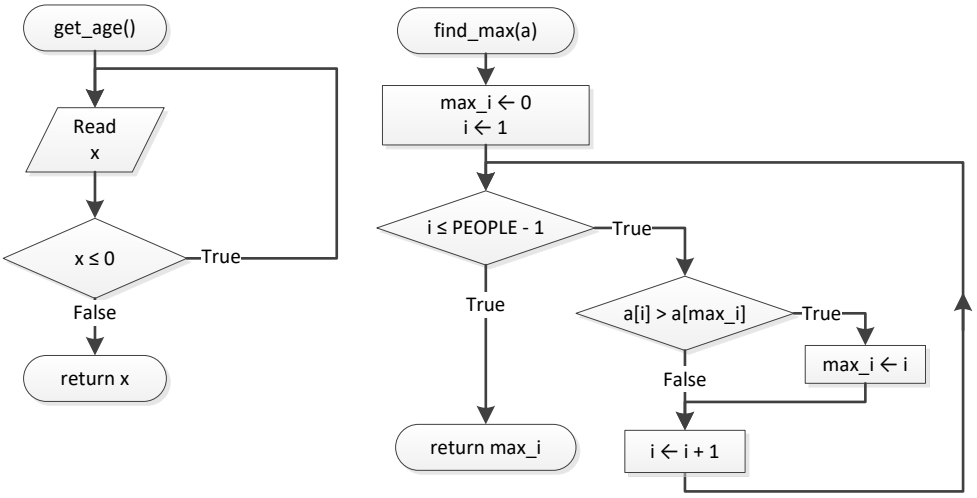
Chapter 42

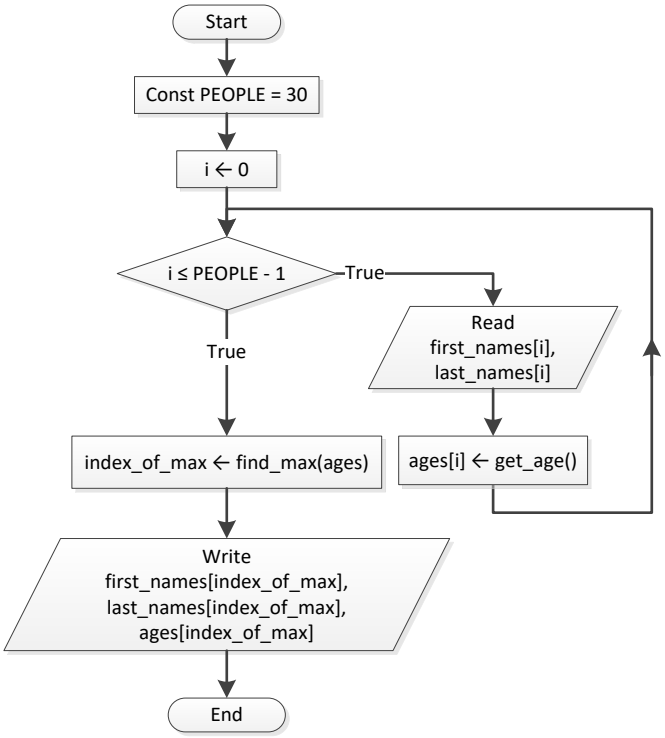
42.4 Review Exercises

1. Solution

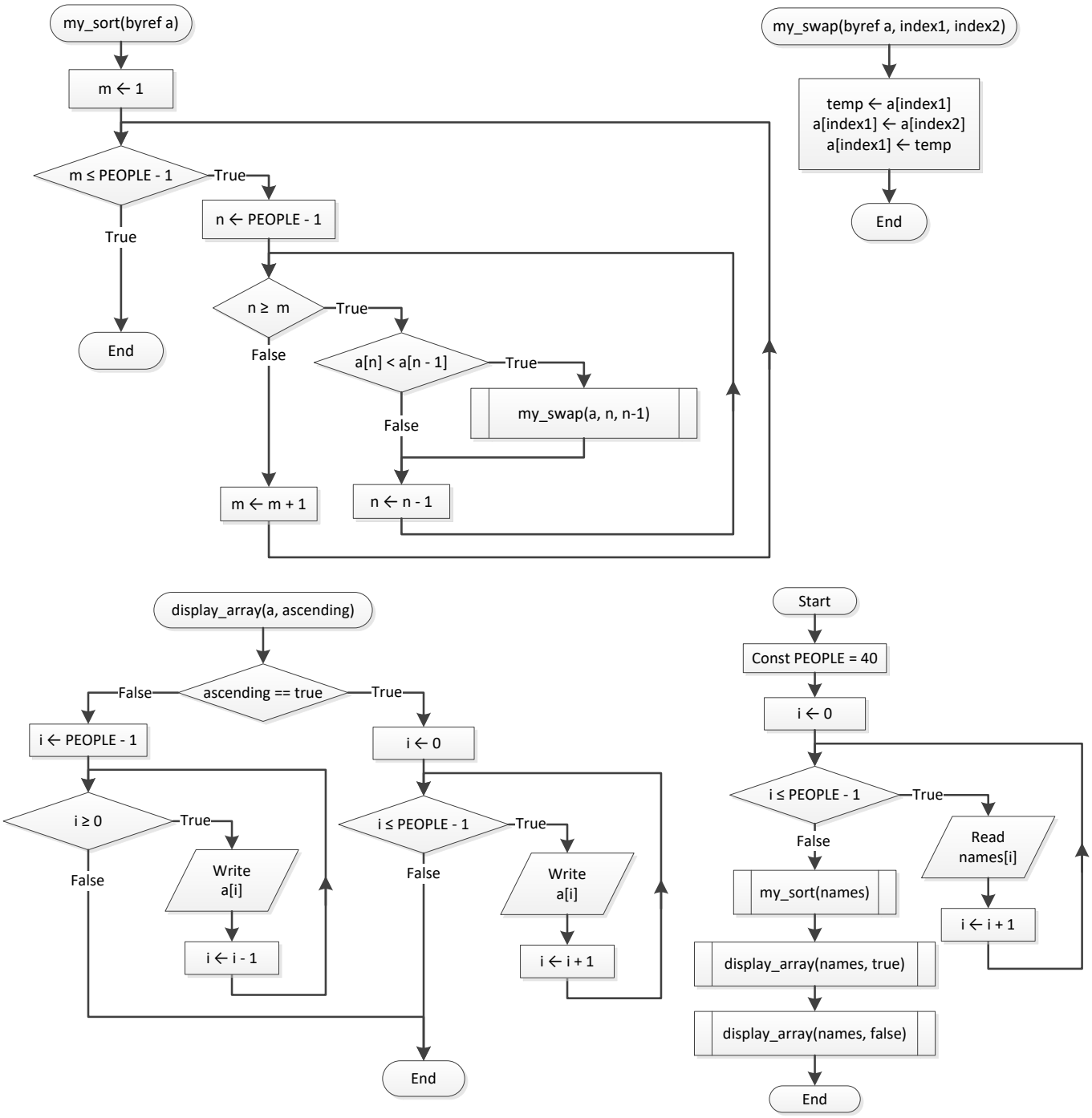


2. Solution

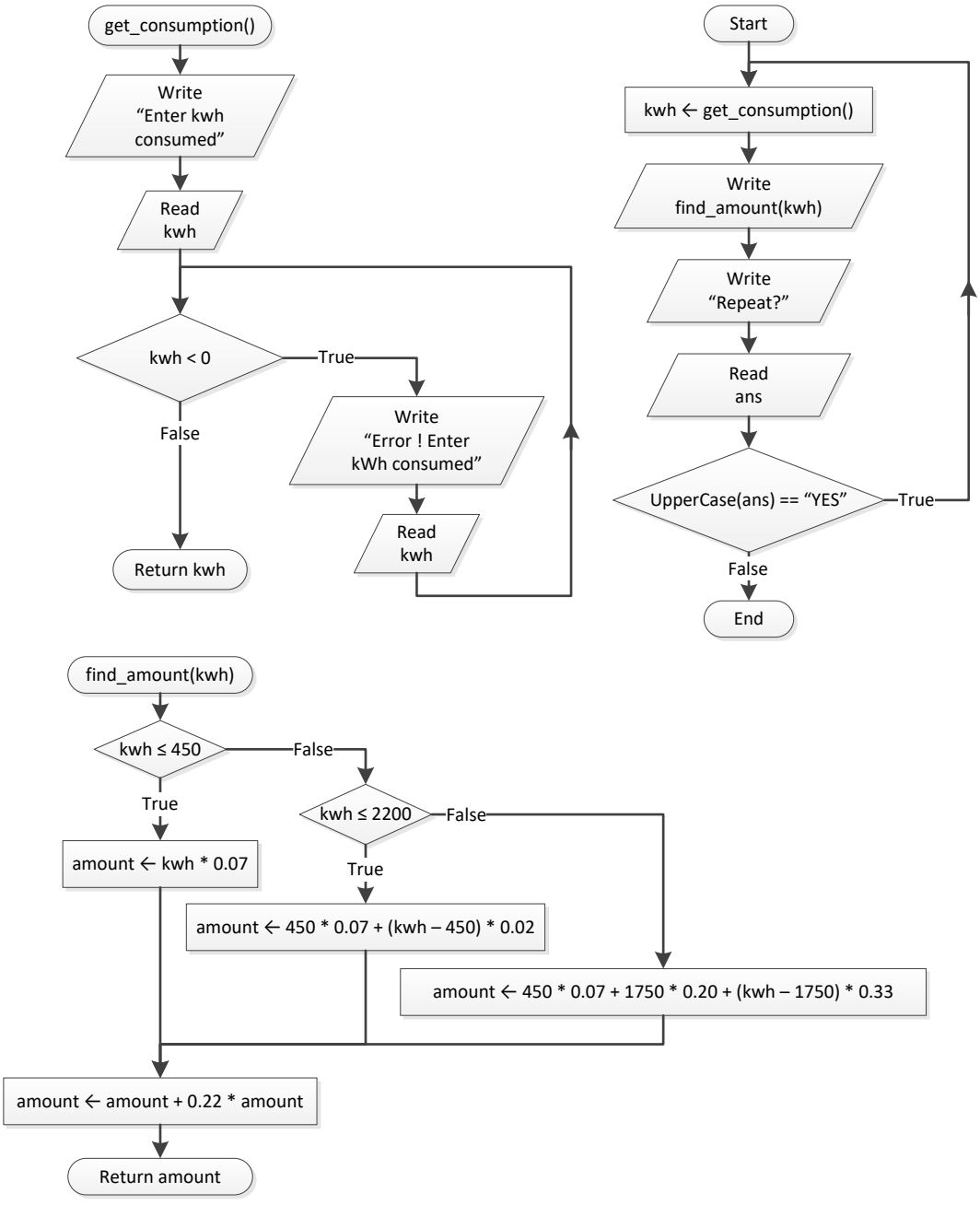

get_age()
Read
x
x ≤ 0
True
False
return x
find_max(a)
max_i ← 0
i ← 1
i ≤ PEOPLE - 1
True
True
a[i] > a[max_i]
True
max_i ← i
False
i ← i + 1
return max_i


Start
Const PEOPLE = 30
i ← 0
i ≤ PEOPLE - 1
True
True
Read
first_names[i],
last_names[i]
index_of_max ← find_max(ages)
ages[i] ← get_age()
Write
first_names[index_of_max],
last_names[index_of_max],
ages[index_of_max]
End

3. Solution


my_sort(byref a)
m ← 1
m ≤ PEOPLE - 1
True
True
End
n ← PEOPLE - 1
n ≥ m
True
False
a[n] < a[n - 1]
True
False
my_swap(a, n, n-1)
m ← m + 1
n ← n - 1
my_swap(byref a, index1, index2)
temp ← a[index1]
a[index1] ← a[index2]
a[index1] ← temp
End
display_array(a, ascending)
ascending == true
False
True
i ← PEOPLE - 1
i ≥ 0
True
False
Write
a[i]
i ← i - 1
i ← 0
i ≤ PEOPLE - 1
True
False
Write
a[i]
i ← i + 1
End
Start
Const PEOPLE = 40
i ← 0
i ≤ PEOPLE - 1
True
False
Read
names[i]
i ← i + 1
my_sort(names)
display_array(names, true)
display_array(names, false)
End

4. Solution



5. Solution

```
static final int STUDENTS = 20;
static final int LESSONS = 10;

static void get_arrays(String[] names, int[][] grades) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j;
```

```
  for (i = 0; i <= STUDENTS - 1; i++) {
    names[i] = cin.readLine();
    for (j = 0; j <= LESSONS - 1; j++) {
      grades[i][j] = Integer.parseInt(cin.readLine());
    }
  }
}

static double[] find_average(int[][] grades) {
  int i, j;
  double[] average = new double[STUDENTS];

  for (i = 0; i <= STUDENTS - 1; i++) {
    average[i] = 0;
    for (j = 0; j <= LESSONS - 1; j++) {
      average[i] += grades[i][j];
    }
    average[i] /= LESSONS;
  }
  return average;
}

static void display(String[] names, double[] average) {
  int i;

  for (i = 0; i <= STUDENTS - 1; i++) {
    if (average[i] > 89) {
      System.out.println(names[i] + ", " + average[i]);
    }
  }
}

public static void main(String[] args) throws java.io.IOException {
  String[] names = new String[STUDENTS];
  int[][] grades = new int[STUDENTS][LESSONS];
  double[] av = new double[STUDENTS];

  get_arrays(names, grades);
  av = find_average(grades);
  display(names, av);
}
```

6. Solution

```
static double fib(int n) {
  double return_val;

  if (n == 0 || n == 1) {
    return_val = n;
  }
  else {
    return_val = fib(n - 1) + fib(n - 2);
  }
```

```
  return return_val;
}

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int n;
  String ans;

  do {
    n = Integer.parseInt(cin.readLine());
    while (n < 0) {
      System.out.println("Error");
      n = Integer.parseInt(cin.readLine());
    }

    System.out.println(fib(n));
    System.out.println("Again? ");
    ans = cin.readLine();
  } while (ans.equals("Y") == true);
}
```

Chapter 43

43.3 Review Exercises

1. Solution

```
static final double ACCURACY = 0.000000001;

static double factorial(int n) {
  int i;

  double return_value = 1;
  for (i = 1; i <= n; i++) {
    return_value *= i;
  }
  return return_value;
}

static double my_sin(double x) {
  int i, sign;
  double sinus, sinus_previous;
  sign = 1;
  sinus = 0;
  i = 1;
  do {
    sinus_previous = sinus;
    sinus += sign * Math.pow(x, i) / factorial(i);

    sign = -sign;
    i += 2;
  } while (Math.abs(sinus - sinus_previous) > ACCURACY);
  return sinus;
}

static double degrees_to_rad(double degrees) {
  return 2 * Math.PI * degrees / 360;
}

public static void main(String[] args) throws java.io.IOException {
  int i;

  for (i = 0; i <= 360; i++) {
    System.out.println("sin(" + i + ") ~= " + my_sin(degrees_to_rad(i)));
  }
}
```

2. Solution

```
static boolean is_leap(int year) {
  boolean return_value = false;
  if (year % 4 == 0 && year % 100 != 0 || year % 400 == 0) {
    return_value = true;
```

```
  }
  return return_value;
}

static int num_of_days(int year, int month) {
  int days;

  switch (month) {
    case 4:
    case 6:
    case 9:
    case 11:
      days = 30;
      break;
    case 2:
      if (is_leap(year) == true) {
        days = 29;
      }
      else {
        days = 28;
      }
      break;
    default:
      days = 31;
  }

  return days;
}

static boolean check_date(int day, int month, int year) {
  boolean return_value = true;
  if (month < 1 || month > 12) {
    return_value = false;
  }
  else if (day < 1 || day > num_of_days(year, month)) {
    return_value = false;
  }
  return return_value;
}

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int day, month, year, sum, i;


  System.out.print("Enter day: ");
  day = Integer.parseInt(cin.readLine());
  System.out.print("Enter month: ");
  month = Integer.parseInt(cin.readLine());
  System.out.print("Enter year: ");
  year = Integer.parseInt(cin.readLine());
  while (check_date(day, month, year) == false) {
    System.out.println("Error!");
    System.out.print("Enter day: ");
```

```
    day = Integer.parseInt(cin.readLine());
    System.out.print("Enter month: ");
    month = Integer.parseInt(cin.readLine());
    System.out.print("Enter year: ");
    year = Integer.parseInt(cin.readLine());
  }

  sum = 0;
  for (i = 1; i <= month - 1; i++) {
    sum += num_of_days(year, i);
  }
  sum += day;

  System.out.println(sum);
}
```

3. Solution

```
static int dice() {
  return 1 + (int)(Math.random() * 6);
}

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int dice1, dice2, i, player, sum, sum_player1 = 0, sum_player2 = 0;
  String key, name1, name2;

  System.out.print("Player1 - Enter name: ");
  name1 = cin.readLine();
  System.out.print("Player2 - Enter name: ");
  name2 = cin.readLine();

  for (player = 1; player <= 2; player++) {
    sum = 0;
    for (i = 1; i <= 10; i++) {
      if (player == 1) {
        System.out.println(name1 + ", hit enter to roll the dice!");
      }
      else {
        System.out.println(name2 + ", hit enter to roll the dice!");
      }
      key = cin.readLine();

      dice1 =  dice();
      dice2 =  dice();
      System.out.println(dice1 + "   " + dice2);
      sum += dice1 + dice2;
    }
    if (player == 1) {
      sum_player1 = sum;
    }
    else {
      sum_player2 = sum;
    }
```

```
  }

  if (sum_player1 == sum_player2) {
    System.out.println("Tie!");
  }
  else if (sum_player1 > sum_player2) {
    System.out.println(name1 + " wins");
  }
  else {
    System.out.println(name2 + " wins");
  }
}
```

4. Solution

```
static final int GAS = 1;
static final int DIESEL = 2;
static final int HYBRID = 3;
static final double TAX_RATE = 0.10;
static final int CARS = 40;

static int get_choice () throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));

  System.out.println("1. Gas");
  System.out.println("2. Diesel");
  System.out.println("3. Hybrid");
  System.out.print("Enter type of the car: ");
  return Integer.parseInt(cin.readLine());
}

static int get_days () throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));

  System.out.print("Enter total number of rental days: ");
  return Integer.parseInt(cin.readLine());
}

static double get_charge(int type, int rental_days) {
  double charge;

  if (type == GAS) {
    if (rental_days <= 5) {
      charge = rental_days * 24;
    }
    else if (rental_days <= 8) {
      charge = 5 * 24 + (rental_days - 5) * 22;
    }
    else {
      charge = 5 * 24 + 3 * 22 + (rental_days - 8) * 18;
    }
  }
  else if (type == DIESEL) {
    if (rental_days <= 5) {
```

```
      charge = rental_days * 28;
    }
    else if (rental_days <= 8) {
      charge = 5 * 28 + (rental_days - 5) * 25;
    }
    else {
      charge = 5 * 28 + 3 * 25 + (rental_days - 8) * 21;
    }
  }
  else {
    if (rental_days <= 5) {
      charge = rental_days * 30;
    }
    else if (rental_days <= 8) {
      charge = 5 * 30 + (rental_days - 5) * 28;
    }
    else {
      charge = 5 * 30 + 3 * 28 + (rental_days - 8) * 23;
    }
  }
  charge = charge * (1 + TAX_RATE); //This is equivalent to charge += charge * TAX_RATE;
  return charge;
}

public static void main(String[] args) throws java.io.IOException {

  int count, i;
  double charge, sum;

  int[] rented_car_types = new int[CARS];
  int[] rented_days = new int[CARS];

  for (i = 0; i <= CARS - 1; i++) {
    rented_car_types[i] = get_choice();
    rented_days[i] = get_days();
  }

  sum = 0;
  for (i = 0; i <= CARS - 1; i++) {
     charge = get_charge(rented_car_types[i], rented_days[i]);
     System.out.println("Car No " + (i + 1) + ": " + charge);
     sum += charge;
  }

  count = 0;
  for (i = 0; i <= CARS - 1; i++) {
   if (rented_car_types[i] == HYBRID) {
     count++;
   }
  }

  System.out.println("Hybrids rented: " + count);
  System.out.println("Net profit: " + sum / (1 + TAX_RATE));
}
```

5. Solution

```
static final int CHANNELS = 10;
static final int DAYS = 7;
static final String day_names[] = {"Monday", "Tuesday", "Wednesday",
                                   "Thursday", "Friday", "Saturday", "Sunday"};

static void get_data(String[] names, int[][] viewers) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j;

  for (i = 0; i <= CHANNELS - 1; i++) {
    System.out.println("Enter name for channel No. " + (i + 1) + ": ");
    names[i] = cin.readLine();
    for (j = 0; j <= DAYS - 1; j++) {
      System.out.print("Enter the number of viewers of the main news program on " + day_names[j]);
      System.out.print(" for channel " + names[i] + ": ");
      viewers[i][j] = Integer.parseInt(cin.readLine());
    }
  }
}

static double get_average(int a[]) {
  int sum ,i;

  sum = 0;
  for (i = 0; i <= 4; i++) {
    sum += a[i];
  }
  return sum / 5.0;
}

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j;
  double weekend;
  boolean increasing;

  String[] names = new String[CHANNELS];
  int[][] viewers = new int[CHANNELS][DAYS];
  get_data(names, viewers);

  int[] temporary_array = new int[5];
  for (i = 0; i <= CHANNELS - 1; i++) {
    for (j = 0; j <= 4; j++) {
      temporary_array[j] = viewers[i][j];
    }
    weekend = (viewers[i][DAYS - 2] + viewers[i][DAYS - 1]) / 2;
    if (weekend >= 1.2 * get_average(temporary_array)) {
      System.out.println(names[i]);
    }
  }
```

```
  for (i = 0; i <= CHANNELS - 1; i++) {
    increasing = true;
    for (j = 1; j <= DAYS - 1; j++) {
      if (viewers[i][j] <= viewers[i][j - 1]) {
        increasing = false;
      }
    }
    if (increasing == true) {
      System.out.println(names[i]);
    }
  }
}
```

6. Solution

```
static final int CITIZENS = 30;

static void input_data(long[] SSNs, String[] answers) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i;

  for (i = 0; i <= CITIZENS - 1; i++) {
    System.out.print("Enter SSN: ");
    SSNs[i] = Long.parseLong(cin.readLine());
    System.out.print("Enter answer: ");
    answers[i] = cin.readLine();
  }
}

static void sort_arrays(long[] SSNs, String[] answers) {
  int m, n, index_of_min;
  long min, temp;
  String temp_str;

  for (m = 0; m <= CITIZENS - 1; m++) {
    min = SSNs[m];
    index_of_min = m;
    for (n = m; n <= CITIZENS - 1; n++) {
      if (SSNs[n] < min) {
        min = SSNs[n];
        index_of_min = n;
      }
    }
    temp = SSNs[m];
    SSNs[m] = SSNs[index_of_min];
    SSNs[index_of_min] = temp;
    temp_str = answers[m];
    answers[m] = answers[index_of_min];
    answers[index_of_min] = temp_str;
  }
}

static int search_array(long[] SSNs, long SSN) {
  int left, right, middle, index_position = 0, return_value;
```

```
  boolean found;

  left = 0;
  right = CITIZENS - 1;
  found = false;
  while (left <= right && found == false) {
    middle = (int)((left + right) / 2);

    if (SSNs[middle] > SSN) {
      right = middle - 1;
    }
    else if (SSNs[middle] < SSN) {
      left = middle + 1;
    }
    else {
      found = true;
      index_position = middle;
    }
  }

  if (found == false) {
    System.out.println("SSN not found!");
    return_value = -1;
  }
  else {
    return_value = index_position;
  }
  return return_value;
}

static int count_answers(String[] answers, String answer) {
  int count, i;

  count = 0;
  for (i = 0; i <= CITIZENS - 1; i++) {
    if (answers[i].equals(answer) == true) {
      count++;
    }
  }
  return count;
}

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  long[] SSNs = new long[CITIZENS];
  long SSN;
  String[] answers = new String[CITIZENS];
  int index, count;
  String answer;

  do {
    input_data(SSNs, answers);
    sort_arrays(SSNs, answers);
```

```
    System.out.print("Enter an SSN to search: ");
    SSN = Long.parseLong(cin.readLine());

    index = search_array(SSNs, SSN);
    if (index != -1) {
      answer = answers[index];
      System.out.println(answer);

      count = count_answers(answers, answer);
      System.out.println(count * 100 / (double)CITIZENS);
    }
    System.out.println("Repeat? ");
    answer = cin.readLine();
  } while (answer.equals("Yes") == true);
}
```

7. Solution

```
static final int TEAMS = 8;
static final int GAMES = 12;

static void input_data(String[] names, String[][] results) throws java.io.IOException  {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int i, j;

  for (i = 0; i <= TEAMS - 1; i++) {
    System.out.print("Enter team name: ");
    names[i] = cin.readLine();
    for (j = 0; j <= GAMES - 1; j++) {
      System.out.print("Enter result (W, L, T): ");
      results[i][j] = cin.readLine();
    }
  }
}

static void display_result(String[] names, String[][] results) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  String result;
  int i, j;
  boolean found;

  System.out.print("Enter a result to search (W, L, T): ");
  result = cin.readLine();
  for (i = 0; i <= TEAMS - 1; i++) {
    System.out.println("Team: " + names[i]);
    found = false;
    for (j = 0; j <= GAMES - 1; j++) {
      if (results[i][j].equals(result) == true) {
        System.out.println("Week: " + (j + 1));
        found = true;
      }
    }
    if (found == false) {
      System.out.println("Nothing found");
```

```
    }
  }
}

static int find_team(String[] names) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  String name;
  int i, return_value;

  System.out.print("Enter a name to search: ");
  name = cin.readLine();

  i = 0;
  while (i < TEAMS - 1 && names[i].equals(name) != true) {
    i++;
  }

  if (names[i].equals(name) != true) {
    return_value = -1;
  }
  else {
    return_value = i;
  }
  return return_value;
}

public static void main(String[] args) throws java.io.IOException {
  String[] names = new String[TEAMS];
  String[][] results = new String[TEAMS][GAMES];
  int j, index, sum;

  input_data(names, results);
  display_result(names, results);

  index = find_team(names);
  while (index != -1) {
    sum = 0;
    for (j = 0; j <= GAMES - 1; j++) {
      if (results[index][j].equals("W") == true) {
        sum += 3;
      }
      else if (results[index][j].equals("T") == true) {
        sum += 1;
      }
    }
    System.out.println("Points: " + sum);
    index = find_team(names);
  }
}
```

8. Solution

```
//space is a valid character!
static String alphabet = " abcdefghijklmnopqrstuvwxyz";
```

```
static String my_encrypt(String message, int encryption_key) {
  String return_value;
  int i, index, new_index;
  String letter, new_letter;

  return_value = "";
  for (i = 0; i <= message.length() - 1; i++) {
    letter = "" + message.charAt(i);
    index = alphabet.indexOf(letter);
    new_index = (index + encryption_key) % 27; //26 letters + 1 space
    new_letter = "" + alphabet.charAt(new_index);
    return_value += new_letter;
  }
  return return_value;
}

static String my_decrypt(String message, int decryption_key) {
  String return_value;
  int i, index, new_index;
  String letter, new_letter;

  return_value = "";
  for (i = 0; i <= message.length() - 1; i++) {
    letter = "" + message.charAt(i);
    index = alphabet.indexOf(letter);
    new_index = (index + 27 - decryption_key) % 27; //26 letters + 1 space
    new_letter = "" + alphabet.charAt(new_index);
    return_value += new_letter;
  }
  return return_value;
}

static void display_menu() {
  System.out.println();
  System.out.println("1. Encrypt a message");
  System.out.println("2. Decrypt a message");
  System.out.println("3. Exit");
}

public static void main(String[] args) throws java.io.IOException {
  java.io.BufferedReader cin = new java.io.BufferedReader(new java.io.InputStreamReader(System.in));
  int choice, encryption_key, decryption_key;
  String message;


  do {
    display_menu();
    System.out.print("Enter a choice: ");
    choice = Integer.parseInt(cin.readLine());
    if (choice == 1) {
      System.out.print("Enter a message to encrypt: ");
      message = cin.readLine();
      System.out.print("Enter an encryption key: ");
```

```
      encryption_key = Integer.parseInt(cin.readLine());
      System.out.println("Your encrypted message is: " + my_encrypt(message, encryption_key));
    }
    else if (choice == 2) {
      System.out.print("Enter a message to decrypt: ");
      message = cin.readLine();
      System.out.print("Enter an decryption key: ");
      decryption_key = Integer.parseInt(cin.readLine());
      System.out.println("Your decrypted message is: " + my_decrypt(message, decryption_key));
    }
  } while (choice != 3);
}
```

Some Final Words from the Authors

We hope you really enjoyed reading this book. We made every possible effort to make it comprehensible even by people that probably have no previous experience in programming.

So if you liked this book, please visit the web store where you bought it and show us your gratitude by writing a good review and giving us as many stars as possible. By doing this, you will encourage us to continue writing and of course you'll help other readers to reach us.

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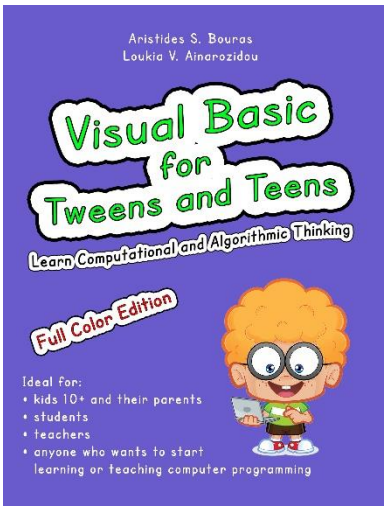

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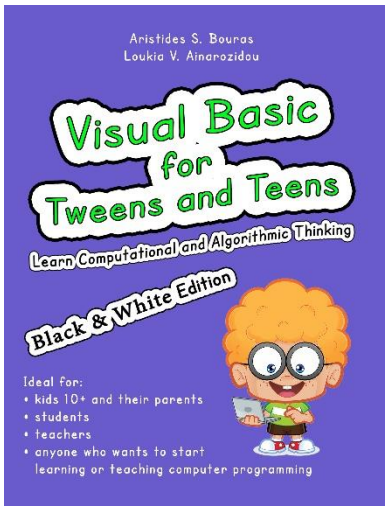

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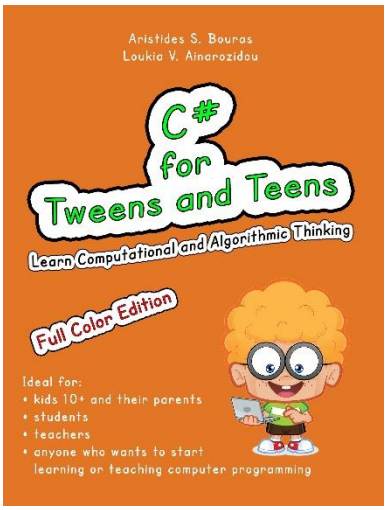

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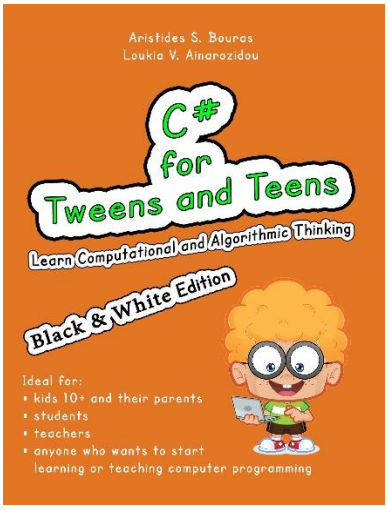

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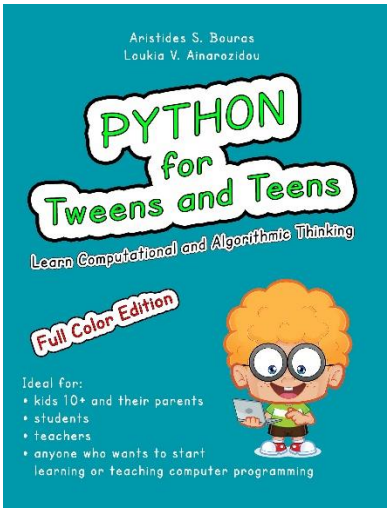

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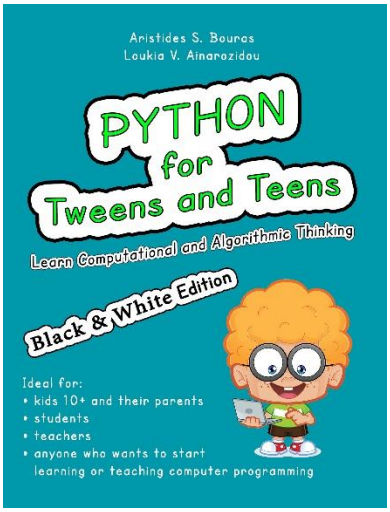

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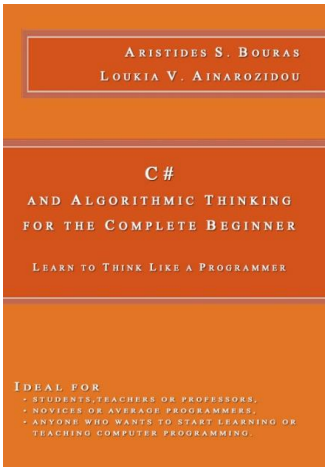

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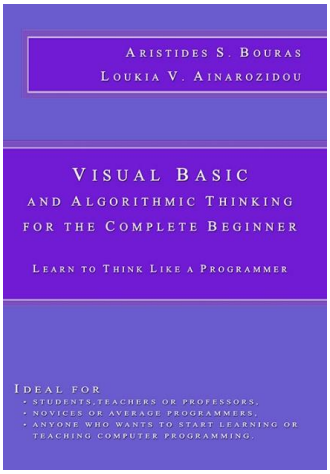

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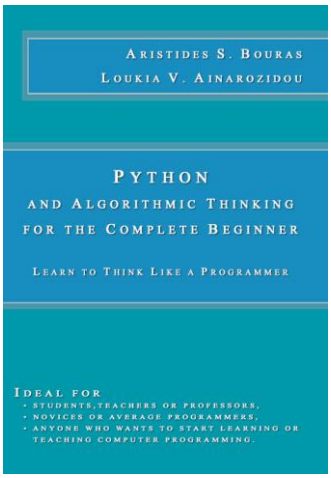

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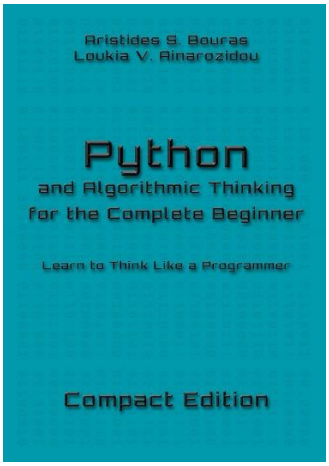

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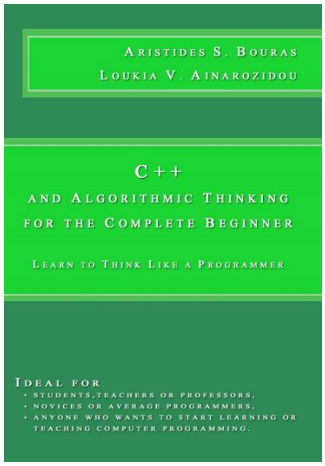

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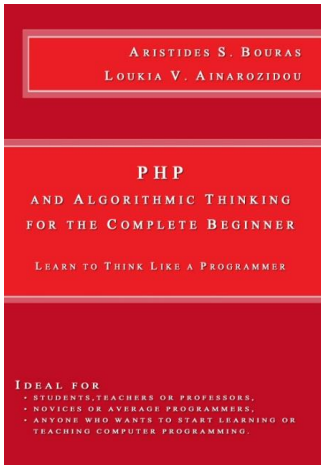

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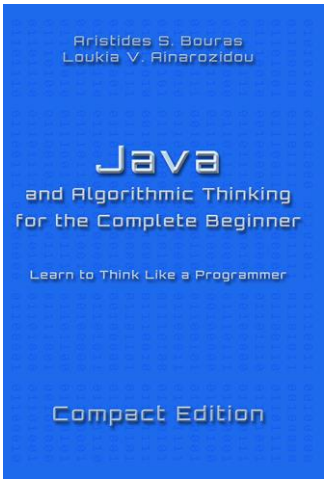

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