Question

25 students of your school participated in a tournament of three games namely: cricket, Football and basketball.
15 students received medals in cricket,
12 in Football,
11 in basketball,
5 in cricket and basketball,
9 in cricket and football,
4 in football and basketball
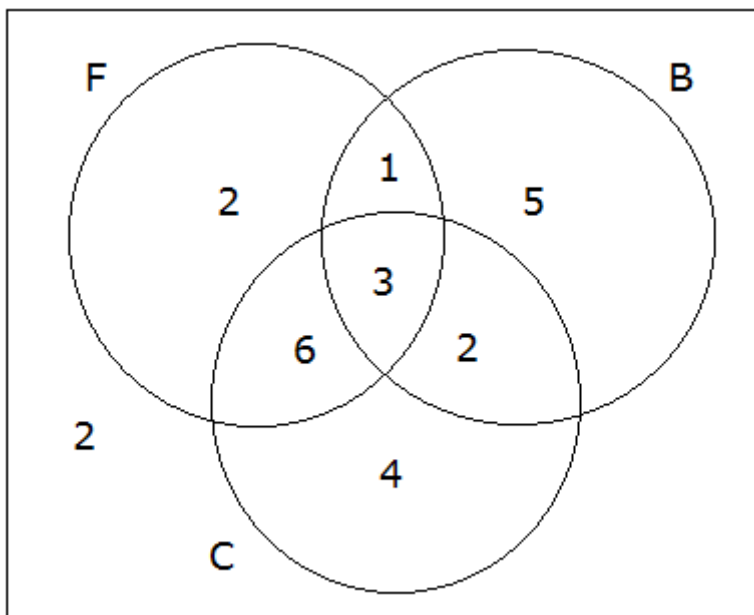and 3 in all the three games.
How many students received medals in:

(i) none of the games;
(ii) cricket only.

Solution

Venn diagram

It is given that
$|S| = 25$ students participated in a tournament of three games namely: cricket, football, and basketball.
$|C| = 15$ students received medals in cricket,
$|B| = 11$ students received medals in basketball,
$|F| = 12$ students received medals in football,
$|C \cap B| = 5$ students received medals in cricket and basketball,
$|C \cap F| = 9$ students received medals in cricket and football,

$|B \cap F| = 4$ students received medals in basketball and football, $|C \cap B \cap F| = 3$ students received medals in cricket, basketball, and football.

(i) Using inclusion-exclusion principle

$|C \cup B \cup F| = |C| + |B| + |F| - |C \cap B| - |C \cap F| - |B \cap F| + |C \cap B \cap F| =$
$= 15 + 11 + 12 - 5 - 9 - 4 + 3 = 23$ students received medals in either of the games or in all three games.

Then using a complement set obtain

$|\overline{C \cup B \cup F}| = |S| - |C \cup B \cup F| = 25 - 23 = 2$ students received medals in none of the games.

(ii) Using the union of disjoint sets

$|C \cap \bar{B} \cap F| = |C \cap F| - |C \cap B \cap F| = 9 - 3 = 6$ students received medals in cricket and football, but did not receive ones in basketball;

$|C \cap B \cap \bar{F}| = |C \cap B| - |C \cap B \cap F| = 5 - 3 = 2$ students received medals in cricket and basketball, but did not receive ones in football;

$|C \cap \bar{B} \cap \bar{F}| = |C| - |C \cap \bar{B} \cap F| - |C \cap B \cap \bar{F}| - |C \cap B \cap F| = 15 - 6 - 2 - 3 =$
$= 15 - 11 = 4$ students received medals in cricket only.

Answer: (i) 2; **(ii)** 4.