

**Information and Computer Science Department**

**Summer Semester 143**

**ICS 103 – Computer Programming in C**

**Midterm Exam Key**

**Sunday, July 05, 2015**

**Duration: 120 minutes**

|  |  |
| --- | --- |
| **Name:** |  |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ID#:** |  |  |  |  |  |  |  |  |  |

|  |  |
| --- | --- |
| **Section:** |  |

|  |  |  |
| --- | --- | --- |
| **Question #** | **Maximum**  **Grade** | **Obtained**  **Grade** |
| **1** | 20 |  |
| **2** | 20 |  |
| **3** | 15 |  |
| **4** | 17 |  |
| **5** | 18 |  |
| **6** | 10 |  |
| **Total** | **100** |  |

**Question # 1 [3 + 8 + 3 + 3 + 3 points]**

I- Find the value for each of the following expressions:

|  |  |
| --- | --- |
| Expression | Value |
| 20 + 40 / 5 \* 4 | 52 |
| 198 / 100 | 1 |
| 198 % 100 | 98 |

II- Convert each of the following algebraic expressions to C expressions:

|  |  |
| --- | --- |
| algebraic expression | C expression |
|  | (A - B) / (C + D) |
|  | 2 \* A / (3 \* B) |
|  | sqrt(A) / (-B) |
|  | A >= 0 && A <= 10 |

III- Convert the **for-**loop in the following program to a **while-**loop.

|  |  |
| --- | --- |
| **#include <stdio.h>**  **int main (void)**  **{**  **int x;**  **for (x = 10; x > 0; x--)**  **printf("Exam\n");**  **return (0);**  **}** | **#include <stdio.h>**  **int main (void)**  **{**  **int x;**  **x = 10;**  **while (x > 0)**  **{**  **printf("Exam\n");**  **x--;**  **}**  **return (0);**  **}** |

IV- What values of integer variable y make the following code segment print hello 15 times?

**for (x = 1; x <= y; x +=3)**

**printf("hello\n");**

**43, 44, 45**

V- What values of integer variable x make the following code segment print the letter 'C'?

**if (x <= 20)**

**if (x < 10)**

**if (x <= 0)**

**printf("A\n");**

**else**

**printf("B\n");**

**else**

**printf("C\n");**

**else**

**printf("D\n");**

**10 to 20**

**Question # 2 [20 points]**

Write the output of each program below.

| **Code Fragment** | **Output** |
| --- | --- |
| **#include <stdio.h>**  **int main (void)**  **{**  **double x = 56.69;**  **printf("%.1f\n%.3f\n" , x , x );**  **return (0);**  **}** | 3 points  56.7  56.690 |
| **#include <stdio.h>**  **int main (void)**  **{**  **int x;**  **x = 20;**  **if (x > 1)**  **x = x + 10;**  **else if (x > 15)**  **x = x + 5;**  **printf("%d\n", x);**  **return (0);**  **}** | 2 points  30 |
| **#include <stdio.h>**  **int main (void)**  **{**  **int x;**  **x = 20;**  **if (x > 1)**  **x = x + 10;**  **if (x > 15)**  **x = x + 5;**  **printf("%d\n", x);**  **return (0);**  **}** | 2 points  35 |
| **#include <stdio.h>**  **int main(void)**  **{**  **int x = 3;**  **switch (x)**  **{**  **case 1: printf("one\n");**  **case 2: printf("two\n");**  **case 3: printf("three\n");**  **case 4: printf("four\n");**  **case 5: printf("five\n");**  **}**  **return (0);**  **}** | 2 points  three  four  five |
| **#include <stdio.h>**  **int main (void)**  **{**  **int x, p;**  **p = 1;**  **for (x = 1; x <= 5; x++)**  **p \*= x;**  **printf("%d\n" , p);**  **return (0);**  **}** | 3 points  120 |
| **#include <stdio.h>**  **int main (void)**  **{**  **int x, y, s = 0;**  **for ( x = 1; x <= 100; x++)**  **{**  **s++;**  **for ( y = 1; y <= 5; y++)**  **s += 2;**  **}**  **printf("%d\n" , s );**  **return (0);**  **}** | 4 points  1100 |
| **#include <stdio.h>**  **int test(int n);**  **int main (void)**  **{**  **int n = 3, m;**  **m = test(n);**  **printf("%d %d\n", n , m);**  **return (0);**  **}**    **int test(int n)**  **{**  **n = n \* n;**  **return n;**  **}** | 4 points  3 9 |

**Question # 3 [15 points]**

Write a C program that prompts for and reads the volume **V** of a cylinder [in cubic cm] and the height **h** [in cm]. It then calculates and displays the surface area of the cylinder in cm2.

The surface area must be displayed with an appropriate message and in two decimal places.

|  |  |
| --- | --- |
| Cylinderr2.jpg |  |

Your program must use a named constant with a value of 3.14159

Assume that the input typed by the user is valid i.e. no need to check for invalid input.

#include <stdio.h>

#include <math.h>

#define PI 3.14159

int main(void)

{

double height, radius, volume, surfaceArea;

printf("Enter volume[cm3] and height [cm] of a cylinder: ");

scanf("%lf%lf", &volume, &height);

radius = sqrt(volume / (PI \* height));

surfaceArea = 2 \* PI \* radius \* (height + radius);

printf("Surface Area = %.2f sqr cm", surfaceArea);

return 0;

}

**Question # 4 [17 points]**

Write a C program containing 2 functions: the main and triangleArea function.

The triangleArea function receives the coefficients a, b, and c of a line ax + by = c as input arguments and returns the triangular area formed by the line, the x-axis, and the y-axis.

Your main function prompts for and reads the coefficients a, b, and c of the line. Then, if the line forms a triangle with x and y axes, it calls the function triangleArea and prints the result. Otherwise, it prints an error message.

ax+by=c

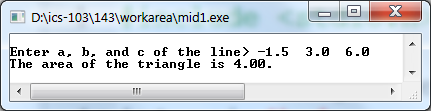
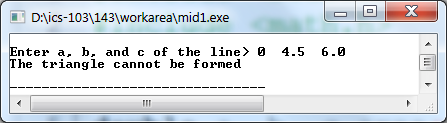
c/a

c/b

x

y

Note that the triangle cannot be formed if one of the coefficients a, b, or c is 0.



#include <stdio.h>

#include <math.h>

double triangleArea (double a, double b, double c);

int main(void)

{

double a, b, c,area;

printf("\nEnter a, b, and c of the line> ");

scanf("%lf%lf%lf", &a, &b, &c);

if(a == 0 || b == 0 || c == 0)

printf("The triangle cannot be formed\n");

else

{

area = triangleArea(a, b, c);

printf("The area of the triangle is %.2f.\n", area);

}

return 0;

}

double triangleArea (double a, double b, double c)

{

double area;

area=fabs(c \* c / (2 \* a \* b));

return area;

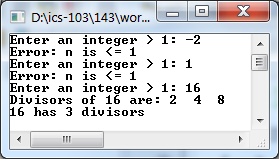
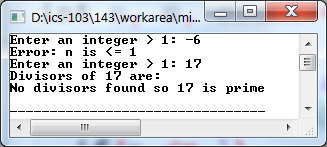
}

**Question # 5 [18 points]**

Write a complete C program that prompts for and reads an integer **n** greater than 1. As long as **n** is less than or equal 1, the program displays an error message and then prompts again for an integer **n.** Once n is valid, the program finds and displays all the divisors of n excluding 1 and itself. It also counts them and display their count. If no divisor is printed, the program displays that n is a prime number.

Note: Your program must be general and behaves as shown in the sample runs below.

Sample program runs:

#include <stdio.h>

int main(void)

{

int n, m, count = 0;

do

{

printf("Enter an integer > 1: ");

scanf("%d", &n);

if(n <= 1)

printf("Error: n is <= 1\n");

}while(n <= 1);

printf("Divisors of %d are: ", n);

for(m = 2; m < n; m++)

{

if(n % m == 0)

{

printf("%d ", m);

count++;

}

}

if(count!=0)

printf("\n%d has %d divisors \n",n, count);

else

printf("\nNo divisors found so %d is prime\n",n);

return 0;

}**Question # 6 [10 points]**

An airline charges **zero** Saudi Riyals for the **first** 20 kilograms of baggage. For each extra kilogram of the **next** 25 kilograms the charge is 55.0 Saudi Riyals per kilogram. For extra kilograms above 45 kilograms, the charge is 65.0 Saudi Riyals per kilogram.

Write a function **baggageCharge** that receives the baggage weight in kilograms and returns the baggage charge in Saudi Riyals. Your function must be general and it must not contain **printf** and **scanf** statements.

Note: Don’t write the main function; write the function definition of **baggageCharge** only**.**

double baggageCharge(double weight)

{

double charge;

if(weight <= 20)

charge = 0;

else if(weight <= 45)

charge = (weight - 20) \* 55.0;

else

charge = 25 \* 55.0 + (weight - 45) \* 65.0;

return charge;

}