

1155: Number of Dice Rolls with Target Sum

$n \rightarrow$ no of dice

$k \rightarrow 1-k$ faces (k faces with numbers $1-k$)

target

Number of ways dice can be rolled such that sum of face-up of all n dices is equal to target.

$$\underbrace{1 \leq n \leq k}_{\substack{\text{---} + \text{---} + \text{---} + \text{---} \dots}} = \text{target}$$

Is this a DP problem?

1) Problem can be divided into sub-problems

$$\underbrace{x}_{\text{target}-x} + \boxed{\text{---} + \text{---} + \text{---} \dots} = \text{target}$$

if pos = 1 is x

then remaining problem can be solved for target - x

2) And outcome (current) will direct the future outcome

① Brute force with memorization

@ lru-cache
(maxSize=None)

```
def func(pos, sum):
```

```
    if sum == target and pos == n:
```

```
        return 1
```

```
    if sum > target or pos > n: return 0
```

```
    count = 0
```

```
    for i in range(1, k+1):
```

```
        count += func(pos+1, sum+i)
```

```
    return count
```


② Converting the solution to Bottom-up,

State variables, pos, and sum.

Base case $dp[n][target] = 1$

Answer should come in $dp[0][0]$

```
for pos in range(n, -1, -1):
```

```
    for sum in range(target, -1, -1):
```

```
        for i in range(1, k+1):
```

```
            if sum + i > target: break
```

```
            count = count + dp[pos+1][sum+i]
```

```
        dp[pos][sum] = count:
```

```
return dp[0][0]
```