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Warning and Disclaimer
This book is designed to provide the answers to all of the review questions, as well as the solutions to all review exercises of the book “PYTHON AND ALGORITHMIC THINKING FOR THE COMPLETE BEGINNER”. Every effort has been taken to make this book compatible with all releases of Python 3.x, and it is almost certain to be compatible with any future releases of Python.

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</tbody>
</table>
How to Report Errata

Although we have taken great care to ensure the accuracy of our content, mistakes do occur. If you find a mistake in this book, either in the text or the code, we encourage you to report it to us. By doing so, you can save other readers from frustration and, of course, help us to improve the next version of this book. If you find any errata, please feel free to report them by visiting the following address:

http://www.bouraspage.com

Once your errata are verified, your submission will be accepted and the errata will be uploaded to our website, and added to any existing list of errata.
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

5.8 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

5.9 Answers of Review Questions: Multiple Choice

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

5.10 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
7.6 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

7.7 Answers of Review Questions: Multiple Choice

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

7.8 Answers of Review Exercises

1. ii, iv, v, ix, x
3. i. d, ii. f, iii. c, iv. e
4. i. 27, 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

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a = int(input())</td>
<td></td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>a = (a + 1) * (a + 1) + 6 / 3 * 2 + 20</td>
<td>40</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td>b = a % 13</td>
<td>40</td>
<td>1</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>4</td>
<td>c = b % 7</td>
<td>40</td>
<td>1</td>
<td>1</td>
<td>?</td>
</tr>
<tr>
<td>5</td>
<td>d = a * b * c</td>
<td>40</td>
<td>1</td>
<td>1</td>
<td>40</td>
</tr>
<tr>
<td>6</td>
<td>print(a, &quot;,&quot;, b, &quot;,&quot;, c, &quot;,&quot;, d)</td>
<td>40</td>
<td>1</td>
<td>1</td>
<td>40</td>
</tr>
</tbody>
</table>

For the input value of 4

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a = int(input())</td>
<td></td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>a = (a + 1) * (a + 1) + 6 / 3 * 2 + 20</td>
<td>49</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td>b = a % 13</td>
<td>49</td>
<td>10</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>4</td>
<td>c = b % 7</td>
<td>49</td>
<td>10</td>
<td>3</td>
<td>?</td>
</tr>
<tr>
<td>5</td>
<td>d = a * b * c</td>
<td>49</td>
<td>10</td>
<td>3</td>
<td>1470</td>
</tr>
<tr>
<td>6</td>
<td>print(a, &quot;,&quot;, b, &quot;,&quot;, c, &quot;,&quot;, d)</td>
<td>49</td>
<td>10</td>
<td>3</td>
<td>1470</td>
</tr>
</tbody>
</table>

For the input value of 1

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a = int(input())</td>
<td>1</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>a = (a + 1) * (a + 1) + 6 / 3 * 2 + 20</td>
<td>28</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td>b = a % 13</td>
<td>28</td>
<td>2</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>4</td>
<td>c = b % 7</td>
<td>28</td>
<td>2</td>
<td>2</td>
<td>?</td>
</tr>
<tr>
<td>5</td>
<td>d = a * b * c</td>
<td>28</td>
<td>2</td>
<td>2</td>
<td>112</td>
</tr>
<tr>
<td>6</td>
<td>print(a, &quot;,&quot;, b, &quot;,&quot;, c, &quot;,&quot;, d)</td>
<td>28</td>
<td>2</td>
<td>2</td>
<td>112</td>
</tr>
</tbody>
</table>

is displayed
## 2. Solution

For the input values of 3, 4

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><code>a = float(input())</code></td>
<td>3</td>
<td>?</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td><code>b = float(input())</code></td>
<td>3</td>
<td>4</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td><code>c = a + b</code></td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>4</td>
<td><code>d = 1 + a / b * c + 2</code></td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>8.25</td>
<td>?</td>
</tr>
<tr>
<td>5</td>
<td><code>e = c + d</code></td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>8.25</td>
<td>15.25</td>
</tr>
<tr>
<td>6</td>
<td><code>c += d + e</code></td>
<td>3</td>
<td>4</td>
<td>30.5</td>
<td>8.25</td>
<td>15.25</td>
</tr>
<tr>
<td>7</td>
<td><code>e -= 1</code></td>
<td>3</td>
<td>4</td>
<td>30.5</td>
<td>8.25</td>
<td>14.25</td>
</tr>
<tr>
<td>8</td>
<td><code>d -= c + d % c</code></td>
<td>3</td>
<td>4</td>
<td>30.5</td>
<td>-30.5</td>
<td>14.25</td>
</tr>
<tr>
<td>9</td>
<td><code>print(c, &quot;,&quot;, d, &quot;,&quot;, e)</code></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>30.5, -30.5, 14.25 is displayed</td>
</tr>
</tbody>
</table>

For the input values of 4, 4

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><code>a = float(input())</code></td>
<td>4</td>
<td>?</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td><code>b = float(input())</code></td>
<td>4</td>
<td>4</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td><code>c = a + b</code></td>
<td>4</td>
<td>4</td>
<td>8</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>4</td>
<td><code>d = 1 + a / b * c + 2</code></td>
<td>4</td>
<td>4</td>
<td>8</td>
<td>11</td>
<td>?</td>
</tr>
<tr>
<td>5</td>
<td><code>e = c + d</code></td>
<td>4</td>
<td>4</td>
<td>8</td>
<td>11</td>
<td>19</td>
</tr>
<tr>
<td>6</td>
<td><code>c += d + e</code></td>
<td>4</td>
<td>4</td>
<td>38</td>
<td>11</td>
<td>19</td>
</tr>
<tr>
<td>7</td>
<td><code>e -= 1</code></td>
<td>4</td>
<td>4</td>
<td>38</td>
<td>11</td>
<td>18</td>
</tr>
<tr>
<td>8</td>
<td><code>d -= c + d % c</code></td>
<td>4</td>
<td>4</td>
<td>38</td>
<td>-38</td>
<td>18</td>
</tr>
<tr>
<td>9</td>
<td><code>print(c, &quot;,&quot;, d, &quot;,&quot;, e)</code></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>38, -38, 18 is displayed</td>
</tr>
</tbody>
</table>
Chapter 9

9.5 Answers of Review Exercises

1. Solution

The statement \( S = S_1 + S_3 + S_5 \) is wrong. It must be \( S = S_1 + S_3 + S_5 \)

2. Solution

For the input values of 5, 5

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>( a = \text{float(input())} )</td>
<td>5</td>
<td>?</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>( b = \text{float(input())} )</td>
<td>5</td>
<td>5</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td>( c = a + b )</td>
<td>5</td>
<td>5</td>
<td>10</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>4</td>
<td>( d = 5 + a / b * c + 2 )</td>
<td>5</td>
<td>5</td>
<td>10</td>
<td>17</td>
<td>?</td>
</tr>
<tr>
<td>5</td>
<td>( e = c - d )</td>
<td>5</td>
<td>5</td>
<td>10</td>
<td>17</td>
<td>-7</td>
</tr>
<tr>
<td>6</td>
<td>( c = d + c )</td>
<td>5</td>
<td>5</td>
<td>-17</td>
<td>17</td>
<td>-7</td>
</tr>
<tr>
<td>7</td>
<td>( e = 1 )</td>
<td>5</td>
<td>5</td>
<td>-17</td>
<td>17</td>
<td>-8</td>
</tr>
<tr>
<td>8</td>
<td>( d = c + a % c )</td>
<td>5</td>
<td>5</td>
<td>-17</td>
<td>29</td>
<td>-8</td>
</tr>
<tr>
<td>9</td>
<td>\text{print(c,&quot;&quot;,&quot;d&quot;,&quot;&quot;,e)}</td>
<td></td>
<td></td>
<td>-17, 29, -8 is displayed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For the input values of 4, 8

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>( a = \text{float(input())} )</td>
<td>4</td>
<td>?</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>( b = \text{float(input())} )</td>
<td>4</td>
<td>8</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td>( c = a + b )</td>
<td>4</td>
<td>8</td>
<td>12</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>4</td>
<td>( d = 5 + a / b * c + 2 )</td>
<td>4</td>
<td>8</td>
<td>12</td>
<td>13</td>
<td>?</td>
</tr>
<tr>
<td>5</td>
<td>( e = c - d )</td>
<td>4</td>
<td>8</td>
<td>12</td>
<td>13</td>
<td>-1</td>
</tr>
<tr>
<td>6</td>
<td>( c = d + c )</td>
<td>4</td>
<td>8</td>
<td>-13</td>
<td>13</td>
<td>-1</td>
</tr>
<tr>
<td>7</td>
<td>( e = 1 )</td>
<td>4</td>
<td>8</td>
<td>-13</td>
<td>13</td>
<td>-2</td>
</tr>
<tr>
<td>8</td>
<td>( d = c + a % c )</td>
<td>4</td>
<td>8</td>
<td>-13</td>
<td>22</td>
<td>-2</td>
</tr>
<tr>
<td>9</td>
<td>\text{print(c,&quot;&quot;,&quot;d&quot;,&quot;&quot;,e)}</td>
<td></td>
<td></td>
<td>-13, 22, -2 is displayed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Solution

For the input value of 0.50

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>a</th>
<th>b</th>
<th>c</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>( b = \text{float(input())} )</td>
<td>?</td>
<td>0.50</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>( c = 5 )</td>
<td>?</td>
<td>0.50</td>
<td>5</td>
</tr>
</tbody>
</table>
For the input value of 3

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>a</th>
<th>b</th>
<th>c</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>b = float(input())</td>
<td>?</td>
<td>3</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>c = 5</td>
<td>?</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>c = c * b</td>
<td>?</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>4</td>
<td>a = 10 * c % 10</td>
<td>0</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>5</td>
<td>print(a)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Value 0 is displayed

For the input value of 15

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>a</th>
<th>b</th>
<th>c</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>b = float(input())</td>
<td>?</td>
<td>15</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>c = 5</td>
<td>?</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>c = c * b</td>
<td>?</td>
<td>15</td>
<td>75</td>
</tr>
<tr>
<td>4</td>
<td>a = 10 * c % 10</td>
<td>0</td>
<td>15</td>
<td>75</td>
</tr>
<tr>
<td>5</td>
<td>print(a)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Value 0 is displayed
Chapter 10

10.2 Answers of Review Exercises

1. **Solution**

   ```python
   base = float(input("Enter base: "))
   height = float(input("Enter height: "))
   
   area = 0.5 * base * height
   print(area)
   ```

2. **Solution**

   ```python
   angle1 = float(input("Enter 1st angle: "))
   angle2 = float(input("Enter 2nd angle: "))
   
   angle3 = 180 - angle1 - angle2
   print(angle3)
   ```

3. **Solution**

   ```python
   g1 = int(input("Enter 1st grade: "))
   g2 = int(input("Enter 2nd grade: "))
   g3 = int(input("Enter 3rd grade: "))
   g4 = int(input("Enter 4th grade: "))
   
   average = (g1 + g2 + g3 + g4) / 4
   print(average)
   ```

4. **Solution**

   ```python
   PI = 3.14159
   
   r = float(input("Enter radius: "))
   
   perimeter = 2 * PI * r
   print(perimeter)
   ```

5. **Solution**

   ```python
   charge = float(input("Enter charge for a meal: "))
   tip = charge * 10 / 100
   tax = charge * 7 / 100
   
   total = charge + tip + tax
   ```
6. Solution

```python
a = float(input("Enter acceleration in m/sec2: "))
t = float(input("Enter time traveled in sec: "))
s = 0.5 * a * t * t
print(s)
```

7. Solution

```python
f = float(input("Enter temperature in Fahrenheit: "))
c = 5 / 9 * (f - 32)
print(c)
```

8. Solution

```python
w = int(input("Enter weight in pounds: "))
h = int(input("Enter height in inches: "))
bmi = w * 703 / (h * h)
print(bmi)
```

9. Solution

```python
s_total = float(input("Enter subtotal: "))
g_rate = float(input("Enter gratuity rate: "))
tip = s_total * g_rate / 100
total = s_total + tip
print("Tip is", tip, "and Total is", total)
```

10. Solution

```python
VAT = 0.20
btax_price1 = float(input("Enter before-tax price 1: "))
btax_price2 = float(input("Enter before-tax price 2: "))
btax_price3 = float(input("Enter before-tax price 3: "))
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
```
11. Solution

```python
VAT = 0.20

atax_price = float(input("Enter after-tax price: "))

btax_price = atax_price / (1 + VAT)

print(btax_price)
```

12. Solution

```python
i_price = float(input("Enter price: "))
discount = float(input("Enter discount: "))

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

print(f_price, saved)
```

13. Solution

```python
VAT = 0.20

i_kWh = int(input("Enter kWh at the beginning of the month: "))
f_kWh = int(input("Enter kWh at the end of the month: "))

kWh_consumed = f_kWh - i_kWh

cost = kWh_consumed * 0.06

cost += cost * VAT

print(kWh_consumed, cost)
```

14. Solution

```python
day = int(input("Enter day: "))
month = int(input("Enter month: "))

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

print(days_left)
```
Chapter 11

11.3 Answers of Review Questions: True/False

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

11.4 Answers of Review Questions: Multiple Choice

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

11.5 Answers of Review Exercises

1. Solution

For the input value of 9

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>a</th>
<th>b</th>
<th>c</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a = float(input())</td>
<td>9</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>a += 6 / math.sqrt(a) * 2 + 20</td>
<td>33</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td>b = round(a) % 4</td>
<td>33</td>
<td>1</td>
<td>?</td>
</tr>
<tr>
<td>4</td>
<td>c = b % 3</td>
<td>33</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>print(a, &quot;,&quot;, b, &quot;,&quot;, c)</td>
<td>33, 1, 1 is displayed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For the input value of 4

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>a</th>
<th>b</th>
<th>c</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a = float(input())</td>
<td>4</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>a += 6 / math.sqrt(a) * 2 + 20</td>
<td>30</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td>b = round(a) % 4</td>
<td>30</td>
<td>2</td>
<td>?</td>
</tr>
<tr>
<td>4</td>
<td>c = b % 3</td>
<td>30</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>print(a, &quot;,&quot;, b, &quot;,&quot;, c)</td>
<td>30, 2, 2 is displayed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Solution

For the input value of -2

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>a</th>
<th>b</th>
<th>c</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a = int(input())</td>
<td>-2</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>b = abs(a) % 4 + a ** 4</td>
<td>-2</td>
<td>18</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td>c = b % 5</td>
<td>-2</td>
<td>18</td>
<td>3</td>
</tr>
</tbody>
</table>
For the input value of -3

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>a</th>
<th>b</th>
<th>c</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a = int(input())</td>
<td>-3</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>b = abs(a) % 4 + a ** 4</td>
<td>-3</td>
<td>84</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td>c = b % 5</td>
<td>-3</td>
<td>84</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>print(b, &quot;,&quot;, c)</td>
<td>84</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

3. Solution

```python
import math

radians = float(input("Enter angle in radians: "))
degrees = radians * 180 / math.pi
print(degrees)
```

4. Solution

```python
import math

a = float(input("Enter side A of a right-angled triangle: "))
b = float(input("Enter side B of a right-angled triangle: "))

hypotenuse = math.sqrt(a ** 2 + b ** 2)
print(hypotenuse)
```

5. Solution

```python
import math

th = float(input("Enter angle (in degrees) of a right-angled triangle: "))
adjacent = float(input("Enter length of adjacent side: "))

opposite = math.tan(th * math.pi / 180) * adjacent
print(opposite)
```
Chapter 12

12.2 Answers of Review Exercises

1. Solution

i. a, e, g, h

ii. c, f

2. Solution

i. \( y = (x + 3)^2 \frac{(5 \cdot w)}{(7 \cdot (x - 4))} \)

ii. \( y = (3 \cdot x^2 - x^3) \frac{4}{(1/5)} \)

iii. \( y = \text{math.sqrt}(x^4 - 2 \cdot x^3 - 7 \cdot x^2 + 2 + x) \frac{(4 \cdot (7 \cdot x^4 - 3 \cdot x^3)}{(7 \cdot x^2 + x)} \frac{(1/3)} \)

iv. \( y = x / (x - 3 \cdot (x - 1)) + x \cdot (x - 1) \frac{(1/5)}{(x^3 - 2) \cdot (x - 1) \cdot 3} \)

v. \( y = \text{math.sin} \frac{(\text{math.pi} / 3)}{\text{math.cos} \frac{2 \cdot \text{math.pi} / 2 \cdot w}} \frac{2}{\text{math.sin} \frac{2 \cdot \text{math.pi} / 3 \cdot w}{\text{math.sin} \frac{2 \cdot \text{x}}{2 \cdot x}} \frac{0.5}{\text{math.sin}} \)

3. Solution

```python
import math

x = float(input("Enter value for x: "))

y = math.sqrt(x) * (x ** 3 + x ** 2)

print(y)
```

4. Solution

```python
x = float(input("Enter value for x: "))

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

print(y)
```

5. Solution

```python
import math

x = float(input("Enter value for x: "))

w = float(input("Enter value for w: "))

y = x ** (x + 1) / (math.tan(2 * w / 3 + 5) - math.tan(x / 2 + 1)) ** 3

print(y)
```
6. Solution

```python
x = float(input("Enter value for x: "))
w = float(input("Enter value for w: "))

y = (3 + w) / (6 * x - 7 * (x + 4)) + x * (3 * w + 1)**(1 / 5) * (5 * x + 4) / ((x ** 3 + 3) * (x - 1) ** 7)
print(y)
```

7. Solution

```python
import math

x = float(input("Enter value for x: "))
w = float(input("Enter value for w: "))

y = x ** x / (math.sin(2 * w / 3 + 5) - x)**2 + (math.sin(3 * x) + w)**(x + 1) / math.sqrt(7 * w)**(3 / 2)
print(y)
```

8. Solution

```python
import math

a = float(input("Enter length A: "))
b = float(input("Enter length B: "))
c = float(input("Enter length C: "))

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

print(area)
```
Chapter 13

13.2 Answers of Review Exercises

1. Solution

```python
n = int(input("Enter an integer: "))

last_digit = n % 10
result = last_digit * 8

print(result)
```

2. Solution

```python
number = int(input("Enter a five-digit integer: "))

digit5 = number % 10
r = number // 10

digit4 = r % 10
r = r // 10

digit3 = r % 10
r = r // 10

digit2 = r % 10
digit1 = r // 10

reversed_number = digit5 * 10000 + digit4 * 1000 + digit3 * 100 + digit2 * 10 + digit1

print(reversed_number)
```

However, using the `divmod()` function it can become:

```python
number = int(input("Enter a five-digit integer: "))

r, digit5 = divmod(number, 10)
r, digit4 = divmod(r, 10)
r, digit3 = divmod(r, 10)
digit1, digit2 = divmod(r, 10)

reversed_number = digit5 * 10000 + digit4 * 1000 + digit3 * 100 + digit2 * 10 + digit1

print(reversed_number)
```

3. Solution

```python
n = int(input("Enter an integer: "))

result = n % 2

print(result)
```
4. Solution

```python
n = int(input("Enter an integer: "))
result = 1 - n % 2
print(result)
```

5. Solution

```python
number = int(input("Enter a period of time in seconds: "))
weeks = number // 604800  # 60 * 60 * 24 * 7 = 604800
r = number % 604800
days = r // 86400         # 60 * 60 * 24 = 86400
r = r % 86400
hours = r // 3600         # 60 * 60 * 24 = 86400
r = r % 3600
minutes = r // 60
seconds = r % 60
print(weeks, "weeks", days, "days", hours, "hours", minutes, "minutes and", seconds, "seconds")
```

However, using the `divmod()` function it can become:

```python
number = int(input("Enter a period of time in seconds: "))
weeks, r = divmod(number, 604800)  # 60 * 60 * 24 * 7 = 604800
days, r = divmod(r, 86400)         # 60 * 60 * 24 = 86400
hours, r = divmod(r, 3600)
minutes, seconds = divmod(r, 60)
print(weeks, "weeks", days, "days", hours, "hours", minutes, "minutes and", seconds, "seconds")
```

6. Solution

```python
amount = int(input("Enter amount to withdraw: "))
usd20, r = divmod(amount, 20)
usd10, r = divmod(r, 10)
usd5, usd1 = divmod(r, 5)
print(usd20, "notes of $20", usd10, "notes of $10", usd5, "notes of $5 and", usd1, "notes of $1")
```

7. Solution

```python
steps = int(input("Enter number of steps: "))
distance = steps * 25
miles, r = divmod(distance, 63360)
```
yards, r = divmod(r, 36)
feet, inches = divmod(r, 12)

print(miles, "miles", yards, "yards", 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

```python
first_name = input("First name: ")
middle_name = input("Middle name: ")
last_name = input("Last name: ")
title = input("Title: ")

print(title, first_name, middle_name, last_name)
print(first_name, middle_name, last_name)
print(last_name, ",", first_name, middle_name)
print(last_name, ",", first_name, middle_name, ",", title)
print(first_name, last_name)
```

2. Solution

```python
import random
import string

alphabet = string.ascii_lowercase

random_word = alphabet[random.randrange(26)].upper() + \
    alphabet[random.randrange(26)] + \
    alphabet[random.randrange(26)] + \
    alphabet[random.randrange(26)]
```
print(random_word)

3. Solution

```python
import random
name = input("Enter name: ").lower()

secret_password = name[random.randrange(len(name))] + \
    name[random.randrange(len(name))] + \
    name[random.randrange(len(name))] + \
    str(random.randrange(1000, 10000))

print(secret_password)
```
Chapter 15

15.9 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

15.10 Answers of Review Questions: Multiple Choice

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

15.11 Answers of Review Exercises

1. Solution

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

2. Solution

<table>
<thead>
<tr>
<th>a</th>
<th>b</th>
<th>c</th>
<th>a != 1</th>
<th>b &gt; a</th>
<th>c / 2 &gt; 2 * a</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>-5</td>
<td>8</td>
<td>True</td>
<td>False</td>
<td>False</td>
</tr>
<tr>
<td>1</td>
<td>10</td>
<td>20</td>
<td>False</td>
<td>True</td>
<td>True</td>
</tr>
<tr>
<td>-4</td>
<td>-2</td>
<td>-9</td>
<td>True</td>
<td>True</td>
<td>True</td>
</tr>
</tbody>
</table>

3. Solution

<table>
<thead>
<tr>
<th>Boolean Expression1 (BE1)</th>
<th>Boolean Expression2 (BE2)</th>
<th>BE1 or BE2</th>
<th>BE1 and BE2</th>
<th>not(BE2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>False</td>
<td>False</td>
<td>False</td>
<td>False</td>
<td>True</td>
</tr>
<tr>
<td>False</td>
<td>True</td>
<td>True</td>
<td>False</td>
<td>False</td>
</tr>
</tbody>
</table>
4. Solution

<table>
<thead>
<tr>
<th>a</th>
<th>b</th>
<th>c</th>
<th>a &gt; 3 or c &gt; b and c &gt; 1</th>
<th>a &gt; 3 and c &gt; b or c &gt; 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>-6</td>
<td>2</td>
<td>True</td>
<td>True</td>
</tr>
<tr>
<td>-3</td>
<td>2</td>
<td>-4</td>
<td>False</td>
<td>False</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>5</td>
<td>False</td>
<td>True</td>
</tr>
</tbody>
</table>

5. Solution

<table>
<thead>
<tr>
<th>Expression</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(x + y) ** 3</td>
<td>8</td>
</tr>
<tr>
<td>(x + y) / (x ** 2 - 14)</td>
<td>1</td>
</tr>
<tr>
<td>x - 1 == y + 5</td>
<td>True</td>
</tr>
<tr>
<td>x &gt; 2 and y == 1</td>
<td>False</td>
</tr>
<tr>
<td>x == 1 or y == -2 and not(flag == False)</td>
<td>True</td>
</tr>
<tr>
<td>not(x &gt;= 3) and (x % 2 &gt; 1)</td>
<td>False</td>
</tr>
</tbody>
</table>

6. Solution

i. False
ii. True

7. Solution

i. age < 12 and age != 8
ii. 6 <= age <= 9 or age == 11
iii. age > 7 and age != 10 and age != 12
iv. age == 6 or age == 9 or age == 11
v. 6 <= age <= 12 and age != 8
vi. age != 7 and age != 10

8. Solution

i. x != 4 or y == 3
ii. x + 4 > 0
iii. not(x <= 5) and y != 4
iv. x == False
v. not(x < 4 and z <= 4)
vi. x == 2 or x < -5
9. Solution

i. \( \text{not}(x < 4 \text{ or } y == 10) \)

ii. \( \text{not}(x - 2 < 9) \)

iii. \( \text{not}(\text{not}(x < 2 \text{ and } y == 4)) \)

iv. \( \text{not}(x == \text{False} \text{ and } y != 3) \)

v. First approach: \( \text{not}(\text{not}(x < 2 \text{ or } y < 2)) \)
   
   Second approach: \( x < 2 \text{ or } y < 2 \)

vi. \( \text{not}(x == -2 \text{ or } x > 2) \)
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

```python
x = float(input())
y = -5
if x * y / 2 > 20:
y += 1
x += 4 * x ** 2
print(x, y)
```

2. Solution

For the input value of 10

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>x = float(input())</td>
<td>10</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>y = -5</td>
<td>10</td>
<td>-5</td>
</tr>
<tr>
<td>3</td>
<td>if x * y / 2 &gt; 20:</td>
<td>False</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>if x &gt; 0:</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>y += 30</td>
<td>10</td>
<td>25</td>
</tr>
<tr>
<td>6</td>
<td>x = x ** 2</td>
<td>100</td>
<td>25</td>
</tr>
<tr>
<td>7</td>
<td>print(x, &quot;,&quot;, y)</td>
<td>100, 25 is displayed</td>
<td></td>
</tr>
</tbody>
</table>

For the input value of -10

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>x = float(input())</td>
<td>-10</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>y = -5</td>
<td>-10</td>
<td>-5</td>
</tr>
<tr>
<td>3</td>
<td>if x * y / 2 &gt; 20:</td>
<td>True</td>
<td></td>
</tr>
</tbody>
</table>
### 3. Solution

For the input value of -11

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>x = int(input())</td>
<td>-11</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>y = 8</td>
<td>-11</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>if abs(x) &gt; 10: True</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>y += x</td>
<td>-11</td>
<td>-3</td>
</tr>
<tr>
<td>5</td>
<td>x -= 1</td>
<td>-12</td>
<td>-3</td>
</tr>
<tr>
<td>6</td>
<td>if abs(x) &gt; 10: True</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>y *= 3</td>
<td>-12</td>
<td>-9</td>
</tr>
<tr>
<td>8</td>
<td>print(x, &quot;,&quot;, y)</td>
<td>-12, -9 is displayed</td>
<td></td>
</tr>
</tbody>
</table>
For the input value of 11

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>x = int(input())</td>
<td>11</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>y = 8</td>
<td>11</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>if abs(x) &gt; 10:</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>y += x</td>
<td>11</td>
<td>19</td>
</tr>
<tr>
<td>5</td>
<td>x -= 1</td>
<td>10</td>
<td>19</td>
</tr>
<tr>
<td>6</td>
<td>if abs(x) &gt; 10:</td>
<td>False</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>print(x, &quot;&quot;,&quot;&quot;, y)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10, 19 is displayed

4. Solution

For input values of 1, 2 and 3

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>x</th>
<th>y</th>
<th>z</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>x = int(input())</td>
<td>1</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>y = int(input())</td>
<td>1</td>
<td>2</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td>z = int(input())</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>if x + y &gt; z:</td>
<td>False</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>if x &gt; y + z:</td>
<td>False</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>if x &gt; y - z:</td>
<td>True</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>z = x - z % 2</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>
For input values of 4, 2 and 1

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>x</th>
<th>y</th>
<th>z</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(x = \text{int}(\text{input}()))</td>
<td>4</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>(y = \text{int}(\text{input}()))</td>
<td>4</td>
<td>2</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td>(z = \text{int}(\text{input}()))</td>
<td>4</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>if (x + y &gt; z):</td>
<td>True</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>(x = y + z)</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>if (x &gt; y + z):</td>
<td>False</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>if (x &gt; y - z):</td>
<td>True</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>(z = x - z \mod 2)</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>print(x, &quot;,&quot;, y, &quot;,&quot;, z)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. Solution

```python
x = float(input("Enter a number: "))
if x > 0:
    print("Positive")
```

6. Solution

```python
x = float(input("Enter a number: "))
y = float(input("Enter a second number"))
```
7. Solution

```python
if x > 0 and y > 0:
    print("Positive")
```

8. Solution

```python
import re
IS_NUMERIC = "^[+\-]?\d+(\.\d+)?$"
x = input("Enter a number: ")
if re.match(IS_NUMERIC, x):
    print("Numeric")
```

9. Solution

```python
s = input("Enter a string: ")
if s == s.upper():
    print("Uppercase")
```

10. Solution

```python
n1 = float(input("Enter 1st number: "))
n2 = float(input("Enter 2nd number: "))
n3 = float(input("Enter 3rd number: "))
n4 = float(input("Enter 4th number: "))
if n1 < 0 or n2 < 0 or n3 < 0 or n4 < 0:
    print("Among the given numbers, there is a negative one!")
```

11. Solution

```python
a = float(input("Enter 1st number: "))
b = float(input("Enter 2nd number: "))
if a > b:
    c = a            # Or you can do the following:
    a = b            # a, b = b, a
    b = c            #
print(a, b)```
12. Solution

t1 = float(input("Enter 1st temperature: "))
t2 = float(input("Enter 2nd temperature: "))
t3 = float(input("Enter 3rd temperature: "))

average = (t1 + t2 + t3) / 3

if average > 60:
    print("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

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>a</th>
<th>y</th>
<th>z</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><code>a = float(input())</code></td>
<td>3</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td><code>z = a * 3 - 2</code></td>
<td>3</td>
<td>?</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td><code>if z &gt;= 1:</code></td>
<td></td>
<td></td>
<td>True</td>
</tr>
<tr>
<td>4</td>
<td><code>y = 6 * a</code></td>
<td>3</td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>5</td>
<td><code>print(z, &quot;,&quot;, y)</code></td>
<td></td>
<td></td>
<td>7, 18 is displayed</td>
</tr>
</tbody>
</table>

For input value of 0.5

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>a</th>
<th>y</th>
<th>z</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><code>a = float(input())</code></td>
<td>0.5</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td><code>z = a * 3 - 2</code></td>
<td>0.5</td>
<td>?</td>
<td>-0.5</td>
</tr>
<tr>
<td>3</td>
<td><code>if z &gt;= 1:</code></td>
<td></td>
<td></td>
<td>False</td>
</tr>
<tr>
<td>4</td>
<td><code>z += 1</code></td>
<td>0.5</td>
<td>?</td>
<td>0.5</td>
</tr>
<tr>
<td>5</td>
<td><code>y = 6 * a + z</code></td>
<td>0.5</td>
<td>3.5</td>
<td>0.5</td>
</tr>
<tr>
<td>6</td>
<td><code>print(z, &quot;,&quot;, y)</code></td>
<td>0.5</td>
<td>3.5</td>
<td>0.5</td>
</tr>
</tbody>
</table>
2. **Solution**

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>x</th>
<th>y</th>
<th>z</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>( x = 3 )</td>
<td>3</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>( y = x \times 3 + 9 )</td>
<td>3</td>
<td>36</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td>( z = 2 \times x + y - 4 )</td>
<td>3</td>
<td>36</td>
<td>38</td>
</tr>
<tr>
<td>4</td>
<td>if ( x &gt; y ):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>( x = z \mod y )</td>
<td>2</td>
<td>36</td>
<td>38</td>
</tr>
<tr>
<td>6</td>
<td>( z = \text{math.sqrt}(y) )</td>
<td>2</td>
<td>36</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>( \text{print}(x, &quot;&quot;, y, &quot;&quot;, z) )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2, 36, 6 is displayed</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3. Solution

```python
x = float(input())
w = x * 3 - 15
z = (w + 7) * (x + 4) - 10
if w > x and z > x:
x += 1
    y = x / 2 + 4
else:
    y = x / 4 + 2
print(y)
```

For input value of 10

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>x</th>
<th>y</th>
<th>w</th>
<th>z</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>x = float(input())</td>
<td>10</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>w = x * 3 - 15</td>
<td>10</td>
<td>?</td>
<td>15</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td>z = (w + 7) * (x + 4) - 10</td>
<td>10</td>
<td>?</td>
<td>15</td>
<td>298</td>
</tr>
<tr>
<td>4</td>
<td>if w &gt; x and z &gt; x:</td>
<td></td>
<td>True</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>x += 1</td>
<td>11</td>
<td>?</td>
<td>15</td>
<td>298</td>
</tr>
<tr>
<td>6</td>
<td>y = x / 2 + 4</td>
<td>11</td>
<td>9.5</td>
<td>15</td>
<td>298</td>
</tr>
<tr>
<td>7</td>
<td>print(y)</td>
<td></td>
<td></td>
<td></td>
<td>9.5 is displayed</td>
</tr>
</tbody>
</table>

For input value of 2

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>x</th>
<th>y</th>
<th>w</th>
<th>z</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>x = float(input())</td>
<td>2</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>w = x * 3 - 15</td>
<td>2</td>
<td>?</td>
<td>-9</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td>z = (w + 7) * (x + 4) - 10</td>
<td>2</td>
<td>?</td>
<td>-9</td>
<td>-22</td>
</tr>
<tr>
<td>4</td>
<td>if w &gt; x and z &gt; x:</td>
<td></td>
<td>False</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>y = x / 4 + 2</td>
<td>2</td>
<td>2.5</td>
<td>-9</td>
<td>-22</td>
</tr>
<tr>
<td>6</td>
<td>print(y)</td>
<td></td>
<td></td>
<td>2.5 is displayed</td>
<td></td>
</tr>
</tbody>
</table>

4. Solution

```python
x = int(input())
if x % 6 == 0:
    print(x, "is a multiple of 6")
else:
    print(x, "is not a multiple of 6")
```

5. Solution

```python
x = int(input())
if x % 6 == 0 or x % 7 == 0:
    print(x, "is a multiple of 6 or a multiple of 7")
else:
    print(x, "is neither a multiple of 6 nor a multiple of 7")
```
6. Solution

```python
x = int(input())
y = x % 4
if y == 0:
    print(x, "is a multiple of 4")
else:
    print(x, "is not a multiple of 4")
print("The structure is:", x, ", "", (x // 4), "x 4 +", y)
```

7. Solution

```python
x = int(input())
if 1000 <= x <= 9999:
    print(x, "is a four-digit integer")
else:
    print(x, "is not a four-digit integer")
```

8. Solution

```python
a = float(input())
b = float(input())
if a < b:
    print(a)
else:
    print(b)
```

9. Solution

```python
a = float(input())
b = float(input())
c = float(input())
if a < b + c and b < a + c and c < a + b:
    print("Given numbers can be lengths of the three sides of a triangle")
else:
```
10. Solution

```python
a = float(input())
b = float(input())
c = float(input())

if a ** 2 == b ** 2 + c ** 2 or b ** 2 == a ** 2 + c ** 2 or c ** 2 == a ** 2 + b ** 2:
    print("Given numbers can be lengths of the three sides of a right triangle")
else:
    print("Given numbers cannot be lengths of the three sides of a right triangle")
```

11. Solution

```python
a = float(input("Enter 1st jump in meters: "))
b = float(input("Enter 2nd jump in meters: "))
c = float(input("Enter 3rd jump in meters: "))

average = (a + b + c) / 3

if average < 8:
    print("Disqualified")
else:
    print("Qualified")
```

12. Solution

```python
pay_rate = float(input())
hours_worked = int(input())

if hours_worked <= 40:
    gross_pay = pay_rate * hours_worked
else:
    gross_pay = 2 * pay_rate * hours_worked

net_pay = 0.7 * gross_pay
```
print("Net Pay:", net_pay)

13. Solution

miles = int(input("Enter miles traveled: "))
r = miles % 12000

if r > 6000:
    miles_left = 12000 - r
    print("Your car needs a major service in", miles_left, "miles")
else:
    miles_left = 6000 - r
    print("Your car needs a minor service in", miles_left, "miles")

14. Solution

t = float(input("Enter the time the two cars traveled: "))
a1 = float(input("Enter the acceleration for car A: "))
a2 = float(input("Enter the acceleration for car B: "))

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

if s1 > s2:
    print("Car A is first")
else:
    print("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

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>q</th>
<th>b</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>q = int(input())</td>
<td>5</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>if 0 &lt; q &lt;= 50:</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>b = 1</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>print(b)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For input value of 150

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>q</th>
<th>b</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>q = int(input())</td>
<td>150</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>if 0 &lt; q &lt;= 50:</td>
<td>False</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>elif 50 &lt; q &lt;= 100:</td>
<td>False</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>elif 100 &lt; q &lt;= 200:</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>b = 3</td>
<td>150</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>print(b)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For input value of 250

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>q</th>
<th>b</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>q = int(input())</td>
<td>250</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>if 0 &lt; q &lt;= 50:</td>
<td>False</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>elif 50 &lt; q &lt;= 100:</td>
<td>False</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>elif 100 &lt; q &lt;= 200:</td>
<td>False</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>b = 4</td>
<td>250</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>print(b)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For input value of -1

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>q</th>
<th>b</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>q = int(input())</td>
<td>-1</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>if 0 &lt; q &lt;= 50:</td>
<td>False</td>
<td></td>
</tr>
</tbody>
</table>
2. **Solution**

For input value of 5

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>amount</th>
<th>discount</th>
<th>payment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>amount = float(input())</td>
<td>5</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>discount = 0</td>
<td>5</td>
<td>0</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td>if amount &lt; 20:</td>
<td>True</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>discount = 0</td>
<td>5</td>
<td>0</td>
<td>?</td>
</tr>
<tr>
<td>5</td>
<td>payment = amount - amount * discount / 100</td>
<td>5</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>print(discount, &quot;,&quot;, payment)</td>
<td>0, 5</td>
<td>is displayed.</td>
<td></td>
</tr>
</tbody>
</table>

For input value of 150

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>amount</th>
<th>discount</th>
<th>payment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>amount = float(input())</td>
<td>150</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>discount = 0</td>
<td>150</td>
<td>0</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td>if amount &lt; 20:</td>
<td>False</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>elif 20 &lt;= amount &lt; 60:</td>
<td>False</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>elif 60 &lt;= amount &lt; 100:</td>
<td>False</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>elif amount &gt;= 100:</td>
<td>True</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>discount = 15</td>
<td>150</td>
<td>15</td>
<td>?</td>
</tr>
<tr>
<td>8</td>
<td>payment = amount - amount * discount / 100</td>
<td>150</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>9</td>
<td>print(discount, &quot;,&quot;, payment)</td>
<td>15, 127.5</td>
<td>is displayed.</td>
<td></td>
</tr>
</tbody>
</table>

For input value of -1

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>amount</th>
<th>discount</th>
<th>payment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>amount = float(input())</td>
<td>-1</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>discount = 0</td>
<td>-1</td>
<td>0</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td>if amount &lt; 20:</td>
<td>True</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>discount = 0</td>
<td>-1</td>
<td>0</td>
<td>?</td>
</tr>
<tr>
<td>5</td>
<td>payment = amount - amount * discount / 100</td>
<td>-1</td>
<td>0</td>
<td>-1</td>
</tr>
<tr>
<td>6</td>
<td>print(discount, &quot;,&quot;, payment)</td>
<td>0,-1</td>
<td>is displayed.</td>
<td></td>
</tr>
</tbody>
</table>
### 3. Solution

For input value of 1

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>a</th>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><code>a = int(input())</code></td>
<td>1</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td><code>x = 0</code></td>
<td>1</td>
<td>0</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td><code>y = 0</code></td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td><code>if a == 1:</code></td>
<td></td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td><code>x = x + 5</code></td>
<td>1</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td><code>y = y + 5</code></td>
<td>1</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td><code>print(x, &quot;,&quot;, y)</code></td>
<td></td>
<td>5, 5</td>
<td>displayed</td>
</tr>
</tbody>
</table>

For input value of 3

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>a</th>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><code>a = int(input())</code></td>
<td>3</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td><code>x = 0</code></td>
<td>3</td>
<td>0</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td><code>y = 0</code></td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td><code>if a == 1:</code></td>
<td></td>
<td>False</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td><code>elif a == 2:</code></td>
<td></td>
<td>False</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td><code>elif a == 3:</code></td>
<td></td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td><code>x = x - 9</code></td>
<td>3</td>
<td>-9</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td><code>y = y + 3</code></td>
<td>3</td>
<td>-9</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td><code>print(x, &quot;,&quot;, y)</code></td>
<td></td>
<td>-9, 3</td>
<td>displayed</td>
</tr>
</tbody>
</table>

For input value of 250

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>a</th>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><code>a = int(input())</code></td>
<td>250</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td><code>x = 0</code></td>
<td>250</td>
<td>0</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td><code>y = 0</code></td>
<td>250</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td><code>if a == 1:</code></td>
<td></td>
<td>False</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td><code>elif a == 2:</code></td>
<td></td>
<td>False</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td><code>elif a == 3:</code></td>
<td></td>
<td>False</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td><code>x = x + 3</code></td>
<td>250</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td><code>y += 1</code></td>
<td>250</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td><code>print(x, &quot;,&quot;, y)</code></td>
<td></td>
<td>3, 1</td>
<td>displayed</td>
</tr>
</tbody>
</table>
4. Solution

For input values of 10, 2, 5

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>a</th>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a = int(input())</td>
<td>10</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>x = int(input())</td>
<td>10</td>
<td>2</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td>y = float(input())</td>
<td>10</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>if a == 10: True</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>x = x % 2</td>
<td>10</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>y = y ** 2</td>
<td>10</td>
<td>0</td>
<td>25</td>
</tr>
<tr>
<td>7</td>
<td>print(x, &quot;,&quot;, y)</td>
<td>0</td>
<td>25</td>
<td></td>
</tr>
</tbody>
</table>

For input values of 5, 2, 3

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>a</th>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a = int(input())</td>
<td>5</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>x = int(input())</td>
<td>5</td>
<td>2</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td>y = float(input())</td>
<td>5</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>if a == 10: False</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>elif a == 3: False</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>elif a == 5: True</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>x = x + 4</td>
<td>5</td>
<td>6</td>
<td>3</td>
</tr>
</tbody>
</table>
For input values of 4, 6, 2

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>a</th>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><code>a = int(input())</code></td>
<td>4</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td><code>x = int(input())</code></td>
<td>4</td>
<td>6</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td><code>y = float(input())</code></td>
<td>4</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td><code>if a == 10:</code></td>
<td>False</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td><code>elif a == 3:</code></td>
<td>False</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td><code>elif a == 5:</code></td>
<td>False</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td><code>x -= 3</code></td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td><code>y += 1</code></td>
<td>4</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td><code>print(x, &quot;,&quot;, y)</code></td>
<td>3</td>
<td>3</td>
<td>displayed</td>
</tr>
</tbody>
</table>

```
8  y += 7
9  print(x, ",", y)
```

6, 10 is displayed
5. Solution

First Approach

```python
a = int(input())
if -9999 <= a <= -1000 or 1000 <= a <= 9999:
    n = 4
elif -999 <= a <= -100 or 100 <= a <= 999:
    n = 3
elif -99 <= a <= -10 or 10 <= a <= 99:
    n = 2
else:
    n = 1
print("You entered a ", n, "-digit integer", sep = ")
```

Second Approach

```python
a = int(input())
a_string = str(abs(a))
print("You entered a ", len(a_string), "-digit integer", sep = ")
```
6. **Solution**

```python
print("1. Convert USD to Euro (EUR)")
print("2. Convert USD to British Pound Sterling (GBP)")
print("3. Convert USD to Japanese Yen (JPY)")
print("4. Convert USD to Canadian Dollar (CAD)")
ch = int(input("Enter a choice: "))

usd = float(input("Enter an amount in US dollars: "))

if ch == 1:
    eur = usd / 0.72
    print("\$", usd, " = ", eur, " EUR", sep = "")
elif ch == 2:
    gbp = usd / 0.60
    print("\$", usd, " = ", gbp, " GBP", sep = "")
elif ch == 3:
    jpy = usd / 102.15
    print("\$", usd, " = ", jpy, " JPY", sep = "")
else:
    cad = usd / 1.10
    print("\$", usd, " = ", cad, " CAD", sep = "")
```

7. **Solution**

```python
m = int(input("Enter the number of a month between 1 and 12: "))

if m <= 2 or m == 12:
    print("Winter")
elif m <= 5:
    print("Spring")
elif m <= 8:
    print("Summer")
else:
    print("Fall (Autumn)")
```

8. **Solution**

```python
n = float(input("Enter a number between 1.0 and 4.9: "))
x = int(n)
y = int(n * 10) % 10

if x == 1:
    print("One", end = "")
elif x == 2:
    print("Two", end = "")
elif x == 3:
    print("Three", end = "")
elif x == 4:
    print("Four", end = "")
print(" point ", end = "")
```
if y == 1:
    print("one")
elif y == 2:
    print("two")
elif y == 3:
    print("three")
elif y == 4:
    print("four")
elif y == 5:
    print("five")
elif y == 6:
    print("six")
elif y == 7:
    print("seven")
elif y == 8:
    print("eight")
elif y == 9:
    print("nine")
eelif y == 0:
    print("zero")

9. Solution

Start

Read
"Enter a letter between A and F"

Read
letter

letter == "A" False
True

letter == "B" False

Write
"90 - 100"

letter == "C" True False

letter == "D" False

Write
"60 - 69"

letter == "E" True

Write
"0 - 59"

letter == "F" False

Write
"0 - 59"

End
letter = input("Enter a letter between A and F: ")

if letter == "A":
    print("90 - 100")
elif letter == "B":
    print("80 - 89")
elif letter == "C":
    print("70 - 79")
elif letter == "D":
    print("60 - 69")
else:
    print("0 - 59")

10. Solution

name = input("Enter the name of a month: ")

if name == "JANUARY":
    print(1)
elif name == "FEBRUARY":
    print(2)
elif name == "MARCH":
    print(3)
elif name == "APRIL":
    print(4)
elif name == "MAY":
    print(5)
elif name == "JUNE":
    print(6)
elif name == "JULY":
    print(7)
elif name == "AUGUST":
    print(8)
elif name == "SEPTEMBER":
    print(9)
elif name == "OCTOBER":
    print(10)
elif name == "NOVEMBER":
    print(11)
elif name == "DECEMBER":
    print(12)
else:
    print("Error")
11. Solution

```python
print("1. Convert Miles to Yards")
print("2. Convert Miles to Feet")
print("3. Convert Miles to Inches")

choice = int(input("Enter a choice: "))
```
if choice == 1:
    miles = float(input("Enter miles: "))
    yards = miles * 1760
    print(miles, "miles =", yards, "yards")
elif choice == 2:
    miles = float(input("Enter miles: "))
    feet = miles * 5280
    print(miles, "miles =", feet, "feet")
elif choice == 3:
    miles = float(input("Enter miles: "))
    inches = miles * 63360
    print(miles, "miles =", inches, "inches")
else:
    print("Invalid choice!")

12. Solution

roman = input("Enter a Roman number between I and X: ")

if roman == "I":
    print(1)
elif roman == "II":
    print(2)
elif roman == "III":
    print(3)
elif roman == "IV":
    print(4)
elif roman == "V":
    print(5)
elif roman == "VI":
    print(6)
elif roman == "VII":
    print(7)
elif roman == "VIII":
    print(8)
elif roman == "IX":
    print(9)
elif roman == "X":
    print(10)
else:
    print("Error")

13. Solution

total = int(input("Enter the total number of CDs purchased in a month: "))

if total == 1:
    print("You are awarded 3 points")
elif total == 2:
    print("You are awarded 10 points")
elif total == 3:
    print("You are awarded 20 points")
else:
    print("You are awarded 45 points")

14. Solution

import random

name = input("Enter your name: ")
i = random.randrange(3)

if i == 0:
    print("Good morning", name)
elif i == 1:
    print("Good evening", name)
elif i == 2:
    print("Good night", name)

15. Solution

num = input()

if num == "ZERO":
    print(0)
elif num == "ONE":
    print(1)
elif num == "TWO":
    print(2)
elif num == "THREE":
    print(3)
elif num == "FOUR":
    print(4)
elif num == "FIVE":
    print(5)
elif num == "SIX":
    print(6)
elif num == "SEVEN":
    print(7)
elif num == "EIGHT":
    print(8)
elif num == "NINE":
    print(9)
else:
    print("I don't know this number!")

16. Solution

b = int(input("Enter Beaufort number: "))

if b == 0:
    print("Calm")
elif b == 1:
    print("Light Air")
elif b == 2:
    print("Light breeze")
elif b == 3:
    print("Gentle breeze")
elif b == 4:
    print("Moderate breeze")
elif b == 5:
    print("Fresh breeze")
elif b == 6:
    print("Strong breeze")
elif b == 7:
    print("Moderate gale")
elif b == 8:
    print("Gale")
elif b == 9:
    print("Strong gale")
elif b == 10:
    print("Storm")
elif b == 11:
    print("Violent storm")
elif b == 12:
    print("Hurricane force")
else:
    print("Invalid Beaufort number!")
Chapter 19

19.3 Answers of Review Questions: True/False

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

19.4 Answers of Review Exercises

1. Solution

For input values of 20, 1

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>x = int(input())</td>
<td>20</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>y = int(input())</td>
<td>20</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>if x &lt; 30:</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>if y == 1:</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>x = x % 3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>y = 5</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>print(x, &quot;,&quot;, y)</td>
<td>2, 5 is displayed</td>
<td></td>
</tr>
</tbody>
</table>

For input values of 20, 3

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>x = int(input())</td>
<td>20</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>y = int(input())</td>
<td>20</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>if x &lt; 30:</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>if y == 1:</td>
<td>False</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>elif y == 2:</td>
<td>False</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>elif y == 3:</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>x = x + 5</td>
<td>25</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>y += 3</td>
<td>25</td>
<td>6</td>
</tr>
<tr>
<td>9</td>
<td>print(x, &quot;,&quot;, y)</td>
<td>25, 6 is displayed</td>
<td></td>
</tr>
</tbody>
</table>

For input values of 12, 8

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>x = int(input())</td>
<td>12</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>y = int(input())</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>if x &lt; 30:</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>if y == 1:</td>
<td>False</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>elif y == 2:</td>
<td>False</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Statement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---------------------------------------------------------------------------</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>6</td>
<td><code>elif y == 3:</code></td>
<td></td>
<td>False</td>
</tr>
<tr>
<td>7</td>
<td><code>x -= 2</code></td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>8</td>
<td><code>y += 1</code></td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>9</td>
<td><code>print(x, &quot;,&quot;, y)</code></td>
<td>10, 9 is displayed</td>
<td></td>
</tr>
</tbody>
</table>

For input values of 50, 0

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><code>x = int(input())</code></td>
<td>50</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td><code>y = int(input())</code></td>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td><code>if x &lt; 30:</code></td>
<td>False</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td><code>y += 1</code></td>
<td>50</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td><code>print(x, &quot;,&quot;, y)</code></td>
<td>50, 1 is displayed</td>
<td></td>
</tr>
</tbody>
</table>

2. Solution

For input values of 60, 25

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><code>x = int(input())</code></td>
<td>60</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td><code>y = int(input())</code></td>
<td>60</td>
<td>25</td>
</tr>
<tr>
<td>3</td>
<td><code>(x + y) / 2 &lt;= 20:</code></td>
<td>False</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td><code>if y &lt; 15:</code></td>
<td>False</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td><code>elif y &lt; 23:</code></td>
<td>False</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td><code>x = 2 * x + 5</code></td>
<td>125</td>
<td>25</td>
</tr>
<tr>
<td>7</td>
<td><code>y += 1</code></td>
<td>125</td>
<td>26</td>
</tr>
<tr>
<td>8</td>
<td><code>print(x, &quot;,&quot;, y)</code></td>
<td>125, 26 is displayed</td>
<td></td>
</tr>
</tbody>
</table>

For input values of 50, 8

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><code>x = int(input())</code></td>
<td>50</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td><code>y = int(input())</code></td>
<td>50</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td><code>(x + y) / 2 &lt;= 20:</code></td>
<td>False</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td><code>if y &lt; 15:</code></td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td><code>x = x % 4</code></td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>6</td>
<td><code>y = 2</code></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td><code>print(x, &quot;,&quot;, y)</code></td>
<td>2, 2 is displayed</td>
<td></td>
</tr>
</tbody>
</table>

For input values of 20, 15

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><code>x = int(input())</code></td>
<td>20</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td><code>y = int(input())</code></td>
<td>20</td>
<td>15</td>
</tr>
</tbody>
</table>
3. **Solution**

```python
print("Enter the three sides of a triangle: ")
a = float(input())
b = float(input())
c = float(input())

if a >= b + c or b >= a + c or c >= a + b:
    print("Given numbers cannot be lengths of the three sides of a triangle")
else:
    if a == b and b == c:
        print("Equilateral")
    elif a ** 2 == b ** 2 + c ** 2 or b ** 2 == a ** 2 + c ** 2 or c ** 2 == a ** 2 + b ** 2:
        print("Right (or right-angled)")
    else:
        print("not special")
```

4. **Solution**

```python
pin = int(input("Enter your four-digit PIN : "))
if pin != 1234:
    pin = int(input("Wrong PIN. Enter your four-digit PIN : "))
    if pin != 1234:
        pin = int(input("Wrong PIN. Enter your four-digit PIN : "))
if pin != 1234:
    print("PIN locked!")
else:
```
amount = int(input("Enter the amount of money (an integer value) that you want to withdraw: "))
usd10 = amount // 10
r = amount % 10
usd5 = r // 5
usd1 = r % 5
print(usd10, "notes of $10", usd5, "notes of $5", "and", usd1, "notes of $1")

5. Solution

First Approach

```python
t = float(input("Enter temperature (in Fahrenheit): "))
w = float(input("Enter wind speed (in miles/hour): "))
if t > 75:
    if w > 12:
        print("The day is hot and windy")
    else:
        print("The day is hot and not windy")
else:
    if w > 12:
        print("The day is cold and windy")
    else:
        print("The day is cold and not windy")
```

Second Approach

```python
t = float(input("Enter temperature (in Fahrenheit): "))
w = float(input("Enter wind speed (in miles/hour): "))
if t > 75:
    message1 = "hot"
else:
    message1 = "cold"
if w > 12:
    message2 = "windy"
else:
    message2 = "not windy"
print("The day is", message1, "and", message2)```
Chapter 20

20.10 Answers of Review Questions: True/False

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

20.11 Answers of Review Questions: Multiple Choice

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

20.12 Answers of Review Exercises

1. Solution

```python
y = int(input())
x = int(input())

if y > 0:
a = x * 4 * y + 1
else:
a = x * 2 * y + 6

print(y)
print(a)
```

2. Solution

![Flowchart](image)
3. Solution

```python
a = float(input())
if a >= 10:
    print("Error!")
else:
    if a < 1:
        y = 5 + a
    elif a < 5:
        y = 23 / a
    else:
        y = 5 * a
    print(y)
```

4. Solution

```python
day = int(input())
month = int(input())
nname = input()
if day == 16 and month == 2 and name == "Loukia":
    print("Happy Birthday!!!")
else:
    print("No match!")
```

5. Solution

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

```python
a = float(input())
b = float(input())
c = float(input())
if a > 10:
    if c < 2000:
        d = (a + b + c) / 12
        print("The result is:", d)
    else:
        print("Error!")
else:
    print("Error!")
```

6. Solution

```python
a = float(input())
b = float(input())
c = float(input())
if a > 10 and b < 2000 and c != 10:
    d = (a + b + c) / 12
    print("The result is:", d)
```
if a <= 10:
    print("Error!")

7. Solution

```python
a = int(input())
b = int(input())
y = 3
if a > 0:
    y = y * a
    print("Hello Zeus")
print(y, b)
```

8. Solution

```python
a = float(input())
b = float(input())
y = 0
if a > 0:
    y = y + 7
else:
    print("Hello Zeus")
    print(abs(a))
print(y)
```

9. Solution

```python
os = input("What is your tablet's OS? ")
if os == "iOS":
    print("Apple")
elif os == "android":
    print("Google")
elif os == "Windows":
    print("Microsoft")
```

10. Solution

```python
a = int(input())
x = float(input())
y = float(input())
if a in (3, 5, 15):
    x = x / 4
    y = y ** 5
elif a >= 7 and a <= 12:
    x = x * 3
    y += 1
elif a > 52:
    x = x % 4
```
```
y += 9
else:
    x -= 9
    y += 1
print(x, y)
```

### 11. Solution

```
print("1. Red")
print("2. Green")
print("3. Blue")
print("4. White")
print("5. Black")
print("6. Gray")
color = int(input("Select a color: "))
print("Your color in hexadecimal is: ")
if color == 1:
    print("FF0000")
else:
    if color == 2:
        print("00FF00")
    else:
        if color == 3:
            print("0000FF")
        else:
            if color == 4:
                print("FFFFFF")
            else:
                if color == 5:
                    print("000000")
                else:
                    if color == 6:
                        print("7F7F7F")
                    else:
                        print("Unknown color!")
```

### 12. Solution

```
a = int(input())
if a > 1000:
    print("Big Positive")
else:
    if a > 0:
        print("Positive")
    else:
        if a < -1000:
            print("Big Negative")
        else:
            if a < 0:
                print("Negative")
```
else:
    print("Zero")

a = int(input())
if a > 1000:
    print("Big Positive")
elif a > 0:
    print("Positive")
elif a < -1000:
    print("Big Negative")
elif a < 0:
    print("Negative")
else:
    print("Zero")

13. Solution

a = float(input())
if a < 1:
    y = 5 + a
    print(y)
elif a < 5:
    y = 23 / a
    print(y)
elif a < 10:
    y = 5 * a
    print(y)
else:
    print("Error!")

a = float(input())
if a < 1:
    y = 5 + a
    print(y)
else:
    if a < 5:
        y = 23 / a
        print(y)
    else:
        if a < 10:
            y = 5 * a
            print(y)
        else:
            print("Error!")
Chapter 21

21.4 Answers of Review Exercises

1. Solution

Start
Read a

a MOD 10 == 0
True
a ← a + 1
Write "Message #1"

False

a MOD 3 == 1
True
a ← a + 5
Write "Message #2"

False

a MOD 3 == 2
True
a ← a + 10
Write "Message #3"

False

Write a

End
2. **Solution**

![Flowchart for Solution 1]

3. **Solution**

![Flowchart for Solution 2]
4. Solution

5. Solution
6. **Solution**

```python
x = float(input())
y = float(input())
if x != 100 or y <= 10:
z = float(input())
    if z <= x + y:
x = 3
    y = x + 4
print(x, y)
```

7. **Solution**

```python
x = int(input())
if x == 1:
    print("Good Morning")
    print("How Do you do?")
    print("Is everything okay?")
elif x == 2:
    print("Good Evening")
    print("How Do you do?")
    print("Is everything okay?")
elif x == 3:
    print("Good Afternoon")
    print("Is everything okay?")
else:
    print("Good Night")
```

8. **Solution**

```python
import re
IS_NUMERIC = "^\[-+]?\d+(\.|\d+)?$"
inp = input()
if re.match(IS_NUMERIC, inp):
x = int(inp)
    if x % 10 == 0:
        print("Last digit equal to 0")
    elif x % 10 == 1:
        print("Last digit equal to 1")
    else:
        print("None")
else:
    if inp == "Exit":
        print("Bye")
    else:
        print("Invalid Number")
```

9. **Solution**

```python
a = float(input())
```
b = float(input())
y = a * b
if y > 0:
    y -= 1
    y /= 2
else:
    y += 10
    if y > 0:
        y /= 2
    else:
        y *= 2

10. Solution

a = float(input())
b = float(input())
c = float(input())
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
print(a, b, c)
22.6 Answers of Review Exercises

1. Solution

```python
import re
IS_NUMERIC = "^[+-]?\d+(\.\d+)?$"

inp = input()
if re.match(IS_NUMERIC, inp):
x = int(inp)
inp = input()
if re.match(IS_NUMERIC, inp):
y = int(inp)
if x % 2 == 1 or y % 2 == 1:
    print("At least one integer is odd")
else:
    print("nothing Special")
else:
    print("Invalid Number")
else:
    print("Invalid Number")
```
import re
IS_NUMERIC = "^[+-]?\d+(\.\d+)?$"

inp = input()
if not re.match(IS_NUMERIC, inp):
    print("First value must be numeric")
else:
    x = float(inp)
    if x != int(x):
        print("First number must be integer")
    else:
        inp = input()
        if not re.match(IS_NUMERIC, inp):
            print("Second value must be numeric")
else:
    y = float(inp)
    if y != int(y):
        print("Second number must be integer")
    else:
        if x % 3 == 0 and x % 4 == 0 and y % 3 == 0 and y % 4 == 0:
            print("Both values are divisible exactly by 3 and by 4")
        else:
            print("nothing Special")

3. **Solution**

```python
import re
IS_NUMERIC = "^[^-]+\d+(\.\d+)?$"

print("1. Convert Kelvin to Fahrenheit")
print("2. Convert Fahrenheit to Kelvin")
print("3. Convert Fahrenheit to Celsius")
print("4. Convert Celsius to Fahrenheit")

choice = int(input("Enter a choice: "))
inp = input("Enter a temperature: ")

if choice < 1 or choice > 4:
    print("Wrong choice")
elif not re.match(IS_NUMERIC, inp):
    print("Wrong temperature")
else:
    t = float(inp)
    if choice == 1:
        print(1.8 * t - 459.67)
    elif choice == 2:
        print((t + 459.57) / 1.8)
    elif choice == 3:
        print(5 / 9 * (t - 32))
    elif choice == 4:
        print(9 / 5 * t + 32)
```

4. **Solution**

```python
a = int(input("Enter 1st integer: "))
op = input("Enter type of operation: ")
b = int(input("Enter 2nd integer: "))

if op == "+":
    print(a, b)
elif op == "-":
    print(a - b)
elif op == "*":
    print(a * b)
elif op == "/":
    if b == 0:
        print("Error: Division by zero")
```
else:
    print(a / b)
elif op == "DIV":
    if b == 0:
        print("Error: Division by zero")
    else:
        print(a // b)
elif op == "MOD":
    if b == 0:
        print("Error: Division by zero")
    else:
        print(a % b)
elif op == "POWER":
    print(a ** b)

5. Solution

```python
x = float(input())
if x == 5 or x == 1:
    print("Error: Division by zero")
else:
    y = (5 * x + 3) / (x - 5) + (3 * x ** 2 + 2 * x + 2) / (x + 1)
    print(y)
```
6. Solution

```python
import re
IS_NUMERIC = "^[\-]d+\.d+|$"

import math
inp = input()
if re.match(IS_NUMERIC, inp):
    x = float(inp)
    if x >= 10:
        y = x ** 2 / (x + 1) + (3 - math.sqrt(x)) / (x + 2)
        print(y)
    else:
        if x == 9:
            print("Error: Division by zero")
        else:
            y = 40 * x / (x + 9) + 3 * x
            print(y)
else:
    print("Invalid number")
```

7. Solution

```python
import math
x = float(input())
if x <= -15 or x > 25:
    y = x - 1
```
```python
print(y)
eelif x <= -10:
    y = x / math.sqrt(x + 30) + (8 + x) ** 2 / (x + 1)
    print(y)
eelif x <= 0:
    y = abs(40 * x) / (x - 8)
    print(y)
eelse:
    if x == 9:
        print("Error: Division by zero")
    elif x < 9:
        print("Error: Invalid square root")
    else:
        y = 3 * x / math.sqrt(x - 9)
        print(y)
8. Solution

age1 = int(input("Enter age for person No1:"))
age2 = int(input("Enter age for person No2:"))
age3 = int(input("Enter age for person No3:"))

minimum = age1
if age2 < minimum:
    minimum = age2
if age3 < minimum:
    minimum = age3
maximum = age1
if age2 > maximum:
    maximum = age2
if age3 > maximum:
    maximum = age3

middle = age1 + age2 + age3 - minimum - maximum
print(middle)
9. Solution

a1 = int(input("Enter the age of the first person: "))
n1 = input("Enter the name of the first person: ")
a2 = int(input("Enter the age of the second person: "))
n2 = input("Enter the name of the second person: ")
a3 = int(input("Enter the age of the third person: "))
n3 = input("Enter the name of the third person: ")

minimum = a1
min_name = n1
if a2 > minimum:
    minimum = a2
    min_name = n2
if a3 > minimum:
    minimum = a3
    min_name = n3
```
10. Solution

```python
import re
IS_NUMERIC = "^[+-]?(\d+)(\.)\d+?$"

inp = input("Enter a three-digit integer: ")
if not re.match(IS_NUMERIC, inp):
    print("Entered value contains non-numeric characters")
else:
    x = int(inp)
    if x < 100 or x > 999:
        print("Entered integer is not a three-digit integer")
    else:
        digit1, r = divmod(x, 100)
        digit2, digit3 = divmod(r, 10)
        total = digit1 ** 3 + digit2 ** 3 + digit3 ** 3
        if total == x:
            print("You entered an Armstrong number!")
        else:
            print("You entered a non-Armstrong number!")
```

11. Solution

```python
d = int(input("Enter day 1 - 31: "))
m = int(input("Enter month 1 - 12: "))
y = int(input("Enter year: "))
if m == 2:
    if y % 4 == 0 and y % 100 != 0 or y % 400 == 0:
        print(29 - d)
    else:
        print(28 - d)
elif m == 4 or m == 6 or m == 9 or m == 11:
```
print(30 - d)
else:
    print(31 - d)

12. **Solution**

```python
word = input()
word1 = word[0].upper() + word[1].lower() + word[2].upper() + word[3].lower() + word[4].upper() + word[5].lower()
word2 = word[0].lower() + word[1].upper() + word[2].lower() + word[3].upper() + word[4].lower() + word[5].upper()

if word == word1 or word == word2:
    print("Word is okay!")
else:
    print("Word is not okay")
```

13. **Solution**

```python
q = int(input("Enter quantity: "))
if q < 3:
    discount = 0
elif q < 6:
    discount = 10
elif q < 10:
    discount = 15
elif q < 14:
    discount = 20
elif q < 20:
    discount = 27
else:
    discount = 30

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

print("You got a discount of ", discount, ",", sep = "")
print("You must pay ", payment, sep = ")
```

14. **Solution**

```python
import re
IS_NUMERIC = "^[+-]?\d+(\.\d+)?$"
```
Chapter 22

VAT = 0.19

inp = input("Enter total amount: ")

if not re.match(IS_NUMERIC, inp):
    print("Entered value contains non-numeric characters")
else:
    amount = float(inp)
    if amount < 0:
        print("Entered non-negative value")
    else:
        if amount < 50:
            discount = 0
        elif amount < 100:
            discount = 1
        elif amount < 250:
            discount = 2
        else:
            discount = 3

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

        print("You got a discount of ", discount, ",", sep ="")
        print("You must pay $", payment, sep = "")

15. Solution

a = int(input("Enter age: "))
if a < 18:
    print("Invalid age")
else:
    w = int(input("Enter weight in pounds: ")
    h = int(input("Enter height in inches: "))

    bmi = w * 703 / h ** 2

    if bmi < 15:
        print("Very severely underweight")
    elif bmi < 16:
        print("Severely underweight")
    elif bmi < 18.5:
        print("Underweight")
    elif bmi < 25:
        print("Normal")
    elif bmi < 30:
        print("Overweight")
    elif bmi < 35:
        print("Severely overweight")
    else:
        print("Very severely overweight")
16. Solution

```python
import re
IS_NUMERIC = "^[^-]?\d+(\\d+)?$"
TAX_RATE = 0.10

inp = input("Enter water consumption (in cubic feet): ")
if not re.match(IS_NUMERIC, inp):
    print("Entered value contains non-numeric characters")
else:
    water = int(inp)
    if water < 0:
        print("Entered value is negative")
    else:
        if water <= 10:
            total = water * 3
        elif water <= 20:
            total = 10 * 3 + (water - 10) * 5
        elif 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
        print("Total amount to pay (taxes included): ", total)
```

17. Solution

```python
income = float(input("Enter taxable income: "))
children = int(input("Enter number of children: "))
if income <= 8000:
    tax = income * 0.10
elif income <= 30000:
    tax = 8000 * 0.10 + (income - 8000) * 0.15
elif 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
print("Tax: ", tax)
```

18. Solution

```python
import re
IS_NUMERIC = "^[^-]?\d+(\\d+)?$"

inp = input("Enter wind speed (in miles/hour): ")"
if not re.match(IS_NUMERIC, inp):
    print("Entered value contains non-numeric characters")
else:
    wind = float(inp)
    if wind < 0:
        print("Entered value is negative")
    else:
        if wind < 1:
            print("Beaufort: 0\n", "Calm", sep = ")
        elif wind < 4:
            print("Beaufort: 1\n", "Light air", sep = ")
        elif wind < 8:
            print("Beaufort: 2\n", "Light breeze", sep = ")
        elif wind < 13:
            print("Beaufort: 3\n", "Gentle breeze", sep = ")
        elif wind < 18:
            print("Beaufort: 4\n", "Moderate breeze", sep = ")
        elif wind < 25:
            print("Beaufort: 5\n", "Fresh breeze", sep = ")
        elif wind < 31:
            print("Beaufort: 6\n", "Strong breeze", sep = ")
        elif wind < 39:
            print("Beaufort: 7\n", "Moderate gale", sep = ")
        elif wind < 47:
            print("Beaufort: 8\n", "Gale", sep = ")
        elif wind < 55:
            print("Beaufort: 9\n", "Strong gale", sep = ")
        elif wind < 64:
            print("Beaufort: 10\n", "Storm", sep = ")
        elif wind < 74:
            print("Beaufort: 11\n", "Violent storm", sep = ")
        else:
            print("Beaufort: 12\n", "Hurricane force", sep = ")

if wind < 13:
    print("It's Fishing Day!!")
# Chapter 23

## 23.3 Answers of Review Questions: True/False

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>true</td>
</tr>
<tr>
<td>2.</td>
<td>true</td>
</tr>
<tr>
<td>3.</td>
<td>false</td>
</tr>
<tr>
<td>4.</td>
<td>false</td>
</tr>
<tr>
<td>5.</td>
<td>true</td>
</tr>
</tbody>
</table>
Chapter 24

24.4 Answers of Review Questions: True/False

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

24.5 Answers of Review Questions: Multiple Choice

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

24.6 Answers of Review Exercises

1. Solution

```python
i = 3
while True:
    i -= 1
    if i > 0: break
print("The end")
```

2. Solution

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>i</th>
<th>x</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>i = 3</td>
<td>3</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>x = 0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>while i &gt;= 0:</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>i -= 1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>x += i</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>while i &gt;= 0:</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>i -= 1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>x += i</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>while i &gt;= 0:</td>
<td>True</td>
<td></td>
</tr>
</tbody>
</table>
It performs 4 iterations

3. Solution

It performs an infinite number of iterations

4. Solution
5. Solution

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>x</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a = 1</td>
<td>1</td>
<td>?</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>b = 1</td>
<td>1</td>
<td>1</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td>c = 0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>4</td>
<td>d = 0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>?</td>
</tr>
<tr>
<td>5</td>
<td>while b &lt; 2:</td>
<td>True</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>x = a + b</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>if x % 2 != 0:</td>
<td>False</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>d = d + 1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
6. Solution

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

7. Solution

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
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<td>y = 5</td>
<td>?</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>x = 38</td>
<td>38</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>y *= 2</td>
<td>38</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>x += 1</td>
<td>39</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>print(y)</td>
<td></td>
<td>10 is displayed</td>
</tr>
<tr>
<td>6</td>
<td>if y &gt;= x: break</td>
<td></td>
<td>False</td>
</tr>
<tr>
<td>7</td>
<td>y *= 2</td>
<td>39</td>
<td>20</td>
</tr>
<tr>
<td>8</td>
<td>x += 1</td>
<td>40</td>
<td>20</td>
</tr>
<tr>
<td>9</td>
<td>print(y)</td>
<td></td>
<td>20 is displayed</td>
</tr>
<tr>
<td>10</td>
<td>if y &gt;= x: break</td>
<td></td>
<td>False</td>
</tr>
<tr>
<td>11</td>
<td>y *= 2</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>12</td>
<td>x += 1</td>
<td>41</td>
<td>40</td>
</tr>
<tr>
<td>13</td>
<td>print(y)</td>
<td></td>
<td>40 is displayed</td>
</tr>
<tr>
<td>14</td>
<td>if y &gt;= x: break</td>
<td></td>
<td>False</td>
</tr>
<tr>
<td>15</td>
<td>y *= 2</td>
<td>41</td>
<td>80</td>
</tr>
</tbody>
</table>
8. Solution

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>Notes</th>
<th>x</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>x = 1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>if x % 2 == 0:</td>
<td>False</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>x += 3</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>print(x)</td>
<td>4 is displayed</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>if x &gt;= 12: break</td>
<td>False</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>if x % 2 == 0:</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>x += 1</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>print(x)</td>
<td>5 is displayed</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>if x &gt;= 12: break</td>
<td>False</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>if x % 2 == 0:</td>
<td>False</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>x += 3</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>12</td>
<td>print(x)</td>
<td>8 is displayed</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>if x &gt;= 12: break</td>
<td>False</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>if x % 2 == 0:</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>x += 1</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>16</td>
<td>print(x)</td>
<td>9 is displayed</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>if x &gt;= 12: break</td>
<td>False</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>if x % 2 == 0:</td>
<td>False</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>x += 3</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>20</td>
<td>print(x)</td>
<td>12 is displayed</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>if x &gt;= 12: break</td>
<td>True</td>
<td></td>
</tr>
</tbody>
</table>

9. Solution

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>y = 2</td>
<td>?</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>x = 0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>y = y ** 2</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>if x &lt; 256:</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>x = x + y</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>print(x, &quot;,&quot;, y)</td>
<td>4, 4 is displayed</td>
<td></td>
</tr>
</tbody>
</table>
### 10. Solution

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>x</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a = 2</td>
<td>2</td>
<td>?</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>b = 4</td>
<td>2</td>
<td>4</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td>c = 0</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>4</td>
<td>d = 0</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>?</td>
</tr>
<tr>
<td>5</td>
<td>x = a + b</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>if x % 2 != 0:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>False</td>
</tr>
<tr>
<td>7</td>
<td>elif d % 2 == 0:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>True</td>
</tr>
<tr>
<td>8</td>
<td>d = d + 5</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>9</td>
<td>a = b</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>10</td>
<td>b = d</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>11</td>
<td>if c &gt;= 11: break</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>False</td>
</tr>
<tr>
<td>12</td>
<td>x = a + b</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>13</td>
<td>if x % 2 != 0:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>True</td>
</tr>
<tr>
<td>14</td>
<td>c = c + 5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>15</td>
<td>a = b</td>
<td></td>
<td>b</td>
<td>5</td>
<td>5</td>
<td>9</td>
</tr>
</tbody>
</table>
Chapter 24

11. Solution

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

12. Solution

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

13. Solution

```python
n = int(input())
total = 0
i = 1
while i <= n:
    # code
```
a = float(input())
total = total + a
i += 1

print(total)
if n > 0:
    print(total / n)

14. Solution

n = int(input())
p = 1
i = 1
while i <= n:
a = int(input())
    if a % 2 == 0:
p = p * a
    i += 1
print(p)

15. Solution

total = 0
i = 1
while i <= 100:
a = int(input())
    if a % 10 == 0:
total = total + a
    i += 1
print(total)

16. Solution

total = 0
i = 1
while i <= 20:
a = int(input())
    if 100 <= a <= 999:
total = total + a
    i += 1
print(total)

17. Solution

p = 1
a = float(input())
while a != 0:
p = p * a
    a = float(input())
### 18. Solution

```python
population = 30000

years = 0
while population <= 100000:
    population += population * 0.03
    years += 1

print(years)
```
19. Solution

```python
i = 1
sum_even = 0
sum_odd = 0

while True:
    a = int(input())
    if a % 2 == 0:
        sum_even += a
    else:
        sum_odd += a
    i += 1
    if i > 50: break

print(sum_odd, sum_even)
```

20. Solution

```python
n = int(input())
i = 1
p = 1

while True:
    a = int(input())
    if a < 0:
        p *= a
    i += 1
    if i > n: break

print(abs(p))
```
21. Solution

```python
i = 1
p = 1
while True:
    a = int(input("Enter an integer: "))
    if 500 <= a <= 599:
        p *= a
    i += 1
    if i > 5: break
print(p)
```

22. Solution

```python
population = 50000
years = 0
while population >= 20000:
    population -= population * 0.10
    years += 1
print(years)
```
Chapter 25

25.3 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

25.4 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

25.5 Answers of Review Exercises

1. Solution

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>a</th>
<th>b</th>
<th>j</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a = 0</td>
<td>0</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>b = 0</td>
<td>0</td>
<td>0</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td>j = 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>if j &lt; 5:</td>
<td>True</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>b += 1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>j = 2</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>if j &lt; 5:</td>
<td>True</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>b += 1</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>j = 4</td>
<td>0</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>if j &lt; 5:</td>
<td>True</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>b += 1</td>
<td>0</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>12</td>
<td>j = 6</td>
<td>0</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>13</td>
<td>if j &lt; 5:</td>
<td>False</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>a += j - 1</td>
<td>5</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>15</td>
<td>j = 8</td>
<td>5</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>16</td>
<td>if j &lt; 5:</td>
<td>False</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>a += j - 1</td>
<td>12</td>
<td>3</td>
<td>8</td>
</tr>
</tbody>
</table>
2. **Solution**

For input value of 10

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>a</th>
<th>b</th>
<th>j</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><code>a = int(input())</code></td>
<td>10</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td><code>b = a</code></td>
<td>10</td>
<td>10</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td><code>j = a - 5</code></td>
<td>10</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td><code>if j % 2 != 0:</code></td>
<td>True</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td><code>b = a + j + 5</code></td>
<td>10</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td><code>j = 7</code></td>
<td>10</td>
<td>20</td>
<td>7</td>
</tr>
<tr>
<td>7</td>
<td><code>if j % 2 != 0:</code></td>
<td>True</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td><code>b = a + j + 5</code></td>
<td>10</td>
<td>22</td>
<td>7</td>
</tr>
<tr>
<td>9</td>
<td><code>j = 9</code></td>
<td>10</td>
<td>22</td>
<td>9</td>
</tr>
<tr>
<td>10</td>
<td><code>if j % 2 != 0:</code></td>
<td>True</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td><code>b = a + j + 5</code></td>
<td>10</td>
<td>24</td>
<td>9</td>
</tr>
<tr>
<td>12</td>
<td><code>print(b)</code></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For input value of 21

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>a</th>
<th>b</th>
<th>j</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><code>a = int(input())</code></td>
<td>21</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td><code>b = a</code></td>
<td>21</td>
<td>21</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td><code>j = a - 5</code></td>
<td>21</td>
<td>21</td>
<td>16</td>
</tr>
<tr>
<td>4</td>
<td><code>if j % 2 != 0:</code></td>
<td>False</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td><code>b = a - j</code></td>
<td>21</td>
<td>5</td>
<td>16</td>
</tr>
<tr>
<td>6</td>
<td><code>j = 18</code></td>
<td>21</td>
<td>5</td>
<td>18</td>
</tr>
<tr>
<td>7</td>
<td><code>if j % 2 != 0:</code></td>
<td>False</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td><code>b = a - j</code></td>
<td>21</td>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>9</td>
<td><code>j = 20</code></td>
<td>21</td>
<td>3</td>
<td>20</td>
</tr>
<tr>
<td>10</td>
<td><code>if j % 2 != 0:</code></td>
<td>False</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td><code>b = a - j</code></td>
<td>21</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>12</td>
<td><code>print(b)</code></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. **Solution**

For input value of 12

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>a</th>
<th>x</th>
<th>y</th>
<th>j</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><code>a = int(input())</code></td>
<td>12</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
</tbody>
</table>
```python
j = 2
x = j * 3 + 3
y = j * 2 + 10
if y - x > 0 or x > 30:
    True
y *= 2
x += 4
print(x, ',', y)
j = 5
x = j * 3 + 3
y = j * 2 + 10
if y - x > 0 or x > 30:
    True
y *= 2
x += 4
print(x, ',', y)
j = 8
x = j * 3 + 3
y = j * 2 + 10
if y - x > 0 or x > 30:
    False
x += 4
print(x, ',', y)
j = 11
x = j * 3 + 3
y = j * 2 + 10
if y - x > 0 or x > 30:
    True
y *= 2
x += 4
print(x, ',', y)
```

### 4. Solution

i. 9
ii. 20
iii. -7
iv. -1
5. Solution

```python
p = 1
total = 0
for i in range(20):
    a = float(input("Enter a number: "))
    p = p * a
    total = total + a
print(p, total / 20)
```

6. Solution

```python
import math

deg = int(input("Enter degrees: "))
for i in range(0, deg * 10 + 5, 5):
    print(math.sin((i / 10) * math.pi / 180))
```
Total Solution

```python
total = 0
for i in range(30):
    a = int(input("Enter a four-digit integer: "))
    digit1 = a // 1000
    digit4 = a % 10
    if digit1 == 5 and digit4 == 3:
        total += a
print(total)
```
8. Solution

```python
n = int(input("Enter N: "))
count = 0
for i in range(n):
    a = int(input("Enter an integer: "))
    if a % 2 == 0:
        count += 1

if count > 0:
    print(count)
else:
    print("You entered no even integers")
```
9. Solution

sum_even ← 0
sum_odd ← 0
count_even ← 0
count_odd ← 0

Start

For i in [0, 1, ..., 49]

Write "Enter an integer"

Read a

If a MOD 2 == 0

sum_odd ← sum_odd + a
count_odd ← count_odd + 1

Else

sum_even ← sum_even + a
count_even ← count_even + 1

End

For i in range(50):
    a = int(input("Enter an integer: "))
    if a % 2 == 0:
        sum_even += a
        count_even += 1
    else:
        sum_odd += a
        count_odd += 1

End

sum_even = 0
sum_odd = 0
count_even = 0
count_odd = 0
if count_even > 0:
    print(sum_even / count_even)
if count_odd > 0:
    print(sum_odd / count_odd)

10. Solution

```python
start = int(input("Enter start value: "))
finish = int(input("Enter finish value: "))
if start > finish:          # Or you can do the following:
c = start               # start, finish = finish, start
    start = finish
    finish = c
for i in range(start, finish + 1):
    print(i)
```
11. Solution

```
start = int(input("Enter start value: "))
finish = int(input("Enter finish value: "))

if start > finish:
c = start
start = finish
finish = c

for i in range(start, finish + 1):
    if i % 5 == 0:
        print(i)
```

12. Solution

First Approach

```
base = float(input("Enter a value for base: "))
exp = int(input("Enter an integer for exponent: "))

p = 1
if exp >= 0:
    for i in range(exp):
        p *= base
else:
    for i in range(-exp):
        p *= 1 / base

print(p)
```
Second Approach

```python
base = float(input("Enter a value for base: "))
exp = int(input("Enter an integer for exponent: "))

p = 1
for i in range(abs(exp)):
    p *= base

if exp < 0:
    p = 1 / p
print(p)
```

13. Solution

```python
msg = input("Enter a message: ")

characters = len(msg)
count = 0
for i in range(characters):
    if msg[i] == " ":
        count += 1

words = count + 1
print("The message entered contains", words, "words")
```

14. Solution

```python
msg = input("Enter a message: ")

characters = len(msg)
count = 0
for i in range(characters):
    if msg[i] == " ":
        count += 1

words = count + 1
print("The average number of letters in each word is", (characters - count) / words)
```
Chapter 26

26.3 Answers of Review Questions: True/False

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

26.4 Answers of Review Questions: Multiple Choice

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

26.5 Answers of Review Exercises

1. Solution

   i. 10
   ii. 50
   iii. -7
   iv. 138

2. Solution

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>a</th>
<th>i</th>
<th>j</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a = 1</td>
<td>1</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>j = 1</td>
<td>1</td>
<td>?</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>j &lt;= 2</td>
<td>True</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>i = 10</td>
<td>1</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>i &lt; 30</td>
<td>True</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3. **Solution**

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>s</th>
<th>i</th>
<th>j</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>s = 0</td>
<td>0</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>i = 1</td>
<td>0</td>
<td>1</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td>j = 3</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>s = s + i * j</td>
<td>3</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>
5 \begin{align*}
& j = 2 \\
& s = s + i \times j \\
& j = 1 \\
& s = s + i \times j \\
& i = 2 \\
& j = 3 \\
& s = s + i \times j \\
& j = 2 \\
& s = s + i \times j \\
& i = 3 \\
& j = 3 \\
& s = s + i \times j \\
& i = 4 \\
& \text{print(s)} \quad \text{25 is displayed}
\end{align*}

The statement \( s = s + i \times j \) is executed 6 times

4. **Solution**

For input value of "NO"

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>s</th>
<th>y</th>
<th>i</th>
<th>ans</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>s = 1</td>
<td>1</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>y = 25</td>
<td>1</td>
<td>25</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td>i = 1</td>
<td>1</td>
<td>25</td>
<td>1</td>
<td>?</td>
</tr>
<tr>
<td>4</td>
<td>s = s + y</td>
<td>26</td>
<td>25</td>
<td>1</td>
<td>?</td>
</tr>
<tr>
<td>5</td>
<td>y -= 5</td>
<td>26</td>
<td>20</td>
<td>1</td>
<td>?</td>
</tr>
<tr>
<td>6</td>
<td>i = 2</td>
<td>26</td>
<td>20</td>
<td>2</td>
<td>?</td>
</tr>
<tr>
<td>7</td>
<td>s = s + y</td>
<td>46</td>
<td>20</td>
<td>2</td>
<td>?</td>
</tr>
<tr>
<td>8</td>
<td>y -= 5</td>
<td>46</td>
<td>15</td>
<td>2</td>
<td>?</td>
</tr>
<tr>
<td>9</td>
<td>i = 3</td>
<td>46</td>
<td>15</td>
<td>3</td>
<td>?</td>
</tr>
<tr>
<td>10</td>
<td>s = s + y</td>
<td>61</td>
<td>15</td>
<td>3</td>
<td>?</td>
</tr>
<tr>
<td>11</td>
<td>y -= 5</td>
<td>61</td>
<td>10</td>
<td>3</td>
<td>?</td>
</tr>
<tr>
<td>12</td>
<td>ans = input()</td>
<td>61</td>
<td>10</td>
<td>3</td>
<td>&quot;NO&quot;</td>
</tr>
<tr>
<td>13</td>
<td>if ans != &quot;YES&quot;: break</td>
<td>True</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>\text{print(s)}</td>
<td>61</td>
<td></td>
<td></td>
<td>is displayed</td>
</tr>
</tbody>
</table>
### For input values of “YES”, “NO”

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>s</th>
<th>y</th>
<th>i</th>
<th>ans</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>s = 1</td>
<td>1</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>y = 25</td>
<td>25</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td>i = 1</td>
<td>1</td>
<td>25</td>
<td>1</td>
<td>?</td>
</tr>
<tr>
<td>4</td>
<td>s = s + y</td>
<td>26</td>
<td>25</td>
<td>1</td>
<td>?</td>
</tr>
<tr>
<td>5</td>
<td>y -= 5</td>
<td>20</td>
<td>1</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>6</td>
<td>i = 2</td>
<td>26</td>
<td>20</td>
<td>2</td>
<td>?</td>
</tr>
<tr>
<td>7</td>
<td>s = s + y</td>
<td>46</td>
<td>20</td>
<td>2</td>
<td>?</td>
</tr>
<tr>
<td>8</td>
<td>y -= 5</td>
<td>15</td>
<td>2</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>9</td>
<td>i = 3</td>
<td>15</td>
<td>3</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>10</td>
<td>s = s + y</td>
<td>61</td>
<td>15</td>
<td>3</td>
<td>?</td>
</tr>
<tr>
<td>11</td>
<td>y -= 5</td>
<td>10</td>
<td>3</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>12</td>
<td>ans = input()</td>
<td>10</td>
<td>3</td>
<td>“YES”</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>if ans != &quot; YES&quot;: break</td>
<td>False</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>i = 1</td>
<td>10</td>
<td>1</td>
<td>“YES”</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>s = s + y</td>
<td>71</td>
<td>10</td>
<td>1</td>
<td>“YES”</td>
</tr>
<tr>
<td>16</td>
<td>y -= 5</td>
<td>5</td>
<td>1</td>
<td>“YES”</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>i = 2</td>
<td>5</td>
<td>2</td>
<td>“YES”</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>s = s + y</td>
<td>76</td>
<td>5</td>
<td>2</td>
<td>“YES”</td>
</tr>
<tr>
<td>19</td>
<td>y -= 5</td>
<td>0</td>
<td>2</td>
<td>“YES”</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>i = 3</td>
<td>0</td>
<td>3</td>
<td>“YES”</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>s = s + y</td>
<td>76</td>
<td>0</td>
<td>3</td>
<td>“YES”</td>
</tr>
<tr>
<td>22</td>
<td>y -= 5</td>
<td>-5</td>
<td>3</td>
<td>“YES”</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>ans = input()</td>
<td>-5</td>
<td>3</td>
<td>“NO”</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>if ans != &quot; YES&quot;: break</td>
<td>True</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>print(s)</td>
<td>76</td>
<td></td>
<td></td>
<td>76 is displayed</td>
</tr>
</tbody>
</table>

### For input values of “YES”, “YES”, “NO”

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>s</th>
<th>y</th>
<th>i</th>
<th>ans</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>s = 1</td>
<td>1</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>y = 25</td>
<td>25</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td>i = 1</td>
<td>1</td>
<td>25</td>
<td>1</td>
<td>?</td>
</tr>
<tr>
<td>4</td>
<td>s = s + y</td>
<td>26</td>
<td>25</td>
<td>1</td>
<td>?</td>
</tr>
<tr>
<td>5</td>
<td>y -= 5</td>
<td>20</td>
<td>1</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>6</td>
<td>i = 2</td>
<td>26</td>
<td>20</td>
<td>2</td>
<td>?</td>
</tr>
<tr>
<td>7</td>
<td>s = s + y</td>
<td>46</td>
<td>20</td>
<td>2</td>
<td>?</td>
</tr>
</tbody>
</table>
5. Solution

```python
for hour in range(24):
    for minutes in range(60):
        print(hour, "\t", minutes)
```

6. Solution

```python
for i in range(5, 0, -1):
    s = s + y
    y = y - 5
    ans = input()
    if ans != "YES": break
    i = i + 1
    s = s + y
    y = y - 5
    ans = input()
    if ans != "YES": break
    i = i + 1
```
for j in range(i):
    print(i, end = "")
print()

7. Solution

for i in range(6):
    for j in range(i + 1):
        print(j, end = "")
    print()

8. Solution

for i in range(4):
    for j in range(10):
        print("* ", end = "")
    print()

9. Solution

n = int(input("Enter an integer between 3 and 20: "))
for i in range(n):
    for j in range(n):
        print("* ", end = "")
    print()

10. Solution

n = int(input("Enter an integer between 3 and 20: "))
for j in range(n):
    print("* ", end = "")
print()
for i in range(n - 2):
    print("* ", end = "")
    for j in range(n - 2):
        print(" ", end = "")
    print("* ")
for j in range(n):
    print("* ", end = "")

11. Solution

for i in range(1, 5):
    for j in range(i):
        print("* ", end = "")
    print()
for i in range(5, 0, -1):
    for j in range(i):
print(" ", end = ")
print()
Chapter 27

27.10 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

27.11 Answers of Review Questions: Multiple Choice

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

27.12 Answers of Review Exercises

1. Solution

```python
s = 0
for i in range(100):
    number = float(input())
    s = s + number
average = s / 100
print(average)
```

2. Solution

```python
s = 0
denom = 1
for j in range(1, 101):
    denom *= j
for i in range(1, 101):
    s += i / denom
print(s)
```

3. Solution

```python
import math
s = 10
i = 1
while i <= 10:
    s += math.sqrt(i)
```
4. **Solution**

```python
i += 1
print(s)
```

5. **Solution**

```python
start = int(input())
finish = int(input())
i = start
while i <= finish:
    print(i)
i += 1
```

6. **Solution**

```python
import math
x = 42
i = 0
while i <= 99:
    x = math.sqrt(x) + i
    print(x)
i += 1
```

7. **Solution**

```python
import math
s = 0
for i in range(100, 0, -5):
    s = s + math.sqrt(i)
print(s)
```

8. **Solution**

```python
import math
s = 0
y = 0
for i in range(1, 21, 3):
    s = s + math.sqrt(y + i + 3)
    y = y + (i + 3) * 2
print(s)
```
9. Solution

```python
y = 0
for i in range(1, 11, 2):
    a = float(input())
    a += i
    y = y + (a + i + 2) ** 3
print(y)
```

10. Solution

This conversion cannot be carried out in Python.

11. Solution

This conversion cannot be carried out in Python.

12. Solution

```python
x = 0
for y in range(-10, 10):
    x = x + 2 ** y
print(x)
```

13. Solution

This conversion cannot be carried out in Python.

14. Solution

```python
for i in range(1, 5):
    for j in range(1, 5):
        print(i, "x", j, ",=", i * j)
```

15. Solution

```python
print("\t\t", end = "")
for i in range(1, 13):
    print(i, "\t", end = "")
print()
for i in range(1, 13):
    print("--------", end = "")
print()
for i in range(1, 13):
    print(i, "\t\t", end = "")
    for j in range(1, 13):
        print(i * j, end = "\t")
    print()```
Chapter 28

28.4 Answers of Review Exercises

1. **Solution**

   ![Flowchart for Solution 1]

2. **Solution**

   ![Flowchart for Solution 2]
3. **Solution**

```
Start
Read a, b
For i in [a, a + 1, ... b]
  Write i
End
```

4. **Solution**

```
Start
i ← 35
i > -35
  True
    Write 2 * i
    True
    Write 3 * i
    False
End
```

```
False
  i MOD 2 == 0
    True
      Write 2 * i
End
```

```
False
  i ← i - 1
```
5. **Solution**

\[
i \leftarrow -20
\]
\[
\text{Start}
\]
\[
i \leftarrow i + 1
\]
\[
x \equiv 0
\]
\[
\text{True}
\]
\[
\text{Read} \ x
\]
\[
x \equiv 0
\]
\[
\text{False}
\]
\[
\text{Write} \ "Zero"
\]
\[
x \text{ MOD 2 } \equiv 0
\]
\[
\text{True}
\]
\[
\text{Write} \ 2 \times i
\]
\[
x \text{ MOD 2 } \equiv 0
\]
\[
\text{False}
\]
\[
\text{Write} \ 3 \times i
\]
\[
i > 20
\]
\[
\text{False}
\]
\[
\text{End}
\]

6. **Solution**

\[
i \leftarrow 0
\]
\[
\text{Start}
\]
\[
\text{Read} \ a
\]
\[
a > 0
\]
\[
\text{True}
\]
\[
\text{Write} \ "Non-Positive Entered"
\]
\[
\text{Write} \ i
\]
\[
i \leq a
\]
\[
\text{True}
\]
\[
i \leftarrow i + 5
\]
\[
i \leftarrow i + 5
\]
\[
\text{End}
\]
7. Solution

```
Start

Read a

i ← 0

i ≤ a

i ← i + 1

True

False

Read

a

i ≥ 10

Write

2 * i - i / 3

i ← i - 3

i < a

False

True

i ≤ a

Write

3 * i + i / 2

i ← i + 1

True

False

End
```
8. Solution

Start

Read a

a > 0

True

For i in [0, 1, ..., a]

Write 3 * i + i / 2

False

a == 0

True

Read b

b > 0

False

Read b

Write 2 * a + b

b < 0

Read b

i ← a

Write i

For i in [a, a + 1, ..., b]

Write i

End
9. Solution

Start
Read $a, b, c, d$

$\text{total} \leftarrow 0$
$i \leftarrow a$

For $i$ in $[a, a + 1, \ldots, b - 1]$

For $j$ in $[c, c + 2, \ldots, d - 1]$

$\text{total} \leftarrow \text{total} + i + j$

Write total

End

10. Solution

Start
$s \leftarrow 0$

For $i$ in $[1, 2, \ldots, 50]$

Read $n$

$n \geq 0$
False
False
$s \leftarrow s + \sqrt{n}$

Write $s$

End
11. Solution

12. Solution
13. **Solution**

```python
i = 1
while True:
    print(i)
    i += 5
    if i > 500: break
print("The End")
```

14. **Solution**

```python
i = 0
a = int(input())
while True:
    if i % 2 != 0:
        print(i)
    i += 5
    if i >= a: break
```

15. **Solution**

```python
a = int(input())
while a != -1:
    while True:
        b = int(input())
        if b > a: break
    i = a
    while i <= b:
        print(i)
        i += 1
    a = int(input())
```

16. **Solution**

```python
i = 1
S = 0
P = 1
a = 0
while True:
    if i < 45:
        S += a
    else:
        P *= a
    i += 1
    if i >= 90: break
a = float(input())
print(S, P)
```
Chapter 29

29.7 Answers of Review Questions: True/False

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

29.8 Answers of Review Exercises

1. Solution

```python
s = 0
for i in range(1, 101, 2):
    s += i
print(s)
```

2. Solution

```python
n = int(input())
p = 1
for i in range(2, 2 * n + 2, 2):
    p *= i ** (i - 1)
print(p)
```

3. Solution

```python
s = 0
i = 1
offset = 0
while i <= 191:
    s += i
    offset += 1
    i += offset
print(s)
```
4. Solution

```python
total_num = int(input())
total = 0
count = 0
for i in range(total_num):
    grade = int(input())
    if 90 <= grade <= 100:
        total += grade
        count += 1
if count > 0:
    print(total / count)
```
5. **Solution**

```python
count = 0
count_zeros = 0
total = 0

while True:
    a = float(input("Enter a numeric, non-negative value: "))
    if a == 0:
        count_zeros += 1
        count += 1
        total += a
    if total / count > 3000: break

print(count_zeros)
```
6. Solution

First Approach

```python
a = int(input("Enter an integer between 1 and 20: "))
for i in range(1000, 10000):
    d4 = i % 10
    r = i // 10
    d3 = r % 10
    r = r // 10
    d2 = r % 10
    d1 = r // 10
    if d1 + d2 + d3 + d4 < a:
        print(i)
```

However, using the `divmod()` function, it can become:

```python
a = int(input("Enter an integer between 1 and 20: "))
for i in range(1000, 10000):
    r, d4 = divmod(i, 10)
    r, d3 = divmod(r, 10)
    d1, d2 = divmod(r, 10)
    if d1 + d2 + d3 + d4 < a:
        print(i)
```

Second Approach

```python
a = int(input("Enter an integer between 1 and 20: "))
a = int(input("Enter an integer between 1 and 20: "))
for d1 in range(1, 10):
    for d2 in range(10):
        for d3 in range(10):
            for d4 in range(10):
                if d1 + d2 + d3 + d4 < a:
                    print(d1 * 1000 + d2 * 100 + d3 * 10 + d4)
```

Third Approach

```python
a = int(input("Enter an integer between 1 and 20: "))
for i in range(1000, 10000):
    d1, d2, d3, d4 = str(i)  # d1, d2, d3, d4 are strings
    if int(d1) + int(d2) + int(d3) + int(d4) < a:  # In order to sum the digits, convert to integer
        print(i)
```

7. Solution

First Approach

```python
for i in range(1000, 10000):
    d1 = i // 1000
    r = i % 1000
    d2 = r // 100
    r = r % 100
    d3 = r // 10
    d4 = r % 10
    if d1 > d2 and d2 == d3 and d3 < d4:
        print(i)
```
However, using the `divmod()` function, it can become:

```python
for i in range(1000, 10000):
    d1, r = divmod(i, 1000)
    d2, r = divmod(r, 100)
    d3, d4 = divmod(r, 10)
    if d1 > d2 and d2 == d3 and d3 < d4:
        print(i)
```

**Second Approach**

```python
for d1 in range(1, 10):
    for d2 in range(10):
        for d3 in range(10):
            for d4 in range(10):
                if d1 > d2 and d2 == d3 and d3 < d4:
                    print(d1 * 1000 + d2 * 100 + d3 * 10 + d4)
```

**Third Approach**

```python
for i in range(1000, 10000):
    d1, d2, d3, d4 = str(i)  # d1, d2, d3, d4 are strings
    if d1 > d2 and d2 == d3 and d3 < d4:
        # No need to convert to integer. Compare them as strings
        print(i)
```

### 8. Solution

```python
inp = input()
while not re.match(IS_NUMERIC, inp) or int(inp) != 1 and int(inp) != 0:
    print("Error")
    inp = input()
x = int(inp)
```

### 9. Solution

```python
while True:
    sex = input()
    if sex.upper() == "M" or sex.upper() == "F": break
```

### 10. Solution

```python
import re
import math
IS_NUMERIC = "^[^-+]?\d+(\.\d+)?$"

inp = input("Enter a non-negative number: ")
count = 1
while not re.match(IS_NUMERIC, inp) or int(inp) < 0:
    print("Error: Invalid number!")
    inp = input("Enter a non-negative number: ")
    if not re.match(IS_NUMERIC, inp) or int(inp) < 0:
        count += 1
        if count == 3: break
    if count < 3:
        x = int(inp)
```
y = math.sqrt(x)
    print(y)
else:
    print("Dude, you are dumb!")

11. Solution

import math

while True:
    r = float(input("Enter the length of a radius: "))
    while r <= 0:
        r = float(input("Invalid radius. Enter the length of a radius: "))
    area = math.pi * r ** 2
    print("The area is:", area)

    answer = input("Would you like to repeat? ")
    if answer.upper() != "YES": break

12. Solution

for x in range(-100, 101):
    for y in range(-100, 101):
        if 5 * x + 3 * y ** 2 == 0:
            print(x, ",", y)

13. Solution

for x in range(-10, 11):
    for y in range(-10, 11):
        for z in range(-10, 11):
            if (x + y) / 2 + 3 * z ** 2 / (x + 3 * y + 45) == x / 3:
                print(x, ",", y, ",", z)

14. Solution

m1 = int(input())
m2 = int(input())
m3 = int(input())

s = 0
while m2 != 0:
    if m2 % 2 != 0:
        s += m1
    m1 *= 2
    m2 = m2 // 2

m1 = s
m2 = m3
s = 0
while m2 != 0:
if m2 % 2 != 0:
    s += m1
    m1 *= 2
    m2 = m2 // 2

print(s)

15. Solution

a = int(input("Enter an integer greater than 1: "))
while a < 2:
    a = int(input("Wrong number. Please enter an integer greater than 1: "))

b = int(input("Enter a second integer greater than 1: "))
while b < 2:
    b = int(input("Wrong number. Please enter a second integer greater than 1: "))

if a > b:
    a, b = b, a
for x in range(a, b + 1):
    number_of_divisors = 2
    i = 2
    while i <= x // 2 and number_of_divisors == 2:
        if x % i == 0:
            number_of_divisors += 1
            i += 1
    if number_of_divisors == 2:
        print("Number", x, "is prime")

16. Solution

First Approach

import re
IS_NUMERIC = "^[+-]?\d+\.\d+?$"

inp = input("Enter a four-digit integer: ")
while not re.match(IS_NUMERIC, inp) or int(inp) < 1000 or int(inp) > 9999:
    inp = input("Wrong number. Please enter a four-digit integer: ")
a = int(inp)

inp = input("Enter a second four-digit integer: ")
while not re.match(IS_NUMERIC, inp) or int(inp) < 1000 or int(inp) > 9999:
    inp = input("Wrong number. Please enter a second four-digit integer: ")
b = int(inp)

if a > b:
    c = a  # Or you can do the following:
    a = b  # a, b = b, a
    b = c
for x in range(a, b + 1):
    r, d4 = divmod(x, 10)
r, d3 = divmod(r, 10)
d1, d2 = divmod(r, 10)

if d1 == d4 and d2 == d3:
    print(x)

Second Approach

import re

IS_NUMERIC = "^[+-]?\d+\.\d+)?$"

inp = input("Enter a four-digit integer: ")
while not re.match(IS_NUMERIC, inp) or int(inp) < 1000 or int(inp) > 9999:
    inp = input("Wrong number. Please enter a four-digit integer: ")
a = int(inp)

inp = input("Enter a second four-digit integer: ")
while not re.match(IS_NUMERIC, inp) or int(inp) < 1000 or int(inp) > 9999:
    inp = input("Wrong number. Please enter a second four-digit integer: ")
b = int(inp)

if a > b:
    a, b = b, a

for x in range(a, b + 1):
    if str(x) == str(x)[::-1]:
        print(x)

17. Solution

for i in range(31):
    print(2 ** i)

18. Solution

offset = 10
i = 1
while i <= 401:
    print(i)
    i += offset
    offset += 2

19. Solution

for i in range(1, 101):
    print(-i, "\n", i)

20. Solution

First Approach

value = 0
for i in range(8):
    offset = 10 ** i
    value += offset
21. Solution

First Approach

```python
a = int(input())

fib_prev_prev = 0
fib_prev = 1
fib = 1
for i in range(a):
    print(fib)
    fib = fib_prev + fib_prev_prev
    fib_prev_prev = fib_prev
    fib_prev = fib
```

Second Approach

```python
a = int(input())

fib_prev_prev, fib_prev, fib = 0, 1, 1
for i in range(a):
    print(fib)
    fib = fib_prev + fib_prev_prev
    fib_prev_prev, fib_prev = fib_prev, fib
```

22. Solution

First Approach

```python
a = int(input())

fib_prev_prev = 0
fib_prev = 1
fib = 1
while fib < a:
    print(fib)
    fib = fib_prev + fib_prev_prev
    fib_prev_prev = fib_prev
    fib_prev = fib
```

Second Approach

```python
a = int(input())

fib_prev_prev, fib_prev, fib = 0, 1, 1
while fib < a:
    print(fib)
    fib = fib_prev + fib_prev_prev
    fib_prev_prev, fib_prev = fib_prev, fib
```
Chapter 29

23. Solution

```python
import re
IS_NUMERIC = "^[\+-]?\d+(\.\d+)?$"

inp = input("Enter a positive integer: ")
while not re.match(IS_NUMERIC, inp) or int(inp) < 1:
    inp = input("Wrong number. Please enter a positive integer: ")
n = int(inp)
nominator = 0
for i in range(2, 2 * n + 2, 2):
    nominator += i
denominator = 1
for i in range(1, n + 1):
    denominator *= i

y = nominator / denominator
print(y)
```

24. Solution

```python
import re
IS_NUMERIC = "^[\+-]?\d+(\.\d+)?$"

inp = input("Enter a positive integer: ")
while not re.match(IS_NUMERIC, inp) or int(inp) < 1:
    inp = input("Wrong number. Please enter a positive integer: ")
n = int(inp)
nominator = 0
sign = 1
for i in range(1, 2 * n + 1 + 2, 2):
    nominator += sign * i
    sign = -sign

y = nominator / n
print(y)
```

25. Solution

```python
import re
IS_NUMERIC = "^[\+-]?\d+(\.\d+)?$"

inp = input("Enter a positive integer: ")
while not re.match(IS_NUMERIC, inp) or int(inp) < 1:
    inp = input("Wrong number. Please enter a positive integer: ")
n = int(inp)
y = 0.5  #This is equal to the first two terms: 1 - 1 / 2
sign = 1
```
Chapter 29

for i in range(3, n + 2, 2):
    y += sign / i
    sign = -sign

print(y)

26. Solution

import re
IS_NUMERIC = "^[+-]?\d+(\.\d+)?$"

inp = input("Enter a positive integer: ")
while not re.match(IS_NUMERIC, inp) or int(inp) < 1:
    inp = input("Wrong number. Please enter a positive integer: ")
n = int(inp)
y = 0
for i in range(1, n + 1):
    y += 1 / i ** (n - i + 1)

print(y)

27. Solution

n = int(input("Enter a non-negative integer: "))

factorial = 1
for i in range(1, n + 1):
    factorial *= i

print(factorial)

Notice: Please note that this Python code operates properly for all non-negative integers, including zero.

28. Solution

First Approach

ACCURACY = 0.00001

x = float(input())

exponential = 0
i = 0
while True:
    exponential_previous = exponential
    factorial = 1
    for j in range(1, i + 1):
        factorial *= j
    exponential += x ** i / factorial
    i += 1
if abs(exponential - exponential_previous) <= ACCURACY: break
print("e", x, ") ~="), exponential

**Second Approach**

```python
ACCURACY = 0.00001
x = float(input())
exponential = 1
i = 1
factorial = 1
while True:
exponential_previous = exponential
factorial *= i
exponential += x ** i / factorial
i += 1
if abs(exponential - exponential_previous) <= ACCURACY: break
print("e", x, ") ~="), exponential
```

**29. Solution**

**First Approach**

```python
ACCURACY = 0.00001
x = float(input())
sign = 1
sinus = 0
i = 1
while True:
sinus_previous = sinus
factorial = 1
for j in range(1, i + 1):
    factorial *= j
sinus += sign * x ** i / factorial
sign = -sign
i += 2
if abs(sinus - sinus_previous) <= ACCURACY: break
print("sin", x, ") ~="), sinus
```

**Second Approach**

```python
ACCURACY = 0.00001
x = float(input())
```
sign = -1
sinus = x
i = 3
factorial = 1
while True:
    sinus_previous = sinus
    factorial *= i * (i - 1)
    sinus += sign * x ** i / factorial
    sign = -sign
    i += 2
    if abs(sinus - sinus_previous) <= ACCURACY: break
print("sin", x, "\approx", sinus)

30. Solution

First Approach

ACCURACY = 0.00001
x = float(input())

sign = 1
cosinus = 0
i = 0
while True:
    cosinus_previous = cosinus
    factorial = 1
    for j in range(1, i + 1):
        factorial *= j
    cosinus += sign * x ** i / factorial
    sign = -sign
    i += 2
    if abs(cosinus - cosinus_previous) <= ACCURACY: break
print("cos", x, "\approx", cosinus)

Second Approach

ACCURACY = 0.00001
x = float(input())

sign = -1
cosinus = 1
i = 2
factorial = 1
while True:
    cosinus_previous = cosinus
factorial *= i * (i - 1)

cosinus += sign * x ** i / factorial

sign = -sign
i += 2
if abs(cosinus - cosinus_previous) <= ACCURACY: break

print("cos", x, ") ~", cosinus)

31. Solution

import re
IS_NUMERIC = "^[\-+]?\d+(\.\d+)?$"

maximum = -460
total = 0
for i in range(31):
    while True:
        inp = input("Enter temperature for day " + str(i + 1) + ": ")

        failure = False
        if not re.match(IS_NUMERIC, inp):
            print("Please enter numeric values!")
            failure = True
        elif float(inp) < -459.67:
            print("Please enter a value greater than 459.67")
            failure = True
        if failure == False: break
    t = float(inp)
    total += t
    if t > maximum:
        maximum = t

print(total / 31, maximum)

32. Solution

level = float(input())
if level != 9999:
    hour = int(input())
    minutes = int(input())
    maximum = level
    max_hour = hour
    max_minutes = minutes
    minimum = level
    min_hour = hour
    min_minutes = minutes
    level = float(input())
while level != 9999:
    hour = int(input())
    minutes = int(input())
    if level > maximum:
        maximum = level
        max_hour = hour
        max_minutes = minutes
    if level < minimum:
        minimum = level
        min_hour = hour
        min_minutes = minutes
    level = float(input())
print(maximum, max_hour, max_minutes, minimum, min_hour, min_minutes)

33. Solution

import string
import re
IS_NUMERIC = "^[\-+]?\d+(\.\d+)?$"
alphabet = string.ascii_lowercase
while True:
    inp = input("Enter an integer between 1 and 26: ")
    failure = False
    if not re.match(IS_NUMERIC, inp):
        print("Please enter numeric values!")
        failure = True
    elif int(inp) < 1:
        print("Please enter positive integers!")
        failure = True
    elif int(inp) > 26:
        print("Please enter a value less than or equal to 26!")
        failure = True
    if failure == False: break
    a = int(inp)
while True:
    inp = input("Enter an integer between 1 and 26: ")
    failure = False
    if not re.match(IS_NUMERIC, inp):
        print("Please enter numeric values!")
        failure = True
    elif int(inp) < 1:
        print("Please enter positive integers!")
        failure = True
    elif int(inp) > 26:
        print("Please enter a value less than or equal to 26!")
34. Solution

```python
import random

secret_number = random.randrange(1, 101)

attempts = 1
guess = int(input("Enter a guess: "))
while guess != secret_number:
    if guess > secret_number:
        print("Your guess is bigger than my secret number. Try again.")
    else:
        print("Your guess is smaller than my secret number. Try again.")
    attempts += 1
    guess = int(input("Enter a guess: "))

print("You found it!")
print("Attempts:", attempts)
```

35. Solution

```python
import random

for i in range(2):
    secret_number = random.randrange(1, 101)
    attempts = 1
    guess = int(input("Enter a guess: "))
    while guess != secret_number:
        if guess > secret_number:
            print("Your guess is bigger than my secret number. Try again.")
        else:
            print("Your guess is smaller than my secret number. Try again.")
        attempts += 1
        guess = int(input("Enter a guess: "))
    print("You found it!")
    print("Attempts:", attempts)

if i == 0:
    first_player_attempts = attempts

if first_player_attempts < attempts:
    print("First player wins!")
```
elif first_player_attempts > attempts:
    print("Second player wins!")
else:
    print("It's a draw")

36. Solution

while True:
    print("1. 4/3 TV Screen")
    print("2. 16/9 TV Screen")
    print("3. Exit")
    choice = int(input("Enter a choice: "))
    if choice == 1:
        diagonal = int(input("Enter diagonal: "))
        print("Width:", diagonal * 0.8)
        print("Height:", diagonal * 0.6)
    elif choice == 2:
        diagonal = int(input("Enter diagonal: "))
        print("Width:", diagonal * 0.87)
        print("Height:", diagonal * 0.49)
    elif choice == 3: break

37. Solution

import re
IS_NUMERIC = "^[\-+]?\d+(\.\d+)?$"
inp = input("Enter total number of students: ")
while not re.match(IS_NUMERIC, inp) or int(inp) < 1:
    inp = input("Wrong number. Please enter total number of students: ")
n = int(inp)

total = 0
total_a = 0
count_a = 0
total_b = 0
count_b = 0
total_a_boys = 0
count_a_boys = 0
count_cdef_girls = 0
maximum = -1
minimum = 101
for i in range(n):
    inp = input("Enter grade for student No" + str(i + 1) + ": ")
    while not re.match(IS_NUMERIC, inp) or int(inp) < 0 or int(inp) > 100:
        inp = input("Wrong grade. Please enter grade for student No" + str(i + 1) + ": ")
    grade = int(inp)
    sex = input("Enter sex for student No" + str(i + 1) + ": ").upper()
    while sex != "M" and sex != "F": 
sex = input("Wrong sex. Please enter sex for student No" + str(i + 1) + ": ").upper()

if 90 <= grade <= 100:
    total_a += grade
    count_a += 1
    if sex == "M":
        total_a_boys += grade
        count_a_boys += 1
elif 80 <= grade <= 89:
    total_b += grade
    count_b += 1
else:
    if sex == "F":
        count_cdef_girls += 1

if grade > maximum:
    maximum = grade

if grade < minimum:
    minimum = grade

total += grade

if count_a > 0:
    print("The average value of those who got an 'A' is: ")
    print(total_a / count_a)
if count_b > 0:
    print("The average value of those who got a 'B' is: ")
    print(total_b / count_b)
if count_a_boys > 0:
    print("The average value of boys who got an 'A' is: ")
    print(total_a_boys / count_a_boys)

print("The total number of girls that got less than 'B' is: ", count_cdef_girls)
print("The highest grade is:", maximum)
print("The lowest grade is:", minimum)
print("The average grade of the whole class is:", total / n)

38. Solution

import re
IS_NUMERIC = "^[+-]?\d+\.\d+|\d+$"

while True:
    inp = input("Enter amount: ")
    while not re.match(IS_NUMERIC, inp) or float(inp) < 0:
        inp = input("Wrong amount. Please enter amount: ")
    amount = float(inp)

    if amount < 20:
        discount = 0
    elif amount < 50:
        discount = 3
    elif amount < 100:
        discount = 7
discount = 5
else:
    discount = 10

print("Discount:", discount, ",%", sep = ")
print("Amount to pay (discount included):", {amount - amount * discount / 100})

answer = input("Would you like to repeat? ")
if answer.upper() != "YES": break

39. Solution

import re
IS_NUMERIC = "^[\+-]?\d+(\.\d+)?$"
TAX_RATE = 0.25

inp = input("Enter number of Kilowatt-hours consumed: ")
while not re.match(IS_NUMERIC, inp) or int(inp) < 0 and int(inp) != -1:
    inp = input("Wrong value. Please enter number of Kilowatt-hours consumed: ")
kwh = int(inp)

while kwh != -1:
    if kwh <= 400:
        t = kwh * 0.11
    elif kwh <= 1500:
        t = 400 * 0.11 + (kwh - 400) * 0.22
    elif 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
print("Total amount to pay (taxes included):", t)

inp = input("Enter number of Kilowatt-hours consumed: ")
while not re.match(IS_NUMERIC, inp) or int(inp) < 0 and int(inp) != -1:
    inp = input("Wrong value. Please enter number of Kilowatt-hours consumed: ")
kwh = int(inp)
## 30.3 Answers of Review Questions: True/False

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

## 30.4 Answers of Review Exercises

1. **Solution**

   \[
   \text{Weights} = \begin{bmatrix} 170 \\ 190 \\ 193 \\ 165 \\ 200 \end{bmatrix} \quad \text{People} = \begin{bmatrix} 0 \\ 1 \\ 2 \\ 3 \\ 4 \end{bmatrix}
   \]

2. **Solution**

   \[
   \text{Names} = \begin{bmatrix} \text{John Thompson} \\ \text{Chloe Brown} \\ \text{Ryan Miller} \\ \text{Antony Harris} \\ \text{Alexander Lewis} \\ \text{Samantha Clark} \\ \text{Ava Parker} \end{bmatrix} \quad \text{Weights} = \begin{bmatrix} 170 \\ 190 \\ 193 \\ 165 \\ 200 \\ 170 \\ 172 \end{bmatrix} \quad \text{People} = \begin{bmatrix} 0 \\ 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \end{bmatrix}
   \]

3. **Solution**

   \[
   \text{Names} = \begin{bmatrix} \text{Toba} \\ \text{Issyk Kul} \\ \text{Baikal} \\ \text{Crater} \\ \text{Karakul} \end{bmatrix} \quad \text{Areas} = \begin{bmatrix} 440 & 438 & 437 \\ 2408 & 2405 & 2402 \\ 12248 & 12247 & 12240 \\ 21 & 20 & 18 \\ 150 & 145 & 142 \end{bmatrix} \quad \text{Months} = \begin{bmatrix} 0 & 1 & 2 \end{bmatrix} \quad \text{Lakes} = \begin{bmatrix} 0 & 1 & 2 & 3 & 4 \end{bmatrix}
   \]

   - June
   - July
   - August
4. Solution

5. Solution

Chapter 30
6. Solution

Names =

Areas =

Days

Lakes

August

July

June
Chapter 31

31.5 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

31.6 Answers of Review Questions: Multiple Choice

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

31.7 Answers of Review Exercises

1. Solution

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>x</th>
<th>a[0]</th>
<th>a[1]</th>
<th>a[2]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a = [None] * 3</td>
<td></td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td>x = 0</td>
<td>0</td>
<td>?</td>
<td>?</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>a[x + a[2]] = 4</td>
<td>0</td>
<td>?</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>a[x] = a[x + 1] * 4</td>
<td>0</td>
<td>16</td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>

2. Solution

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>x = 0</td>
<td>0</td>
<td>?</td>
<td>5</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>4</td>
<td>a[x] = 4</td>
<td>0</td>
<td>4</td>
<td>5</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>5</td>
<td>a[a[0]] = a[x + 1] % 3</td>
<td>0</td>
<td>4</td>
<td>5</td>
<td>?</td>
<td>?</td>
<td>2</td>
</tr>
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</table>
### Solution

For input value of 3

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</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td><code>a[1] = int(input())</code></td>
<td>?</td>
<td>?</td>
<td>3</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td><code>x = 0</code></td>
<td>0</td>
<td>?</td>
<td>3</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>4</td>
<td><code>a[x] = 3</code></td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>5</td>
<td><code>a[a[0]] = a[x + 1] % 2</code></td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>?</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td><code>a[a[0] % 2] = 10</code></td>
<td>0</td>
<td>3</td>
<td>10</td>
<td>?</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td><code>x += 1</code></td>
<td>1</td>
<td>3</td>
<td>10</td>
<td>?</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td><code>a[x + 1] = a[x] + 9</code></td>
<td>1</td>
<td>3</td>
<td>10</td>
<td>19</td>
<td>1</td>
</tr>
</tbody>
</table>

For input value of 4

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</thead>
<tbody>
<tr>
<td>2</td>
<td><code>a[1] = int(input())</code></td>
<td>?</td>
<td>?</td>
<td>4</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td><code>x = 0</code></td>
<td>0</td>
<td>?</td>
<td>4</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>4</td>
<td><code>a[x] = 3</code></td>
<td>0</td>
<td>3</td>
<td>4</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>5</td>
<td><code>a[a[0]] = a[x + 1] % 2</code></td>
<td>0</td>
<td>3</td>
<td>4</td>
<td>?</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td><code>a[a[0] % 2] = 10</code></td>
<td>0</td>
<td>3</td>
<td>10</td>
<td>?</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td><code>x += 1</code></td>
<td>1</td>
<td>3</td>
<td>10</td>
<td>?</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td><code>a[x + 1] = a[x] + 9</code></td>
<td>1</td>
<td>3</td>
<td>10</td>
<td>19</td>
<td>0</td>
</tr>
</tbody>
</table>

For input value of 1

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</thead>
<tbody>
<tr>
<td>2</td>
<td><code>a[1] = int(input())</code></td>
<td>?</td>
<td>?</td>
<td>1</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td><code>x = 0</code></td>
<td>0</td>
<td>?</td>
<td>1</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>4</td>
<td><code>a[x] = 3</code></td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>5</td>
<td><code>a[a[0]] = a[x + 1] % 2</code></td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>?</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td><code>a[a[0] % 2] = 10</code></td>
<td>0</td>
<td>3</td>
<td>10</td>
<td>?</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td><code>x += 1</code></td>
<td>1</td>
<td>3</td>
<td>10</td>
<td>?</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td><code>a[x + 1] = a[x] + 9</code></td>
<td>1</td>
<td>3</td>
<td>10</td>
<td>19</td>
<td>3</td>
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4. Solution

For input value of 100

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<tbody>
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<td>2</td>
<td>a[1] = int(input())</td>
<td>?</td>
<td>?</td>
<td>100</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td>x = 0</td>
<td>0</td>
<td>?</td>
<td>100</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>4</td>
<td>a[x] = 3</td>
<td>0</td>
<td>3</td>
<td>100</td>
<td>?</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>a[a[0]] = a[x + 1] % 10</td>
<td>0</td>
<td>3</td>
<td>100</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>if a[3] &gt; 5:</td>
<td>False</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>a[2] = 3</td>
<td>0</td>
<td>3</td>
<td>100</td>
<td>3</td>
<td>0</td>
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</tbody>
</table>

For input value of 108

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</thead>
<tbody>
<tr>
<td>3</td>
<td>x = 0</td>
<td>0</td>
<td>?</td>
<td>108</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>4</td>
<td>a[x] = 3</td>
<td>0</td>
<td>3</td>
<td>108</td>
<td>?</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>a[a[0]] = a[x + 1] % 10</td>
<td>0</td>
<td>3</td>
<td>108</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>if a[3] &gt; 5:</td>
<td>True</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>a[a[0]] % 2] = 9</td>
<td>0</td>
<td>3</td>
<td>9</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>x += 1</td>
<td>1</td>
<td>3</td>
<td>9</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>a[x + 1] = a[x] + 9</td>
<td>1</td>
<td>3</td>
<td>9</td>
<td>18</td>
<td>8</td>
</tr>
</tbody>
</table>

For input value of 1

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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>a[1] = int(input())</td>
<td>?</td>
<td>?</td>
<td>1</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td>x = 0</td>
<td>0</td>
<td>?</td>
<td>1</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>4</td>
<td>a[x] = 3</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>5</td>
<td>a[a[0]] = a[x + 1] % 10</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>if a[3] &gt; 5:</td>
<td>False</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>a[2] = 3</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

5. Solution

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>x</th>
<th>y</th>
<th>a[0]</th>
<th>a[1]</th>
<th>a[2]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a = [None] * 3</td>
<td>?</td>
<td>?</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>x = 4</td>
<td>4</td>
<td>?</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td>y = x - 1</td>
<td>4</td>
<td>3</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>4, 5</td>
<td>if x &gt; y:</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>?</td>
<td>?</td>
</tr>
</tbody>
</table>
a[0] = 1
else:
    a[0] = y
6   a[1] = x + 3
7   y = y - 1
8   a[y] = (x + 5) % 2

6. Solution

<table>
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<tr>
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<tbody>
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<td>1</td>
<td>a = [17, 12, 45, 12, 12, 49]</td>
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<td>if a[i] == 12:</td>
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<tr>
<td>4</td>
<td>a[i] += 1</td>
<td>0</td>
<td>18</td>
<td>12</td>
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<td>if a[i] == 12:</td>
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<td>7</td>
<td>a[i] = 1</td>
<td>1</td>
<td>18</td>
<td>11</td>
<td>45</td>
<td>12</td>
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<tr>
<td>8</td>
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<td>9</td>
<td>if a[i] == 12:</td>
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<td></td>
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</tr>
<tr>
<td>10</td>
<td>a[i] += 1</td>
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<td>18</td>
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<td>46</td>
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</tr>
<tr>
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<td>46</td>
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<td>12</td>
<td>49</td>
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<tr>
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<td>if a[i] == 12:</td>
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<td></td>
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<tr>
<td>13</td>
<td>a[i] = 1</td>
<td>3</td>
<td>18</td>
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<td>46</td>
<td>11</td>
<td>12</td>
<td>49</td>
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<tr>
<td>14</td>
<td>i = 4</td>
<td>4</td>
<td>18</td>
<td>11</td>
<td>46</td>
<td>11</td>
<td>12</td>
<td>49</td>
</tr>
<tr>
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<td>if a[i] == 12:</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>a[i] = 1</td>
<td>4</td>
<td>18</td>
<td>11</td>
<td>46</td>
<td>11</td>
<td>11</td>
<td>49</td>
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<td>17</td>
<td>i = 5</td>
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<td>18</td>
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<td>46</td>
<td>11</td>
<td>11</td>
<td>49</td>
</tr>
<tr>
<td>18</td>
<td>if a[i] == 12:</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>a[i] += 1</td>
<td>5</td>
<td>18</td>
<td>11</td>
<td>46</td>
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7. Solution

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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a = [10, 15, 12, 23, 22, 19]</td>
<td>?</td>
<td>10</td>
<td>15</td>
<td>12</td>
<td>23</td>
<td>22</td>
<td>19</td>
</tr>
<tr>
<td>2</td>
<td>i = 1</td>
<td>1</td>
<td>10</td>
<td>15</td>
<td>12</td>
<td>23</td>
<td>22</td>
<td>19</td>
</tr>
<tr>
<td>3</td>
<td>a[i] = a[i + 1] + a[i - 1]</td>
<td>1</td>
<td>10</td>
<td>22</td>
<td>12</td>
<td>23</td>
<td>22</td>
<td>19</td>
</tr>
<tr>
<td>4</td>
<td>i = 2</td>
<td>2</td>
<td>10</td>
<td>22</td>
<td>12</td>
<td>23</td>
<td>22</td>
<td>19</td>
</tr>
<tr>
<td>5</td>
<td>a[i] = a[i + 1] + a[i - 1]</td>
<td>2</td>
<td>10</td>
<td>22</td>
<td>45</td>
<td>23</td>
<td>22</td>
<td>19</td>
</tr>
<tr>
<td>6</td>
<td>i = 3</td>
<td>3</td>
<td>10</td>
<td>22</td>
<td>45</td>
<td>23</td>
<td>22</td>
<td>19</td>
</tr>
<tr>
<td>7</td>
<td>a[i] = a[i + 1] + a[i - 1]</td>
<td>3</td>
<td>10</td>
<td>22</td>
<td>45</td>
<td>67</td>
<td>22</td>
<td>19</td>
</tr>
</tbody>
</table>
8. Solution

```python
ELEMENTS = 100

a = [None] * ELEMENTS
for i in range(ELEMENTS):
    a[i] = float(input())

for i in range(ELEMENTS):
    print(a[i] ** 3)
```

9. Solution

```python
ELEMENTS = 80

a = [None] * ELEMENTS
for i in range(ELEMENTS):
    a[i] = float(input())

for i in range(ELEMENTS - 1, -1, -1):
    print(a[i] ** 2)
```

10. Solution

```python
ELEMENTS = 90

a = [None] * ELEMENTS
for i in range(ELEMENTS):
    a[i] = int(input())

for i in range(ELEMENTS - 1, -1, -1):
    if a[i] % 5 == 0:
        print(a[i])
```

11. Solution

```python
ELEMENTS = 50

a = [None] * ELEMENTS
for i in range(ELEMENTS):
    a[i] = int(input())

for i in range(ELEMENTS):
    if a[i] % 2 == 0 or a[i] > 10:
        print(a[i])
```

12. Solution

```python
ELEMENTS = 30

a = [None] * ELEMENTS
```
for i in range(ELEMENTS):
    a[i] = float(input())

total = 0
for i in range(ELEMENTS):
    if a[i] > 0:
        total += a[i]

print(total)

13. Solution

ELEMENTS = 50

a = [None] * ELEMENTS
for i in range(ELEMENTS):
    a[i] = int(input())

total = 0
for i in range(ELEMENTS):
    if 10 <= a[i] <= 99:
        total += a[i]

print(total)

14. Solution

ELEMENTS = 40

a = [None] * ELEMENTS
for i in range(ELEMENTS):
    a[i] = float(input())

sum_pos = 0
sum_neg = 0
for i in range(ELEMENTS):
    if a[i] > 0:
        sum_pos += a[i]
    elif a[i] < 0:
        sum_neg += a[i]

print(sum_pos, sum_neg)

15. Solution

ELEMENTS = 20

a = [None] * ELEMENTS
for i in range(ELEMENTS):
    a[i] = float(input())

total = 0
for i in range(ELEMENTS):
    total += a[i]

print(total / ELEMENTS)
16. Solution

WORDS = 50

a = [None] * WORDS
for i in range(WORDS):
    a[i] = input()

for i in range(WORDS):
    if len(a[i]) >= 10:
        print(a[i])

17. Solution

First Approach

WORDS = 40

a = [None] * WORDS
for i in range(WORDS):
    a[i] = input()

for i in range(WORDS):
    count = 0
    for j in range(len(a[i])):
        if a[i][j] == "w":
            count += 1
    if count >= 2:
        print(a[i])

Second Approach

WORDS = 40

a = [None] * WORDS
for i in range(WORDS):
    a[i] = input()

for i in range(WORDS):
    count = 0
    for letter in a[i]:
        if letter == "w":
            count += 1
    if count >= 2:
        print(a[i])
Chapter 32

32.7 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

32.8 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

32.9 Answers of Review Exercises

1. Solution

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>x</th>
<th>a</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a = [ [None] * 3 for i in range(2) ]</td>
<td>?</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>a[0][2] = 1</td>
<td>?</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>x = 0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>a[0][x] = 9</td>
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<td></td>
</tr>
</tbody>
</table>
### Solution

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>i</th>
<th>j</th>
<th>a</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a = [None * 3 for i in range(2)]</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>i = 0</td>
<td>0</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td>j = 0</td>
<td>0</td>
<td>0</td>
<td>?</td>
</tr>
<tr>
<td>4</td>
<td>a[i][j] = [i + 1] * 5 + j</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>j = 1</td>
<td>0</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>a[i][j] = [i + 1] * 5 + j</td>
<td>0</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>j = 2</td>
<td>0</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>a[i][j] = [i + 1] * 5 + j</td>
<td>0</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>9</td>
<td>i = 1</td>
<td>1</td>
<td>2</td>
<td>5</td>
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### 3. Solution

<table>
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<th>i</th>
<th>j</th>
<th>a</th>
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<tbody>
<tr>
<td>1</td>
<td>a = [ [None] * 3 for i in range(3) ]</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>j = 0</td>
<td>?</td>
<td>0</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td>i = 0</td>
<td>0</td>
<td>0</td>
<td>?</td>
</tr>
<tr>
<td>4</td>
<td>a[i][j] = [i + 1] * 2 + j * 4</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
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<td>i = 1</td>
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<td>0</td>
<td>2</td>
</tr>
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<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>(a[i][j] = (i + 1) \times 2 + j \times 4)</td>
<td>1 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>(i = 2)</td>
<td>2 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>(a[i][j] = (i + 1) \times 2 + j \times 4)</td>
<td>2 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>(j = 1)</td>
<td>2 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>(i = 0)</td>
<td>0 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>(a[i][j] = (i + 1) \times 2 + j \times 4)</td>
<td>0 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>(i = 1)</td>
<td>1 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>(a[i][j] = (i + 1) \times 2 + j \times 4)</td>
<td>1 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>(i = 2)</td>
<td>2 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>(a[i][j] = (i + 1) \times 2 + j \times 4)</td>
<td>2 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>(j = 2)</td>
<td>2 2</td>
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4. Solution

For input value of 5

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<tbody>
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<td>10</td>
</tr>
<tr>
<td>0</td>
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</tbody>
</table>

For input value of 9

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<tbody>
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<td>18</td>
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<tr>
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<td>10</td>
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For input value of 3

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</tr>
<tr>
<td>0</td>
<td>4</td>
<td>8</td>
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</tbody>
</table>

5. Solution

For input value of 13

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<td>3</td>
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<tr>
<td>0</td>
<td>17</td>
<td>18</td>
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</tbody>
</table>
For input value of 10

<table>
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<td>15</td>
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</tbody>
</table>

For input value of 8

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</thead>
<tbody>
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<td>13</td>
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</tbody>
</table>

6. **Solution**

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<td>6</td>
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</tbody>
</table>

7. **Solution**

<table>
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<td>37</td>
<td>34</td>
</tr>
<tr>
<td>59</td>
<td>49</td>
</tr>
</tbody>
</table>

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**

```python
ROWS = 10
COLUMNS = 15

a = [ [None]*COLUMNS for i in range(ROWS) ]
for i in range(ROWS):
    for j in range(COLUMNS):
        a[i][j] = int(input())

for i in range(ROWS):
    for j in range(COLUMNS):
        if a[i][j] % 2 != 0:
            print(i, ",", j)
```
10. Solution

```python
ROWS = 10
COLUMNS = 6

a = [ [None] * COLUMNS for i in range(ROWS) ]
for i in range(ROWS):
    for j in range(COLUMNS):
        a[i][j] = float(input())

for i in range(ROWS):
    for j in range(0, COLUMNS, 2):
        print(a[i][j])
```

11. Solution

```python
ROWS = 12
COLUMNS = 8

a = [ [None] * COLUMNS for i in range(ROWS) ]
for i in range(ROWS):
    for j in range(COLUMNS):
        a[i][j] = float(input())

total = 0
for i in range(1, ROWS, 2):
    for j in range(0, COLUMNS, 2):
        total += a[i][j]
print(total)
```

12. Solution

```python
N = 8

a = [ [None] * N for i in range(N) ]
for i in range(N):
    for j in range(N):
        a[i][j] = float(input())

sum_diagonal = 0
sum_antidiagonal = 0
for k in range(N):
    sum_diagonal += a[k][k]
    sum_antidiagonal += a[k][N - k - 1]
print(sum_diagonal / N, sum_antidiagonal / N)
```

13. Solution

```python
N = 5

a = [ [None] * N for i in range(N) ]
for i in range(N):
    ```
for j in range(N):
    if i == N - j - 1:
        a[i][j] = 5
    elif i > N - j - 1:
        a[i][j] = 88
    else:
        a[i][j] = 11

for i in range(N):
    for j in range(N):
        print(a[i][j], end = "\t")
    print()
a = [ [None] * COLUMNS for i in range(ROWS) ]
for i in range(ROWS):
    for j in range(COLUMNS):
        a[i][j] = float(input())

count = 0
for i in range(ROWS):
    for j in range(COLUMNS):
        if a[i][j] < 0:
            count += 1

print(count)

17. Solution

ROWS = 3
COLUMNS = 4

a = [ [None] * COLUMNS for i in range(ROWS) ]
for i in range(ROWS):
    for j in range(COLUMNS):
        a[i][j] = input()
for i in range(ROWS):
    for j in range(COLUMNS):
        print(a[i][j], " ", end = "")

18. Solution

ROWS = 20
COLUMNS = 14

a = [ [None] * COLUMNS for i in range(ROWS) ]
for i in range(ROWS):
    for j in range(COLUMNS):
        a[i][j] = input()
for i in range(ROWS):
    for j in range(COLUMNS):
        if len(a[i][j]) < 5:
            print(a[i][j])

19. Solution

First Approach

ROWS = 20
COLUMNS = 14

a = [ [None] * COLUMNS for i in range(ROWS) ]
for i in range(ROWS):
    for j in range(COLUMNS):
        a[i][j] = input()
length_limits = [5, 10, 20]

for k in range(3):
    for i in range(ROWS):
        for j in range(COLUMNS):
            if len(a[i][j]) < length_limits[k]:
                print(a[i][j])

Second Approach

ROWS = 20
COLUMNS = 14

a = [ [None] * COLUMNS for i in range(ROWS) ]

for i in range(ROWS):
    for j in range(COLUMNS):
        a[i][j] = input()

for k in range(3):
    for i in range(ROWS):
        for j in range(COLUMNS):
            if len(a[i][j]) < 5 * 2 ** k:
                print(a[i][j])
Chapter 33

33.8 Answers of Review Questions: True/False

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

33.9 Answers of Review Questions: Multiple Choice

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

33.10 Answers of Review Exercises

1. Solution

```python
STUDENTS = 15
TESTS = 5

grades = [ [None] * TESTS for i in range(STUDENTS) ]
for i in range(STUDENTS):
    for j in range(TESTS):
        grades[i][j] = int(input())

average = [None] * STUDENTS
for i in range(STUDENTS):
    average[i] = 0
    for j in range(TESTS):
        average[i] += grades[i][j]
    average[i] /= TESTS

for i in range(STUDENTS):
    print("Student No", (i + 1), ": ")
    if average[i] < 60:
        print("E/F")
    elif average[i] < 70:
        print("D")
    elif average[i] < 80:
        print("C")
    elif average[i] < 90:
        print("B")
    else:
        print("A")
```

2. Solution

First Approach

```python
OBJECTS = 5
FALLS = 10

g = [ [None] * FALLS for i in range(OBJECTS) ]
for i in range(OBJECTS):
    for j in range(FALLS):
        g[i][j] = int(input())

for i in range(OBJECTS):
    total = 0
    for j in range(FALLS):
        total += g[i][j]
    print("Average g for object No", (i + 1), ":", (total / FALLS))

for j in range(FALLS):
    total = 0
    for i in range(OBJECTS):
        total += g[i][j]
    print("Average g for fall No", (j + 1), ":", (total / OBJECTS))

total = 0
for i in range(OBJECTS):
    for j in range(FALLS):
        total += g[i][j]
print("Overall average g:", (total / (OBJECTS * FALLS)))
```

Second Approach

```python
import math
OBJECTS = 5
FALLS = 10

g = [ [None] * FALLS for i in range(OBJECTS) ]
for i in range(OBJECTS):
    for j in range(FALLS):
        g[i][j] = int(input())

for row in g:
    total = math.fsum(row)
    print("Average g for object No", (i + 1), ":", (total / FALLS))

for j in range(FALLS):
    total = 0
    for i in range(OBJECTS):
        total += g[i][j]
    print("Average g for fall No", (j + 1), ":", (total / OBJECTS))

total = 0
for row in g:
```
total += math.fsum(row)
print("Overall average g:", (total / (OBJECTS * FALLS)))

3. Solution

First Approach

PLAYERS = 15
MATCHES = 12

points = [ [None] * MATCHES for i in range(PLAYERS) ]
for i in range(PLAYERS):
    for j in range(MATCHES):
        points[i][j] = int(input())

for i in range(PLAYERS):
    total = 0
    for j in range(MATCHES):
        total += points[i][j]
    print("Total number of points for player No", (i + 1), ":", total)

for j in range(MATCHES):
    total = 0
    for i in range(PLAYERS):
        total += points[i][j]
    print("Total number of points for match No", (j + 1), ":", total)

Second Approach

import math
PLAYERS = 15
MATCHES = 12

points = [ [None] * MATCHES for i in range(PLAYERS) ]
for i in range(PLAYERS):
    for j in range(MATCHES):
        points[i][j] = int(input())

for row in points:
    total = math.fsum(row)
    print("Total number of points for player No", (i + 1), ":", total)

for j in range(MATCHES):
    total = 0
    for i in range(PLAYERS):
        total += points[i][j]
    print("Total number of points for match No", (j + 1), ":", total)

4. Solution

CITIES = 20
HOURS = 24

temperatures = [ [None] * HOURS for i in range(CITIES) ]
for i in range(CITIES):
for j in range(HOURS):
    temperatures[i][j] = float(input())

for j in range(HOURS):
    total = 0
    for i in range(CITIES):
        total += temperatures[i][j]
    if total / CITIES < 10:
        print("Hour:", (j + 1))

5. Solution

PLAYERS = 24
MATCHES = 10

names = [None] * PLAYERS
goals = [ [None] * MATCHES for i in range(PLAYERS) ]
for i in range(PLAYERS):
    names[i] = input()
    for j in range(MATCHES):
        goals[i][j] = int(input())

    # Or you can do the following:
    # for row in goals:
    #     print(names[i], ":", math.fsum(row) / MATCHES)

for i in range(PLAYERS):
    total = 0
    for j in range(MATCHES):
        total += goals[i][j]
    print(names[i], ":", (total / MATCHES))

for j in range(MATCHES):
    total = 0
    for i in range(PLAYERS):
        total += goals[i][j]
    print("Match No", (j + 1), ":", total)

6. Solution

STUDENTS = 24
LESSONS = 10

names = [None] * STUDENTS
grades = [ [None] * LESSONS for i in range(STUDENTS) ]
for i in range(STUDENTS):
    names[i] = input()
    for j in range(LESSONS):
        grades[i][j] = int(input())

    average = [None] * STUDENTS
    # Or you can do the following:
    # for row in grades:
    #     average[i] = math.fsum(row) / LESSONS
    for j in range(LESSONS):
        total += grades[i][j]
    average[i] = total / LESSONS
print(names[i], "=" , average[i])  #

for j in range(LESSONS):
    total = 0
    for i in range(STUDENTS):
        total += grades[i][j]
    print(total / STUDENTS)

for i in range(STUDENTS):
    if average[i] < 60:
        print(names[i])

for i in range(STUDENTS):
    if average[i] > 89:
        print(names[i], "Bravo!")

7. Solution

ARTISTS = 15
JUDGES = 5

judge_names = [None] * JUDGES
for j in range(JUDGES):
    judge_names[j] = input("Enter name for judge No" + str(j + 1) + ": ")

artist_names = [None] * ARTISTS
song_titles = [None] * ARTISTS
score = [ [None] * JUDGES for i in range(ARTISTS) ]
for i in range(ARTISTS):
    artist_names[i] = input("Enter name for artist No" + str(i + 1) + ": ")
    song_titles[i] = input("Enter song title for artist " + artist_names[i] + ": ")
    for j in range(JUDGES):
        score[i][j] = int(input("Enter score for artist " + artist_names[i] + " gotten from judge " + judge_names[j] + ": "))

for i in range(ARTISTS):
    total = 0
    for j in range(JUDGES):
        total += score[i][j]
    print(artist_names[i], ",", song_titles[i], ":", total)

for j in range(JUDGES):
    total = 0
    for i in range(ARTISTS):
        total += score[i][j]
    print(judge_names[j], ":", total / ARTISTS)

8. Solution

PEOPLE = 30
MONTHS = 12

weights = [ [None] * MONTHS for i in range(PEOPLE) ]
Chapter 33

heights = [ [None] * MONTHS for i in range(PEOPLE) ]
for i in range(PEOPLE):
    for j in range(MONTHS):
        weights[i][j] = int(input())
        heights[i][j] = int(input())

for i in range(PEOPLE):
    sum_weights = 0
    sum_heights = 0
    for j in range(MONTHS):
        sum_weights += weights[i][j]
        sum_heights += heights[i][j]
    average_weight = sum_weights / MONTHS
    average_height = sum_heights / MONTHS
    print(average_weight, "", average_height)
    print(average_weight * 702 / average_height ** 2)

for i in range(PEOPLE):
    print(weights[i][4] * 702 / heights[i][4] ** 2)
    print(weights[i][7] * 702 / heights[i][7] ** 2)

9. Solution

VAT = 0.19
CONSUMERS = 1000

meter_reading = [ [None] * 2 for i in range(CONSUMERS) ]
for i in range(CONSUMERS):
    meter_reading[i][0] = int(input())
    meter_reading[i][1] = int(input())

total = 0
for i in range(CONSUMERS):
    consumed = meter_reading[i][1] - meter_reading[i][0]
    print(consumed)
    payment = consumed * 0.07
    payment += VAT * payment
    print(payment)
    total += consumed
print(total, total * 0.07 + total * 0.07 * VAT)

10. Solution

First Approach

CURRENCIES = 4
DAYS = 5

usd = float(input("Enter an amount in US dollars: "))
currency = ["British Pound Sterling", "Euro", "Canadian Dollar", "Australian Dollar"]
rate = [[1.579, 1.577, 1.572, 1.58, 1.584],]
for i in range(CURRENCIES):
    total = 0
    for j in range(DAYS):
        total += rate[i][j]
    average = total / DAYS
    print(usd, " US dollars = ", (usd / average), " ", currency[i], "s", sep = "")

Second Approach

import math
DAYS = 5

usd = float(input("Enter an amount in US dollars: "))
currency = ["British Pound Sterling", "Euro", "Canadian Dollar", "Australian Dollar"]
rate = [[1.579, 1.577, 1.572, 1.58, 1.584],
       [1.269, 1.27, 1.265, 1.24, 1.255],
       [0.895, 0.899, 0.884, 0.888, 0.863],
       [0.811, 0.815, 0.822, 0.829, 0.819]]

for i in range(len(rate)):
    average = math.fsum(rate[i]) / DAYS  #rate[i] returns the whole row
    print(usd, " US dollars = ", (usd / average), " ", currency[i], "s", sep = "")

11. Solution

EMPLOYEES = 10
DAYS = 5

weekdays = ["Monday", "Tuesday", "Wednesday", "Thursday", "Friday"]

pay_rate = float(input())

names = [None] * EMPLOYEES
hours_worked_per_day = [None] * DAYS for i in range(EMPLOYEES)
for i in range(EMPLOYEES):
    names[i] = input()
for j in range(DAYS):
    hours_worked_per_day[i][j] = int(input())

hours_worked_per_week = [None] * EMPLOYEES
for i in range(EMPLOYEES):
    hours_worked_per_week[i] = 0
for j in range(DAYS):
    hours_worked_per_week[i] += hours_worked_per_day[i][j]
if hours_worked_per_week[i] > 40:
    print(names[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)
print(names[i], gross_pay)

for i in range(EMPLOYEES):
    if hours_worked_per_week[i] > 40:
        for j in range(DAYS):
            if hours_worked_per_day[i][j] > 8:
                print(names[i], weekdays[j], "Overtime!")

for j in range(DAYS):
    total = 0
    for i in range(EMPLOYEES):
        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)
        total += gross_pay
    print(weekdays[j], total)

12. Solution

First Approach

ROWS = 3
COLUMNS = 4
ELEMENTS = ROWS * COLUMNS

a = [[9, 9, 2, 6],
    [4, 1, 10, 11],
    [12, 15, 7, 3]]

b = [None] * ELEMENTS
k = 0
for i in range(ROWS):
    for j in range(COLUMNS):
        b[k] = a[i][j]
        k += 1

for k in range(ELEMENTS):
    print(b[k], end = " ")

Second Approach

a = [[9, 9, 2, 6],
    [4, 1, 10, 11],
    [12, 15, 7, 3]]

b = []
for row in a:
    b = b + row
### 13. Solution

```python
ROWS = 3
COLUMNS = 3

a = [16, 12, 3, 5, 6, 9, 18, 19, 20]

b = [ [None] * COLUMNS for i in range(ROWS) ]
k = 0
for i in range(ROWS - 1, -1, -1):
    for j in range(COLUMNS):
        b[i][j] = a[k]
        k += 1

for i in range(ROWS):
    for j in range(COLUMNS):
        print(b[i][j], end = "\t")
    print()
```
Chapter 34

34.4 Answers of Review Exercises

1. Solution

```
Start
Const ELEMENTS = 30
For i in [0, 1, ... ELEMENTS - 1]
Write "Enter a two-digit integer"
Read values[i]
For i in [0, 1, ... ELEMENTS - 1]
digit1 ← values[i] DIV 10
digit2 ← values[i] MOD 10
If digit1 < digit2
Write values[i]
Else
False
End
End
```
2. Solution

Start

Const ELEMENTS = 20

For i in [0, 1, ... ELEMENTS – 1]

Write "Enter a three-digit integer"

Read values[i]

total ← 0

For i in [0, 1, ... ELEMENTS – 1]

digit3 ← values[i] MOD 10
r ← values[i] DIV 10
digit2 ← r MOD 10
digit1 ← r DIV 10

values[i] == digit3 * 100 + digit2 * 10 + digit1

total ← total + values[i]

Write total

End
3. Solution

```
for i in [0, 1, ..., N - 1]
    start
    const N = 10
    for j in [0, 1, ..., N - 1]
        read a[i][j]
    end
    total ← 0
    for k in [0, 1, ..., N - 1]
        total ← total + a[k][k]
    end
    write "Sum = ", total
end
```
4. Solution

```
For i in [0, 1, ..., N – 1]
  Start
  Const N = 10
  For j in [0, 1, ..., N – 1]
    i == j
    a[i][j] ← “*”
    False
    i > j
    a[i][j] ← “-”
    True
    a[i][j] ← “+”
  End
  For i in [0, 1, ..., N – 1]
    For j in [0, 1, ..., N – 1]
      Write
      a[i][j]
End
```
5. Solution

For $i$ in $[0, 1, \ldots, \text{ROWS} - 1]$

- $\text{average}[i] \leftarrow 0$

For $j$ in $[0, 1, \ldots, \text{COLUMNS} - 1]$

- $\text{average}[i] \leftarrow \text{average}[i] + \text{values}[i][j]$

- $\text{average}[i] \leftarrow \text{average}[i] / \text{COLUMNS}$

For $i$ in $[0, 1, \ldots, \text{ROWS} - 1]$

- $\text{average}[i] > 89 \rightarrow \text{True}$
- $\text{average}[i] \leftarrow 0$
- $\text{Write average}[i]$

6. Solution

```python
i = 0
while i < \text{PEOPLE}:
    while True:
        a[i] = \text{int}(\text{input}())
        if a[i] % 2 == 2: break
    i += 1
```

7. Solution

```python
for i in \text{range}(\text{ELEMENTS})�:
    a[i] = \text{float}(\text{input}())
    while a[i] < 0:
        print("Error")
        a[i] = \text{float}(\text{input}())
```
8. Solution

```python
i = 0
S = 0
a[i] = float(input())
i += 1
while i < 90:
    S += a[i - 1] * i
    a[i] = float(input())
i += 1
print(S)
while i >= 0:
    print(a[i])
i -= 5
```

9. Solution

```python
for i in range(ROWS):
    maximum = a[i][0]
    for j in range(1, COLUMNS):
        if a[i][j] > maximum:
            maximum = a[i][j]
    print(maximum)
```

10. Solution

```python
for i in range(ROWS):
    for j in range(COLUMNS):
        a[i][j] = float(input())
        while a[i][j] == 0:
            print("Error")
a[i][j] = float(input())
```
Chapter 35

35.7 Answers of Review Questions: True/False

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>true</td>
</tr>
<tr>
<td>2.</td>
<td>false</td>
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<tr>
<td>3.</td>
<td>true</td>
</tr>
<tr>
<td>4.</td>
<td>true</td>
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<td>5.</td>
<td>true</td>
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<tr>
<td>6.</td>
<td>true</td>
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<td>7.</td>
<td>true</td>
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<tr>
<td>8.</td>
<td>false</td>
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<td>9.</td>
<td>true</td>
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<tr>
<td>10.</td>
<td>false</td>
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<tr>
<td>11.</td>
<td>false</td>
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<tr>
<td>12.</td>
<td>true</td>
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<tr>
<td>13.</td>
<td>false</td>
</tr>
<tr>
<td>14.</td>
<td>false</td>
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<tr>
<td>15.</td>
<td>false</td>
</tr>
<tr>
<td>16.</td>
<td>true</td>
</tr>
<tr>
<td>17.</td>
<td>true</td>
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<td>18.</td>
<td>true</td>
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<td>19.</td>
<td>false</td>
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<tr>
<td>20.</td>
<td>false</td>
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<tr>
<td>21.</td>
<td>true</td>
</tr>
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<td>true</td>
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<td>23.</td>
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<td>24.</td>
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<td>25.</td>
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<td>26.</td>
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<td>27.</td>
<td>true</td>
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<td>28.</td>
<td>false</td>
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<td>29.</td>
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<td>30.</td>
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<td>31.</td>
<td>true</td>
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<td>32.</td>
<td>false</td>
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<tr>
<td>33.</td>
<td>true</td>
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<td>34.</td>
<td>true</td>
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<td>35.</td>
<td>true</td>
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<tr>
<td>36.</td>
<td>true</td>
</tr>
<tr>
<td>37.</td>
<td>false</td>
</tr>
<tr>
<td>38.</td>
<td>true</td>
</tr>
<tr>
<td>39.</td>
<td>true</td>
</tr>
<tr>
<td>40.</td>
<td>true</td>
</tr>
</tbody>
</table>
First Approach

Start

Const ELEMENTS_OF_A = 50
Const ELEMENTS_OF_NEW = ELEMENTS_OF_A - 3

For i in [0, 1, ..., ELEMENTS_OF_A - 1]
Read
a[i]

End

For i in [0, 1, ..., ELEMENTS_OF_NEW - 1]
new_arr[i] ← (a[i] + a[i + 1] + a[i + 2] + a[i + 3]) / 4

End

ELEMENTS_OF_A = 50
ELEMENTS_OF_NEW = ELEMENTS_OF_A - 3

a = [None] * ELEMENTS_OF_A
for i in range(ELEMENTS_OF_A):
  a[i] = float(input())

new_arr = [None] * ELEMENTS_OF_NEW
for i in range(ELEMENTS_OF_NEW):
  new_arr[i] = (a[i] + a[i + 1] + a[i + 2] + a[i + 3]) / 4

for i in range(ELEMENTS_OF_NEW):
  print(new_arr[i], end = "\t")
Second Approach

```python
import math
ELEMENTS_OF_A = 50

a = [None] * ELEMENTS_OF_A
for i in range(ELEMENTS_OF_A):
    a[i] = float(input())

new_arr = []
for i in range(ELEMENTS_OF_A - 3):
    new_arr.append(math.fsum(a[i:i + 4]) / 4)

for element in new_arr:
    print(element, end = "\t")
```

2. Solution

```python
ELEMENTS = 15
a = [None] * ELEMENTS
for i in range(ELEMENTS):
    a[i] = float(input())

b = [None] * ELEMENTS
for i in range(ELEMENTS):
    b[i] = float(input())

c = [None] * ELEMENTS
for i in range(ELEMENTS):
    c[i] = float(input())

new_arr = [None] * ELEMENTS
for i in range(ELEMENTS):
    # Or you can do the following:
    minimum = a[i]  # new_arr[i] = min(a[i], b[i], c[i])
    if b[i] < minimum:
        minimum = b[i]
    if c[i] < minimum:
        minimum = c[i]
    new_arr[i] = minimum

for i in range(ELEMENTS):
    print(new_arr[i])
```
For $i$ in $[0, 1, \text{ELEMENTS} - 1]$

\[
\text{new}_\text{arr}[i] \leftarrow \text{min}
\]

\[
\text{min} \leftarrow a[i]
\]

\[b[i] < \text{min} \]

\[\text{True} \]

\[\text{min} \leftarrow b[i]
\]

\[c[i] < \text{min} \]

\[\text{True} \]

\[\text{min} \leftarrow c[i]
\]

\[\text{new}_\text{arr}[i] \leftarrow \text{min}
\]

3. Solution

First Approach

```
ELEMENTS_OF_A = 10
ELEMENTS_OF_B = 5
ELEMENTS_OF_C = 15
ELEMENTS_OF_NEW = ELEMENTS_OF_A + ELEMENTS_OF_B + ELEMENTS_OF_C

a = [None] * ELEMENTS_OF_A
for i in range(ELEMENTS_OF_A):
    a[i] = float(input())

b = [None] * ELEMENTS_OF_B
for i in range(ELEMENTS_OF_B):
    b[i] = float(input())

c = [None] * ELEMENTS_OF_C
for i in range(ELEMENTS_OF_C):
    c[i] = float(input())

new_arr = [None] * ELEMENTS_OF_NEW
for i in range(ELEMENTS_OF_C):
    new_arr[i] = c[i]
for i in range(ELEMENTS_OF_B):
    new_arr[ELEMENTS_OF_C + i] = b[i]
for i in range(ELEMENTS_OF_A):
    new_arr[ELEMENTS_OF_B + ELEMENTS_OF_C + i] = a[i]

for i in range(ELEMENTS_OF_NEW):
    print(new_arr[i], end = "\t")
```
For i in [0, 1, ..., ELEMENTS_OF_A – 1]
new_arr[i] ← a[i]

For i in [0, 1, ..., ELEMENTS_OF_B – 1]
new_arr[ELEMENTS_OF_A + i] ← b[i]

For i in [0, 1, ..., ELEMENTS_OF_C – 1]
new_arr[ELEMENTS_OF_A + ELEMENTS_OF_B + i] ← c[i]

Second Approach

ELEMENTS_OF_A = 10
ELEMENTS_OF_B = 5
ELEMENTS_OF_C = 15

a = [None] * ELEMENTS_OF_A
for i in range(ELEMENTS_OF_A):
    a[i] = float(input())

b = [None] * ELEMENTS_OF_B
for i in range(ELEMENTS_OF_B):
    b[i] = float(input())

c = [None] * ELEMENTS_OF_C
for i in range(ELEMENTS_OF_C):
    c[i] = float(input())

new_arr = []
for element in c:
    new_arr.append(element)
for element in b:
    new_arr.append(element)
for element in a:
    new_arr.append(element)

for element in new_arr:
    print(element, end = "\t")
Third Approach

```python
ELEMENTS_OF_A = 10
ELEMENTS_OF_B = 5
ELEMENTS_OF_C = 15

a = [None] * ELEMENTS_OF_A
for i in range(ELEMENTS_OF_A):
    a[i] = float(input())

b = [None] * ELEMENTS_OF_B
for i in range(ELEMENTS_OF_B):
    b[i] = float(input())

c = [None] * ELEMENTS_OF_C
for i in range(ELEMENTS_OF_C):
    c[i] = float(input())

new_arr = c + b + a
for element in new_arr:
    print(element, end = "\t")
```

4. Solution

```python
COLUMNS_OF_A = 10
COLUMNS_OF_B = 15
COLUMNS_OF_C = 20
ROWS = 5
COLUMNS = COLUMNS_OF_A + COLUMNS_OF_B + COLUMNS_OF_C

a = [ [None] * COLUMNS_OF_A for i in range(ROWS) ]
for i in range(ROWS):
    for j in range(COLUMNS_OF_A):
        a[i][j] = float(input())

b = [ [None] * COLUMNS_OF_B for i in range(ROWS) ]
for i in range(ROWS):
    for j in range(COLUMNS_OF_B):
        b[i][j] = float(input())

c = [ [None] * COLUMNS_OF_C for i in range(ROWS) ]
for i in range(ROWS):
    for j in range(COLUMNS_OF_C):
        c[i][j] = float(input())

new_arr = [ [None] * COLUMNS for i in range(ROWS) ]
for i in range(ROWS):
    for j in range(COLUMNS_OF_A):
        new_arr[i][j] = a[i][j]
    for j in range(COLUMNS_OF_B):
        new_arr[i][COLUMNS_OF_A + j] = b[i][j]
    for i in range(ROWS):
```
for j in range(COLUMNS_OF_C):
    new_arr[i][COLUMNS_OF_A + COLUMNS_OF_B + j] = c[i][j]

for i in range(ROWS):
    for j in range(COLUMNS):
        print(new_arr[i][j], end = "\t")
    print()  

5. Solution

First Approach

ELEMENTS = 50
a = [None] * ELEMENTS
for i in range(ELEMENTS):
a[i] = float(input())
reals = [None] * ELEMENTS
integers = [None] * ELEMENTS
reals_index = 0
integers_index = 0
for i in range(ELEMENTS):
    if a[i] != int(a[i]):
        reals[reals_index] = a[i]
        reals_index += 1
    elif a[i] != 0:
        integers[integers_index] = int(a[i])
        integers_index += 1
for i in range(reals_index):
    print(reals[i], end = "\t")
print()
for i in range(integers_index):
    print(integers[i], end = "\t")
Second Approach

```python
ELEMENTS = 50

a = [None] * ELEMENTS
for i in range(ELEMENTS):
    a[i] = float(input())

reals = []
integers = []
for element in a:
    if element != int(element):
        reals.append(element)
    elif element != 0:
        integers.append(element)

for element in reals:
    print(element, end = "\t")
print()
for element in integers:
    print(element, end = "\t")
```

6. Solution

First Approach

```python
ELEMENTS = 50

a = [None] * ELEMENTS
for i in range(ELEMENTS):
    a[i] = int(input())

b = []
for element in a:
    digit1, r = divmod(element, 100)
    digit2, digit3 = divmod(r, 10)
    if digit1 < digit2 < digit3:
        b.append(element)
```
for element in b:
    print(element, end = "\t")

**Second Approach**

ELEMENTS = 50

a = [None] * ELEMENTS
for i in range(ELEMENTS):
a[i] = int(input())

b = []
for element in a:
digit1, digit2, digit3 = str(element)  #digit1, digit2, digit3 are strings
    if digit1 < digit2 < digit3:
        b.append(element)

for element in b:
    print(element, end = "\t")

7. **Solution**

PRODUCTS = 10
CITIZENS = 1000

prod_names = [None] * PRODUCTS
answers = [ [None] * CITIZENS for i in range(PRODUCTS) ]
for i in range(PRODUCTS):
    prod_names[i] = input()
    for j in range(CITIZENS):
        answers[i][j] = input()
        while not("A" <= answers[i][j] <= "D"):
            print("Error!")
            answers[i][j] = input()

count_A = [None] * PRODUCTS
for i in range(PRODUCTS):
count_A[i] = 0
    for j in range(CITIZENS):
        if answers[i][j] == "A":
            count_A[i] += 1
            print(prod_names[i], count_A[i])

for j in range(CITIZENS):
count_B = 0
    for i in range(PRODUCTS):
        if answers[i][j] == "B":
            count_B += 1
            print(count_B)

maximum = count_A[0]  # This code fragment can be replaced by the statement
for i in range(1, PRODUCTS):  # maximum = max(count_A)
    if count_A[i] > maximum:  #
maximum = count_A[i]  #

for i in range(PRODUCTS):
    if count_A[i] == maximum:
        print(prod_names[i])

8. Solution

US_CITIES = 20
CANADIAN_CITIES = 20

us_names = [None] * US_CITIES
for i in range(US_CITIES):
    us_names[i] = input("Enter name for US city No" + str(i + 1) + "": ")

canadian_names = [None] * CANADIAN_CITIES
for j in range(CANADIAN_CITIES):
    canadian_names[j] = input("Enter name for Canadian city No" + str(j + 1) + "": ")

distances = [ [None] * CANADIAN_CITIES for i in range(US_CITIES) ]
for i in range(US_CITIES):
    for j in range(CANADIAN_CITIES):
        distances[i][j] = float(input("Enter distance between " + us_names[i] + " and " +
                                      canadian_names[j] + "": "))

for i in range(US_CITIES):
    minimum = distances[i][0]
    min_j = 0
    for j in range(1, CANADIAN_CITIES):
        if distances[i][j] < minimum:
            minimum = distances[i][j]
            min_j = j
    print("Closest Canadian city to", us_names[i], "is", canadian_names[min_j])
9. Solution

Start

Const MOUNTAINS = 30

For i in [0, 1, MOUNTAINS – 1]

Read
names[i],
heights[i],
countries[i]

max ← heights[0]
index_of_max ← 0
min ← heights[0]
index_of_min ← 0

For i in [0, 1, MOUNTAINS – 1]

heights[i] > max
  True
  max ← heights[i]
  index_of_max ← i
  False

heights[i] < min
  True
  min ← heights[i]
  index_of_min ← i
  False

Write
heights[index_of_max],
names[index_of_max],
countries[index_of_max]

Write
heights[index_of_min],
names[index_of_min],
countries[index_of_min]

End
10. Solution

11. Solution
GAMES = 15

names = [None] * TEAMS
results = [ [None] * GAMES for i in range(TEAMS) ]
for i in range(TEAMS):
    names[i] = input()
    for j in range(GAMES):
        results[i][j] = input()

points = [None] * TEAMS
for i in range(TEAMS):
    points[i] = 0
    for j in range(GAMES):
        if results[i][j] == "W":
            points[i] += 3
        elif results[i][j] == "T":
            points[i] += 1

maximum = points[0]
m_i = 0
for i in range(1, TEAMS):
    if points[i] > maximum:
        maximum = points[i]
m_i = i

print(names[m_i])

12. Solution

First Approach

OBJECTS = 10
FALLS = 20

heights = [ [None] * FALLS for i in range(OBJECTS) ]
times = [ [None] * FALLS for i in range(OBJECTS) ]
for i in range(OBJECTS):
    for j in range(FALLS):
        heights[i][j] = float(input())
        times[i][j] = float(input())

g = [ [None] * FALLS for i in range(OBJECTS) ]
for i in range(OBJECTS):
    for j in range(FALLS):
        g[i][j] = 2 * heights[i][j] / times[i][j] ** 2

minimum = [None] * OBJECTS
maximum = [None] * OBJECTS
for i in range(OBJECTS):
    minimum[i] = g[i][0]
    maximum[i] = g[i][0]
    for j in range(1, FALLS):
        if g[i][j] < minimum[i]:
            minimum[i] = g[i][j]
if $g[i][j] > \text{maximum}[i]$
    \text{maximum}[i] = g[i][j]

for $i$ in range(OBJECTS):
    print(\text{minimum}[i], \text{maximum}[i])

maxim = \text{maximum}[0]
minim = \text{minimum}[0]
for $i$ in range(1, OBJECTS):
    if $\text{maximum}[i] > \text{maxim}$:
        \text{maxim} = \text{maximum}[i]
    if $\text{minimum}[i] < \text{minim}$:
        \text{minim} = \text{minimum}[i]

print(\text{minim}, \text{maxim})

### Second Approach

OBJECTS = 10
FALLS = 20

$g = \begin{bmatrix} \text{None} * \text{FALLS} \text{ for } i \text{ in range(OBJECTS) } \end{bmatrix}$

for $i$ in range(OBJECTS):
    for $j$ in range(FALLS):
        height = float(input())
        time = float(input())
        $g[i][j] = 2 * \text{height} / \text{time} ^ 2$

\text{minimum} = [\text{None} * \text{OBJECTS}
\text{maximum} = [\text{None} * \text{OBJECTS}
for $i$ in range(OBJECTS):
    \text{minimum}[i] = \text{min}(g[i]) \quad \# g[i] \text{ returns the whole row}
    \text{maximum}[i] = \text{max}(g[i])

for $i$ in range(OBJECTS):
    print(\text{minimum}[i], \text{maximum}[i])

print(\text{min}(\text{minimum}), \text{max}(\text{maximum}))

### 13. Solution

STATIONS = 10
DAYS = 365

\text{names} = [\text{None} * \text{STATIONS}
\text{co2} = \begin{bmatrix} \text{None} * \text{DAYS} \text{ for } i \text{ in range(STATIONS) } \end{bmatrix}
for $i$ in range(STATIONS):
    \text{names}[i] = \text{input()}
    for $j$ in range(DAYS):
        \text{co2}[i][j] = float(\text{input()})

    \# Or you can do the following:
    \text{average} = [\text{None} * \text{STATIONS}
    \text{for } i \text{ in range(STATIONS)}:
        \text{average}[i] = 0
        \# \text{average}.append(math.fsum(\text{row}) / \text{DAYS})
for j in range(DAYS):  #
    average[i] += co2[i][j]  #
    average[i] /= DAYS  #

minimum = average[0]
m_i = 0
for i in range(1, STATIONS):
    if average[i] < minimum:
        minimum = average[i]
        m_i = i
print(names[m_i])

14. Solution

min ← a[i][j]
max ← a[i][j]
True
False

Write
min, max
For i in 
For j in 
 min ← a[i][0]
 max ← a[i][0]

15. Solution

TEAMS = 20
GAMES = 10

names = [None] * TEAMS
results = [ [None] * GAMES for i in range(TEAMS) ]
for i in range(TEAMS):
    names[i] = input("Enter team name: ")
for j in range(GAMES):

results[i][j] = input("Enter result for team " + names[i] + " for game No" + str(j + 1) + ": ")
while results[i][j] not in ["W", "L", "T"]: 
    results[i][j] = input("Error! Enter only value W, L, or T: ")

points = [None] * TEAMS
for i in range(TEAMS):
    points[i] = 0
    for j in range(GAMES):
        if results[i][j] == "W":
            points[i] += 3
        elif results[i][j] == "T":
            points[i] += 1

for m in range(TEAMS - 1):
    swaps = False
    for n in range(TEAMS - 1, m, -1):
        if points[n] > points[n - 1]:
            points[n], points[n - 1] = points[n - 1], points[n]
            names[n], names[n - 1] = names[n - 1], names[n]
            swaps = True
        if swaps == False: break

print("Gold:", names[0])
print("Silver:", names[1])
print("Bronze:", names[2])

16. Solution

PEOPLE = 50
names = [None] * PEOPLE
heights = [None] * PEOPLE
for i in range(PEOPLE):
    names[i] = input("Enter name for person No." + str(i + 1) + ": ")
    heights[i] = float(input("Enter height for person No." + str(i + 1) + ": "))

for m in range(PEOPLE - 1):
    for n in range(PEOPLE - 1, m, -1):
        if heights[n] > heights[n - 1]:
            heights[n], heights[n - 1] = heights[n - 1], heights[n]
            names[n], names[n - 1] = names[n - 1], names[n]
        elif heights[n] == heights[n - 1]:
            if names[n] < names[n - 1]:
                names[n], names[n - 1] = names[n - 1], names[n]

for i in range(PEOPLE):
    print(heights[i], names[i])

17. Solution

ARTISTS = 12
JUDGES = 10
artist_names = [None] * ARTISTS
score = [ [None] * JUDGES for i in range(ARTISTS) ]
for i in range(ARTISTS):
    artist_names[i] = input("Enter name for artist No." + str(i + 1) + ": ")
    for j in range(JUDGES):
        print("Enter score for artist: ", artist_names[i])
        score[i][j] = int(input(" gotten from judge No." + str(j + 1) + ": "))

# Or you can do the following:
total = [None] * ARTISTS
for i in range(ARTISTS):
    total[i] = 0
data for row in score:
    for j in range(1, JUDGES):
        total[i] += score[i][j]

# Or you can do the following:

for i in range(ARTISTS):
    minimum = score[i][0]
    maximum = score[i][0]
    for j in range(1, JUDGES):
        if score[i][j] < minimum:
            minimum = score[i][j]
        if score[i][j] > maximum:
            maximum = score[i][j]
    total[i] = total[i] - minimum - maximum
    print(total[i])

for m in range(ARTISTS - 1):
    for n in range(ARTISTS - 1, m, -1):
        if total[n] > total[n - 1]:
            total[n], total[n - 1] = total[n - 1], total[n]
            artist_names[n], artist_names[n - 1] = artist_names[n - 1], artist_names[n]
        elif total[n] == total[n - 1]:
            if artist_names[n] < artist_names[n - 1]:
                artist_names[n], artist_names[n - 1] = artist_names[n - 1], artist_names[n]

for i in range(ARTISTS):
    print(artist_names[i], total[i])
18. Solution

PEOPLE = 10
PUZZLES = 8

names = [None] * PEOPLE
times = [ [None] * PUZZLES for i in range(PEOPLE) ]
for i in range(PEOPLE):
    names[i] = input()
    for j in range(PUZZLES):
        times[i][j] = float(input())

for i in range(PEOPLE):
    for m in range(PUZZLES):
        minimum = times[i][m]
        index_of_min = m
        for n in range(m, PUZZLES):
            if times[i][n] < minimum:
                minimum = times[i][n]
                index_of_min = n
        times[i][m], times[i][index_of_min] = times[i][index_of_min], times[i][m]

19. Solution
for i in range(PEOPLE):
    print(names[i])
    for j in range(3):
        print(times[i][j])

    # Or you can do the following:
    average = [None] * PEOPLE
    for i in range(PEOPLE):
        average[i] = 0
        for j in range(PUZZLES):
            average[i] += times[i][j]
        average[i] /= PUZZLES

    for m in range(PEOPLE):
        minimum = average[m]
        index_of_min = m
        for n in range(m, PEOPLE):
            if average[n] < minimum:
                minimum = average[n]
                index_of_min = n
        average[m], average[index_of_min] = average[index_of_min], average[m]
        names[m], names[index_of_min] = names[index_of_min], names[m]

print(names[0], names[1], names[2])

20. Solution
21. Solution

```python
CITIES = 5
HOURS = 48

names = [None] * CITIES
CO2 = [ [None] * HOURS for i in range(CITIES) ]
for i in range(CITIES):
    names[i] = input()
    for j in range(HOURS):
        CO2[i][j] = float(input())

# Or you can do the following:
average_per_hour = [None] * CITIES
for i in range(CITIES):
    average_per_hour[i] = 0
    for j in range(HOURS):
        average_per_hour[i] += CO2[i][j]
    average_per_hour[i] /= HOURS
for i in range(CITIES):
    print(names[i], average_per_hour[i])

average_per_city = [None] * HOURS
for j in range(HOURS):
    average_per_city[j] = 0
    for i in range(CITIES):
        average_per_city[j] += CO2[i][j]
    average_per_city[j] /= CITIES
for j in range(HOURS):
    print(average_per_city[j])

maximum = average_per_city[0]
m_j = 0
for j in range(1, HOURS):
    if average_per_city[j] > maximum:
        maximum = average_per_city[j]
m_j = j
print(m_j)

maximum = CO2[0][0]
m_i = 0
m_j = 0
for i in range(CITIES):
    for j in range(HOURS):
        if CO2[i][j] > max:
            maximum = CO2[i][j]
m_i = i
m_j = j
print(m_j, names[m_i])
```

for m in range(1, CITIES):

```
element_1 = average_per_hour[m]

n = m
while n > 0 and average_per_hour[n - 1] < element_1:
    average_per_hour[n] = average_per_hour[n - 1]
    names[n] = names[n - 1]
    n -= 1

average_per_hour[n] = element_1
names[n] = element_2

print(names[0], names[1], names[2])

22. Solution
23. Solution

import re
IS_NUMERIC = "^[^-]+\d+(\.\d+)?$"

TEAMS = 10
GAMES = 16

names = [None] * TEAMS
goals_scored = [ [None] * GAMES for i in range(TEAMS) ]
goals_let_in = [ [None] * GAMES for i in range(TEAMS) ]
for i in range(TEAMS):
    names[i] = input("Enter team name: ")
    for j in range(GAMES):
        inp = input("Enter goals scored: ")
        while not re.match(IS_NUMERIC, inp) or int(inp) < 0:
            inp = input("Error! Enter goals scored: ")
goals_scored[i][j] = int(inp)

inp = input("Enter goals let in: ")
for i in range(TEAMS):
    for j in range(GAMES):
        while not re.match(IS_NUMERIC, inp) or int(inp) < 0:
            inp = input("Error! Enter goals let in: ")
goals_let_in[i][j] = int(inp)

24. Solution
needle = input("Enter a team to search: ")

i = 0
while i < TEAMS - 1 and names[i] != needle:
    i += 1

if names[i] != needle:
    print("This team does not exist")
else:
    total = 0
    for j in range(GAMES):
        if goals_scored[i][j] > goals_let_in[i][j]:
            total += 3
        elif goals_scored[i][j] == goals_let_in[i][j]:
            total += 1
    print(total)

for m in range(1, CLASS1):
    element = names1[m]
    n = m
    while n > 0 and names1[n - 1] > element:
        names1[n] = names1[n - 1]
        n -= 1
    names1[n] = element

for m in range(1, CLASS2):
    element = names2[m]
    n = m
    while n > 0 and names2[n - 1] > element:
        names2[n] = names2[n - 1]
        n -= 1
    names2[n] = element

print("\nClass A")
for i in range(CLASS1):
    print(names1[i])

print("\nClass B")
for i in range(CLASS2):
    print(names2[i])
needle = input("Enter a name to search: ")
left = 0
right = CLASS1 - 1
found = False
while left <= right and found == False:
    middle = (left + right) // 2
    if names1[middle] > needle:
        right = middle - 1
    elif names1[middle] < needle:
        left = middle + 1
    else:
        found = True
if found == True:
    print("Student found in class No 1")
else:
    left = 0
    right = CLASS2 - 1
    while left <= right and found == False:
        middle = (left + right) // 2
        if names2[middle] > needle:
            right = middle - 1
        elif names2[middle] < needle:
            left = middle + 1
        else:
            found = True
    if found == True:
        print("Student found in class No 2")
    else:
        print("Student not found in either class")
26. Solution

```python
usr = input("Enter username: ")
pwd = input("Enter password: ")

i = 0
while i < 99 and usernames[i].upper() != usr.upper():
    i += 1

if usernames[i].upper() == usr.upper() and passwords[i].upper() == pwd.upper():
    print("Login OK!")
else:
    print("Login Failed!")
```
27. Solution

```python
value_str = input("Enter a value to search: ")
found = False

# Check if entered value is a valid nine-digit SSN
if re.match(IS_NUMERIC, value_str) and value_str >= 100000000 and value_str <= 999999999:
    value = int(value_str)
    i = 0
    while i < 999 and SSNs[i] != value:
        i += 1

    if SSNs[i] == value:
        found = True
        print(names[i])
else:
    for i in range(1000):
        if names[i] == value_str:
            print(names[i])
            found = True

if found == False:
    print("This value does not exist")
```

28. Solution

```python
STUDENTS = 12
LESSONS = 6

grades = 
for i in range(STUDENTS):
    for j in range(LESSONS):
        grades[i][j] = int(input())

# Or you can do the following:
average = 
for i in range(STUDENTS):
    for row in grades:
        average[i] = 0
        average.append(math.fsum(row) / LESSONS)

found = False
for i in range(STUDENTS):
    if average[i] < 70:
        found = True
        break

if found == True:
    print("There is at least one student that has an average value below 70")
```
Chapter 36

36.4 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 37

37.5 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. false  
18. true  
19. false  
20. true  
21. true  
22. true

37.6 Review Exercises

1. Solution

```python
def find_max(a, b):
    if a > b:
        maximum = a
    else:
        maximum = b
    return maximum
```

2. Solution

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>Main Code</th>
<th>Function <code>sum_digits()</code></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><code>s = 0</code></td>
<td>0</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td><code>i = 25</code></td>
<td>0 25</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td><code>s += sum_digits(i)</code></td>
<td>25 ? ?</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td><code>d1 = a % 10</code></td>
<td>25 5 ?</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td><code>d2 = a // 10</code></td>
<td>25 5 2</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td><code>return d1 + d2</code></td>
<td>7 25</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td><code>i = 26</code></td>
<td>7 26</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td><code>s += sum_digits(i)</code></td>
<td>26 ? ?</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td><code>d1 = a % 10</code></td>
<td>26 6 ?</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td><code>d2 = a // 10</code></td>
<td>26 6 2</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td><code>return d1 + d2</code></td>
<td>15 26</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td><code>i = 27</code></td>
<td>15 27</td>
<td></td>
</tr>
</tbody>
</table>
### 3. Solution

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>Main Code</th>
<th>Function $\text{sss}(\cdot)$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>s</td>
<td>i</td>
</tr>
<tr>
<td>1</td>
<td>$i = 1$</td>
<td>?</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>$s = 0$</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>while $i &lt; 6$: True</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>if $i % 2 == 1$: True</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>$s += 1$</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>$i += 1$</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>while $i &lt; 6$: True</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>if $i % 2 == 1$: False</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>$s += \text{sss}(i)$</td>
<td>2</td>
<td>?</td>
</tr>
<tr>
<td>10</td>
<td>total = 0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>11</td>
<td>$k = 1$</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>12</td>
<td>total += $k$</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>$k = 2$</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>total += $k$</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>15</td>
<td>return total</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>16</td>
<td>$i += 1$</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>17</td>
<td>while $i &lt; 6$: True</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>if $i % 2 == 1$: True</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>$s += 1$</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>20</td>
<td>$i += 1$</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>21</td>
<td>while $i &lt; 6$: True</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>if $i % 2 == 1$: False</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>$s += \text{sss}(i)$</td>
<td>4</td>
<td>?</td>
</tr>
<tr>
<td>24</td>
<td>total = 0</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>25</td>
<td>$k = 1$</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>26</td>
<td>total += $k$</td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>
### Solution

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>Main Code</th>
<th>Function custom_div()</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>k = int(input())</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>m = 2</td>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>a = 1</td>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>while a &lt; 6:</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>if k % m != 0:</td>
<td>False</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>x = a + m + custom_div(m, a)</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>return (b + d) // 2</td>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>print(m, a, x)</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>a += 2</td>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>m += 1</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>11</td>
<td>while a &lt; 6:</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>if k % m != 0:</td>
<td>False</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>x = a + m + custom_div(m, a)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>14</td>
<td>return (b + d) // 2</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>15</td>
<td>print(m, a, x)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>16</td>
<td>a += 2</td>
<td>12</td>
<td>3</td>
</tr>
</tbody>
</table>
### 5. Solution

```python
def my_round(x):
    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

```python
def find_min(a, b):
    minimum = a
    if b < minimum:
        minimum = b
    return minimum

# Main code starts here
print("Enter four numbers: ")
x1 = float(input())
x2 = float(input())
x3 = float(input())
x4 = float(input())

# Or you can do the following
temp1 = find_min(x1, x2)  #
temp2 = find_min(x3, x4)  #
print(find_min(temp1, temp2))  # print(find_min(find_min(x1, x2), find_min(x3, x4)))
```

### 7. Solution

```python
def Kelvin_to_Fahrenheit(kelvin):
    return 1.8 * kelvin - 459.67

def Kelvin_to_Celsius(kelvin):
    return kelvin - 273.15
```
# Main code starts here
k = float(input("Enter a temperature in degrees Kelvin: "))
print("Fahrenheit:", Kelvin_to_Fahrenheit(k))
print("Celsius:", Kelvin_to_Celsius(k))

8. Solution

```python
import re
IS_NUMERIC = "^[+-]?\d+(\.\d+)?$"

def bmi(w, h):
    b = w * 703 / h ** 2
    if b < 16:
        return_value = "You must add weight."
    elif b < 18.5:
        return_value = "You should add some weight."
    elif b < 25:
        return_value = "Maintain your weight."
    elif b < 30:
        return_value = "You should lose some weight."
    else:
        return_value = "You must lose weight."
    return return_value

# Main code starts here
inp = input("Enter your weight (in pounds): ")
while not re.match(IS_NUMERIC, inp) or float(inp) < 0:
    inp = input("Error! Enter your weight (in pounds): ")
weight = float(inp)

inp = input("Enter your age: ")
while not re.match(IS_NUMERIC, inp) or int(inp) < 18:
    inp = input("Error! Enter your age: ")
age = int(inp)

inp = input("Enter your height (in inches): ")
while not re.match(IS_NUMERIC, inp) or float(inp) < 0:
    inp = input("Error! Enter your height (in inches): ")
height = float(inp)

print(bmi(weight, height))
```
Chapter 38

38.5 Review Questions: True/False

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

38.6 Review Exercises

1. Solution

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>Main Code</th>
<th>Function display()</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>i = 0</td>
<td>0</td>
<td>a</td>
</tr>
<tr>
<td>2</td>
<td>x = int(input())</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>display(x)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>if a % 2 == 0:</td>
<td></td>
<td>False</td>
</tr>
<tr>
<td>5</td>
<td>print(a, &quot;is odd&quot;)</td>
<td></td>
<td>The message “3 is odd” is displayed</td>
</tr>
<tr>
<td>6</td>
<td>i = 1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>x = int(input())</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td>display(x)</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>9</td>
<td>if a % 2 == 0:</td>
<td></td>
<td>False</td>
</tr>
<tr>
<td>10</td>
<td>print(a, &quot;is odd&quot;)</td>
<td></td>
<td>The message “7 is odd” is displayed</td>
</tr>
<tr>
<td>11</td>
<td>i = 2</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>12</td>
<td>x = int(input())</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>13</td>
<td>display(x)</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>14</td>
<td>if a % 2 == 0:</td>
<td></td>
<td>False</td>
</tr>
<tr>
<td>15</td>
<td>print(a, &quot;is odd&quot;)</td>
<td></td>
<td>The message “9 is odd” is displayed</td>
</tr>
<tr>
<td>16</td>
<td>i = 3</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>17</td>
<td>x = int(input())</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>18</td>
<td>display(x)</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>19</td>
<td>if a % 2 == 0:</td>
<td></td>
<td>True</td>
</tr>
<tr>
<td>20</td>
<td>print(a + &quot; is even&quot;)</td>
<td></td>
<td>The message “2 is even” is displayed</td>
</tr>
<tr>
<td>21</td>
<td>i = 4</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>
```
22  x = int(input())          4  4
23  display(x)              
24  if a % 2 == 0:          True
25  print(a, "is even")     The message "4 is even" is displayed
```

### 2. Solution

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>Main Code</th>
<th>Function division()</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>x = 20</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>y = 30</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>while x % y &lt; 30:</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>division(y, x)</td>
<td>30 20</td>
<td>30 20</td>
</tr>
<tr>
<td>5</td>
<td>b = b // a</td>
<td>0</td>
<td>30 0</td>
</tr>
<tr>
<td>6</td>
<td>print(a * b)</td>
<td>0 is displayed</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>x = 4 * y</td>
<td>120</td>
<td>30</td>
</tr>
<tr>
<td>8</td>
<td>y += 1</td>
<td>120</td>
<td>31</td>
</tr>
<tr>
<td>9</td>
<td>while x % y &lt; 30:</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>division(y, x)</td>
<td>31 120</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>b = b // a</td>
<td>31</td>
<td>31 3</td>
</tr>
<tr>
<td>12</td>
<td>print(a * b)</td>
<td>93 is displayed</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>x = 4 * y</td>
<td>124</td>
<td>31</td>
</tr>
<tr>
<td>14</td>
<td>y += 1</td>
<td>124</td>
<td>32</td>
</tr>
<tr>
<td>15</td>
<td>while x % y &lt; 30:</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>division(y, x)</td>
<td>32 124</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>b = b // a</td>
<td>32</td>
<td>32 3</td>
</tr>
<tr>
<td>18</td>
<td>print(a * b)</td>
<td>96 is displayed</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>x = 4 * y</td>
<td>128</td>
<td>32</td>
</tr>
<tr>
<td>20</td>
<td>y += 1</td>
<td>128</td>
<td>33</td>
</tr>
<tr>
<td>21</td>
<td>while x % y &lt; 30:</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>division(y, x)</td>
<td>33 128</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>b = b // a</td>
<td>33</td>
<td>33 3</td>
</tr>
<tr>
<td>24</td>
<td>print(a * b)</td>
<td>99 is displayed</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>x = 4 * y</td>
<td>132</td>
<td>33</td>
</tr>
<tr>
<td>26</td>
<td>y += 1</td>
<td>132</td>
<td>34</td>
</tr>
</tbody>
</table>
### Solution

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>Main Code</th>
<th>Function calculate()</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>i = 0</td>
<td>i</td>
<td>m</td>
</tr>
<tr>
<td>2</td>
<td>m = int(input())</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>calculate(m)</td>
<td>2</td>
<td>?</td>
</tr>
<tr>
<td>4</td>
<td>s = 0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>j = 2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>s = s + j * j</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>j = 4</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>s = s + j * j</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>9</td>
<td>print(s)</td>
<td>20 is displayed</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>i = 1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>11</td>
<td>m = int(input())</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>12</td>
<td>calculate(m)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>13</td>
<td>s = 0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>14</td>
<td>j = 2</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>15</td>
<td>s = s + j * j</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>16</td>
<td>j = 4</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>17</td>
<td>s = s + j * j</td>
<td>3</td>
<td>20</td>
</tr>
<tr>
<td>18</td>
<td>j = 6</td>
<td>3</td>
<td>20</td>
</tr>
<tr>
<td>19</td>
<td>s = s + j * j</td>
<td>3</td>
<td>56</td>
</tr>
<tr>
<td>20</td>
<td>print(s)</td>
<td>56 is displayed</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>i = 2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>22</td>
<td>m = int(input())</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>23</td>
<td>calculate(m)</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>24</td>
<td>s = 0</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>25</td>
<td>j = 2</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>26</td>
<td>s = s + j * j</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>27</td>
<td>j = 4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>28</td>
<td>s = s + j * j</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>29</td>
<td>j = 6</td>
<td>4</td>
<td>20</td>
</tr>
</tbody>
</table>
s = s + j ** 2

j = 8

s = s + j ** 2

print(s)

---

4. Solution

```
def maximum(a, b, c, d, e):
    m = a
    if b > m:
        m = b
    if c > m:
        m = c
    if d > m:
        m = d
    if e > m:
        m = e
    print(m)
```

5. Solution

```
def num_of_days(year, month):
    if month in [4, 6, 9, 11]:
        days = 30
    elif month == 2:
        if year % 4 == 0 and year % 100 != 0 or year % 400 == 0:
            days = 29
        else:
            days = 28
    else:
        days = 31
    print(days)

#Main code starts here
y = int(input("Enter a year: "))
for m in range(1, 13):
    num_of_days(y, m)
```

6. Solution

```
def display_menu():
    print()
    print("1. Convert meters to miles")
    print("2. Convert miles to meters")
    print("3. Exit")
    print("Enter a choice: ")

def meters_to_miles(meters):
    print(meters, "meters equals", (meters / 1609.344), "miles")

def miles_to_meters(miles):
```
print(miles, "miles equals", (miles * 1609.344), "meters")

#Main code starts here
while True:
    display_menu()

    choice = int(input())

    if choice == 3:
        print("Bye!")
    else:
        distance = float(input("Enter distance: "))
        if choice == 1:
            meters_to_miles(distance)
        else:
            miles_to_meters(distance)
        if choice == 3: break

7. Solution

def amount_to_pay(seconds):
    if seconds <= 600:
        extra = 0
    elif 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

    print("Total amount to pay:", total)

#Main code starts here
seconds = int(input("Enter number of seconds: ")
amount_to_pay(seconds)
Chapter 39

39.9 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

39.10 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

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>Main Code</th>
<th>Function swap()</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>k = int(input())</td>
<td>?</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>m = 1</td>
<td>?</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>a = 1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>while a &lt; 8:</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>if k % m != 0:</td>
<td>False</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>x = a + m + int(a - m)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>print(m, a, x)</td>
<td>1 1 2 is displayed</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>a += 2</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>9</td>
<td>m += 1</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>a, m = swap(a, m)</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>11</td>
<td>x, y = y, x</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>12</td>
<td>while a &lt; 8:</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>13</td>
<td>if k % m != 0:</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>x = a + m + int(a - m)</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>15</td>
<td>print(m, a, x)</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>16</td>
<td>a += 2</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>17</td>
<td>m += 1</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>18</td>
<td>a, m = swap(a, m)</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>19</td>
<td>x, y = y, x</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>20</td>
<td>while a &lt; 8:</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>21</td>
<td>if k % m != 0:</td>
<td>False</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>x = a + m + int(a - m)</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>23</td>
<td>print(m, a, x)</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>24</td>
<td>a += 2</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>25</td>
<td>m += 1</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>26</td>
<td>a, m = swap(a, m)</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>27</td>
<td>x, y = y, x</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>28</td>
<td>while a &lt; 8:</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>29</td>
<td>if k % m != 0:</td>
<td>False</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>x = a + m + int(a - m)</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>31</td>
<td>print(m, a, x)</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>32</td>
<td>a += 2</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>33</td>
<td>m += 1</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>34</td>
<td>a, m = swap(a, m)</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>35</td>
<td>x, y = y, x</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>36</td>
<td>while a &lt; 8:</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>37</td>
<td>if k % m != 0:</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>x = a % m</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>39</td>
<td>m, a = swap(m, a)</td>
<td>7</td>
<td>7</td>
</tr>
</tbody>
</table>
5. **Solution**

"hellohellohello" is displayed

6. **Solution**

The value 15 is displayed

7. **Solution**

11 4 is displayed

8. **Solution**

```python
STUDENTS = 10
LESSONS = 5

def part1(names, grades):
    for i in range(STUDENTS):
        names[i] = input("Enter name for student No." + str(i + 1) + ": ")
    for j in range(LESSONS):
        grades[i][j] = input("Enter grade for lesson No." + str(j + 1) + ": ")

def part2(grades):
    average = [None] * STUDENTS
    for i in range(STUDENTS):
        average[i] = 0
        for j in range(LESSONS):
            average[i] += grades[i][j]
        average[i] /= LESSONS
    return average

def part3(average, names):
    for m in range(1, STUDENTS):
        for n in range(STUDENTS - 1, m - 1, -1):
            if average[n] > average[n - 1]:
                average[n], average[n - 1] = average[n - 1], average[n]
                names[n], names[n - 1] = names[n - 1], names[n]
```
elif average[n] == average[n - 1]:
    if names[n].CompareTo(names[n - 1]) < 0:
        names[n], names[n - 1] = names[n - 1], names[n]

#Main code starts here
names = [None] * STUDENTS
grades = [ [None] * LESSONS for i in range(STUDENTS) ]

part1(names, grades)
average = part2(grades)
part3(average, names)

for i in range(STUDENTS):
    print(names[i], "\t", average[i])

---

9. Solution

def part1():
    message = input("Enter a message: ").lower()
    return message

def part2(message):
    message_clean = ""
    for i in range(len(message)):
        if message[i] not in " ,.?":
            message_clean += message[i]
    return message_clean

def part3(message_clean):
    middle_pos = (len(message_clean) - 1) // 2
    j = len(message_clean) - 1
    palindrome = True
    for i in range(middle_pos + 1):
        if message_clean[i] != message_clean[j]:
            palindrome = False
            break
        j -= 1
    return palindrome

def part4(message):
    message_clean = part2(message)
    palindrome = part3(message_clean)
    return palindrome

#Main code starts here
message = part1()
palindrome = part4(message)
if palindrome == True:
    print("The message is palindrome")

---

10. Solution

a = int(input())
b = int(input())
c = int(input())
d = input()

maximum = a
if b > maximum:
    maximum = b
if c > maximum:
    maximum = c
if d > maximum:
    maximum = d

print(maximum)

11. Solution

def f1(a, b, c):
    total = a + b + c
    average = total / 3
    return total, average

12. Solution

def my_round(x, decimal_places = 2):
    digit_to_check = x * 10 ** (decimal_places + 1) % 10
    if digit_to_check >= 5:
        return_value = int(x * 10 ** decimal_places + 1) / 10 ** decimal_places
    else:
        return_value = int(x * 10 ** decimal_places) / 10 ** decimal_places
    return return_value

13. Solution

def get_input():
    while True:
        answer = input("Enter Yes or No: ").upper()
        if answer == "YES" or answer == "NO": break
    return answer
def find_area(b, h):
    return b * h

#Main code starts here
while True:
    bas = float(input("Enter the base of the parallelogram: "))
    height = float(input("Enter the height of the parallelogram: "))
    print("Area =", find_area(bas, height))
    print("Would you like to repeat? ")
    if get_input() == "NO": break
14. Solution

```python
STUDENTS = 100

def get_lists(names, grades):
    for i in range(STUDENTS):
        names[i] = input("Enter name: ")
        grades[i] = int(input("Enter grade: "))

def get_average(grades):
    total = 0  # Or you can do the following:
    for i in range(STUDENTS):  
        total += grades[i]  
    return total / STUDENTS  # return math.fsum(grades) / STUDENTS

def sort_lists(grades, names):
    for m in range(1, STUDENTS):
        element_grds = grades[m]
        element_nms = names[m]

        n = m
        while n > 0 and grades[n - 1] > element_grds:
            grades[n] = grades[n - 1]
            names[n] = names[n - 1]
            n -= 1

        grades[n] = element_grds
        names[n] = element_nms

#Main code starts here
names = [None] * STUDENTS
grades = [None] * STUDENTS
get_lists(names, grades)
average = get_average(grades)
sort_lists(grades, names)
for i in range(STUDENTS):
    if grades[i] < average:
        print(names[i])
```

15. Solution

First Approach

```python
JUDGES = 10

def get_list():
    score = [None] * JUDGES
    for i in range(JUDGES):
        score[i] = int(input("Judge No" + str(i + 1) + ". Enter score: "))
    return score

def find_min_max(score):
    minimum = score[0]
    maximum = score[0]```
for i in range(1, JUDGES):
    if score[i] > maximum:
        maximum = score[i]
    if score[i] < minimum:
        minimum = score[i]

    return minimum, maximum

#Main code starts here
name = input("Enter artist's name: ")
score = get_list()
minimum, maximum = find_min_max(score)

total = 0
for i in range(JUDGES):
    total += score[i]

points = total - minimum - maximum
print("Artist", name, "got", points, "points")

Second Approach

import math
JUDGES = 10
def get_list():
    score = [None] * JUDGES
    for i in range(JUDGES):
        score[i] = int(input("Judge No" + str(i + 1) + ". Enter score: "))
    return score
def find_min_max(score):
    return min(score), max(score)

#Main code starts here
name = input("Enter artist's name: ")
score = get_list()
minimum, maximum = find_min_max(score)
points = math.fsum(score) - minimum - maximum
print("Artist", name, "got", points, "points")

16. Solution

def woc(index):
    if index == 1:
        return_value = 1
    else:
        return_value = 2 * woc(index - 1)
    return return_value

#Main code starts here
total = 0
for i in range(1, 65):
    total += woc(i)
import math
def fact(value):
    if value == 1:
        return_value = 1
    else:
        return_value = value * fact(value - 1)
    return return_value
def my_cos(x, i = 40):
    if i == 0:
        return_value = 1
    else:
        return_value = my_cos(x, i - 4) + x ** i / fact(i) - x ** (i - 2) / fact(i - 2)
    return return_value

#Main code starts here
print(my_cos(math.pi / 4))
Chapter 40

40.4 Review Exercises

1. Solution

```python
def test_integer(number):
    return_value = False
    return_value = True
    return return_value

def test_positive(number):
    return_value = False
    return_value = True
    return return_value

Start

total ← 0
count ← 0
Read
x
test_positive(x) == true
test_integer(x) == true
True
total ← total + x
count ← count + 1
True
Read
x
False
count > 0
False
End
Write
total / count
True
```

The code above defines two functions, `test_integer` and `test_positive`, which check if a number is an integer and if a number is positive, respectively. The flowchart visually represents the logic of these functions, ensuring that the operations are performed correctly based on the conditions.
2. Solution

```python
def get_age():
    x = int(input())
    if x <= 0:
        return x
    return False

def find_max(a):
    max_i = 0
    for i in range(len(a)):
        if a[i] > a[max_i]:
            max_i = i
    return max_i

READ x

Const PEOPLE = 30
For i in [0, 1, ..., PEOPLE – 1]
Read first_names[i], last_names[i]
ages[i] ← get_age()
index_of_max ← find_max(ages)
Write first_names[index_of_max], last_names[index_of_max], ages[index_of_max]
```
3. Solution

```plaintext
my_sort(byref a)

For m in [0, 1, ..., PEOPLE - 2]
    For n in [PEOPLE - 1, PEOPLE - 2, ..., m + 1]
        a[n] < a[n - 1] True
        False
            my_swap(a, n, n-1)

End

my_swap(byref a, index1, index2)

temp ← a[index1]
a[index1] ← a[index2]
a[index1] ← temp

End

my_sort(byref a)

display_list(a, ascending)

For i in [0, 1, ..., PEOPLE – 2] For i in [0, 1, ..., PEOPLE – 1]
    Write a[i]

End

Write

Const PEOPLE = 40

For i in [0, 1, ..., PEOPLE – 1]
    Read names[i]

my_sort(names)

display_list(names, true)
display_list(names, false)

End
```

For i in [0, 1, ..., PEOPLE – 1]
    Write names[i]
4. Solution

```python
STUDENTS = 20
LESSONS = 10

def get_lists(names, grades):
    for i in range(STUDENTS):
        names[i] = input()
    for j in range(LESSONS):
```

5. Solution

```python
        ```
grades[i][j] = int(input())

def find_average(grades):
    average = [None] * STUDENTS

    for i in range(STUDENTS):
        average[i] = 0
        for j in range(LESSONS):
            average[i] += grades[i][j]
        average[i] /= LESSONS
    return average

def display(names, average):
    for i in range(STUDENTS):
        if average[i] > 89:
            print(names[i], average[i])

#Main code starts here
names = [None] * STUDENTS
grades = [ [None] * LESSONS for i in range(STUDENTS) ]

get_lists(names, grades)
av = find_average(grades)
display(names, av)

6. Solution

def fib(n):
    if n == 0 or n == 1:
        return_val = n
    else:
        return_val = fib(n - 1) + fib(n - 2)

    return return_val

#Main code starts here
while True:
    n = int(input())
    while n < 0:
        n = int(input("Error"))

    print(fib(n))
    ans = input("Again? ")
    if ans != "Y": break
Chapter 41

41.3 Review Exercises

1. Solution

```python
import math
ACCURACY = 0.000000001

def factorial(n):
    return_value = 1
    for i in range(1, n + 1):
        return_value *= i
    return return_value

def my_sin(x):
    sign = 1
    sinus = 0
    i = 1
    while True:
        sinus_previous = sinus
        sinus += sign * x ** i / factorial(i)
        sign = -sign
        i += 2
        if abs(sinus - sinus_previous) <= ACCURACY: break
    return sinus

def degrees_to_rad(degrees):
    return 2 * math.pi * degrees / 360

#Main code starts here
for i in range(361):
    print("sin(", i, ") ~= ", my_sin(degrees_to_rad(i)), sep = "")
```

2. Solution

```python
def is_leap(year):
    return_value = False
    if year % 4 == 0 and year % 100 != 0 or year % 400 == 0:
        return_value = True
    return return_value

def num_of_days(year, month):
    days = 30
    if month in [4, 6, 9, 11]:
        days = 30
    elif month == 2:
        if is_leap(year) == True:
            days = 29
        else:
            days = 28
    else:
```
days = 31

return days

def check_date(day, month, year):
    return_value = True
    if month not in range(1, 13):
        return_value = False
    elif day < 1 or day > num_of_days(year, month):
        return_value = False
    return return_value

#Main code starts here
day = int(input("Enter day: "))
month = int(input("Enter month: "))
year = int(input("Enter year: "))
while check_date(day, month, year) == False:
    print("Error!")
    day = int(input("Enter day: "))
    month = int(input("Enter month: "))
    year = int(input("Enter year: "))

total = 0
for i in range(1, month):
    total += num_of_days(year, i)
total += day
print(total)

3. Solution

import random

def dice():
    return random.randrange(1, 7)

#Main code starts here
names = [None] * 2
names[0] = input("Player1 - Enter name: ")
names[1] = input("Player2 - Enter name: ")

for player in range(2):
    total = 0
    for i in range(10):
        print("Player " + names[player] + ", hit enter to roll the dice!")
        key = input()
        dice1 = dice()
        dice2 = dice()
        print(dice1, dice2)
        total += dice1 + dice2
    if player == 0:
        total_player1 = total
    else:
total_player2 = total

if total_player1 == total_player2:
    print("Tie!")
elif total_player1 > total_player2:
    print(names[0], " wins")
else:
    print(names[1], " wins")

4. Solution

GAS = 1
DIESEL = 2
HYBRID = 3
TAX_RATE = 0.1
CARS = 40

def get_choice():
    print("1. Gas")
    print("2. Diesel")
    print("3. Hybrid")
    choice = int(input("Enter type of the car: "))
    return choice

def get_days():
    days = int(input("Enter total number of rental days: "))
    return days

def get_charge(car_type, rental_days):
    if car_type == GAS:
        if rental_days <= 5:
            charge = rental_days * 24
        elif rental_days <= 8:
            charge = 5 * 24 + (rental_days - 5) * 22
        else:
            charge = 5 * 24 + 3 * 22 + (rental_days - 8) * 18
    elif car_type == DIESEL:
        if rental_days <= 5:
            charge = rental_days * 28
        elif 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
        elif 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
# Main code starts here
rented_car_types = [None] * CARS
rented_days = [None] * CARS

for i in range(CARS):
    rented_car_types[i] = get_choice()
    rented_days[i] = get_days()

total = 0
for i in range(CARS):
    charge = get_charge(rented_car_types[i], rented_days[i])
    print("Car No", (i + 1), ":", charge)
    total += charge

count = 0
for i in range(CARS):
    if rented_car_types[i] == HYBRID:
        count += 1

print("Hybrids rented:", count)
print("Net profit:", total / (1 + TAX_RATE))

5. **Solution**

CHANNELS = 10
DAYS = 7

def get_data(names, viewers):
    day_names = ["Monday", "Tuesday", "Wednesday", "Thursday", "Friday", "Saturday", "Sunday"]

    for i in range(CHANNELS):
        names[i] = input("Enter name for channel No." + str(i + 1) + ": ")
        for j in range(DAYS):
            viewers[i][j] = int(input("Enter the number of viewers of the main news program on " + " +
 day_names[j] + " for channel " + names[i] + ": ")

    def get_average(a):
        total = 0
        for i in range(5):
            total += a[i]
        return total / 5

    # Main code starts here
    names = [None] * CHANNELS
    viewers = [ [None] * DAYS for i in range(CHANNELS) ]
    get_data(names, viewers)

    for i in range(CHANNELS):
        weekend = (viewers[i][DAYS - 2] + viewers[i][DAYS - 1]) / 2
        if weekend >= 1.2 * get_average(viewers[i]):  # viewers[i] represents the whole row
            print(names[i])

    for i in range(CHANNELS):
        increasing = True
for j in range(1, DAYS):
    if viewers[i][j] <= viewers[i][j - 1]:
        increasing = False
if increasing == True:
    print(names[i])

6. Solution

CITIZENS = 300

def input_data(SSNs, answers):
    for i in range(CITIZENS):
        SSNs[i] = int(input("Enter SSN: "))
        answers[i] = input("Enter answer: ")

def sort_lists(SSNs, answers):
    for m in range(CITIZENS):
        minimum = SSNs[m]
        index_of_min = m
        for n in range(m, CITIZENS):
            if SSNs[n] < minimum:
                minimum = SSNs[n]
                index_of_min = n
        SSNs[m], SSNs[index_of_min] = SSNs[index_of_min], SSNs[m]
        answers[m], answers[index_of_min] = answers[index_of_min], answers[m]

def search_list(SSNs, SSN):
    left = 0
    right = CITIZENS - 1
    found = False
    while left <= right and found == False:
        middle = (left + right) // 2
        if SSNs[middle] > SSN:
            right = middle - 1
        elif SSNs[middle] < SSN:
            left = middle + 1
        else:
            found = True
            index_position = middle
    if found == False:
        print("SSN not found!")
        return_value = -1
    else:
        return_value = index_position
        return return_value

def count_answers(answers, answer):
    count = 0
    for i in range(CITIZENS):
        if answers[i] == answer:
            count += 1
return count

#Main code starts here
SSNs = [None] * CITIZENS
answers = [None] * CITIZENS

while True:
    input_data(SSNs, answers)
    sort_lists(SSNs, answers)

    SSN = int(input("Enter an SSN to search: "))

    index = search_list(SSNs, SSN)
    if index != -1:
        answer = answers[index]
        print(answer)

        count = count_answers(answers, answer)
        print(count * 100 / CITIZENS)
        answer = input("Repeat? ")
        if answer != "yes": break

7. Solution

TEAMS = 8
GAMES = 12

def input_data(names, results):
    for i in range(TEAMS):
        names[i] = input("Enter team name: ")
    for j in range(GAMES):
        results[i][j] = input("Enter result (W, L, T): ")

def display_result(names, results):
    result = input("Enter a result to search (W, L, T): ")
    for i in range(TEAMS):
        print("Team: ", names[i])
        found = False
        for j in range(GAMES):
            if results[i][j] == result:
                print("Week: ", (j + 1))
                found = True
        if found == False:
            print("nothing found")

def find_team(names):
    name = input("Enter a name to search: ")

    i = 0
    while i < TEAMS - 1 and names[i] != name:
        i += 1

    if names[i] != name:
        return_value = -1
else:
    return_value = i
return return_value

#Main code starts here
names = [None] * TEAMS
results = [ [None] * GAMES for i in range(TEAMS) ]

input_data(names, results)
display_result(names, results)

index = find_team(names)
while index != -1:
    total = 0
    for j in range(GAMES):
        if results[index][j] == "W":
            total += 3
        elif results[index][j] == "T":
            total += 1
    print("Points:", total)
    index = find_team(names)

8. Solution

import string
alphabet = " " + string.ascii_lowercase  # space is a valid character!

def my_encrypt(message, encryption_key):
    return_value = ""
    for i in range(len(message)):
        letter = message[i]
        index = alphabet.find(letter)
        new_index = (index + encryption_key) % 27  # 26 letters + 1 space
        new_letter = alphabet[new_index]
        return_value += new_letter
    return return_value

def my_decrypt(message, decryption_key):
    return_value = ""
    for i in range(len(message)):
        letter = message[i]
        index = alphabet.find(letter)
        new_index = (index + 27 - decryption_key) % 27  # 26 letters + 1 space
        new_letter = alphabet[new_index]
        return_value += new_letter
    return return_value

def display_menu():
    print()  
    print("1. Encrypt a message")
    print("2. Decrypt a message")
    print("3. Exit")

#Main code starts here
while True:
    display_menu()
    choice = int(input("Enter a choice: "))

    if choice == 1:
        message = input("Enter a message to encrypt: ")
        encryption_key = int(input("Enter an encryption key: "))
        print("Your encrypted message is:", my_encrypt(message, encryption_key))
    elif choice == 2:
        message = input("Enter a message to decrypt: ")
        decryption_key = int(input("Enter an decryption key: "))
        print("Your decrypted message is:", my_decrypt(message, decryption_key))
    if choice == 3: break
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.

And remember: Learning is a process within an endless loop structure. It begins at birth and continues throughout your lifetime!
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