

### Exercise – Variables and Arithmetic

1. For the first part of this exercise, write the following segments of code in Java and answer the following questions.

Example 1:

```
public static void main(String[] args)
{
    int counter;
    counter = 0;
    System.out.println(counter);
    counter = counter+1;
    System.out.println(counter);
    counter = counter+1;
    System.out.println(counter);
    counter += 1;
    System.out.println(counter);
    counter *= counter;
    System.out.println(counter);
    counter *= (counter+1);
    System.out.println(counter);
    counter /= counter;
    System.out.println(counter);
}
```

Explain what each of the operators do. Provide your explanation within your code using Java documentation (using a `/**` before your explanation – which will make your text green).

- a) `x = y`
- b) `x += y`
- c) `x *= y`
- d) `x /= y`

Example 2:

```
public static void main(String[] args)
{
    int a = 5;
    double b = 16.5;

    System.out.println(a);
    a++;
    System.out.println(a);
    a--;
    System.out.println(a);

    System.out.println(b);
    b++;
    System.out.println(b);
    b--;
    System.out.println(b);
}
```

What do the `++` and `--` operators do in the following program?

The “++” operator increments the variable by 1 whereas the “- -” operator decrements the variable by 1.

Example 3:

```
public static void main(String[] args)
{
    System.out.println(5 % 2);
    System.out.println(9 % 3);
    System.out.println(9 % 5);
    System.out.println(-5 % 2);
    System.out.println(12 % 10);
    System.out.println(106 % 10);
    System.out.println(1278 % 10);
}
```

What is the name and function of the “%” operator in the following program?

The “%” operator simply gives the remainder of two numbers for example 10%3 is 1.

\*\*\*\*\*

For all the following questions use the math method Math.abs() to ensure that all values entered by the user are positive numbers.

2. Write a program to calculate the volume of a cube.

Test Input	Output
Enter Length: 5 Enter Width: 6 Enter Depth: 7	Volume = 210 units cubed

```
int lenght;
int width;
int depth;
int volume;
System.out.println("Enter Lenght");
lenght = input.nextInt();
System.out.print("Enter width:");
width = input.nextInt();
System.out.println("Enter depth:");
depth = input.nextInt();
volume = lenght*width*depth;
System.out.println(volume + " unit cubic.");
```

3. There are 2.54 cm in one inch. Write a program to input the length of a desk in inches and output its length in centimeters. Use a constant for the conversion factor. The program should round the answer to two decimal places.

Test Input	Output
Enter desk length in inches: 15	Desk length = 38.1 cm

```
double inches;
double desklenght;
System.out.println("Enter desk length in inches");
inches = input.nextDouble();
```

```

        desklenght = 2.54*inches;
        System.out.println("Desk lenght = " + desklenght);

```

4. Write a program that will prompt the user for the temperature in Celsius and convert Celsius to Fahrenheit.  $F = [(9.0/5.0)*C]+32$ . The program should round the answer to the nearest degree Fahrenheit.

Test Input	Output
Enter Celsius: 10	10 degrees Celsius = 50 degrees Fahrenheit.

```

        double celcius;
        double fahrenheit;
        System.out.println("Enter Celsius");
        celcius = input.nextDouble();
        fahrenheit = (((9.0/5.0)*celcius)+32);
        System.out.println (celcius + " degrees Celsius = " + fahrenheit + "
degrees Fahrenheit.");

```

5. Write a program to figure out the following: Louise runs the first half of a race at n miles per hour. Then she picks up her pace and runs the last half of the race at x miles per hour. How long does it take her to run k miles? The program should round the time down to the nearest hour.

Test Input	Output
Enter first speed: 10 Enter second speed: 9.2 Enter total distance: 72	She was running for 7 hours.

```

        double speed1;
        double speed2;
        double time;
        double distance;
        System.out.println("Enter first speed:");
        speed1 = input.nextDouble();
        System.out.println("Enter second speed:");
        speed2 = input.nextDouble();
        System.out.println("Enter total distance:");
        distance = input.nextDouble();
        time = (distance/((speed1+speed2)/2));
        System.out.println("She was running for " + Math.floor (time) + "
hours");

```

6. Write a program that prompts for the number of hours and outputs the equivalent number of days and hours.

Sample Output
Enter the total number of hours 300 There are 12 days and 12 hours in 300 hours

```

        double hours;
        int days;
        double rhour; //remaining hours
        System.out.println("Enter the total number of hours:");
        hours = input.nextDouble();
        days = (int) (hours/24);
        rhour = (hours%24);
        System.out.println("There are " + Math.floor(days) + " days and
"+ rhour + " hours in " + hours + " hours.");

```

7. Write a program that will prompt the user for any integer. The program will output the last digit of the integer.

**Example**

Enter an integer:

2312412

The final digit is 2

```
String integer;  
System.out.println("Enter an integer:");  
integer = input.next();  
System.out.print(integer.charAt(integer.length()-1));
```

8. Write a program that will prompt the user for a number. The program will output the square root of that number.

```
int number;  
System.out.println("Enter a number:");  
number = input.nextInt();  
System.out.println("The square root of " + number + " is " +  
Math.sqrt(number));
```

9. Write a program that will prompt the user for the base and exponent for a power. Calculate and output the result.

```
int base;  
int exponent;  
System.out.println("Enter base:");  
base = input.nextInt();  
System.out.println("Enter exponent");  
exponent = input.nextInt();  
System.out.println(base + " to the power of " + exponent + " is "  
+ Math.pow(base, exponent));
```

10. Write a program that will prompt the user for the height and length of a right-angled triangle. Your program will calculate and output the hypotenuse of the triangle. Round the answer down to the nearest integer.

```
double height;  
double length;  
double hypotenuse;  
System.out.println("Enter the height of the triangle:");  
height = input.nextDouble();  
System.out.println("Enter the length of the triangle:");  
length = input.nextDouble();  
hypotenuse = (Math.pow(height, 2) + Math.pow(length, 2));  
hypotenuse = Math.sqrt(hypotenuse);  
System.out.println("The hypotenuse of the right angle triangle is  
" + Math.floor(hypotenuse));
```

11. Write a program that will prompt the user for the height and hypotenuse of a right-angled triangle. Your program will calculate and output the length of the triangle. Round the answer down to the nearest integer.

```
double height;  
double length;  
double hypotenuse;  
System.out.println("Enter the height of the triangle:");  
height = input.nextDouble();
```

```

        System.out.println("Enter hypotenuse of the triangle:");
        hypotenuse = input.nextDouble();
        length = (Math.pow(hypotenuse, 2)+Math.pow(heighth, 2));
        length = Math.sqrt(length);
        System.out.println("The length of a right angle triangle is " +
Math.floor(length));

```

12. Write a program that will prompt the user for the height of a can with a diameter of 10 cm. This program will determine and output the volume of the can.

```

double height;
double diameter;
double volume;
double area;
diameter = 10;
System.out.println ("Enter the height of the can:");
height = input.nextDouble();
area = 3.14159*Math.pow(5, 2);
volume = (area*height);
System.out.println("The volume of the can is " + volume + "cm");

```

13. A ball pit contains 3000 balls. Each ball has diameter of 12 cm. Write a program that will determine and output the volume of balls in the pit.

```

double volume;
double pi;
pi = 3.14159;
volume = ((4/3*pi*Math.pow(6,2))*3000);
System.out.println("The volume of balls in the pit is " +
volume);

```

14. You have been asked by The HB baseball team to write a program that calculates baseball statistics. Write a program that will ask the user for the number of times at bat, and the number of singles, doubles, triples, and home runs. Then calculate both of their averages based on the following formulas:

batting average = total number of hits / total times at bat

slugging average = 
$$\frac{(\text{\# singles}) + (\text{\#doubles} * 2) + (\text{\#triples} * 3) + (\text{\#HomeRuns} * 4)}{\text{total times at bat}}$$

round the batting average and the slugging averages to 3 decimal places.

```

double bat;
double singles;
double doubles;
double triples;
double homeruns;
double battingaverage;
double sluggingaverage;
System.out.println("Enter the number of times at bat:");
bat = input.nextDouble();
System.out.println("Enter the number of times at singles:");
singles = input.nextDouble();
System.out.println("Enter the number of times at doubles:");
doubles = input.nextDouble();
System.out.println("Enter number of times at triples:");

```

```
triples = input.nextDouble();
System.out.println("Enter number of home runs:");
homeruns = input.nextDouble();
battingaverage = ((singles+doubles+triples+homeruns)/bat);
sluggingaverage =
(((singles)+(doubles*2)+(triples*3)+(homeruns*4))/bat);
System.out.println("The batting average is " +
Math.round(battingaverage));

System.out.println("The slugging average is " +
Math.round(sluggingaverage));
```