

ROD CUTTING (Unbounded Knapsack) 82

Question :

Given a rod of length N inches and an array of prices, $\text{price}[1] \dots \text{price}[i]$ denotes the value of a piece of length i .

Determine the maximum value obtainable by cutting up the rod and selling the pieces.

NOTE: Consider 1-based indexing.

Input :

$N = 8$

$\text{price}[] = \{1, 5, 8, 9, 10, 17, 17, 20\}$

Output :

22

Explanation : The maximum obtainable value is 22 by cutting in two pieces of lengths 2 and 6, i.e., $5 + 17 = 22$.

Constraints :

$1 \leq N \leq 1000$

$1 \leq A_i \leq 10^5$

CODE

```
VECTOR<INT> PRCE;
INT DP[1005];
```

```
INT FUNC (INT LEN)
```

```
{
    IF (LEN == 0) RETURN 0;
    IF (DP[LEN] != -1) RETURN DP[LEN];
```

```
    INT ANS = 0;
```

```
    FOR (INT LEN-TO-CUT = 1; LEN-TO-CUT <
        PRCE.size(); LEN-TO-CUT++)
```

```
{
```

```
        IF (LEN - LEN-TO-CUT >= 0)
```

```
{
```

```
            ANS = MAX (ANS, FUNC (LEN - LEN-TO-CUT)
                + PRCE[LEN-TO-CUT - 1]);
```

```
}
```

```
}
```

```
    RETURN DP[LEN] = ANS;
```

```
}
```

```
INT MAIN()
```

```
{
```

```
    MEMSET (DP, -1, sizeof (DP));
```

```
    INT n = 8;
```

```
    PRCE = {1, 5, 8, 9, 10, 17, 17, 20};
```

```
    cout << FUNC(n) << "\n";
```

```
    RETURN 0;
```

```
}
```