

Print all combinations of points that can compose a given number

You can win three kinds of basketball points, 1 point, 2 points, and 3 points. Given a total score n , print out all the combination to compose n .

Examples:

For $n = 1$, the program should print following:

1

For $n = 2$, the program should print following:

1 1

2

For $n = 3$, the program should print following:

1 1 1

1 2

2 1

3

For $n = 4$, the program should print following:

1 1 1 1

1 1 2

1 2 1

1 3

2 1 1

2 2

3 1

and so on ...

Algorithm:

At first position we can have three numbers 1 or 2 or 3.

First put 1 at first position and recursively call for $n-1$.

Then put 2 at first position and recursively call for $n-2$.

Then put 3 at first position and recursively call for $n-3$.

If n becomes 0 then we have formed a combination that compose n , so print the current combination.

Below is a generalized implementation. In the below implementation, we can change `MAX_POINT` if there are higher points (more than 3) in the basketball game.

```
#define MAX_POINT 3
#define ARR_SIZE 100
#include<stdio.h>
```

```
/* Utility function to print array arr[] */
void printArray(int arr[], int arr_size);
```

```
/* The function prints all combinations of numbers 1, 2, ...MAX_POINT
that sum up to n.
i is used in recursion keep track of index in arr[] where next
element is to be added. Initial value of i must be passed as 0 */
void printCompositions(int n, int i)
{
```

```
/* array must be static as we want to keep track
of values stored in arr[] using current calls of
printCompositions() in function call stack*/
static int arr[ARR_SIZE];

if (n == 0)
{
    printArray(arr, i);
}
else if(n > 0)
{
    int k;
    for (k = 1; k <= MAX_POINT; k++)
    {
        arr[i]= k;
        printCompositions(n-k, i+1);
    }
}

/* UTILITY FUNCTIONS */
/* Utility function to print array arr[] */
void printArray(int arr[], int arr_size)
{
    int i;
    for (i = 0; i < arr_size; i++)
        printf("%d ", arr[i]);
    printf("\n");
}

/* Driver function to test above functions */
int main()
{
    int n = 5;
    printf("Differnt compositions formed by 1, 2 and 3 of %d are\n", n);
    printCompositions(n, 0);
    getchar();
    return 0;
}
```