1. The coefficient of x^9 in the polynomial $g(x) = (1+x)^6(1-x)^7$ is

(A) 15 (B) -15 (C) -210 (D) -35

2. A pair of fair (balanced) dice are rolled independently three times. The probability of getting a score of exactly 9 twice (for the sum of the dots that show up on the two dice) is

(A) $\frac{2}{3}$ (B) $\frac{8}{243}$ (C) $\frac{1}{4}$ (D) $\frac{8}{729}$

3. The side of a square is increasing at a rate of 0.2 cm/sec. Find the rate of increase of perimeter of the square.

(A) 0.8 cm/sec (B) 0.08 cm/sec

(C) 0.2 cm/sec (D) none of the above

4. A policeman fires three bullets on a dacoit. The probability that the dacoit will be killed by one bullet is 0.7. What is the probability that the dacoit is still alive?

(A) 0.147 (B) 0.21 (C) 0.027 (D) 0.09

5. In the expansion of $\log_e \left\{\frac{1}{1-x-x^2+x^3}\right\}$, the coefficient of x is ------

(A) 1 (B) 2 (C) 3 (D) none of the above

6. The minimum of $g(x) = e^{2x} + |x|, -10 \leq x \leq 10$ is

(A) 1 (B) $\frac{1+\log_e 2}{2}$

(C) $e^{-1} + \frac{1}{2}$ (D) $\frac{1-\log_e 2}{2}$

7. Let a be the value of the infinite series, $\frac{1}{2!} - \frac{1}{3!} + \frac{1}{4!} - \frac{1}{5!} + - - -$ Then a equal

(A) $e^{-\frac{1}{2}}$ (B) e^{-1} (C) $e^{-1} - 2$ (D) $e^{-1} - 1$

8. All the values of real numbers m for which both the solutions of the equation $x^2 - 2mx + m^2 - 1 = 0$ are greater than -2 but less than 4 must lie in the interval

(A) $(3,\infty)$ (B) $(-1, 3)$ (C) $(1, 4)$ (D) $(-2, 0)$

9. Let A be the matrix $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$. Then the number of matrices B of the form $B = \begin{bmatrix} a & 0 \\ 0 & b \end{bmatrix}$, where a and b are integers and satisfying $AB = BA$ is

(A) 0 (B) 1

(C) countably infinite (D) uncountably infinite

10. The total revenue in rupees received from the sale of x units of a product is given by $R(x) = 13x^2 + 26x + 15$. Find the marginal revenue when $x = 7$.

(A) 26 (B) 182 (C) 208 (D) none of the above

11. A pizza chain claims that with its choice of toppings, it can create just over 100 pizzas. What is the minimum number of toppings it must offer?

(A) 7 (B) 10 (C) 6 (D) 8

12. The equation of the tangent to the curve $y = x + \frac{4}{x^2}$, that is parallel to the X-axis is

(A) $y = 0$ (B) $y = 1$ (C) $y = 2$ (D) $y = 3$

13. The sum to infinity of the series $1 + \frac{2}{3} + \frac{6}{3^2} + \frac{10}{3^3} + \frac{14}{3^4} + \cdots$ is

(A) 3 (B) 4 (C) 6 (D) 2

14. The area bounded by $y = |x - 1|$ and $y = 1$ is

(A) 2 sq units (B) 1 sq unit

(C) $\frac{1}{2}$ sq unit (D) none of the above

15. The maximum area of a right-angled triangle with hypotenuse h is

(A) $\frac{h^3}{2\sqrt{2}}$ (B) $\frac{h^2}{2}$ (C) $\frac{h^2}{\sqrt{2}}$ (D) $\frac{h^2}{4}$

16. The point diametrically opposite to the point $P(1, 0)$ on the circle $x^2 + y^2 + 2x + 4y - 3 = 0$ is

(A) (3, 4) (B) (3, -4) (C) (-3, 4) (D) (-3, -4)

17. If α and β are the roots of the equation $ax^2 - 2bx + c = 0$, then $\alpha^3\beta^3 + \alpha^2\beta^3 + \alpha^3\beta^2$ is equal to

(A) $\frac{c^2}{a^3}(c - 2b)$ (B) $\frac{c^2}{a^3}(c + 2b)$ (C) $\frac{bc^2}{a^3}$ (D) none of the above

18. If both 11^2 and 3^3 are factors of the number $(a \times 4^3 \times 6^2 \times 13^{11})$, then what is the smallest possible value of a?

(A) 121 (B) 9 (C) 363 (D) 33

19. Consider three numbers a, b and c such that $\text{Max}(a, b, c) + \text{Min}(a, b, c) = 13$ and $\text{Median}(a, b, c) - \text{Mean}(a, b, c) = 2$. Find the mean of a, b, and c.

(A) 7.5 (B) 9.5 (C) 6 (D) none of the above

20. Find the missing number 4, 8, 21, 59, ?, 314

(A) 146 (B) 168 (C) 87 (D) none of the above

21. How many numbers of up to 5 digits can be created using the digits 1, 2, 3 and 5 each at least once such that they are a multiple of 15?

(A) 12 (B) 24 (C) 48 (D) none of the above

22. What is the next number in this sequence: 6, 14, 36, 98, 276?

(A) 794 (B) 729 (C) 766 (D) none of the above

23. How many words of 4 consonants and 2 vowels can be formed out of 6 consonants and 3 vowels

(A) 90 (B) 720 (C) 64000 (D) 64800

24. After simplification $\frac{1}{2}\log(1^3 + 2^3 + 3^3 + \cdots + n^3)$ is equal to

(A) $\log n + \log(n-1) - \log 4$ (B) $\log n - \log(n+1) - \log 4$

(C) $\log n + \log(n+1) - \log 2$ (D) none of the above

25. How many terms meaning, a 'square term' or a 'product term' will the expansion of $(a + b + c + \cdots + z)^2$ contain?

(A) 350 (B) 351 (C) 352 (D) 353

26. There are four dice each one having faces with a number from 1 to 6. All of these four dice are rolled. Find the number of possible outcomes such that at least one of the dice shows the number 5.

(A) 671 (B) 625 (C) 1296 (D) none of the above

27. A casting manufacturing company supplies metallic castings to an automobile company. The automobile company inspect every casting and reject the casting if found defective. Suppose a batch of 950 castings supplied by the casting manufacturer contains 70 defectives, what is the chance that the first and second castings inspected are defective and the 3rd casting is a good one?

(A) 0.01 (B) 0.001 (C) 0.09 (D) none of the above

28. The points (1, 3) and (5, 1) are two opposite vertices of a rectangle. The other two vertices lie on the line $y = 2x + c$. The remaining vertices are;

(A) (2, 0) and (4, 4) (B) (2, 0) and (-4, -4)

(C) (2, 0) and (-4, 4) (D) (-2, 0) and (4, 4)

29. For any positive integer n define $h(n) = \sum_{k=1}^{n} \frac{1}{\sqrt{k}}$ then,

(A) $h(n) > n$ for all n (B) $h(n) > \sqrt{n}$ for all n

(C) $n \geq h(n) \geq \sqrt{n}$ for all n (D) $n\sqrt{n} \geq h(n) \geq n$ for all n

30. The set of all points where $g(x) = \frac{x}{1+2|x|}$ is differentiable, is

(A) $(-\infty, \infty)$ (B) $(-\infty, -0.5) \cup (-0.5, \infty)$

(C) $(-\infty, 0) \cup (0, \infty)$ (D) $(-\infty, -0.5) \cup (-0.5, 0) \cup (0, \infty)$