

**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:** |  |

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| **Section:** |  |

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| **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 points56.756.690 |
| **#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 points30 |
| **#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 points35 |
| **#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 pointsthreefourfive |
| **#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 points120 |
| **#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 points1100 |
| **#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 points3 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 | $V= πr^{2}h$ $S=2πrh+2πr^{2}$  |

Your program must use a named constant $π$ 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;

}