CS19101 PDS laboratory
Assignment 5

Write programs for problems 1,2 and 3 in three different files named A5_1_<machine number>_<Roll no.>.c, A5_2_<machine number>_<Roll no.>.c and A5_3_<machine number>_<Roll no.>.c respectively (without the '<' and '>'). Put these three files into a compressed directory named A5_<machine number>_<Roll no.>.zip and submit it.

Example: If your roll number is 19DEP99999 and your machine number is 99, then the names of your files should be A5_1_99_19DEP99999.c, A5_2_99_19DEP99999.c and A5_3_99_19DEP99999.c.

This is an assignment on functions and one-dimensional arrays. Use of multi-dimensional arrays, pointers and global variables are not allowed.

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1. Take integers m, n and p as inputs through the keyboard. Then take mn integers as inputs through keyboard. They will be interpreted as entries of a $m \times n$ matrix, and stored in a 1-dimensional integer array A of size mn (see sample input/output below). Then take another np integers as inputs, interpret them as entries of a $n \times p$ matrix, and store them in another 1-dimensional integer array B of size np. Then print the product of matrices A and B onto the screen (see sample input/output).

   Enter m: 2
   Enter n: 3
   Enter p: 4
   Enter A11: 1
   Enter A12: -1
   Enter A13: 2
   Enter A21: 0
   Enter A22: 4
   Enter A23: 6
   Enter B11: 4
   Enter B12: -2

Enter B13: -3
Enter B14: 0
Enter B21: 0
Enter B22: 1
Enter B23: 2
Enter B24: 5
Enter B31: 3
Enter B32: 0
Enter B33: 3
Enter B34: 0
The product matrix is:
10 -3 1 -5
18 4 26 20

[20 marks.]

2. Write a **recursive** function with the following prototype:
int f(int A[], int i, int s);
The function takes in a 1-d array and two integers i and s. The function returns 1 if there exists a subset of $\{A[0], A[1], \ldots, A[i]\}$ whose sum is equal to s, and returns 0 otherwise. In main(), take 10 integers as inputs through the keyboard, and store them all in a 1-d array A of size 10. Then take an integer s through the keyboard. Then compute if there exists a set of integers in the array A whose sum is equal to s by a call to $f(\cdot, \cdot, \cdot)$ with appropriate arguments, and print "yes" or "no" accordingly.

   Sample input/output:

   Enter number 1: 2
   Enter number 2: 50
   Enter number 3: 6
   Enter number 4: -4
   Enter number 5: -24
   Enter number 6: 30
   Enter number 7: 0
   Enter number 8: -2
   Enter number 9: 8
   Enter number 10: -100
   Enter s: 33
   no

   [20 marks.]

3. In the previous question, if the answer is "yes" print a subset as a comma separated sequence of integers, the sum of whose elements is s. If necessary, change the prototype of the function f.

Hint: Use a new array B[10] to represent a subset of $\{1, \ldots, 10\}$ as follows: $B[i] = 1$ if $A[i]$ is in the subset and $B[i] = 0$ otherwise.

Sample input/output:

```
Enter number 1: 2
Enter number 2: 50
Enter number 3: 6
Enter number 4: -4
Enter number 5: -24
Enter number 6: 30
Enter number 7: 0
Enter number 8: -2
Enter number 9: 8
Enter number 10: -100
Enter s: 84
yes
2,50,-4,30,0,-2,8
```

[7 marks.]