Week 2: Computer Science 1

Programming with variables & casting.

Write a program called 'Area.java' which will save the width and height of a rectangle and calculate the area. The width and height will be saved in variables.

Your output should look like this:

```
width: 4.2
height: 5.5
Area of the rectangle is: 23.1
```

Solution

```
class Area {
    public static void main(String[] args) {
        double width = 4.2;
        double height = 5.5;
        double area = width * height;
        System.out.println("width: " + width);
        System.out.println("height: " + height);
        System.out.println("Area of the rectangle is: " + area);
    }
}
```

Write a program called 'Mph.java' which will save the distance and time of a trip and calculate the average speed. The distance and time will be saved in variables. Time should be saved in minutes as a whole number. Distance should be saved in miles as a decimal number. Your output should look like this:

```
distance: 100.0
time: 120
Average speed: 50.0
```

Solution

```
class Mph {
    public static void main(String[] args) {
        double distance = 100.0;
        int time = 120;
        double mph = distance / (time/60);
        System.out.println("distance: " + distance);
        System.out.println("time: " + time);
        System.out.println("Average speed: " + mph);
    }
}
```

Casting Practice

Type	Size (bits)
byte	8 bits
short	16 bits
int	32 bits
float	32 bits
double	64 bits

```
byte b = 20;
short s = 10;
int i = 100;
float f = 10.0f;
double d = 10.0;
```

Which of the following are legal in Java?

```
i = b;
s = b;
f = b;
d = b;
b = i;
s = i;
f = i;
f = d;
```

Type	Size (bits)
byte	8 bits
short	16 bits
int	32 bits
float	32 bits
double	64 bits

```
byte b = 20;
short s = 10;
int i = 100;
float f = 10.0f;
double d = 10.0;
```

Which of the following are legal in Java?

```
i = b; // legal
s = b; // legal
f = b; // legal
d = b; // legal
b = i; // illegal
s = i; // illegal
f = i; // legal
f = d; // illegal
```

If you are going to assign a larger type to a smaller type, you must use a cast. For example:

```
int i = 100;
byte b = (byte) i;
println(b); // prints 100.
```

Remember, byte has a range of -128 to 127. So no information is lost in this case.

But if you try to assign a larger number to a smaller type, you will lose information. For example:

```
int i = 257;
byte b = (byte) i;
println(b); // prints 1
```

Why 1?

Remember, byte has a range of -128 to 127. So 257 is out of range. The byte will only store the last 8 bits of the number, which is 1.

- 257 in binary is 100000001.
- The last 8 bits are 00000001, which is 1 in decimal.