

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 (Volume= $side^3$) and the Surface Area (Surface Area= $6 \times side^2$).
- 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 $1 \text{ Mile} \approx 1.60934 \times \text{Kilometers}$.

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 ($\text{Initial Price} + \text{Tax Amount}$).
- 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
```