Solutions

1 ***Method 1:*** *Find a pattern.*
Notice that 1 + 2 + 3 = 6, 2 + 3 + 4 = 9, 3 + 4 + 5 = 12 and so on. The question becomes 6 + 9 + 12 + ... + 33 = ? This is an arithmetic series with common difference 3. Notice that there are 10 terms [Hints : (1 + 2 + 3) + (2 + 3 + 4) + ... + (10 + 11 + 12)].

The formula for this sum is $\frac{10}{2}$ × (6 + 33) = 5 × 39 = **195.**

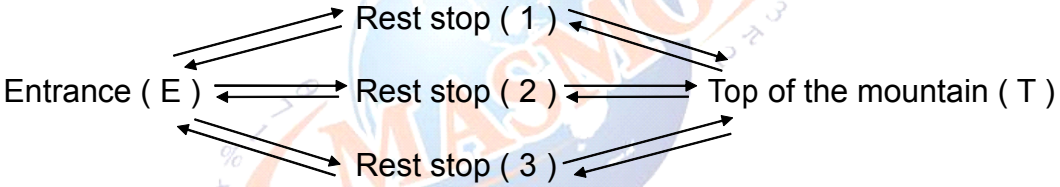
Method 2: *Using summation.*
Rewrite the summation:
(1 + 2 + 3 + ... + 10) + (2 + 3 + 4 + ... + 11) + (3 + 4 + 5 + ... + 12)

The summation from 1 to 10 is 55, 2 to 11 is 65 [55 – 1 + 11], 3 to 12 is 75 [55 – 1 – 2 + 11 + 12].

Hence the sum is 55 + 65 + 75 = **195**.

Solutions

2 ***Method 1:*** *List out all possible routes.*



Consider all the possible routes:

E → 1 → T → 1 → E	E → 2 → T → 1 → E	E → 3 → T → 1 → E
E → 1 → T → 2 → E	E → 2 → T → 2 → E	E → 3 → T → 2 → E
E → 1 → T → 3 → E	E → 2 → T → 3 → E	E → 3 → T → 3 → E

There are 9 different routes to climb up the mountain and return to the entrance.

Method 2: *By multiplication rule.*
Since there are 3 different routes to climb up the mountain and 3 different routes to come back to the entrance, we can multiply 3 by 3.

So in total there are 3 × 3 = 9 different routes.

Solutions

3 ***Method 1:*** *Reasoning.*

First use half of the clothes to make large flags and the other half to make small flags. We will have 55 × 4 = 220 large flags and 55 × 9 = 495 small flags. This does not match the question's requirement. Now use 54 clothes to make large flag and 56 clothes to make small flags. We will have 54 × 4 = 216 large flags and 55 × 9 = 504 small flags. $\frac{504}{216} = \frac{7}{3}$. The question's requirement is met.

Hence, we use 56 clothes to make small flags.

Method 2: *Algebra.*

Let m denote the number of clothes being cut to make large flags, n denote the number of clothes being cut to make small flags. According to the question,

$m + n = 110$ ——— (1)

$\frac{4m}{3} = \frac{9n}{7}$ ——— (2)

From (2), $m = \frac{3}{4} \times \frac{9}{7}n = \frac{27}{28}n$ ——— (3)

Plug (3) into (1),

$\frac{27}{28}n + n = 110$

$\frac{55}{28}n = 110$

$\therefore n = 110 \times \frac{28}{55} = 56$

Thus, we need 56 clothes to make small flags.

Solutions

4 ***Method 1:*** *Algebra.*
Suppose the share of the eldest is E.

Eldest	2nd	3rd	4th	5th	Youngest
E	E – 50	E – 100	E – 150	E – 200	E – 250

The sum of their share is E + E – 50 + E – 100 + E – 150 + E – 200 + E – 250 = 6 E – 750. This sum equals to 1200.

Hence,
1200 = 6 E – 750
1950 = 6 E

∴ **E = 1950 ÷ 6**
= 325

Method 2: *Using average.*
In average, every brother will get 1200 ÷ 6 = 200. The difference between the eldest and the youngest is 250. Then the eldest gets 125 more than average share.

Hence the share of the eldest is 200 + 125 = 325.

Solutions

5 ***Method 1:***

First, 4 trees are planted at each vertex of the square. Along one side of the square, 70 ÷ 5 - 1 = 13 trees are needed. The perimeter of the half-circle is $2 \times \frac{1}{2} \times \frac{22}{7} \times 35 = 110$ m. 110 ÷ 5 – 1 = 21 trees are needed.

Thus, the gardener needs 4 + 13 × 3 + 21 = **64 trees.**

Method 2:

Calculate the perimeter of the garden.

It is $70 + 70 + 70 + 0.5 \times 2 \times \frac{22}{7} \times 35 = 320$ m.

Since it is a close shape, the trees needed are 320 ÷ 5 = 64.