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DIV:	CSE(DS)D1
EXP:	08
AIM:	Branch and bound (To implement 0/1 Knapsack problem using Branch and Bound.)

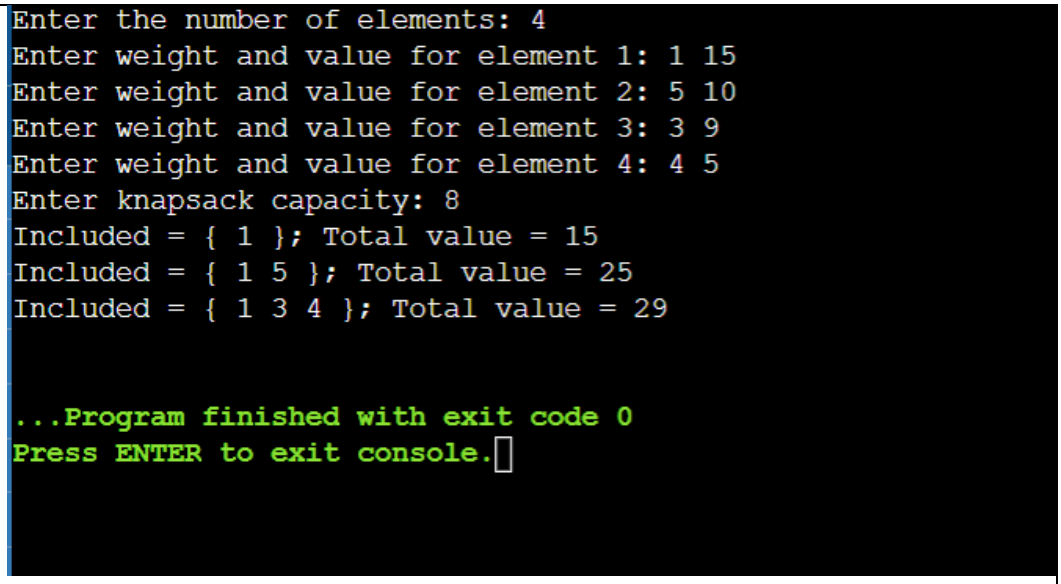
CODE:	#include <stdio.h>
	#include <stdlib.h>
	#include <string.h>
	
	typedef enum
	{ NO, YES } BOOL;
	
	int N;
	int vals[100];
	int wts[100];
	
	int cap = 0;
	int mval = 0;
	
	void
	getWeightAndValue (BOOL incl[N], int *weight, int *value)

```
{
  int i, w = 0, v = 0;
  for (i = 0; i < N; ++i)
    {
      if (incl[i])
          {
            w += wts[i];
            v += vals[i];

}

}

*weight = w;

*value = v;

}



void
printSubset (BOOL incl[N])
{
  int i;
  int val = 0;
  printf ("Included = { ");
```

```
  for (i = 0; i < N; ++i)
    {
      if (incl[i])
          {
            printf ("%d ", wts[i]);
            val += vals[i];

}

}

printf ("}; Total value = %d\n", val);

}



void
findKnapsack (BOOL incl[N], int i)
{
  int cwt, cval;
  getWeightAndValue (incl, &cwt, &cval);
  if (cwt <= cap)
    {
      if (cval > mval)
          {
            printSubset (incl);
```

```
            mval = cval;


}
   }

if (i == N || cwt >= cap)
   {
     return;

}

int x = wts[i];
  BOOL use[N], nouse[N];
  memcpy (use, incl, sizeof (use));
  memcpy (nouse, incl, sizeof (nouse));
  use[i] = YES;
  nouse[i] = NO;
  findKnapsack (use, i + 1);
  findKnapsack (nouse, i + 1);

}



Int main (int argc, char const *argv[])
{
  printf ("Enter the number of elements: ");
```

```
  scanf (" %d", &N);
  BOOL incl[N];
  int i;
  for (i = 0; i < N; ++i)
    {
      printf ("Enter weight and value for element %d: ", i + 1);
      scanf (" %d %d", &wts[i], &vals[i]);
      incl[i] = NO;

}

printf ("Enter knapsack capacity: ");
  scanf (" %d", &cap);
  findKnapsack (incl, 0);
  return 0;

}
```

OUTPUT:	

```
Enter the number of elements: 4
Enter weight and value for element 1: 1 15
Enter weight and value for element 2: 5 10
Enter weight and value for element 3: 3 9
Enter weight and value for element 4: 4 5
Enter knapsack capacity: 8
Included = { 1 }; Total value = 15
Included = { 1 5 }; Total value = 25
Included = { 1 3 4 }; Total value = 29


...Program finished with exit code 0
Press ENTER to exit console.
```

CONCLUSION: IN THIS EXPERIMENT , I HAVE IMPLEMENTED KNAPSACK PROBLEM USING BRANCH AND BOUND.