QUESTION 1 - Functions

```
/* Flat Washer Program */
/*
 * Computes the weight of a batch of flat washers.
 */

#include <stdio.h>
#define PI 3.14159

int main(void)
{
    double hole_diameter; /* input - diameter of hole       */
    double edge_diameter; /* input - diameter of outer edge   */
    double thickness;    /* input - thickness of washer     */
    double density;      /* input - density of material used */
    double quantity;     /* input - number of washers made   */
    double weight;       /* output - weight of washer batch  */
    double hole_radius;  /* radius of hole                */
    double edge_radius;  /* radius of outer edge          */
    double rim_area;     /* area of rim                   */
    double unit_weight;  /* weight of 1 washer            */

    /* Get the inner diameter, outer diameter, and thickness.*/
    printf("Inner diameter in centimeters> ");
    scanf("%lf", &hole_diameter);
    printf("Outer diameter in centimeters> ");
    scanf("%lf", &edge_diameter);
    printf("Thickness in centimeters> ");
    scanf("%lf", &thickness);

    /* Get the material density and quantity manufactured. */
    printf("Material density in grams per cubic centimeter> ");
    scanf("%lf", &density);
    printf("Quantity in batch> ");
    scanf("%lf", &quantity);

    /* Compute the rim area. */
    hole_radius = hole_diameter / 2.0;
    edge_radius = edge_diameter / 2.0;
    rim_area = PI * edge_radius * edge_radius - PI * hole_radius * hole_radius;

    /* Compute the weight of a flat washer. */
    unit_weight = rim_area * thickness * density;
    /* Compute the weight of the batch of washers. */
    weight = unit_weight * quantity;

    /* Display the weight of the batch of washers. */
    printf("\nThe expected weight of the batch is %.2f", weight);
    printf(" grams.\n");

    return (0);
}
```

Revise the flat washer program to use function subprograms ***find_area***, ***find_rim_area***, ***find_unit_weight*** and ***instruct***.

/* **sample output is going to be the same for the revised one:**
*/

```
#include <stdio.h>
#include <math.h>

#define PI 3.14159

/* Add function prototypes */




int main (void)
{
        /* Declare variables */









        /* Give the user instructions. */



        /* Get the inner diameter, outer diameter, and thickness. */
```

```
        /* Get the material density and quantity manufactured. */




        /* Compute the rim area. */




        /* Compute the weight of a single flat washer. */


        /* Compute the weight of the batch of washers. */


        /* Display the weight of the batch of washers. */


        return (0);
}
```

```
/* Displays instructions to a user of program to compute the weight of a batch of flat
washers */
---------- instruct(----------)
{




}



/* Computes the area of a circle with radius r.
* Pre:  r is defined and is > 0.
*       PI is a constant macro representing an approximation of pi.
 *      Library math.h is included.
*/
---------- find_area(----------)
{




}

/*
* Computes the area of an annular ring with inner radius of inner
* and outer radius of outer.
* Pre:  inner and outer are defined and are > 0.
*       Function find_area() is defined.
*/
---------- find_rim_area(----------)
{




}
```

```
/*
* Computes the unit weight of a flat object with an area of area,
* with a thickness of thickness, and with a density of density.
* Pre:  area, thickness and density are defined and are > 0.
*/
---------------------------- find_unit_weight(------------------------------------------------------------)
{









}
```

Sample Output:

```
Inner diameter in centimeters> 1.2
Outer diameter in centimeters> 2.4
Thickness in centimeters> 0.1
Material density in grams per cubic centimeter> 7.87
Quantity in batch> 1000

The expected weight of the batch is 2670.23 grams.
```

QUESTION 2 - Functions

Write a function which computes the departure time required to reach a destination that is a given (positive) distance away, based on supplied arrival time and estimated average speed. Arrival must be on same day as departure. Also write a driver to test your function.

Sample Output is:

```
Enter arrival time as integer on a 24 hour clock. For example, 8:30 PM would be entered as 2030
Arrival time>2100
Enter the distance in km>5
Enter anticipated average speed (including stops) in km/hr> 6
You need to leave at 2010.
```

QUESTION 3

Q3.A. What is the ouput of the following code fragment? Why?

```
int a = 0, b = 0, x;
x = 0 && (a = b = 777);
printf("%d %d %d\n", a, b, x);
x = 777 || (a = ++b);
printf("%d %d %d\n", a, b, x);
```

Q3.B. What is the ouput of the following code fragment? Why?

```
int a = 0, b = 0, x;
x = 0 || (a = b = 777);
printf("%d %d %d\n", a, b, x);
x = 777 || (a = ++b);
printf("%d %d %d\n", a, b, x);
```

Q3.C. What is the ouput of the following code fragment? Why?

```
int a = 0, b = 0, x;
x = 0 || (a = b = 777);
printf("%d %d %d\n", a, b, x);
x = 777 && (a = ++b);
printf("%d %d %d\n", a, b, x);
```