MATHEMATICS

DPP

DAILY PRACTICE PROBLEMS

DPP No. 13

Total Marks : 45

Max. Time : 45 min.

Topics : **Fundamentals of Mathematics, Sequence & Series, Trigonometric Ratio, Matrices & Determinants, Binomial Theorem, Straight Line, Permutation & Combination, Complex Number, Circle, Ellipse, Set & Relation**

Type of Questions		**M.M., Min.**
Single choice Objective (no negative marking) Q.1 to Q.13	**(3 marks, 3 min.)**	**[39, 39]**
Assertion and Reason (no negative marking) Q.14, 15	**(3 marks, 3 min.)**	**[6, 6]**

1. The equation $e^{\sin x} - e^{-\sin x} - 4 = 0$ has :

(A) infinite number of real roots (B) no real roots

(C) exactly one real root (D) exactly four real roots

2. Let $A = \begin{pmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 3 & 2 & 1 \end{pmatrix}$. If u_1 and u_2 are column matrices such that $Au_1 = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$ and $Au_2 = \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix}$, then $u_1 + u_2$ is equal to:

(A) $\begin{pmatrix} -1 \\ 1 \\ 0 \end{pmatrix}$ (B) $\begin{pmatrix} -1 \\ 1 \\ -1 \end{pmatrix}$ (C) $\begin{pmatrix} -1 \\ -1 \\ 0 \end{pmatrix}$ (D) $\begin{pmatrix} 1 \\ -1 \\ -1 \end{pmatrix}$

3. If n is a positive integer, then $\left(\sqrt{3}+1\right)^{2n} - \left(\sqrt{3}-1\right)^{2n}$ is :

(A) an irrational number (B) an odd positive integer

(C) an even positive integer (D) a rational number other than positive integers

4. If 100 times the 100^{th} term of an AP with non zero common difference equals the 50 times its 50^{th} term, then the 150^{th} term of this AP is :

(A) – 150 (B) 150 times its 50^{th} term

(C) 150 (D) zero

5. In a ΔPQR, if $3 \sin P + 4 \cos Q = 6$ and $4 \sin Q + 3 \cos P = 1$, then the angle R is equal to :

(A) $\frac{5\pi}{6}$ (B) $\frac{\pi}{6}$ (C) $\frac{\pi}{4}$ (D) $\frac{3\pi}{4}$

6. If the line $2x + y = k$ passes through the point which divides the line segment joining the points (1, 1) and (2, 4) in the ratio 3 : 2, then k equals :

(A) $\frac{29}{5}$ (B) 5 (C) 6 (D) $\frac{11}{5}$

7. Assuming the balls to be identical except for difference in colours, the number of ways in which one or more balls can be selected from 10 white, 9 green and 7 black balls is :

(A) 880 (B) 629 (C) 630 (D) 879

8. If $z \neq 1$ and $\frac{z^2}{z-1}$ is real, then the point represented by the complex number z lies :

(A) either on the real axis or on a circle passing through the origin.
(B) on a circle with centre at the origin.
(C) either on the real axis or on a circle not passing through the origin.
(D) on the imaginary axis.

9. Let P and Q be 3×3 matrices $P \neq Q$. If $P^3 = Q^3$ and $P^2Q = Q^2P$, then determinant of $(P^2 + Q^2)$ is equal to :

(A) -2 (B) 1 (C) 0 (D) -1

10. The length of the diameter of the circle which touches the x-axis at the point (1, 0) and passes through the point (2, 3) is :

(A) $\frac{10}{3}$ (B) $\frac{3}{5}$ (C) $\frac{6}{5}$ (D) $\frac{5}{3}$

11. Let $X = \{1, 2, 3, 4, 5\}$. The number of different ordered pairs (Y, Z) that can formed such that $Y \subseteq X$, $Z \subseteq X$ and $Y \cap Z$ is empty, is :

(A) 5^2 (B) 3^5 (C) 2^5 (D) 5^3

12. An ellipse is drawn by taking a diameter of the circle $(x-1)^2 + y^2 = 1$ as its semi-minor axis and a diameter of the circle $x^2 + (y-2)^2 = 4$ is semi-major axis. If the centre of the ellipse is at the origin and its axes are the coordinate axes, then the equation of the ellipse is :

(A) $4x^2 + y^2 = 4$ (B) $x^2 + 4y^2 = 8$ (C) $4x^2 + y^2 = 8$ (D) $x^2 + 4y^2 = 16$

13. A line is drawn through the point (1, 2) to meet the coordinate axes at P and Q such that it forms a triangle OPQ, where O is the origin. if the area of the triangle OPQ is least, then the slope of the line PQ is :

(A) $-\frac{1}{4}$ (B) -4 (C) -2 (D) $-\frac{1}{2}$

14. **Statement-1 :** The sum of the series $1 + (1 + 2 + 4) + (4 + 6 + 9) + (9 + 12 + 16) + ... + (361 + 380 + 400)$ is 8000.

Statement-2 : $\sum_{k=1}^{n} (k^3 - (k-1)^3) = n^3$, for any natural number n.

(A) Statement-1 is false, Statement-2 is true.
(B) Statement-1 is true, statement-2 is true; statement-2 is a correct explanation for Statement-1.
(C) Statement-1 is true, statement-2 is true; statement-2 is **not** a correct explanation for Statement-1.
(D) Statement-1 is true, statement-2 is false.

15. **Statement-1 :** An equation of a common tangent to the parabola $y^2 = 16\sqrt{3}x$ and the ellipse $2x^2 + y^2 = 4$ is $y = 2x + 2\sqrt{3}$.

Statement-2 : If the line $y = mx + \frac{4\sqrt{3}}{m}$, $(m \neq 0)$ is a common tangent to the parabola $y^2 = 16\sqrt{3}x$ and the ellipse $2x^2 + y^2 = 4$, then m satisfies $m^4 + 2m^2 = 24$.

(A) Statement-1 is false, Statement-2 is true.
(B) Statement-1 is true, statement-2 is true; statement-2 is a correct explanation for Statement-1.
(C) Statement-1 is true, statement-2 is true; statement-2 is **not** a correct explanation for Statement-1.
(D) Statement-1 is true, statement-2 is false.

Answers Key

1. (B)	**2.** (D)	**3.** (A)	**4.** (D)
5. (B)	**6.** (C)	**7.** (D)	**8.** (A)
9. (C)	**10.** (A)	**11.** (B)	**12.** (D)
13. (C)	**14.** (B)	**15.** (B)	