Question 7

A. What is a pointer? A pointer is a construct that gives you more control of the computer's memory, it is the memory address of a variable.
B. What is a dereferencing operator? The dereferencing operator is *, it produces the variable it points to.
C. What is the difference between assignment statements p1 = p2; and *p1 = *p2? The first is setting the value stored in variable p2 to p1. The second statement, the memory address of p2 is stored in p1.
D. What is a dynamic variable? It returns a pointer that points to a new variable – they are created and destroyed while the program is running.
E. What is the purpose of the new operator? It creates a new dynamic variable of a specified type and returns a pointer that points to the new variable.
F. What is the purpose of the delete operator? Eliminates a dynamic variable that returns the memory that the dynamic variable occupied to the freestore. The memory can then be reused.
G. What is the freestore (also called the heap)? A type of memory that is reserved for dynamic variables.
H. What is the difference between dynamic variables and automatic variables? Dynamic variables are created and destroyed while the program is running whereas automatic variables have their dynamic properties managed by the computer – when the function that calls them is called and finishes.
I. What is a dynamic array? An array whose size is not specified when the program is written but determined while the program is running.
J. What is the advantage of using dynamic arrays? If you do not know how large your array needs to be, it can provide more flexibility.
K. What is the relationship between pointers and arrays? An array is represented by a variable that is associated with the address of its first storage location whereas a pointer is also the address of a storage location with a defined type.
L. Write statements to do the following: i.
    a. Define a pointer type int_ptr for pointer variables that contain pointers to int variables.
    b. Declare p1 to be a pointer to an int.
    c. Dynamically allocate an integer variable and store its address in p1. iv. Assign the value 23 to the variable that p1 is pointing to. v. Declare an int variable a. vi. Let p1 point to a.
    d. Free the memory allocated to the variable that p1 is pointing to.
J. Write statements to do the following:
    a. Define a pointer type int_ptr for pointer variables that contain pointers to int variables.
    b. Declare p2 to be a pointer to an int.
    c. Obtain an integer value nrElements from the user indicating the number of elements to allocate.
    d. Dynamically allocate an array of nrElements integers and store its address in p2.
    e. Declare an int array a with 500 elements.
    f. Assume p2 has been initialized and copy the elements of p2 one by one to the corresponding elements in a.
    g. Free the memory allocated to the variable that p2 is pointing to.

K. Write a program that asks a user to enter the size of a dynamic array that stores exam marks obtained by students. Create the dynamic array and a loop that allows the user to enter an exam mark into each array element. Loop through the array, find the average mark for the exam and output it. Delete the memory allocated to your dynamic array before exiting your program.