Python Programming

For Loops Practice

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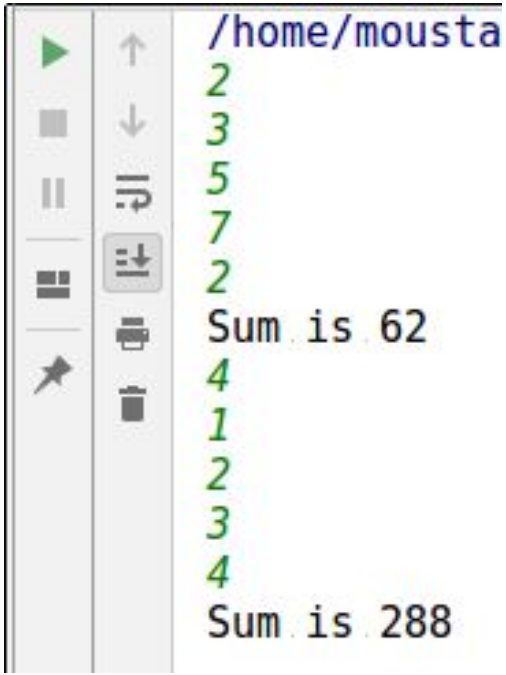
Recall: Special Sum Homework

- Read T for number of test cases.
- For each test case read integer N.
- Then read N integers a, b, c, ….. On seperate lines
- Compute the **sum** of:
  - (a, b*b, c*c*c, d*d*d*d, e*e*e*e*e……)
  - That is the k-th number is repeated k times
- Expantation:
  - 2 test cases
  - 3 5 7 2
    - (5 + 7*7 + 2*2*2) = 62
  - 4 1 2 3 4
    - (1+2*2+3*3*3+4*4*4*4) = 288



Practice: Special Sum

```
total_cases = int(input())

for case in range(total_cases):
    N, sum = int(input()), 0

    for pos in range(N):
        value, result = int(input()), 1

        # Loop to compute the sum: a, b*b, c*c*c
        for it in range(pos + 1):
            result *= value

        sum += result

    print('Sum is', sum)
```

- Let’s rewrite the previous code
- Replace the while loops with for loops

Practice: Special Sum - using power operator

```
2
3   total_cases = int(input())
4
5   for case in range(total_cases):
6       N, sum = int(input()), 0
7
8       for pos in range(N):
9           value = int(input())
10          sum += value ** (pos+1)
11
12      print('Sum is', sum)
13
```

Practice: Pair of numbers

- Read 3 integers N, M, SUM.
- Find total number of pairs that satisfy
  A + B == SUM where
  - 1 <= A <= N
  - 1 <= B <= M
- Stop video and code
- Input ⇒ Output
  - 200 300 70 ⇒ 69
- What about input?
  - 1000000 1000000 1000000
  - How many steps the code do?

```
2
3   n, m, sum = map(int, input().split())
4   cnt = 0
5
6   for i in range(1, n+1):
7       for j in range(1, m + 1):
8           if i + j == sum:
9               cnt += 1
10
11  print(cnt)
```

Practice: Pair of numbers - FASTER

```
2
3   n, m, sum = map(int, input().split())
4   cnt = 0
5
6   for i in range(1, n+1):
7       j = sum - i         # i + j == sum
8
9       if 1 <= j <= m:     # make sure valid pos
10          cnt += 1
11
12  print(cnt)
13
```

- Second loop was useless as only maximum 1 of the js will have value that matches sum
- With simple math, we can know the possible value of j
  - Then **verify** its range
- This code takes like 3n steps
  - So for 1000000, just 3-4 milion

Practice: Triples of numbers

- Read integers N, M, W.
- Find the total number of triples that has A + B <= C where
  - 1 <= A <= N
  - A <= B <= M
  - 1 <= C <= W
- Input: 100 200 20
- Output: 715
- Stop video and code

```
2
3   n, m, w = map(int, input().split())
4   cnt = 0
5
6   for i in range(1, n+1):
7       for j in range(i, m + 1):
8           for k in range(1, w + 1):
9               if i + j <= k:
10                  cnt += 1
11
12  print(cnt)
13
```

Practice: Triples of numbers - FASTER

- We can use the same trick
- Remove the very inner loop
- But this is good for i+j == k not i+j <= k ??
- Still simple math can do it
  - We from k to w all are valid
    - So we add this range
  - E.g. if k = 4, w = 7
    - Then 4, 5, 6, 7 are correct values
  - So we add w-k+1

```
3   n, m, w = map(int, input().split())
4   cnt = 0
5
6   for i in range(1, n+1):
7       for j in range(i, m + 1):
8           k = i + j
9
10          if 1 <= k <= w:
11              cnt += w - k + 1
12
13  print(cnt)
14
```

"Acquire knowledge and impart it to the people."

"Seek knowledge from the Cradle to the Grave."