Sets

1. If A, B and C are three sets such that $A \cap B = A \cap C$ and $A \cup B = A \cup C$, then **[AIEEE-2009]**

   (1) $A = C$ (2) $B = C$

   (3) $A \cap B = \phi$ (4) $A = B$

2. Let $X = \{1, 2, 3, 4, 5\}$. The number of different ordered pairs (Y, Z) that can be formed such that $Y \subseteq X$, $Z \subseteq X$ and $Y \cap Z$ is empty, is **[AIEEE-2012]**

   (1) 3^5 (2) 2^5

   (3) 5^3 (4) 5^2

3. In a class of 140 students numbered 1 to 140, all even numbered students opted Mathematics course, those whose number is divisible by 3 opted Physics course and those whose number is divisible by 5 opted Chemistry course. Then the number of students who did not opt for any of the three courses is **[JEE (Main)-2019]**

   (1) 1 (2) 38

   (3) 102 (4) 42

4. Considering only the principal values of inverse functions, the set **[JEE (Main)-2019]**

$$A = \left\{x \geq 0 : \tan^{-1}(2x) + \tan^{-1}(3x) = \frac{\pi}{4}\right\}$$

   (1) Is a singleton

   (2) Contains two elements

   (3) Contains more than two elements

   (4) Is an empty set

5. Let $S = \{1, 2, 3, \ldots, 100\}$. The number of non-empty subsets A of S such that the product of elements in A is even is **[JEE (Main)-2019]**

   (1) $2^{100} - 1$

   (2) $2^{50} + 1$

   (3) $2^{50}(2^{50} - 1)$

   (4) $2^{50} - 1$

6. Let Z be the set of integers.

   If $A = \{x \in Z : 2^{(x+2)(x^2-5x+6)} = 1\}$ and

   $B = \{x \in Z : -3 < 2x - 1 < 9\}$, then the number of subsets of the set $A \times B$, is **[JEE (Main)-2019]**

   (1) 2^{15} (2) 2^{12}

   (3) 2^{18} (4) 2^{10}

7. Two newspapers A and B are published in a city. It is known that 25% of the city population reads A and 20% reads B while 8% reads both A and B. Further, 30% of those who read A but not B look into advertisements and 40% of those who read B but not A also look into advertisements, while 50% of those who read both A and B look into advertisements. Then the percentage of the population who look into advertisements is **[JEE (Main)-2019]**

   (1) 13.9 (2) 13

   (3) 12.8 (4) 13.5

8. Let A, B and C be sets such that $\phi \neq A \cap B \subseteq C$. Then which of the following statements is not true? **[JEE (Main)-2019]**

   (1) $B \cap C \neq \phi$

   (2) $(C \cup A) \cap (C \cup B) = C$

   (3) If $(A - C) \subseteq B$, then $A \subseteq B$

   (4) If $(A - B) \subseteq C$, then $A \subseteq C$

9. Let A, B, C and D be four non-empty sets. The contrapositive statement of "If $A \subseteq B$ and $B \subseteq D$, then $A \subseteq C$" is **[JEE (Main)-2020]**

   (1) If $A \not\subseteq C$, then $A \subseteq B$ and $B \subseteq D$

   (2) If $A \not\subseteq C$, then $A \not\subseteq B$ and $B \subseteq D$

   (3) If $A \not\subseteq C$, then $A \not\subseteq B$ or $B \not\subseteq D$

   (4) If $A \subseteq C$, then $B \subset A$ or $D \subset B$

10. If $A=\{x\in R:|x|<2\}$ and $B=\{x\in R:|x-2|\geq 3\}$; then **[JEE (Main)-2020]**

(1) $A-B=[-1,2)$

(2) $A\cup B=R-(2,5)$

(3) $B-A=R-(-2,5)$

(4) $A\cap B=(-2,-1)$

11. Consider the two sets :

$A = \{m \in R$: both the roots of $x^2 - (m + 1) x + m + 4 = 0$ are real$\}$ and $B = [-3, 5)$.

Which of the following is not true?

[JEE (Main)-2020]

(1) $A \cap B = \{-3\}$

(2) $B - A = (-3, 5)$

(3) $A \cup B = R$

(4) $A-B=(-\infty,-3)\cup(5,\infty)$

12. A survey shows that 63% of the people in a city read newspaper *A* whereas 76% read newspaper *B*. If *x*% of the people read both the newspapers, then a possible value of *x* can be

[JEE (Main)-2020]

(1) 37 (2) 55

(3) 29 (4) 65

13. Let $\bigcup_{i=1}^{50} X_i = \bigcup_{i=1}^{n} Y_i = T$, where each X_i contains 10 elements and each Y_i contains 5 elements. If each element of the set T is an element of exactly 20 of sets X_i's and exactly 6 of sets Y_i's, then n is equal to **[JEE (Main)-2020]**

(1) 50 (2) 15

(3) 30 (4) 45

14. A survey shows that 73% of the persons working in an office like coffee, whereas 65% like tea. If *x* denotes the percentage of them, who like both coffee and tea, then x cannot be

[JEE (Main)-2020]

(1) 63 (2) 36

(3) 38 (4) 54

15. Set *A* has *m* elements and Set *B* has *n* elements. If the total number of subsets of *A* is 112 more than the total number of subsets of *B*, then the value of $m \cdot n$ is _____. **[JEE (Main)-2020]**

16. Let $X = \{n \in N : 1 \leq n \leq 50\}$. If $A = \{n \in X : n$ is a multiple of 2$\}$ and $B = \{n \in X : n$ is a multiple of 7$\}$, then the number of elements in the smallest subset of *X* containing both *A* and *B* is _____. **[JEE (Main)-2020]**

❑ ❑ ❑