

**Answer on Question #57573 – Math – Combinatorics | Number Theory**

**Question**

25 students of your school participated in a tournament of three games namely : cricket, football & basket ball.

15 students received medals in cricket, 12 in football, 11 in basketball,

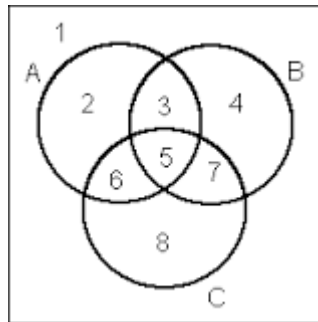
5 in cricket and basket ball, 9 in cricket & football, 4 in football & basketball

and 3 in all the three games.

How many students received medals in

- (i) None of the games
- (ii) (ii) cricket only.

**Solution**



Using this diagram

All games medalist:  $|set5| = 3$

Only cricket & football:  $|set3| = 9-3=6$

Only football & basketball:  $|set7| = 4-3=1$

Only cricket & basketball:  $|set6| = 5-3=2$

Only football:  $|set4| = 12-6-1-3=2$

ii) Only cricket:  $|set2| = 15-6-2-3=4$

Only basketball:  $|set8| = 11-2-1-3=5$

i)

**First method**

Either of games medalists:

$$|set2| + |set3| + |set4| + |set5| + |set6| + |set7| + |set8| = 3+6+1+2+2+4+5=23$$

None of the games:  $|set1| = 25 - 23 = 2$

### Second method

By inclusion-exclusion principle, the number of students received medals in either of games is given by

$$\begin{aligned} |A \cup B \cup C| &= |A| + |B| + |C| - |A \cap B| - |A \cap C| - |B \cap C| + |A \cap B \cap C| = \\ &= 15 + 12 + 11 - 5 - 9 - 4 + 3 = 23. \end{aligned}$$

Hence the number of students received medals in none of the games is

$$|\overline{A \cup B \cup C}| = |X| - |A \cup B \cup C| = 25 - 23 = 2$$

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