Writing C++ Program using expressions to solve real world problems

اَللّٰهُمَّ اُرْزُقْنِى عِلْمًا نَافِعًا وَاسِعًا عَمِيْقًا

اَللّٰهُمَّ اُرْزُقْنِى رِزْقًا وَاسِعًا حَلَالًا طَيِّبًا
مُبَارَكًا مِنْ عِنْدِكَ

Problem: Daily Earnings

Kaka is a programmer in an American company, and he works at home approximately N days per month by earning approximately M dollars per day. At the end of the year, Kaka gets a bonus, which equals 2.5 of his monthly salaries. In addition, 25% of his annual salary goes for taxes.

Write a program that takes working days per month, daily earnings in dollars and exchange rate of USD to PKR as input from the user and calculates the amount of Kaka's net average earnings in Rupees per day, as he spends them in Pakistan.
It is accepted that one year has exactly 365 days.

Problem: What will be the input ?

Input
Enter Working Days per Month: 21 Enter earned Dollars per Day: 75.00 Enter Exchange Rate from USD to PKR: 226

Problem: What will be the output

Input	Output
Enter Working Days per Month: 21 Enter earned Dollars per Day: 75.00 Enter Exchange Rate from USD to PKR: 226	Average Earnings per Day: ?

Problem: How to Convert Input to Output

Input	Output
Enter Working Days per Month: 21 Enter earned Dollars per Day: 75.00 Enter Exchange Rate from USD to PKR: 226	Average Earnings per Day: 10605.4

Explanation

One month salary = 21 * 75.00 = 1575 dollars.
Annual income = 1575 * 12 month + 1575 * 2.5 bonus = 22837.5 dollars.
Taxes = 25% of 22837.5 = 5709.375 dollars.
Net annual income in USD = 22837.5 - 5709.375 = 17128.125 dollars.
Net annual income in PKR = 17128.125 dollars * 226 = 3870956.25 PKR.
Average earnings per day = 3870956.25 / 365 ≈ 10605.4 PKR.

Problem: Daily Earnings

Before coding the solution, best practice is to solve the question on paper.

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In the last lecture, we were declaring variables as we needed them in the program.

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There is another approach in which we identify the variables first and then declare them at the start of the program.

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Daily Earnings: Identify the Variables

We need variables to take input from the user.
How many inputs we are taking from the user?

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Daily Earnings: Identify the Variables

We need variables to take input from the user.
3 Variables are needed.

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Daily Earnings: Identify the Variables

We also need variables to display output to the user on console. How many variables are needed?

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Daily Earnings: Identify the Variables

We also need variables to display output to the user on console.
1 Variable is needed.

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Daily Earnings: Identify the Variables

These are the essential variables that we definitely need.
Further, we also need variables to store intermediate results.

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Daily Earnings: Identify the Variables

Its upto us how many variables we create to store intermediate results to make the solution clean and understandable.

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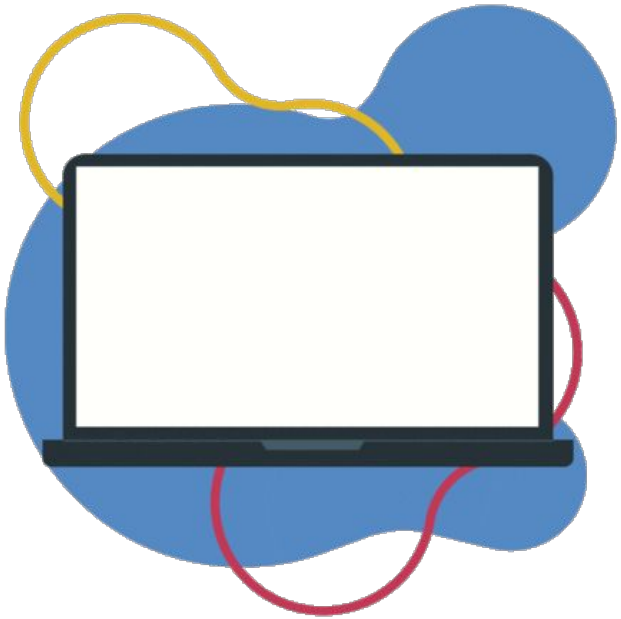
Daily Earnings: Solution Steps

1. Declare 3 variables to take input of working days, Daily earning Dollars and exchange rate.
2. Take inputs from the user in these 3 variables one by one.
3. Multiply working days with dollars and store in a variable named salaryPerMonth.
4. Multiply the salaryPerMonth with 12 and store in a variable named salaryPerYear.
5. Multiply the salaryPerYear with 2.5 and add in the salaryPerYear and store in the variable named salaryAfterBonus.
6. Calculate the 25% of the salaryAfterBonus and subtract it from the salaryAfterBonus and store in the variable named salaryAfterTax.
7. Multiply the salaryAfterTax with exchangeRate and divide with 365 and store in the variable named earningPerDaysInRps.
8. Print the earningPerDaysInRps.

Daily Earnings: Implementation

Lets implement the solution.



```
#include<iostream>
using namespace std;
main()
{
    int days;
    float dollars;
    float exchangeRate;
    float salaryPerMonth;
}
```

```
#include<iostream>
using namespace std;
main()
{
    int days;
    float dollars;
    float exchangeRate;
    float salaryPerMonth;
    cout << "Enter Working Days per Month: ";
    cin >> days;
    cout << "Enter earned Dollars per Day: ";
    cin >> dollars;
    cout << "Enter Exchange Rate from USD to PKR: ";
    cin >> exchangeRate;
}
```

```
#include<iostream>
using namespace std;
main()
{
    int days;
    float dollars;
    float exchangeRate;
    float salaryPerMonth;
    cout << "Enter Working Days per Month: ";
    cin >> days;
    cout << "Enter earned Dollars per Day: ";
    cin >> dollars;
    cout << "Enter Exchange Rate from USD to PKR: ";
    cin >> exchangeRate;
    salaryPerMonth = days * dollars;
}
```

```cpp
#include<iostream>
using namespace std;
main()
{
    int days;
    float dollars;
    float exchangeRate;
    float salaryPerMonth;
    float salaryPerYear;
    cout << "Enter Working Days per Month: ";
    cin >> days;
    cout << "Enter earned Dollars per Day: ";
    cin >> dollars;
    cout << "Enter Exchange Rate from USD to PKR: ";
    cin >> exchangeRate;
    salaryPerMonth = days * dollars;
    salaryPerYear = salaryPerMonth * 12;
}
```

```cpp
#include<iostream>
using namespace std;
main()
{
    int days;
    float dollars;
    float exchangeRate;
    float salaryPerMonth;
    float salaryPerYear;
    float salaryAfterBonus;
    cout << "Enter Working Days per Month: ";
    cin >> days;
    cout << "Enter earned Dollars per Day: ";
    cin >> dollars;
    cout << "Enter Exchange Rate from USD to PKR: ";
    cin >> exchangeRate;
    salaryPerMonth = days * dollars;
    salaryPerYear = salaryPerMonth * 12;
    salaryAfterBonus = salaryPerYear + (salaryPerMonth * 2.5);
}
```

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#include<iostream>
using namespace std;
main()
{
    int days;
    float dollars;
    float exchangeRate;
    float salaryPerMonth;
    float salaryPerYear;
    float salaryAfterBonus;
    float salaryAfterTax;
    cout << "Enter Working Days per Month: ";
    cin >> days;
    cout << "Enter earned Dollars per Day: ";
    cin >> dollars;
    cout << "Enter Exchange Rate from USD to PKR: ";
    cin >> exchangeRate;
    salaryPerMonth = days * dollars;
    salaryPerYear = salaryPerMonth * 12;
    salaryAfterBonus = salaryPerYear + (salaryPerMonth * 2.5);
    salaryAfterTax = salaryAfterBonus - (salaryAfterBonus * 25/100);
}
```

```cpp
#include<iostream>
using namespace std;
main()
{
    int days;
    float dollars;
    float exchangeRate;
    float salaryPerMonth;
    float salaryPerYear;
    float salaryAfterBonus;
    float salaryAfterTax;
    float earningPerDayInRps;
    cout << "Enter Working Days per Month: ";
    cin >> days;
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    cout << "Enter Exchange Rate from USD to PKR: ";
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    salaryPerMonth = days * dollars;
    salaryPerYear = salaryPerMonth * 12;
    salaryAfterBonus = salaryPerYear + (salaryPerMonth * 2.5);
    salaryAfterTax = salaryAfterBonus - (salaryAfterBonus * 25/100);
    earningPerDayInRps = (salaryAfterTax * exchangeRate) / 365;
}
```

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    salaryPerMonth = days * dollars;
    salaryPerYear = salaryPerMonth * 12;
    salaryAfterBonus = salaryPerYear + (salaryPerMonth * 2.5);
    salaryAfterTax = salaryAfterBonus - (salaryAfterBonus * 25/100);
    earningPerDayInRps = (salaryAfterTax * exchangeRate) / 365;
    cout << "Average Earnings per Day: " << earningPerDayInRps;
}
```

Daily Earnings:

This is called the Algorithm.

1. Declare 3 variables to take input of working days, Daily earning Dollars and exchange rate.
2. Take inputs from the user in these 3 variables one by one.
3. Multiply working days with dollars and store in a variable named salaryPerMonth.
4. Multiply the salaryPerMonth with 12 and store in a variable named salaryPerYear.
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7. Multiply the salaryAfterTax with exchangeRate and divide with 365 and store in the variable named earningPerDaysInRps.
8. Print the earningPerDaysInRps.

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#include<iostream>
using namespace std;
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    salaryAfterBonus = salaryPerYear + (salaryPerMonth * 2.5);
    salaryAfterTax = salaryAfterBonus - (salaryAfterBonus * 25/100);
    earningPerDayInRps = (salaryAfterTax * exchangeRate) / 365;
    cout << "Average Earnings per Day: " << earningPerDayInRps;
}
```

This is called the Program.

Learning Objective

Write a C++ program that takes input from the user, apply mathematical operations and gives output on Console.

Self Assessment

1. A Bit is a binary digit. It can hold only one of two values: 0 or 1. Bits are usually assembled into a group of 8 to form a Byte. A Kilobyte (KB) is equal to 1,024 bytes. A Megabyte (MB) is equal to 1,024 kilobytes, or 1,048,576 (1024x1024) bytes or 8,388,608 bits. Write a program that takes Megabytes from the user and converts it into Bits.

Input	Output
Megabytes: 2	16,777,216 Bits