



PL2 
TEAM

PL2

Sheet : 1



1 - Check Point Questions:

Review the questions at the following URL:

<https://liveexample.pearsoncmg.com/checkpoint12/Chapter1.html>

<https://liveexample.pearsoncmg.com/checkpoint12/Chapter2.html>

<https://liveexample.pearsoncmg.com/checkpoint12/Chapter3.html>

<https://liveexample.pearsoncmg.com/checkpoint12/Chapter4.htm>

2 - Exercises from the textbook:

1.5 (*Compute expressions*) Write a program that displays the result of

$$\frac{9.5 \times 4.5 - 2.5 \times 3}{45.5 - 3.5}$$

1.9 (*Area and perimeter of a rectangle*) Write a program that displays the area and perimeter of a rectangle with a width of **4.5** and a height of **7.9** using the following formula:

$$\text{area} = \text{width} \times \text{height}$$

***1.11** (*Population projection*) The U.S. Census Bureau projects population based on the following assumptions:

- One birth every 7 seconds
- One death every 13 seconds
- One new immigrant every 45 seconds

Write a program to display the population for each of the next five years. Assume that the current population is 312,032,486, and one year has 365 days. *Hint:* In Java, if two integers perform division, the result is an integer. The fractional part is truncated. For example, **5 / 4** is **1** (not **1.25**) and **10 / 4** is **2** (not **2.5**). To get an accurate result with the fractional part, one of the values involved in the division must be a number with a decimal point. For example, **5.0 / 4** is **1.25** and **10 / 4.0** is **2.5**.

2.2 (*Compute the volume of a cylinder*) Write a program that reads in the radius and length of a cylinder and computes the area and volume using the following formulas:

```
area = radius * radius * π  
volume = area * length
```

Here is a sample run:

```
Enter the radius and length of a cylinder: 5.5 12 Enter  
The area is 95.0331  
The volume is 1140.4
```



***2.5** (*Financial application: calculate tips*) Write a program that reads the subtotal and the gratuity rate, then computes the gratuity and total. For example, if the user enters **10** for subtotal and **15%** for gratuity rate, the program displays **\$1.5** as gratuity and **\$11.5** as total. Here is a sample run:


```
Enter the subtotal and a gratuity rate: 10 15 Enter  
The gratuity is $1.5 and total is $11.5
```



****2.6** (*Sum the digits in an integer*) Write a program that reads an integer between 0 and 1000 and adds all the digits in the integer. For example, if an integer is 932, the sum of all its digits is 14.

Hint: Use the % operator to extract digits, and use the / operator to remove the extracted digit. For instance, $932 \% 10 = 2$ and $932 / 10 = 93$.

Here is a sample run:

```
Enter a number between 0 and 1000: 999   
The sum of the digits is 27
```



****3.4** (*Random month*) Write a program that randomly generates an integer between 1 and 12 and displays the English month names January, February, . . . , December for the numbers 1, 2, . . . , 12, accordingly.

for the numbers 1, 2, . . . , 12, accordingly.

***3.5** (*Find future dates*) Write a program that prompts the user to enter an integer for today's day of the week (Sunday is 0, Monday is 1, . . . , and Saturday is 6). Also prompt the user to enter the number of days after today for a future day and display the future day of the week. Here is a sample run:

Enter today's day: 1

Enter the number of days elapsed since today: 3

Today is Monday and the future day is Thursday



****3.9** (*Business: check ISBN-10*) An ISBN-10 (International Standard Book Number) consists of 10 digits: $d_1d_2d_3d_4d_5d_6d_7d_8d_9d_{10}$. The last digit, d_{10} , is a checksum, which is calculated from the other 9 digits using the following formula:

$$(d_1 \times 1 + d_2 \times 2 + d_3 \times 3 + d_4 \times 4 + d_5 \times 5 + d_6 \times 6 + d_7 \times 7 + d_8 \times 8 + d_9 \times 9) \% 11$$

If the checksum is **10**, the last digit is denoted as X according to the ISBN-10 convention. Write a program that prompts the user to enter the first 9 digits and displays the 10-digit ISBN (including leading zeros). Your program should read the input as an integer. Here are sample runs:



Enter the first 9 digits of an ISBN as integer: 013601267
The ISBN-10 number is 0136012671

***4.2** (*Geometry: great circle distance*) The great circle distance is the distance between two points on the surface of a sphere. Let (x_1, y_1) and (x_2, y_2) be the geographical latitude and longitude of two points. The great circle distance between the two points can be computed using the following formula:

$$d = \text{radius} \times \arccos(\sin(x_1) \times \sin(x_2) + \cos(x_1) \times \cos(x_2) \times \cos(y_1 - y_2))$$

Write a program that prompts the user to enter the latitude and longitude of two points on the earth in degrees and displays its great circle distance. The average radius of the earth is 6,371.01 km. Note you need to convert the degrees into radians using the **Math.toRadians** method since the Java trigonometric methods use radians. The latitude and longitude degrees in the formula are for north and west. Use negative to indicate south and east degrees. Here is a sample run:



```
Enter point 1 (latitude and longitude) in degrees: 39.55 -116.25 [Enter]
Enter point 2 (latitude and longitude) in degrees: 41.5 87.37 [Enter]
The distance between the two points is 10691.79183231593 km
```


***4.3** (*Geography: estimate areas*) Use the GPS locations for Atlanta, Georgia; Orlando, Florida; Savannah, Georgia; and Charlotte, North Carolina in the figure in Section 4.1 to compute the estimated area enclosed by these four cities. (Hint: Use the formula in Programming Exercise 4.2 to compute the distance between two cities. Divide the polygon into two triangles and use the formula in Programming Exercise 2.19 to compute the area of a triangle.)

***4.5** (*Geometry: area of a regular polygon*) A regular polygon is an n -sided polygon in which all sides are of the same length and all angles have the same degree (i.e., the polygon is both equilateral and equiangular). The formula for computing the area of a regular polygon is

$$\text{Area} = \frac{n \times s^2}{4 \times \tan\left(\frac{\pi}{n}\right)}$$

Here, s is the length of a side. Write a program that prompts the user to enter the number of sides and their length of a regular polygon and displays its area. Here is a sample run:

```
Enter the number of sides: 5  Enter
Enter the side: 6.5  Enter
The area of the polygon is 72.69017017488385
```

