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XI/MATHEMATICS/2017-18
OLYMPIAD PRACTICE WORKSHEET

Section-1 - Logical Reasoning (Application based questions)

Directions for question (1-2)

Each of these questions is based on the following information:

M % N means M is the son of N.

M @ N means M is the sister of N.

M \$ N means M is the father of N

1. Which of the following shows the relation that C is the granddaughter of E?

- (a) C % B \$ F \$ E (b) B \$ F \$ E % C (c) C @ B % F % E (d) E % B \$ F \$ C

2. Which of the following shows the relation that S is the father of Q?

- (a) S @ P \$ Q (b) Q @ P % S (c) Q \$ S @ P (d) None of these

3. In alphabet series, some alphabets are missing which are given in that order as one of the alternatives below it. Choose the correct alternative.: a _ cdaab _ cc _ daa _ bbb _ cdddd

- (a) bdbda (b) bddca (c) dbbca (d) bbdac

4. You want to speak to the chief of the village. You question three inhabitants. Amar, Bobby and Charles. Only Bobby's shirt is red. Amar says, "I am not Bobby's son. The chief wears a red shirt." Bobby says, "I am Amar's father, Charles is the chief." Charles says, "The chief is one among us. I am the chief." Who is the chief, if each person speaks a truth and a lie?

- (a) Amar (b) Bobby (c) Charles (d) None of them

5. Along a road lie an odd number of stones placed at intervals of 10 m. These stones have to be assembled around the middle stone. A person can carry only one stone at a time. A man carried out the job starting with the stone in the middle, carrying stones in succession, thereby covering a distance of 4.8 km. Then the number of stones is:

- (a) 35 (b) 15 (c) 29 (d) 31

Section-2: Mathematical Reasoning

Concept based questions:

6. Polar form of a complex number is

- (a) $r (\tan\theta + j \cot\theta)$ (b) $r (\sec\theta + j \operatorname{cosec}\theta)$
(c) $r (\cos\theta + j \sin\theta)$ (d) $r (\sin\theta + j \cos\theta)$

7. $|z_1 + z_2|$ is

- (a) $> |z_1| + |z_2|$ (b) $\leq |z_1| + |z_2|$
(c) $\leq z_1 + z_2$ (d) $> z_1 + z_2$

8. $A^2 + b^2$ is same as

- (a) $(a + b)(a - b)$ (b) $(a + j b)(a - j b)$
(c) $(a + b)(a - j b)$ (d) $(a + j b)(a - b)$

9. If $\tan \theta = \frac{1}{2}$ and $\tan \varphi = \frac{1}{3}$, then the value of $\theta + \varphi$ is

- (a) 0 (b) π (c) $\frac{\pi}{4}$ (d) $\frac{\pi}{6}$

10. The value of $\tan 75^\circ - \cot 75^\circ =$

- (a) $2\sqrt{3}$ (b) $2 + \sqrt{3}$ (c) $2 - \sqrt{3}$ (d) 1

Section-3: Value based questions:

11. The value of $\arg(x)$ when $x < 0$ is

- (a) 0 (b) π (c) $\frac{\pi}{2}$ (d) None of these

12. If $x, y \in R$, then $(x + jy)$ is a non real complex number if

- (a) $x = 0$ (b) $y = 0$ (c) $x \neq 0$ (d) $y \neq 0$

13. The real value of α for which the expression $\frac{1 - j \sin \alpha}{1 + 2j \sin \alpha}$ is purely real is:

- (a) $(n + 1)\frac{\pi}{2}$ (b) $(2n + 1)\frac{\pi}{2}$ (c) $(n\pi)$ (d) $(n - 1)\frac{\pi}{2}$

14. The minimum value of $3 \cos x + 4 \sin x + 8$ is

- (a) 5 (b) 9 (c) 7 (d) 3

15. The value of $\cot\left(\frac{\pi}{4} + \theta\right) \cot\left(\frac{\pi}{4} - \theta\right)$ is

- (a) 1 (b) -1 (c) 0 (d) non defined

Section-4: HOTS:

16. A real value of x satisfying the equation $\left(\frac{3 - 4jx}{3 + 4jx}\right) = (\alpha - j\beta)$ where $(\alpha, \beta \in R)$, if $\alpha^2 + \beta^2 =$

- (a) 1 (b) -1 (c) 2 (d) -2

17. If $f(z) = \frac{7 - z}{1 - z^2}$, where $z = 1 + 2j$, then $|f(z)|$ is

- (a) $\frac{|z|}{2}$ (b) $|z|$ (c) $2|z|$ (d) None of these

18. The real value of θ for which the expression $\frac{1 + j \cos \theta}{1 - 2j \cos \theta}$ is a real number is:

- (a) $n\pi + \frac{\pi}{4}$ (b) $n\pi + (-1)^n \frac{\pi}{4}$ (c) $2n\pi \pm \frac{\pi}{2}$ (d) None of these

19. The value of $\frac{1 - \tan^2 15^\circ}{1 + \tan^2 15^\circ}$ is

- (a) 1 (b) $\sqrt{3}$ (c) $\frac{\sqrt{3}}{2}$ (d) 2

20. If $\tan \alpha = \frac{1}{7}$ and $\tan \beta = \frac{1}{3}$, then the value of $\cos 2\alpha$ is

- (a) $\sin 2\beta$ (b) $\sin 3\beta$ (c) $\sin 4\beta$ (d) $\cos 2\beta$