



RAMAGYA SCHOOL, NOIDA

XI/ MATHS/2018-19

OLYMPIAD WORKSHEET

(Concept based)

1. If X and Y are two sets, then $(X - Y) \cup (Y - X)$ equals
a) $X \cup Y$ b) $X \cap Y$ c) $(X \cup Y) \sim (X \cap Y)$ d) none of these
2. For all $n \in \mathbb{N} - \{1\}$, $7^{2n} - 48n - 1$ is divisible by
a) 25 b) 26 c) 1234 d) 2304
3. The product of three consecutive natural numbers is divisible by
a) 6 b) 5 c) 7 d) 4
4. If $n(A) = 6$ and $n(B) = 4$, then minimum value of $n(A - B)$ is
a) 2 b) 4 c) 6 d) 7
5. If set A is empty set then $n[P[P[P(A)]]]$ is
a) 2 b) 4 c) 6 d) 16
6. If $f(2x + 3y, 2x - 3y) = 24xy$ then $f(x, y)$ is
a) $2xy$ b) $2(x^2 - y^2)$ c) $x^2 - y^2$ d) none of these

(Application based)

7. If A and B are two non-empty sets, then $A \Delta B$ is
a) $A - B$ b) $B - A$ c) $(A \cup B) - (A \cap B)$ d) $(A \cap B) - (A \cup B)$
8. The remainder when 5^{99} is divided by 13, is
a) 6 b) 8 c) 9 d) 10
9. Let $P(n): n^2 + n + 1$ is an odd integer. If it is assumed that $P(k)$ is true $\Rightarrow P(k+1)$ is true, therefore $P(n)$ is true
a) $n > 1$ b) $n > 2$ c) for all $n \in \mathbb{N}$ d) None of these
10. Range of $f(x) = \frac{x^2 + 34x - 71}{x^2 + 2x - 7}$ is
a) $[5, 9]$ b) $(5, 9]$ c) $(-\infty, 5] \cup [9, \infty)$ d) $(-\infty, 5] \cup [9, \infty)$
11. If A is the set of even natural numbers less than 8 and B is the set of prime numbers less than 7, then the number of relations from A to B is
a) 2^9 b) 9^2 c) 3^2 d) $2^9 - 1$

12. If function f satisfies the equation $3f(x) + 2f\left(\frac{x+59}{x-1}\right) = 10x + 30$, $x \neq -1$, then $f(7)$ is

- a) 4 b) 8 c) -8 d) 11

13. The domain of the function $f(x) = \cos^{-1}\left(\log_3 \frac{x}{4}\right)$ is

- a) $[4, 12]$ b) $[0, 3]$ c) $[4/3, 4]$ d) $[4/3, 12]$

(HOTS)

14. The greatest positive integer, which divides $(n + 2)(n + 3)(n + 4)(n + 5)(n + 6)$ for all $n \in \mathbb{N}$ is

- a) 120 b) 4 c) 240 d) 24

15. If $x^{2n-1} + y^{2n-1}$ is divisible by $x + y$, then n is

- a) positive integer b) even positive integer c) odd positive integer d) $n \geq 2$

16. If two sets A and B are 43 elements in common, then the number of elements common to each of the sets $A \times B$ and $B \times A$ is

- a) 43^2 b) 2^{43} c) 43^{43} d) 2^{86}

17. If $f(x) = \frac{1-x}{1+x}$, then $f(f(\cos 2\theta))$ is

- a) $\tan 2\theta$ b) $\sec 2\theta$ c) $\cos 2\theta$ d) $\cot 2\theta$

18. If $f(x) = \cos(\log x)$ then $f(x) \cdot f(y) - \frac{1}{2}\left(f\left(\frac{x}{y}\right) + f(xy)\right)$ has the value

- a) 1 b) -1 c) 0 d) 3

(Value based)

19. In a college of 400 students, every student reads 5 newspapers and every newspaper is read by 80 students. The number of newspapers is

- a) 25 b) at most 20 c) at most 25 d) at least 25

20. A survey shows that 70% of the Indian like mango whereas 82% like apple. If $x\%$ of Indian like both mango and apple then

- a) $x = 52$ b) $x = 70$ c) $52 \leq x \leq 70$ d) $70 \leq x \leq 82$