

1. i^2 equals
 A. 1 B. i C. $-i$ D. -1
2. If $x^2 + 9 = 0$, then $x =$
 A. ± 3 B. $9i$ C. $3i$ D. $\pm 3i$
3. The sequence $\langle a_n \rangle = 3 + \frac{n}{n+4}$ converges to
 A. 1 B. 2 C. 3 D. 4
4. If $f(x) = x^2$ and $g(x) = \sqrt{x}$ then $f \circ g(x) =$
 A. x^2 B. $2x$ C. \sqrt{x} D. x
5. The turning point of $y = (x-1)^3(x-3)^2$ which lies on the x -axis is at
 A. $(0, 0)$ B. $(1, 0)$ C. $(2, 0)$ D. $(3, 0)$
6. What is the maximum value of $y = 3\sin x + 4\cos x$?
 A. 25 B. 7 C. 5 D. 1
7. The range of the function $y = 3 + 2\cos x$ is
 A. $2 \leq y \leq 4$ B. $1 \leq y \leq 3$ C. $1 \leq y \leq 5$ D. $2 \leq y \leq 3$
8. Teni's garden is shaped like the region below $y = 4\sin 2x$ and above the x -axis from 0 to $\frac{\pi}{2}$.
 What is the area of Teni's garden? **Hint:** $\int \sin x \, dx = -\cos x$
 A. 1 B. 2 C. 4 D. 5
9. The domain of $\tan^{-1}x$ is
 A. $-1 \leq x \leq 1$ B. $-1 < x < 1$ C. Real numbers D. Whole numbers
10. $\cot^{-1}\left(\frac{1}{\sqrt{3}}\right) =$
 A. 30° B. 45° C. 60° D. 90°

11. Which of the following line represents an asymptote of $y = \frac{x^2}{x-1}$?
- A. $y = x + 2$ B. $y = x + 1$ C. $y = 0$ D. $x = -1$
12. For the function $x^2 + y^2 = 9$, $\frac{dy}{dx}$ equals
- A. $-\frac{y}{x}$ B. $-\frac{x}{y}$ C. x D. y
13. For the function $f(x)$, $f''(x) = -2x$. The function $f(x)$ is concave down in the interval
- A. $x \leq 0$ B. $x > 0$ C. $x < 0$ D. $x \geq 0$
14. The smallest positive value of θ at which the function $y = 12 \sin(\theta + 30^\circ)$ is minimum is
- A. $\theta = 90^\circ$ B. $\theta = 240^\circ$ C. $\theta = 300^\circ$ D. $\theta = 330^\circ$
15. The line $y = 0$ is an asymptote of _____ functions.
- A. balanced B. bottom-heavy C. top-heavy D. trigonometric
16. A fair coin is tossed 5 times. The probability that 3 heads appear is
- A. $\binom{5}{3} \left(\frac{1}{2}\right)^3 \left(\frac{1}{2}\right)^2$ B. $\binom{5}{3} \left(\frac{1}{2}\right)^2 \left(\frac{1}{2}\right)^3$ C. $\left(\frac{1}{2}\right)^3 \left(\frac{1}{2}\right)^2$ D. 1
17. What are the coordinates of a point which lies on the line $x - 2 = y - 3 = z$?
- A. (2, 3, 0) B. (2, 3, 1) C. (2, 0, 0) D. (0, 0, 0)
18. A directional vector of the line $x = y - 2 = z$ is
- A. $i + j + k$ B. $i + 2j + k$ C. $i - j + k$ D. $i - 2j + k$
19. The value of $2^{2024} + 2^{2024}$ is
- A. 2^{2025} B. 2^{4048} C. 4^{2024} D. 4^{4048}
20. A car 3.5 m long is travelling at 70km/h and overtakes a 16.5 m long truck in 7.2 s. What is the speed of the truck?
- A. 60km/h B. 65km/h C. 68km/h D. 80km/h
21. The 5 tyres of a car (4 road tyres and a spare) were each used equally on a car that had travelled 25 000km. The number of kilometres of use of each tyre was
- A. 5 000 B. 6 250 C. 25 000 D. 20 000

Use the following information to answer questions 22-24.

The distance, s metres, of a boat from a port after t seconds is given by $s = 20t - 0.1t^2$

22. The maximum distance of the boat from the port is

- A. 100 m B. 500 m C. 600 m D. 1000 m

23. When does the boat return to the port?

- A. $t = 20$ s B. $t = 100$ s C. $t = 150$ s D. $t = 200$ s

24. The acceleration of the boat in m/s^2 is

- A. 0 B. -0.1 C. -0.15 D. -0.2

25. If $y = x^x$ then $\frac{dy}{dx}$ equals

- A. x^x B. $x^x \ln x$ C. $x^x (\ln x + x)$ D. $x^x (\ln x + 1)$

26. In how many ways can a teacher divide 9 students into 3 groups of 3?

- A. 35 B. 140 C. 280 D. 1680

27. A cube of edge length 3 units is painted. It is then cut into 27 one-unit cubes.

How many faces of the one-unit cubes are not painted?

- A. 27 B. 100 C. 108 D. 162

28. At Aman's hardware 3 bolts, 1 screwdriver and 1 spanner cost \$8; 1 bolt, 3 screwdrivers and 1 spanner cost \$10 while 1 bolt, 1 screwdriver, and 3 spanners cost \$12.

How much will 1 bolt, 1 screwdriver and 1 spanner cost?

- A. \$3 B. \$5 C. \$6 D. \$9

29. An aeroplane takes 2 hours and 20 minutes to fly from Island A to Island B. If it were to decrease its speed by 20%, how long would the trip take?

- A. 28 min B. 1h 52 min C. 2h 55 min D. 3h 45 min

30. $\int_4^{40} \sqrt{2x+1} \, dx =$

- A. 230 B. 233 C. 234 D. 243