

# C++ Problem Set Worksheet 1.A CMPE 261

## Large Scale Programming

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### **Problem 1: Area of a Triangle**

Write a C++ program that calculates the area of a triangle given its base and height. Display the base, height, and calculated area on the same line.

#### **Instructions:**

- Ask the user to input the base and height of the triangle (as floating-point numbers).
- Calculate the Area ( $\text{Area}=0.5 \times \text{Base} \times \text{Height}$ ).
- Display the Base, Height, and Area on the same line, separated by vertical bars ( | ).

#### **Sample Input:**

```
Enter the base of the triangle: 12.5
Enter the height of the triangle: 8.0
```

#### **Sample Output:**

```
Base: 12.50 | Height: 8.00 | Area: 50.00
```

### **Problem 2: Volume and Surface Area of a Cube**

Write a C++ program that calculates the volume and total surface area of a cube given its side length. Display both results on the same line.

**Instructions:**

- Ask the user to input the side length of the cube (as an integer).
- Calculate the Volume ( $\text{Volume}=\text{side}^3$ ) and the Surface Area ( $\text{Surface Area}=6 \times \text{side}^2$ ).
- Display the calculated Volume and Surface Area on the same line separated by a pipe symbol and spaces.

**Sample Input:**

```
Enter the side length of the cube: 4
```

**Sample Output:**

```
Volume: 64 | Surface Area: 96
```

**Problem 3: Average and Sum of Three Numbers**

Write a C++ program that takes three integer numbers as input and calculates their sum and average. Display both results on the same line.

**Instructions:**

- Ask the user to input three integer numbers.
- Calculate the Sum (integer) and the Average (as a floating-point number).
- Display the Sum and the Average on the same line, separated by an equals sign and spaces.

**Sample Input:**

```
Enter three numbers: 15 20 25
```

**Sample Output:**

```
Sum = 60, Average = 20
```

**Problem 4: Distance Conversion (Kilometers to Miles)**

Write a C++ program that converts a given distance in Kilometers to Miles. Assume the conversion rate is 1 Mile  $\approx 1.60934 \times$  Kilometers.

**Instructions:**

- Ask the user to input the distance in Kilometers (as a floating-point number).
- Calculate the equivalent distance in Miles ( $\text{Miles} = \text{Kilometers} / 1.60934$ ).
- Display the original Kilometers and the converted Miles on the same line, clearly labeled and separated by a hyphen.

**Sample Input:**

```
Enter distance in Kilometers: 100
```

**Sample Output:**

```
100 KM - 62.1373 Miles
```

**Problem 5: Calculate Final Price with Tax**

Write a C++ program that calculates the tax amount and the final total price of an item given its initial price and a tax rate percentage. Display both results on the same line.

**Instructions:**

- Ask the user to input the initial item price (double) and the tax rate percentage (integer, e.g., 8 for 8%).
- Calculate the Tax Amount and the Final Price (Initial Price+Tax Amount).
- Display the Tax Amount and the Final Price on the same line, separated by a slash.

**Sample Input:**

```
Enter initial price: 50.00
Enter tax rate (%): 8
```

**Sample Output:**

```
Tax: 4.00 / Final Price: 54.00
```

## **Problem 6: Time Conversion (Seconds to Minutes and Remaining Seconds)**

Write a C++ program that takes a total time in seconds and converts it into equivalent minutes and remaining seconds. Display the results on the same line.

### **Instructions:**

- Ask the user to input the total time in seconds (as an integer).
- Calculate the full Minutes (using integer division) and the Remaining Seconds (using the modulus operator).
- Display the total seconds, the calculated minutes, and the remaining seconds on the same line separated by commas.

### **Sample Input:**

```
Enter total seconds: 350
```

### **Sample Output:**

```
Total Seconds: 350, Minutes: 5, Remaining Seconds: 50
```

## **Problem 7: Power Calculation**

Write a C++ program that calculates the result of a base number raised to an exponent. Display the base, exponent, and result on the same line.

### **Instructions:**

- Ask the user to input the base number and the exponent (both as integers).
- Calculate the Power (Result= $Base^{Exponent}$  ). You will need to use the pow() function from the <cmath> header.
- Display the Base, Exponent, and the Result on the same line, separated by a colon.

### **Sample Input:**

```
Enter base number: 2  
Enter exponent: 10
```

### **Sample Output:**

```
Base: 2 : Exponent: 10 : Result: 1024
```

## Problem 8: Pythagorean Theorem (Hypotenuse)

Write a C++ program that calculates the length of the hypotenuse (c) of a right triangle, given the lengths of the two legs (a and b). The formula is  $c = \sqrt{a^2 + b^2}$ .

### Instructions:

- Ask the user to input the lengths of the two legs (a and b, as floating-point numbers).
- Calculate the hypotenuse c. You will need to use the `sqrt()` and `pow()` functions from the `<cmath>` header.
- Display the lengths of a, b, and the calculated hypotenuse c on the same line, separated by an arrow (->).

### Sample Input:

```
Enter length of leg A: 3.0
Enter length of leg B: 4.0
```

### Sample Output:

```
A: 3.0 -> B: 4.0 -> Hypotenuse: 5.0
```