EGR 125 - Introduction to Engineering Methods (C++)
File: N125T1Sample

Instructions: Work this problem by hand with no notes and no computer within two hours. Once you are finished, compare your solution to the answers provided and calculate your score.

Note: This is just a sample, so the actual test may test other concepts not necessarily included in the problems below. This test shows the approximate level of detail to be expected in test problems.

Sample Test #1

1. (12 points) Circle the letter corresponding the best answer in each part below. Circle only one letter in each part.

   A) Which one of the following expressions yields the **largest** result?
   a) 5%6%3 b) 3%5%6 c) 5%3%6 d) 6%5%3

   B) Which one of the following expressions yields the **largest** result?
   a) 3e1-3 b) pow(16,1/2)+pow(3,3) c) 2*2E1-20*1E-1 d) -33/-3-3e1/-2

   C) Which one of the following is not a valid identifier in C++?
   a) int_main b) Omega c) A_____B d) break e) character

   D) The C++ instructions shown below will yield which output?

```
double x = 21.56;
cout << setprecision(3) << showpoint << x;
```

   a) 21.5 b) 21.6 c) 21.56 d) 21.560 e) 21.56000

   E) The C++ instructions shown below will yield which output?

```
double x = 21.56;
cout << fixed << setprecision(3) << showpoint << x;
```

   a) 21.5 b) 21.6 c) 21.56 d) 21.560 e) 21.56000

   F) Which ***one*** of the following is an invalid C++ expression (i.e., yields a compiler error)?
   a) **cout << "What\?";**
   b) **cout << "\"B\”;**
   c) **double x = 4;**
   cout << 1e-1 << -1e-1 << 1-1e1-1;
   d) **cout << "t\t\tt\t";**
   e) **cout << "int x = 2.99";**

2. (10 points) Determine the output of the following program.

```
// Test 1 - Sample Test - Problem 2
// Some parts may test common errors
#include <iostream>
using namespace std;
int main()
{   int A = 1,  B = 3,  C = 5,  D = -2, E = -4, F = -6;
    if (pow(D-A,-C/D) > pow(E-D,F/D)
        cout << "Part A is True" << endl;
    else
        cout << "Part A is False" << endl;
    if (!(D<E) && -F>-E || A-B >= E-F)
        cout << "Part B is True" << endl;
    else
        cout << "Part B is False" << endl;
    if (!(A%B != C%B || A+B >= -E && D-E+F < A-B-C))
        cout << "Part C is True" << endl;
    else
        cout << "Part C is False" << endl;
    if (F < E < D)
        cout << "Part D is True" << endl;
    else
        cout << "Part D is False" << endl;
    if (!C)
        cout << "Part E is True" << endl;
    else
        cout << "Part E is False" << endl;
    return 0;     }
```

Problem 1 Output:

Part A is _____

Part B is _____

Part C is _____

Part D is _____

Part E is _____

3. (28 points) Determine the output of the program shown below.

```
// Test 1 - Sample Test - Problem 3
#include <iostream>
#include <string>
#include <cmath>
using namespace std;
int main( )
{
    double A, B, C, D, E, G, F, L = 4.56, Y = -1.5;
    int J, P, M = 8, N = 3, Q = 5, R, W = 6, K = 8;
    string A1 = "1a", B1 = "12b", C1 = "123c";
    char a = 70;
    A = 17/5/2 ;
    B = 17/5./2 ;
    C = 17/5/2. ;
    D = 26%9%5;
    E = (4E+1+1E+2)/1E-1;
    F = ceil(Y);
    G = (L - static_cast<int>(L))*10;
    P = A1.length( ) + B1.length( ) + C1.length();
    C1 += A1 ;
    M %= N;
    R = N--;
    W += 3*W;
    J = pow(K,1/3);
    a++;
    a+=4;
    cout  << "\n\n\t Problem 3 Output:"
          << "\n\t A = " << A << "\t\t B = " << B
          << "\n\t C = " << C << "\t\t D = " << D
          << "\n\t E = " << E << "\t\t F = " << F
          << "\n\t G = " << G << "\t\t P = " << P
          << "\n\t C1 = " << C1 << "\t\t M = " << M
          << "\n\t R = " << R << "\t\t W = " << W
          << "\n\t J = " << J << "\t\t a = " << a << endl;
    return 0;        }
```

A = _____ B = _____

C = _____ D = _____

E = _____ F = _____

G = _____ P = _____

C1 = _____ M = _____

R = _____ W = _____

J = _____ a = _____

4. (12 points) Determine the output of the following program for each input indicated in the table.

```
// Test 1 - Sample Test - Problem 4
#include <iostream>
using namespace std;
int main()
{   int X,Sum;
    cout << "Enter X: ";
     cin >> X;
     if (X < -10 || X > 20)
        Sum = 1;
     else if (X > 10 && X%2)
        Sum = 2;
     else if (X >= -5 && !(X%2))
        Sum = 3;
     else if (2*X < -10 || 2*X > 10;)
        Sum = 4;
     else if (abs(X) >1)
        Sum = 5;
     else
         Sum = 6;
    cout << "Sum = " << Sum << endl;
    return 0;  }
```

X	Sum
-2	
1	
3	
8	
9	
15	

5. (6 points) For each part, write one C++ instruction to implement the algebraic statement.

A) $$\phi = \tan^{-1}\left(\frac{|x|}{\sqrt[3]{y}}\right)$$

B) $$\text{Min Value} = \frac{1}{3}e^{-2(y-1)}\sin(75°)$$

6. (8 pts) Determine the output of the program below for each input indicated:

```
// Test 1 - Sample Test - Problem 6
#include <iostream>
using namespace std;

int main()
{
	int A, B, Sum = 0;
	cout << "Enter two numbers: ";
	cin >> A  >> B;
	switch((A+B)%5)
	{
		case 0:
			Sum += 1;
			break;
		case 1:
			Sum += 2;
			break;
		case 2:
			Sum += 3;
		case 3:
			Sum += 4;
			break;
		default:
			Sum += 5;
	}
	cout << "Sum = " << Sum << endl;
	return 0;
}
```

A	B	Sum
5	9	
8	12	
17	15	
19	24	

7. (8 pts) Determine the output of the program below for each input indicated:

```
// Test 1 - Sample Test - Problem 7
#include <iostream>
using namespace std;

int main()
{
  int Sum = 0;
  char A,B,C;
  cout << "Enter 3 characters: ";
  cin >> A >> B >> C;
  if (A > 64 && A < 91) Sum++;
  else if (A > 96 && A < 123) Sum +=3;
  else if  (A > 47 && A < 58)   Sum +=5;
  else  Sum +=10;

  if (B > 64 && B < 91) Sum++;
  else if (B > 96 && B < 123) Sum +=3;
  else if  (B > 47 && B < 58)   Sum +=5;
  else  Sum +=10;

  if (C > 64 && C < 91) Sum++;
  else if (C > 96 && C < 123) Sum +=3;
  else if  (C > 47 && C < 58)   Sum +=5;
  else  Sum +=10;

  cout << Sum << endl;
  return 0;
  }
```

Input	Sum
cat	
DOG	
2+2	
So?	

8. (16 pts) Determine the output of the program below for each input indicated:

Write a ***C++ program*** below (by hand or on separate paper) to solve for V, R, or H (given the other two) for a cylinder using the relationship $V = \pi R^2 H$, where

V = volume of cylinder
R = radius of cylinder
H = height of cylinder

Specifically:

- Prompt the user to enter 1 (solve for volume), 2 (solve for radius), or 3 (solve for height).
- If the user selects option 1 (solve for volume), prompt the user to enter R and H using the equation above. Solve for V and display the result (name and value).
- If the user selects option 2 (solve for radius), prompt the user to enter V and H using the equation above (rearranged to solve for R). Solve for R and display the result (name and value).
- If the user selects option 3 (solve for height), prompt the user to enter R and V using the equation above (rearranged to solve for H). Solve for H and display the result (name and value).

Operator Symbol	Operator Name	Direction	Precedence (1 = highest)
( )	Parentheses	L to R	1
++, --	Post-increment	L to R	2
++, --	Pre-increment	R to L	3
!	Logical NOT	L to R	3
+, -	Positive, negative	L to R	3
*, /, %	Multiplication, division	L to R	4
+, -	Addition, subtraction	L to R	5
<=, >=, >, <	Relational operator	L to R	6
= =, !=	Relational operator	L to R	7
&&	Logical AND	L to R	8
||	Logical OR	L to R	9
+=, -+, *=, /=, %=	Compound assignment	R to L	10
=	Assignment	R to L	10

Character	ASCII decimal equivalent	Character	ASCII decimal equivalent	Character	ASCII decimal equivalent
\a	7	<	60	_	95
\b	8	=	61	`	96
\t	9	>	62	a	97
\n	10	?	63	b	98
\v	11	A	65	c	99
\f	12	B	66	d	100
\r	13	C	67	e	101
space	32	D	68	f	102
!	33	E	69	g	103
"	34	F	70	h	104
#	35	G	71	i	105
%	37	H	72	j	106
&	38	I	73	k	107
'	39	J	74	l	108
(	40	K	75	m	109
)	41	L	76	n	110
*	42	M	77	o	111
+	43	N	78	p	112
,	44	O	79	q	113
-	45	P	80	r	114
.	46	Q	81	s	115
/	47	R	82	t	116
0	48	S	83	u	117
1	49	T	84	v	118
2	50	U	85	w	119
3	51	V	86	x	120
4	52	W	87	y	121
5	53	X	88	z	122
6	54	Y	89	{	123
7	55	Z	90	|	124
8	56	[	91	}	125
9	57	\	92	~	126
:	58	]	93		
;	59	^	94		