SET

1. Out of all the patients in a hospital 89% are found to be suffering from heart ailment and 98% are suffering from lungs infection. If K% of them are suffering from both ailments, then K can not belong to the set :

(1) {80, 83, 86, 89} (2) {84, 86, 88, 90}
(3) {79, 81, 83, 85} (4) {84, 87, 90, 93}

2. If $A = \{x \in \mathbf{R} : |x-2| > 1\}$, $B = \left\{x \in \mathbf{R} : \sqrt{x^2-3} > 1\right\}$, $C = \left\{x \in \mathbf{R} : |x-4| \geq 2\right\}$ and $\mathbf{Z}$ is the set of all integers, then the number of subsets of the set $(A \cap B \cap C)^C \cap \mathbf{Z}$ is ________.

3. Let $A = \{n \in N : n \text{ is a 3-digit number}\}$
$B = \{9k + 2 : k \in N\}$
and $C = \{9k + l : k \in N\}$ for some l $(0 < l < 9)$
If the sum of all the elements of the set $A \cap (B \cup C)$ is 274×400, then l is equal to ______.

4. Let R = {(P,Q) | P and Q are at the same distance from the origin} be a relation, then the equivalence class of (1,–1) is the set :

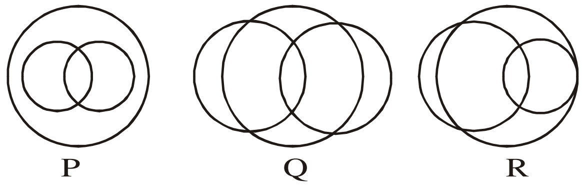
(1) $S = \{(x,y) \mid x^2 + y^2 = 4\}$

(2) $S = \{(x,y) \mid x^2 + y^2 = 1\}$

(3) $S = \{(x,y) \mid x^2 + y^2 = \sqrt{2}\}$

(4) $S = \{(x,y) \mid x^2 + y^2 = 2\}$

5. In a school, there are three types of games to be played. Some of the students play two types of games, but none play all the three games. Which Venn diagrams can justify the above statement?



(1) P and Q (2) P and R
(3) None of these (4) Q and R

6. The number of elements in the set $\{x \in \mathbb{R} : (|x| - 3)\,|x + 4| = 6\}$ is equal to

(1) 3 (2) 2 (3) 4 (4) 1

SOLUTION

1. Official Ans. by NTA (3)

Sol. $n(A \cup B) \geq n(A) + n(B) - n(A \cap B)$

$100 \geq 89 + 98 - n(A \cup B)$

$n(A \cup B) \geq 87$

$87 \leq n(A \cup B) \leq 89$

Option (3)

2. Official Ans. by NTA (256)

Sol. $A = (-\infty, 1) \cup (3, \infty)$

$B = (-\infty, -2) \cup (2, \infty)$

$C = (-\infty, 2] \cup [6, \infty)$

So, $A \cap B \cap C = (-\infty, -2) \cup [6, \infty)$

$z \cap (A \cap B \cap C)' = \{-2, -1, 0, -1, 2, 3, 4, 5\}$

Hence no. of its subsets = $2^8 = 256$.

3. Official Ans. by NTA (5)

Sol. B and C will contain three digit numbers of the form $9k + 2$ and $9k + \ell$ respectively. We need to find sum of all elements in the set $B \cup C$ effectively.

Now, $S(B \cup C) = S(B) + S(C) - S(B \cap C)$

where S(k) denotes sum of elements of set k.

Also, B = {101, 109, ..., 992}

$\therefore \quad S(B) = \frac{100}{2}(101 + 992) = 54650$

Case-I : If $\ell = 2$

then $B \cap C = B$

$\therefore \quad S(B \cup C) = S(B)$

which is not possible as given sum is

$274 \times 400 = 109600$.

Case-II : If $\ell \neq 2$

then $B \cap C = \phi$

$\therefore \quad S(B \cup C) = S(B) + S(C) = 400 \times 274$

$\Rightarrow \; 54650 + \sum_{k=11}^{110} 9k + \ell = 109600$

$\Rightarrow \; 9\sum_{k=11}^{110} k + \sum_{k=11}^{110} \ell = 54950$

$\Rightarrow \; 9\left(\frac{100}{2}(11 + 110)\right) + \ell(100) = 54950$

$\Rightarrow \; 54450 + 100\ell = 54950$

$\Rightarrow \; \ell = 5$

4. Official Ans. by NTA (4)

Sol. Equivalence class of (1, –1) is a circle with centre at (0,0) and radius = $\sqrt{2}$

$\Rightarrow x^2 + y^2 = 2$

$S = \{(x,y) | \; x^2 + y^2 = 2\}$

5. Official Ans. by NTA (3)

Sol. $A \cap B \cap C$ is visible in all three venn diagram

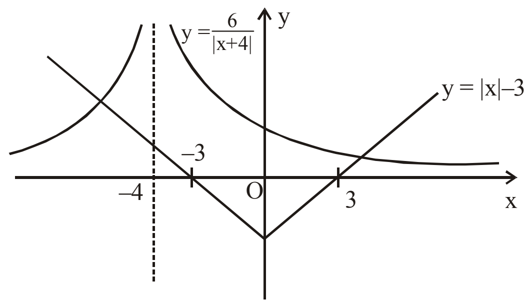
Hence, Option (3)

6. Official Ans. by NTA (2)

Sol. $x \neq -4$

$(|x| - 3)(|x + 4|) = 6$

$\Rightarrow \quad |x| - 3 = \frac{6}{|x + 4|}$



No. of solutions = 2