

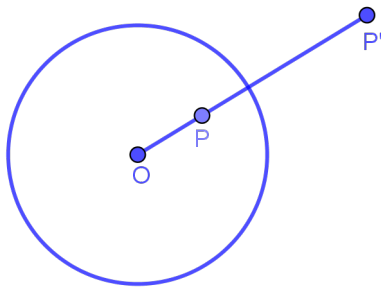
Gandaki Boarding School
(National School)
Lamachaur, Pokhara
SEE SEND UP EXAMINATION, 2078

Time: 3:00 hrs **Optional Mathematics** **F.M. : 100**

Attempt all the questions. All the working must be shown.

Group 'A' $[5 \times (1 + 1) = 10]$

1. (a) What is remainder theorem?
 (b) Find the inverse of the function $f(x) = x + 2$.
2. (a) Write down the notational representation of left hand limit.
 (b) Under what condition the inverse of the matrix is not possible?
3. (a) Which conic section is formed if the plane intersects a cone parallel to the generator of the cone?
 (b) What is the condition for the two lines represented by homogenous equation of second degree to be coincident?
4. (a) Express $\cos 2A$ in terms of $\sin A$.
 (b) Find the acute angle A for $2 \sin A = 1$.
5. (a) In the figure P' is the inverse point of P if $OP \times OP' = 36$. Find the radius of the circle.



- (b) If the dot product of two vectors is zero what is the angle between them?

Group 'B' $[13 \times 2 = 26]$

6. (a) If $f(x) = 3x - 10$ find the value of $f^{-1}(5)$.
 (b) Find the vertex of the parabola $y = x^2 - 6x + 5$
 (c) What is the value of k if $x - 3$ is a factor of $2x^3 - x^2 - 10x - k$.
7. (a) Find the inverse of matrix $A = \begin{pmatrix} 5 & 2 \\ -3 & 2 \end{pmatrix}$
 (b) What is singular matrix? Find the value of p if $\begin{pmatrix} p & 3 \\ 4 & 2 \end{pmatrix}$ is a singular matrix.
8. (a) For what value of k are the lines $3x - 4y + 9 = 0$ and $kx + 3y - 12 = 0$ perpendicular to each other?
 (b) Find the angle between the lines represented by the equation $6x^2 + 5xy - 6y^2 = 0$
9. (a) Prove that: $\cot \frac{A}{2} - \tan \frac{A}{2} = 2 \cot A$
 (b) Prove that: $\cot 22^\circ \cdot \cot 23^\circ - \cot 22^\circ - \cot 23^\circ = 1$
 (c) If $\sin x + \cos x = \sqrt{2}$ $[0^\circ \leq x \leq 180^\circ]$.
10. (a) If $\vec{a} + 2\vec{b}$ and $5\vec{a} - 4\vec{b}$ are perpendicular to each other and \vec{a} and \vec{b} are unit vectors, find the angle between \vec{a} and \vec{b} .
 (b) D is the midpoint of the side BC of $\triangle ABC$. If the position vectors of the points B and C are $3\vec{i} + 5\vec{j}$ and $5\vec{i} - \vec{j}$ respectively, find the position vector of D .
 (c) Find the third quartile Q_3 if quartile deviation $Q.D. = 2.5$ and the first quartile $Q_1 = 18$.

Group 'C' $[11 \times 4 = 44]$

11. Solve: $y^3 - 8y^2 + 19y - 12 = 0$
12. Solve graphically: $x^2 - 2x - 15 = 0$.
13. Examine the continuity of the function

$$f(x) = \begin{cases} 2x + 3 & \text{for } x > 1 \\ 6x - 1 & \text{for } x \leq 1 \end{cases} \text{ at } x = 1$$

14. Solve by matrix method:

$$2x - 3y - 7 = 0, \quad 4y - 3x = -10$$

15. Find the equation of the straight lines passing through the point $(1, -4)$ and making an angle of 45° with the line $2x + 3y + 5 = 0$.

16. Prove that:

$$4 \cos^3 \theta \cdot \sin 3\theta + 4 \sin^3 \theta \cdot \cos 3\theta = 3 \sin 4\theta$$

17. If $A + B + C = 180^\circ$, show that:

$$\sin(B+C-A) + \sin(C+A-B) + \sin(A+B-C) = 4 \sin A \sin B \sin C$$

18. A flagstaff of height 7 m stands as the top of a tower. The angles subtended by the tower and the flagstaff at a point on the ground are 45° and 15° respectively. Find the height of the tower.

19. Find the 2×2 transformation matrix which transforms a square $ABCD$ with vertices $A(2, 3)$, $B(4, 3)$, $C(4, 5)$ and $D(2, 5)$ into a square $A'B'C'D'$ with vertices $A'(3, 2)$, $B'(3, 4)$, $C'(5, 4)$ and $D'(5, 2)$.

20. Calculate the mean deviation and its coefficient from from the median of the data given below.

Class Interval	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50
Frequency	5	7	15	9	4

21. Calculate the standard deviation from the data given below:

Class Interval	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60
Frequency	5	8	15	16	6

Group 'D'

[4 × 5 = 20]

22. The sum of first 9 terms of an AP is 72 and that of first 17 terms is 289. Find the sum of first 25 terms.

23. Find the equation of the circle which touches the x-axis at the point $(12, 0)$ and cuts off an intercept 10 from the y-axis.

24. Prove by vector method that the median of an isosceles triangle is perpendicular to the base.

25. $K(3, 5)$, $L(-1, 4)$ and $M(5, 2)$ are the vertices of a triangle KLM . Find the coordinates of the vertices of the images of ΔKLM under the rotation of negative 90° about the origin followed by the enlargement $E [(0, 0), 2]$. Present object and its image on the same graph paper.

*****Ambik*****