**HOMEWORK 3: CS 102 – 1 (Programming I)**

**Due Date: 09/16/2024**

Problems 3 and 4 are full programs.

1. Using C++ rule and doing only one operation at a time and using the priority rules, evaluate each of the following expressions: (Must show the work in details by doing one operation at a time)
2. 5%7 \* 2 /4 = 5 \*2 /4 = 10/4 = 2
3. (19 – 2)/4 % 2 = 17/4 % 2 = 4%2 = 0
4. pow(3, 3) % 5 \* 2 = 27%5 \* 2 = 2\*2 =4
5. ceil(6.2) /4 = 7/4 = 1
6. 100 – 20 % floor(4.9) = 100 - 20 % 4 = 100 – 0 = 100 – 0 = 100
7. Write down each of the following expressions in C++ using suitable library functions:
8. The monthly mortgage payment (PMT) can be computed from present-value (PV) of a mortgage loan as below:

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Ans: PMT = (PV \* i \*pow(1 + I, n)) / (pow(1+i, n) – 1);

Where i = annualInterest/1200

And n = total number of months to pay off the loan

Write the expression given above using C++, assume that PV, i and n are known and they all are declared as floating point variables.

1. The factorial of an integer number (N) can be computed as 1 \* 2 \* 3 \* … \* N

However this can be approximated using Stirling’s approximation formula as given below:

Factorial =

Ans: Factorial = sqrt(2\*PI\*N) \* pow(n/e, N);

1. An radioactive material decays according to the following formula:

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ANS: M = M0 \* e ( - ln(2) / h ) \* t;

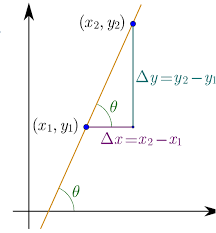
Where ln is natural log, M is the mass of radioactive material after time t

M0 is the initial mass, h is half life in years, t is time in years.

1. The period of a pendulum is given by the following formula. Write it in C++

ANS: P = 2 \* PI \* sqrt( l/g) \* (1+0.25 \* pow(sin(alpha / 2), 2));

1. Write a Computer Program for computing the following information for a straight line whose two end points: (x1, y1) and (x2, y2) as shown in the diagram. Ask user to enter x1, y1 and x2, y2 in separate input statements, and then compute and display the following quantities.



3) mid point coordinate (xmid, ymid) as

` 4) y\_intercept = y1 – slope \* x1

Display all the values using a precision of 2 (i.e. displaying 2 digits after the decimal)

1. In an electrical circuit, a current is generated if a voltage is applied across one or more resistances. Suppose that a circuit contains three resistors arranged in parallel as shown in the figure below.

A diagram of a circuit

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V

Given the voltage (V) and the three resistances R1, R2 and R2, compute the equivalent resistance R , the current I and the power Pas given in the formulae below:

Current, I = V/R

Power, P = I \* V

Display R, I and P in separate lines with proper title. Use precision of 1 for each case (meaning displaying one digit after decimal)

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1. Str1.Length() = 29
2. Str1.find(str2) = 1
3. Str1.substr (4, 25) = ought to start with logic
4. Str1.substr (4, 25). Find(str2) = 0
5. Str1.substr. (str1. Find (“logic”), 3) = log
6. Str1.substr(24, 5). Find(str2. Substr(0,1)) = 1
7. Str1. Find(“end”) = npos // ( doesn’t match this word in str1)