1. Suppose in a heap organisation the free list has four regions of size (20, 10, 15, 10). If one wants to allocate data of the following sizes (12, 8, 5, 2) then give the status of the free list after every malloc operation for the following allocation algorithms:
   (a) Best Fit
   (b) Worst Fit
   (c) First Fit
   (d) Next Fit.

2. Write a C function that evaluates the following:
   (a) The number of digits in a given (base 10) input number.
   (b) Find the approximate (integer) square root of an input number without using any special math library functions.

3. What is the output of the following program segment? Also explain what each instruction does.

   ```c
   main()
   {
       int count = 10, *temp, sum = 0;
       temp = &count;
       *temp = 20;
       temp = &sum;
       *temp = count;
       printf("count = %d, *temp = %d, sum = %d\n", count, *temp, sum);
   }
   ```

4. Explain what happens when the following C codes get executed: (A macro that takes arguments expands into in-line code where each occurrence of a formal parameter is replaced by the corresponding actual argument.)

   (a) 
   ```c
   #include <stdio.h>
   #define max(A,B) ((A) > (B) ? (A) : (B))
   main()
   {
       int i,j,k;
       i = 5;
       j = 6;
       k = max(i++,j++);
       printf(" i = %d , j = %d , k = %d \n", i,j,k);
   }
   ```
(b) #include <stdio.h>
    #define square(x) x * x
    main() {
        int a,b;
        a = 5;
        b = square(a+1);
        printf(" a = %d, b = %d \n",a,b);
    }

5. Write a C function that evaluates the area of a given geometric figure. The data structures are defined as follows:

typedef enum {CIRCLE, RECTANGLE} figure;
typedef struct rect{
    int x;
    int y;
}rect;
typedef struct geometry{
    figure type;
    union{
        int radius;
        rect rectangle;
    }parameter;
} geometry;

The type field of the geometry structure takes the value of CIRCLE if it is a circle and a value of RECTANGLE if it is a rectangle. The area of a circle with radius \( r \) is computed as \( 3.14 * r^2 \). The area of a rectangle is given by the product of its sides.