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monilsharma18@gmail.com ▾

NPTEL (<https://swayam.gov.in/explorer?ncCode=NPTEL>) » Getting Started with Competitive Programming  
(course)



## Course outline

How does an  
NPTEL online  
course work?  
( )

Week 0 ( )

Week 1 ( )

Week 2 ( )

Week 3 ( )

Week 4 ( )

Week 5 ( )

Week 6 ( )

Week 7 ( )

Week 8 ( )

Week 9 ( )

# Week 10: Assignment 1

The due date for submitting this assignment has passed.

Due on 2022-10-12, 23:59 IST.

## Assignment submitted on 2022-10-12, 22:53 IST

1) Consider a money system consisting of  $n$  coins. Each coin has a positive integer value.

Your task is to calculate the number of distinct ordered ways you can produce a money sum  $x$  using the available coins.

For example, if the coins are  $\{2,3,5\}$  and the desired sum is 9, there are 3 ways:

2+2+5

3+3+3

2+2+2+3

Further, if the coins are  $\{2,3,5\}$  and the desired sum is 12, how many ways are there?

Yes, the answer is correct.

Score: 1

Accepted Answers:

(Type: Numeric) 5

1 point

## Week 10 ()

☐ Top-Down Dynamic Programming with Frog 1\_Part A (unit? unit=95&lesson=96)

☐ Top-Down Dynamic Programming with Frog 1\_Part B (unit? unit=95&lesson=97)

☐ Bottom-Up Dynamic Programming with Dice Combinations (unit? unit=95&lesson=98)

☐ Practice: Week 10: Assignment 10 (Non Graded) (assessment? name=178)

☒ **Quiz: Week 10: Assignment 1 (assessment? name=188)**

☒ Week 10: Programming Assignment 1 (/noc22\_cs82/progassignment? name=183)

☐ Week 10 Feedback Form: Getting Started with Competitive Programming (unit? unit=95&lesson=99)

## Week 11 ()

2) Continuing the previous question, if the coins are {1,2} and the desired sum is 5, how many ways are there?

3

Yes, the answer is correct.

Score: 1

Targeted Feedback:

*We can have 0,1, or 2 "2"s in the final answer.*

Accepted Answers:

(Type: Numeric) 3

1 point

3) Let  $dp[w,i]$  equal the number of *ordered* ways to choose coins so that they add up to  $w$ , but assume that we are only allowed to make use of the first  $i$  coins. Which of the following recurrences are valid? **2 points**

Note:  $coins[i]$  denotes the value of the  $i$ -th coin.

- ☒  $dp[w,i] := dp[w,i-1] + dp[w-coins[i],i]$
- ☐  $dp[w,i] := dp[w,i-1] + dp[w-coins[i],i-1]$
- ☐  $dp[w,i] := dp[w,i] + dp[w-coins[i],i-1]$
- ☐  $dp[w,i] := dp[w,i] + dp[w-coins[i],i]$

Yes, the answer is correct.

Score: 2

Feedback:

*When calculating  $dp[w,i]$ , we consider the  $i$ 'th coin. Either we didn't pick the coin, then there are  $dp[w,i-1]$  possibilities. Otherwise, we picked the coin. Since we are allowed to pick it again, there are  $dp[w-coins[i],i]$  possibilities (**not**  $dp[w-coins[i],i-1]$  possibilities).*

Accepted Answers:

$dp[w,i] := dp[w,i-1] + dp[w-coins[i],i]$

4) You are given an integer  $n$ . On each step, you may subtract one of the digits from the number.

What is the smallest number of steps required to make the number equal 27 to 0?

5

Yes, the answer is correct.

Score: 1

Feedback:

*An optimal solution is  $27 \rightarrow 20 \rightarrow 18 \rightarrow 10 \rightarrow 9 \rightarrow 0$ .*

Accepted Answers:

(Type: Numeric) 5

1 point

5) You are given an integer  $n$ . On each step, you may subtract one of the digits from the number.

What is the smallest number of steps required to make the number equal 150 to 0?

Week 12 ()

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27

Hint

Yes, the answer is correct.

Score: 2

Feedback:

*Here's a 27-step sequence.*

5

5

4

6

3

7

2

8

1

9

1

9

9

8

7

6

6

5

9

4

6

3

7

2

8

1

9

Accepted Answers:

(Type: Numeric) 27

**2 points**

6) Consider the previous question once more. You are given an integer  $n$ . On each step, **2 points** you may subtract one of the digits from the number.

We want to know what is the smallest number of steps that are required to make a given number equal  $n$  to 0.

Let  $dp[n]$  denote the solution. Which of the following recurrences are valid? Remember the hint from the previous question.

- ☒  $dp[n] = \min_{d \in \text{digits}(n)} dp[n-d]$ .
- ☒  $dp[n] = dp[n-d^*]$ , where  $d^*$  is the largest digit in  $n$
- ☐  $dp[n] = \max_{d \in \text{digits}(n)} dp[n-d]$ .
- ☐  $dp[n] = dp[n-d^*]$ , where  $d^*$  is the smallest digit in  $n$

Yes, the answer is correct.

Score: 2

Accepted Answers:

$dp[n] = \min_{d \in \text{digits}(n)} dp[n-d]$ .

$dp[n] = dp[n-d^*]$ , where  $d^*$  is the largest digit in  $n$

7) What is the value of  $dp[n]$  defined in the previous question if  $n$  is a **single digit** number?

**1 point**

- ☐  $n$
- ☐  $0$
- ☒  $1$
- ☐  $n-1$

Yes, the answer is correct.

Score: 1

Accepted Answers:

1