

Grade : X

Optional Mathematics

Full Marks : 75

Time : 3:00 Hrs.

Set 'A'

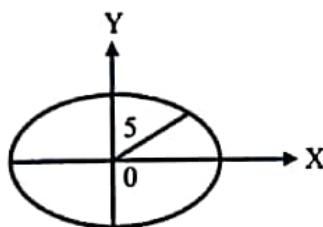
Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.

Attempt all the questions:

Group 'A'

 $(10 \times 1) = 10$

1. If $f(a) = 0$ then find a factor of $f(x)$.
2. If 7th and 9th terms of an A.P are 25 and 21 respectively, find its 8th term.
3. Write the name of the set of number which is continuous.
4. Find the value of x if $\begin{vmatrix} 4 & 5 \\ x & 15 \end{vmatrix} = 0$.
5. If the intersection of cone is parallel to the base of the cone, then what conic does it form.
6. According to the given figure write the equation of circle.



7. Express $\sin 2A$ in terms of $\tan A$.
8. If $\tan \theta = \frac{1}{\sqrt{3}}$, $0^\circ \leq \theta \leq 180^\circ$, find the value of θ .
9. ABC is a triangle such that $\overrightarrow{OG} = \frac{1}{3} (\overrightarrow{OA} + \overrightarrow{OB} + \overrightarrow{OC})$ and O is the origin, write the special name of the point G.
10. What is the inverse of an identity matrix?

Group 'B'

 $(8 \times 2 = 16)$

11. State 'Remainder Theorem' When $x^3 - 3x^2 + kx + k$ is divided by $x + 2$, the remainder is 15. Find the value of k .
12. Find the vertex of the parabola $y = 3x - x^2$.

13. If an inverse matrix of a matrix A is $A^{-1} = \begin{pmatrix} 1 & 3 \\ 2 & 4 \end{pmatrix}$ find the matrix A .
14. If the lines $x - 4y + 3 = 0$ and $px - 12y - 4 = 0$ are parallel to each other, find the value of p .
15. Prove that: $\sin^2(45^\circ + A) + \sin^2(45^\circ - A) = 1$
16. Solve: $\sin \theta = \cos \theta$ ($0^\circ \leq \theta \leq 180^\circ$)
17. If $(\vec{x} + \vec{y})^2 = (\vec{x} - \vec{y})^2$ prove that \vec{x} and \vec{y} are perpendicular to each other.
18. In a continuous series $\sum fd = 0$, $\sum fd^2 = 848$, $N = 100$, $d = m - A$ and $A = 12$, then find the standard deviation and its coefficient.

Group 'C'

(11 × 3 = 33)

19. Solve: $y = x^3 - 4x^2 + x + 8$, $y = 2$.
20. Find the maximum and minimum value of $F = 2x - 4y$ under the following constraints: $x + 2y \geq 1$, $x + y \leq 5$ and $x \geq 0$ and $y \geq 0$.
21. Examine the continuity or discontinuity of the function $f(x) = \begin{cases} 4x - 1 & x < 1 \\ 7x & x \geq 1 \end{cases}$
at $x = 1$ by calculating left hand limit and right - hand limit and functional value.
22. Solve by matrix method: $\frac{4}{x} + \frac{5}{y} = 58$, $\frac{7}{x} + \frac{3}{y} = 67$.
23. If the acute angle between pair of straight line represented by $x^2 + 2xy \operatorname{cosec} \alpha + y^2 = 0$ is 0 then prove that $\theta = 90^\circ - \alpha$.
24. Prove that $16 \cos^5 A + 2 \cos A - \cos 3A - \cos 5A = 16 \cos^3 A$.
25. If $A + B + C + \pi^c$: $\sin(B + 2C) + \sin(C + 2A) + \sin(A + 2B) = 4$

$$\sin \frac{B-C}{2} \cdot \sin \frac{C-A}{2} \cdot \sin \frac{A-B}{2}$$

26. The angle of elevation of the bird from a point 400 above the surface level a pond is found to be 60° . Find the height of the bird from the surface of water.

Grade : X

Optional Mathematics

Full Marks : 75

Time : 3:00 Hrs.

Set 'B'

*Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.*

Attempt all the questions:

Group 'A'**(10 × 1) = 10**

1. What is the minimum value of $y = \sin x$? Write it.
2. If a, G, b are geometric sequence, write G in terms of a and b .
3. Write the interval notation of $\{x : 2 \leq x \leq 6\}$
4. Express the equation $mx + ny = r, px + qy = s$ into matrix form.
5. Write the equation of straight line perpendicular to $ax + bx + c = 0$.
6. Write down the formula to find the angle between the lines represented by $ax^2 + 2hxy + by^2 = 0$.
7. Write the formula of $\cos A$ in terms of $\tan \frac{A}{2}$.
8. Express $2 \cos A \cdot \sin A$ in sum or difference form.
9. Define scalar product of two vectors.
10. Write the single enlargement of two successive enlargements defined by $E_1[(a, b), m]$ and $E_2[(a, b), n]$.

Group 'B'**(8 × 2 = 16)**

11. If $f(x) = 4x - 3$ find $f^{-1}(-1)$.
12. If $f(x) = 4x^3 - 3x^2 + 3x - k$ is divided by $(x - 2)$, the remainder is 12. Find the value of K .
13. If the matrix $P = \begin{pmatrix} 1 & -2 \\ 0 & x \end{pmatrix}$ and $P^{-1} = \begin{pmatrix} 1 & 4 \\ y & 2 \end{pmatrix}$, find the value of x and y .
14. Find the equation of the circle whose center is $(2, -1)$ and which touches the line $3x - 4y + 1 = 0$.
15. If $\cos 30^\circ = \frac{\sqrt{3}}{2}$, find the values of $\cos 15^\circ$.
16. Prove that $\frac{\cos 14^\circ - \sin 14^\circ}{\cos 14^\circ + \sin 14^\circ} = \cot 59^\circ$.
17. If the position vectors of A, B and C of ΔABC are $(3\vec{i} + 4\vec{j})$, $(4\vec{i} + 5\vec{j})$ and $(3\vec{i} + 6\vec{j})$ respectively, find the value of G of the triangle.
18. In a data quartile deviation and first quartile are 20 and 35 respectively. Find the third quartile and the coefficient of quartile deviation.

Group 'C'

(11 × 3 = 33)

19. Solve by using vector method: $2x^3 + 6 = 3x^2 + 11x$.
20. Find the maximum and minimum value the function $P = 3x + y$ under the following constraints: $2y \leq x - 1$, $x + y \leq 4$, $x \geq 0$ and $y \geq 0$.
21. If $f(x) = 3x + 2$ is real valued function,
- What are the values of $f(x)$ at $x = 1.9, 1.99$?
 - What are the values of $f(x)$ at $x = 2.1, 2.01$?
 - What are the values of $\lim_{x \rightarrow 2} f(x) = \lim_{x \rightarrow 2^+} f(x)$?
22. Solve by matrix method: $3x + 2y + 9 = 0$ and $2x - 3y = -6$.
23. Find the single equation of pair of straight lines passing through the origin and the perpendicular to the line represented by the equation $x^2 - xy - 2y^2 = 0$.
24. Prove that: $\text{Cosec } 2A + \text{Cosec } 4A = \text{Cot } A - \text{Cot } 4A$.
25. If $A + B + C = 90^\circ$ then prove that $\sin 2A + \sin 2B + \sin 2C = 4 \cos C \cos B \cos C$
26. From the top of the tower 24 meter high, the angle of depression of the top and the foot of the pole are observed to be 45° and 60° respectively. Find the height of the pole.
27. Find the vertices of the image of a quadrilateral when the unit square is transformed by the matrix $\begin{pmatrix} 3 & 2 \\ 1 & 1 \end{pmatrix}$.
28. Find the mean deviation and its coefficient from the data given below:
- | Marks obtained | 0 - 10 | 10 - 20 | 20 - 30 | 30 - 40 | 40 - 50 |
|------------------|--------|---------|---------|---------|---------|
| No. of students. | 10 | 15 | 25 | 30 | 10 |

29. Compute the standard deviation and coefficient variation from the given data:
- | Age in years. | 0 - 10 | 0 - 20 | 0 - 30 | 0 - 40 | 0 - 50 |
|---------------|--------|--------|--------|--------|--------|
| No. of boys. | 7 | 10 | 15 | 18 | 20 |

Group 'D'

(4 × 4 = 16)

30. The sum of three number in arithmetic series are 24. If 1, 6 and 18 are added to them respectively, the result are geometric series. Find the terms.
31. Find the equation of the circle passing through the points $(6, 6)$, $(5, 7)$ and $(2, -2)$.
32. Prove by vector method the mid-point of hypotenuse of right angled triangle is equidistant from its vertices.
33. The coordinates of vertices of a quadrilateral PQRS are $P(1, 1)$, $Q(2, 3)$, $R(4, 2)$ and $S(3, -2)$. Rotate this quadrilateral about origin through $+90^\circ$. Again, rotate this image of quadrilateral about origin through $+180^\circ$. Draw the object and image on the same graph paper. Also state the single transformation.

Grade : X

Optional Mathematics

Full Marks : 75

Time : 3:00 Hrs.

Set 'C'

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.

Attempt all the questions:**Group 'A'****(10 × 1) = 10**

- Under what condition the inverse of function is possible?
- What is the equation of line of symmetric of the parabola whose equation is $ax^2 + bx + c = 0$.
- Write the interval notation for $\{x : 6 < x \leq 20\}$
- Prove that the matrix $\begin{pmatrix} 2 & 6 \\ 3 & 9 \end{pmatrix}$ has no inverse.
- If the two lines $y = m_1x + c_1$ and $y = m_2x + c_2$ are parallel to each other. Write the relation between their slopes.
- Find the slope of the line perpendicular to the straight line $3x - 4y = 10$.
- What is the relation between $\sin 3A$ and $\sin A$?
- If $A + B + C = \pi^c$, express $\tan(A + B)$ in terms of angle C
- If O be the origin and $\overrightarrow{OA} + \overrightarrow{OB} = 8\vec{i} + 12\vec{j}$ then find the position vector of M which is the midpoint of AB.
- State the single transformation when the reflection in x - axis is followed by the reflection in y - axis.

Group 'B'**(8 × 2 = 16)**

- If $f: x \rightarrow 3x + b$ and $f(2) = 12$, find the value of b.
- If $a, a - 2, a + 1$ are in geometric sequence, find the value of a.
- If the matrices given below are inverse to each other, find the value of m:

$$\begin{pmatrix} m & 1 \\ 5 & 2 \end{pmatrix} \text{ and } \begin{pmatrix} 2 & -1 \\ -5 & m \end{pmatrix}$$

- Find the acute angle between the pair of lines represented by equation $x^2 - 4xy + y^2 = 0$.
- Prove that:
$$\frac{1 - 2\sin A \cdot \cos A}{2} = \sin^2\left(\frac{\pi^c}{4} - A\right)$$
- Solve: $\sin 2\theta + \cos \theta = 0$ [$0^\circ \leq \theta \leq 90^\circ$]
- 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} .
- In a continuous series, $\sum fd = 0$, $\sum fd^2 = 848$, $N = 100$, $d = m - A$ and $A = 12$, then find the standard deviation and its coefficient.

Group 'C'

(11 × 3 = 33)

19. Solve: $6x^3 + x^2 - 19x + 6 = 0$
 20. If the second term and fifth term of a geometric series are 15 and 405 respectively, find the sum of the series from first to 6 terms.
 21. Examine the continuity or discontinuity of

$f(x) = \begin{cases} x^2 + 1, & x \leq 3 \\ 2x + 4, & x > 3 \end{cases}$ at by calculating left hand limit, right hand limit and functional values.

22. Solve by Cramer's rule: $3x + 4y = 2$, $2x + 3y = x + 4y + 3$
 23. Find the equation of the line passing through the centroid of ΔPQR with vertices $P(3, 3)$, $Q(-2, -6)$ and $R(5, -2)$ and parallel to the line QR .
 24. Prove that: $\cos^3 0^\circ \cdot \cos 30^\circ + \sin^3 0^\circ \cdot \sin 30^\circ = \cos^3 20^\circ$
 25. If $A + B + C = \pi$, prove that: $\frac{\cos A}{\sin B \cdot \sin C} + \frac{\cos B}{\sin C \cdot \sin A} + \frac{\cos C}{\sin A \cdot \sin B} = 2$
 26. From the top of mountain 21 meter high, the angles of depression of the top and the bottom of a tower are observed to be 45° and 60° respectively. Find the height of the tower.
 27. Find a 2×2 matrix that transforms a unit square to the parallelogram

$$\begin{bmatrix} 0 & 3 & 3 & 0 \\ 0 & 0 & -3 & -3 \end{bmatrix}$$

28. Find the mean deviation from median and its coefficient from the given data:
- | Marks obtained | 45 - 55 | 55 - 65 | 65 - 75 | 75 - 85 | 85 - 95 |
|-----------------|---------|---------|---------|---------|---------|
| No. of students | 2 | 5 | 3 | 6 | 4 |
29. Find the standard deviation of the data given below:
- | Class interval | 25 - 35 | 35 - 45 | 45 - 55 | 55 - 65 | 65 - 75 |
|-----------------|---------|---------|---------|---------|---------|
| No. of students | 5 | 4 | 6 | 7 | 3 |

Group 'D'

(4 × 4 = 16)

30. One student survey the number of pens which are sold in two stationary shops. The pens of both shops are sold in a week. In the first shop, 60 pens are sold in the first day and 6 pens are sold more in everyday as comparison of previous day. Similarly, in the second shop, 5 pens are sold in the first day and the double number of pens are sold in everyday as compared of previous day. Now in which shop, how many pens are sold more? Find it.
 31. In ΔXYZ , $XY = XZ$ and angle $YXZ = 90^\circ$. If the equation of YZ is $2x - 3y + 10 = 0$ and co-ordinates of the point X are $(2, -1)$, find the equation of equal sides.
 32. In ΔABC , angle $ABC = 90^\circ$ and O is the mid-point of side AC , then prove by, vector method that: $OA = OB = OC$.
 33. E denotes the enlargement about the centre $(3, 1)$ with a scale factor of 2 and R denotes the reflection on the line $y = x$, Find the image of ΔABC having the vertices $A(2, 3)$, $B(4, 5)$ and $C(1, -2)$ under the combined transformation EoR . Draw both ΔABC and image $\Delta A'B'C'$ on the same graph paper.

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Nepal Don Bosco Sec. School, Siddhipur

Pre SEE Examination- 2082

Subject: Optional Mathematics



Class: 10(A+B+C+D)

Time: 3 hours

F.M: 75

P.M: 30

Group A (10 × 1 = 10)

1. What are the maximum and the minimum values of the trigonometric function $y=\cos\theta$?
2. What is the geometric mean between two positive numbers m and $\frac{1}{n}$? Write it .
3. For what value of x , the function $f(x)=\frac{2x-1}{2x-3}$ is discontinuous?
4. If $PQ=QP=I$, what is the relation between matrices P and Q ?
5. What is the single equation represented by the line pairs $x+m=0$ and $x-m=0$?
6. A plane cuts the right cone not passing through the vertex and semi vertex angle (α) is less than the angle made by the plane with the axis of the cone. Name the section so formed.
7. Express $\sin 3A$ in terms of $\sin A$.
8. If $\cos\theta = 1/\sqrt{2}$, find the value of θ . ($0^\circ \leq \theta \leq 180^\circ$)
9. Show that $\vec{a} = \begin{pmatrix} 2 \\ -3 \end{pmatrix}$ and $\vec{b} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$ are perpendicular to each other.
10. Write the equation of the inversion circle with centre at origin and the radius 4 units.

Group B (8 × 2 = 16)

11. If $(x+2)$ is of $2x^3 + 3x^2 - px - 6$, find the value of p .
12. Draw a graph of $5x+3y \leq 15$.
13. In the equations $3x - 4y = 10$ and $4x - 2y = 8$, using Cramer's rule , find the value of D.

14. If the angle between the lines represented by the equations
 $x^2 + 2hxy + y^2 = 0$ is 60° , find the value of h.

15. Prove that: $\frac{\sin\theta - \sqrt{1+\sin 2\theta}}{\cos\theta - \sqrt{1+\sin 2\theta}} = \cot\theta$.

16. Solve for acute angle: $2\cos^2\theta - 3\cos\theta + 1 = 0$.

17. The position vectors of points P and Q are $(8\vec{i} + 6\vec{j})$ and $(3\vec{i} + \vec{j})$ respectively. Find the position vector of the point which divides PQ internally in the ratio 2:3.

18. In a continuous series, median (M_d) = 9. 5, N = 8 and

$\sum f(m - M_d) = 33$. Find the mean deviation from median and its coefficient.

Group C (11×3 = 33)

19. If $f(x) = 3x + k$ and $g(x) = 2x - 1$ such that $(gof)^{-1}(-2) = -2$, find the value of k.

20. If the maximum value of $Z = 4x + 5y + k$ under the given constraints is 40, where k is a positive number, find the value of k. $x+y \leq 7, x-y \geq -1, x \geq 0, y \geq 0$.

21. Examine the continuity of function $f(x) = \begin{cases} 4x-1 & x < 1 \\ 7x & x \geq 1 \end{cases}$ at $x = 1$.

22. Solve the matrix method: $4xy + 11y = 9$ and $3xy + 8y = 6$.

23. P(2, 3), Q(3, 0) and R(-1, 1) are the vertices of ΔPQR . If PS is the altitude of ΔPQR , find the equation of PS.

24. Prove that: $\frac{\sin 5^\circ + \sin 10^\circ + \sin 20^\circ + \sin 25^\circ}{\cos 5^\circ + \cos 10^\circ + \cos 20^\circ + \cos 25^\circ} = \tan 15^\circ$

25. If $A+B+C = \pi$, prove that: $\frac{\cos A}{\sin B \sin C} + \frac{\cos B}{\sin C \sin A} + \frac{\cos C}{\sin A \sin B} = \sec 60^\circ$

26. From a point at a ground in front of a tower the angle of elevations of a top and bottom of a flagstaff 6m high situated at the top of the tower are observed to be 60° and 45° respectively. Find the height of the tower and distance between the base of the tower and the point of observation.

27. A 2×2 matrix transforms a square having vertices P(0, 3), Q(1, 1), R(3, 2) and S(2, 4) to the quadrilateral having the vertices P'(3, 0), Q'(1, -1), R'(2, -3) and S'(4, -2). Find the 2×2 matrix.

28. Find the mean deviation from median of the following data:

Mid value	5	15	25	35	45
frequency	2	3	6	5	4

29. Find the standard deviation from the data given below:

Marks obtained	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
No of students	5	8	15	16	6

Group D (4 × 4 = 16)

30. A man took a loan of Rs. 258000 to pay in monthly installments. Each installments being Rs. 500 more than the previous one and the first installment is Rs. 5000. IN how many installments, is the loan to be paid? FB - Tuition Class of Rajan Shrestha

31. In a given figure, P is the centre and equations of two diameters are $2x - y = 4$ and $x + y = 14$ of a circle. If the circle passes through the point A (3, 4), Find the equation of the circle.

32. Prove by vector method that the diagonals of square are perpendicular to each other.

33. A triangle having vertices (2, 1), (5, 3) and (7, -1) is rotated about origin through negative quarter turn. The images so obtained enlarge with centre O and scale factor 2. Find the co-ordinates of the vertices of the image of the triangle and show all the triangles in the same graph paper.

The End

Candidates are required to give their answers in their own words as far as practicable.

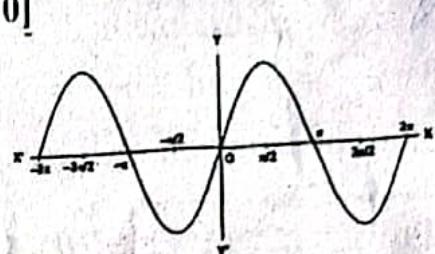
Attempt all the questions:

GROUP-A [10×1=10]

1. Write down the period of the given function.
2. State Remainder Theorem.
3. Write the name of the set of numbers which is continuous .
4. What should be the formula to calculate x using cramer's rule when D , Dx and Dy are given?
5. What is the homogeneous equation of second degree in x and y representing a pair of straight lines through origin ?
6. Which conic forms when a plane intersects the right cone not passing through its vertex and parallel to the generator of cone?
7. Write $\cos 2A$ in terms of $\tan A$.
8. If $\cos(360^\circ - \theta) = x$, then write the value of x ?
9. What should be the angle between \vec{a} and \vec{b} to get the maximum value of $\vec{a} \cdot \vec{b}$.
10. Which transformation does the matrix $\begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$ represents?

GROUP-B [8×2=16]

11. If $(x - 7)$ is a factor of polynomial $x^3 - 9x^2 + (k + 1)x - 7$, find the value of k .
12. If $25, m+1, 35$ is an arithmetic sequence then find the value of m .
13. For what value of k , the equation $3x - 2y = 5$ and $x + y = k+2$ have $Dx = 15$? FB - Tuition Class of Rajan Shrestha
14. Find the angle between the pair of lines represented by the equation $6x^2 - xy - y^2 = 0$.
15. Prove that : $\frac{\sin A + \sin B}{\sin A - \sin B} = \tan \frac{A+B}{2} \cot \frac{A-B}{2}$
16. Solve : $4\sin \alpha = 3\cosec \alpha$ ($0^\circ \leq \alpha \leq 180^\circ$)
17. Given that the vectors $2\vec{a} + \vec{b}$ and $4\vec{a} - 5\vec{b}$ are perpendicular to each other. If \vec{a} and \vec{b} are unit vectors, find the angle between \vec{a} and \vec{b} .
18. In a data first quartile is 35 and third quartile is 75. Find quartile deviation and it's coefficient.



GROUP-C [11×3=33]

19. If $f(x) = x^2 - 2x$, $g(x) = 2x + 3$ and $fog^{-1}(x) = 3$ then find the value of x .
20. The sum of three positive numbers in G.P. is 104 and the product of their extreme terms is 576. Find the numbers..
21. Is the function $f(x)$ is defined by: $f(x) = \begin{cases} 4x^2 - 16 & \text{for } x \neq 2 \\ 12 & \text{for } x = 2 \end{cases}$. Continuous at $x = 2$? If not, how can you make it continuous at $x = 2$?
22. Solve by matrix method:

$$3x + \frac{4}{y} = 7 \text{ and } x + \frac{1}{y} = 3.$$
23. Find the equation of the circle passing through the points $(0,0)$, $(4,0)$ and $(0,2)$.
24. Prove that : $(1 + \sec 2\theta)(1 + \sec 4\theta)(1 + \sec 8\theta) = \tan 8\theta \cot \theta$
25. If $A+B+C=\pi^c$, then prove that:

$$\cos^2 A + \cos^2 B + \cos^2 C = 1 - 2\cos A \cos B \cos C.$$
26. From the roof and foot of a house, the angle of depression and angle of elevation of the top of a tree are 60° and 30° respectively. If the height of the tree is 15ft, find the height of the house.
27. Find the inversion points of $P(2,1)$ and $Q(3,1)$ with respect to the circle $x^2 + y^2 = 20$.
28. Find the mean deviation from mean and its coefficient from the data given below. FB - Tuition Class of Rajan Shrestha

Marks obtained	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50
No. of boys	2	3	6	5	4

29. Find the standard deviation from the following data:

Marks	0 - 10	0 - 20	0 - 30	0 - 40	0 - 50
Frequency	5	13	28	44	50

GROUP-D [4×4=16]

30. Find the maximum value of the objective function $P = 4x + 3y$ under the constraints $x + y \leq 5$, $2x - y \leq 4$, $x \geq 0$, $y \geq 0$.
31. Find the equation of straight line passing through the point $(4, -1)$ and making an angle of 45° with the line $2x - 3y = 5$.
32. Prove vectorically that the angle in the semi-circle is a right angles..
33. A(2,0), B(3,1), and C(1,1) are the vertices of ΔABC . Find the coordinates of the vertices of the ΔABC under the reflection on the line $x = y$ followed by the enlargement E[(-3, -4), 2]. Present the ΔABC and its images on the same graph paper.



PABSON
SEE PRE BOARD EXAMINATION-2082

Subject: Opt. I Additional Mathematics
Time: 3hrs.

Full Marks: 75

Candidates are required to write their answers according to the instructions given.

Attempt all questions.

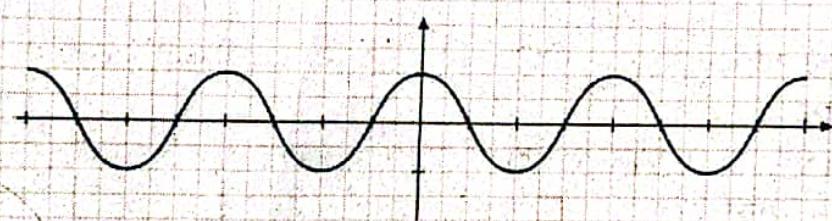
सबै प्रश्न अनिवार्य छन्।

Group 'A'

[$10 \times 1 = 10$]

1. Which trigonometric function is represented by adjoining graph?

संगैको लेखाचित्रमा कुन त्रिकोणमितिय फलन देखाइएको छ ?



2. If 'r' is the geometric mean between 'p' and 'q', write the relation between p, q and r.

यदि 'p' र 'q' बिचको गुणोत्तर मध्यमा 'r' भए p, q र r को सम्बन्ध लेख्नुहोस्।

3. Write the interval notation for " $-2 < x \leq 6$ ".

" $-2 < x \leq 6$ " को लागी अन्तराल संकेत लेख्नुहोस्।

4. What is the determinant of a matrix $M = [-18]$?

मेट्रिक्स $M = [-18]$ को डिटरमिनान्ट कति हुन्छ ? लेख्नुहोस्।

5. State the condition in which a pair of straight lines represented by the equation $ax^2 + 2hxy + by^2 = 0$ are coincident to each other.

समिकरण $ax^2 + 2hxy + by^2 = 0$ ले जनाउने जोडा रेखाहरु आपसमा सम्पाती हुने अवस्था उल्लेख गर्नुहोस्।

6. The vertical angle of a cone is 70° . If the plane surface intersects the cone making an angle of 35° with axis of the cone, write the name of conic so formed.

एउटा सोलीको शिर्षकोण 70° छ। समतल सतहले सोलीको अक्षसंग 35° को कोण बनाएर प्रतिच्छेदन गर्दा बन्ने शाङ्किकको नाम लेख्नुहोस्।

7. Express $\sin \alpha$ in term of $\tan \frac{\alpha}{2}$.

Date: 2082-10-28

 $\sin \alpha$ लाई $\tan \frac{\alpha}{2}$ रूपमा व्यक्त गर्नुहोस् ।8. If $\tan \theta = \cot \theta$, what is the acute value of θ .यदि $\tan \theta = \cot \theta$ भए θ को न्युनकोणीय मान कर्ति हुन्छ ?

9. If P divides line segment AB externally in the ratio m : n, write the relation between the position vector of A, B and P.

यदि रेखाखण्ड AB लाई बिन्दु P ले बाहिरबाट m : n को अनुपातमा विभाजन गर्दछ भने A, B र P को स्थिति भेक्टरहरूको सम्बन्ध लेख्नुहोस् ।

10. What is the coordinates of inversion point of P(x, y) with respect to the circle having equation $x^2 + y^2 = r^2$? Write it.
समिकरण $x^2 + y^2 = r^2$ भएको वृत्तको आधारमा बिन्दु P(x, y) को उत्कम बिन्दुको निर्देशाङ्क कर्ति हुन्छ ? लेख्नुहोस् ।

Group 'B'

[8 × 2 = 16]

11. What must be added to $x^3 - 6x^2 + 11x - 8$ to make a polynomial having a factor $(x - 3)$? $x^3 - 6x^2 + 11x - 8$ मा कर्ति जोड्दा एउटा गुणनखण्ड $x - 3$ भएको बहुपदीय बनाउन सकिन्छ ?12. Find the vertex of a parabola formed from $y = x^2 - 4x + 3$.समिकरण $y = x^2 - 4x + 3$ द्वारा बन्ने पाराबोलाको शिर्षबिन्दु पत्ता लगाउनुहोस् ।13. If the equations $5x - 2y = 4$ and $3y + 2x = 13$ are given, according to Cramer's rule the value of D is 19, find the value of x.समिकरणहरू $5x - 2y = 4$ र $3y + 2x = 13$ मा कामरको नियम अनुसार D को मान 19 भए x को मान पत्ता लगाउनुहोस् ।14. Find the acute angle between straight lines $2x - y + 3 = 0$ and $x - 3y + 2 = 0$.रेखाहरू $2x - y + 3 = 0$ र $x - 3y + 2 = 0$ बिचको न्युनकोण निकाल्नुहोस् ।15. If $\cos \theta = \frac{3}{5}$, find the value of $\sin 3\theta$.यदि $\cos \theta = \frac{3}{5}$ भए $\sin 3\theta$ को मान पत्ता लगाउनुहोस् ।

16. Solve: (हल गर्नुहोस् ।)

$$4 \cos \alpha = 3 \sec \alpha$$

$$[0^\circ \leq \alpha \leq 180^\circ]$$

17. Two vectors $\vec{p} = k\vec{i} + 6\vec{j}$ and $\vec{q} = 8\vec{i} - 4\vec{j}$ are orthogonal to each other, find the value of k.

18. In a continuous data, the value of first quartile is '2a' and quartile deviation is 'a'. Find the third quartile and the co-efficient of quartile deviation.

कुनै एउटा निरन्तर श्रेणीमा पहिलो चतुर्थांशको मान '2a' छ र चतुर्थांश विचलन 'a' छ। तेस्रो चतुर्थांश र चतुर्थांशीय विचलनको गुणांक पत्ता लगाउनुहोस्।

Group 'C'

[$11 \times 3 = 33$]

19. If $f: x \rightarrow 3x - 4$ and $f^{-1}g(x) = \frac{3x+2}{3}$ then find $g(x)$ and $g_0f(5)$.

यदि $f: x \rightarrow 3x - 4$ र $f^{-1}g(x) = \frac{3x+2}{3}$ भए $g(x)$ र $g_0f(5)$ निकाल्नुहोस्।

20. The product of fifth term, seventh term and ninth term of a geometric series is 125. If the seventh term of geometric series is equal to the eighth term of an arithmetic series, find the sum of first 15 terms of the arithmetic series.

कुनै गुणोत्तर श्रेणीको पाचौं पद, सातौं पद र नवौं पदको गुणानफल 125 छ। यदि उक्त गुणोत्तर श्रेणीको सातौं पद कुनै समानान्तर श्रेणीको आठौं पदसँग बराबर भए उक्त समानान्तर श्रेणीको पहिलो पन्थौं पदहरूको योगफल पत्ता लगाउनुहोस्।

21. A function $f(x)$ is given as $f(x) = \begin{cases} 4x+5, & x < 2 \\ 15, & x = 2 \\ 7x-1, & x > 2 \end{cases}$

Examine the continuity of the above function $f(x)$ at $x = 2$.

यदि एउटा फलन $f(x) = \begin{cases} 4x+5, & x < 2 \\ 15, & x = 2 \\ 7x-1, & x > 2 \end{cases}$ दिइएको छ।

$x = 2$ मा फलन $f(x)$ को निरन्तरता परीक्षण गर्नुहोस्।

22. Solve by matrix method. (मेट्रिक्स विधिद्वारा हल गर्नुहोस्।)

$$4x - \frac{9}{y} + 11 = 0, \quad \frac{6}{y} - 3x = 8$$

23. Find the equation of a circle having diameters $x + 4y = 5$ and $2x - 3y + 12 = 0$ whose area is 154 sq. units.

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7:30am

व्यासका समिकरणहरू $x + 4y = 5$ र $2x - 3y + 12 = 0$ तथा क्षेत्रफल

154 वर्ग एकाइ भएको एउटा वृत्तको समिकरण पत्ता लगाउनुहोस् ।

24. Prove that: (प्रमाणित गर्नुहोस् ।)

$$\frac{\sec 8A - 1}{\sec 4A - 1} = \frac{\tan 8A}{\tan 2A}$$

25. If A, B and C are three angles of a triangle, then prove that:

यदि A, B र C त्रिभुजका तीनवटा कोणहरू भए प्रमाणित गर्नुहोस् ।

$$\sin A - \sin B + \sin C = 4 \sin \frac{A}{2} \cdot \cos \frac{B}{2} \cdot \sin \frac{C}{2}$$

26. The height of a tower is half of the height of flagstaff at its top. The angle of elevation of the top of the tower as observed from a point on the ground which is at same level of its foot is 30° . Find the angle of elevation of the top of flagstaff from the same point.

एउटा स्तम्भको उचाइ यसमाथि रहेको ध्वजदण्डको आधा छ । यदि स्तम्भको फेदको समतल सतहमा रहेको जमिनको एउटा बिन्दुबाट स्तम्भको टुप्पोको उन्नतांश कोण 30° भए सोहि बिन्दुबाट ध्वजदण्डको टुप्पोको उन्नतांश कोण कति हुन्छ ? पत्ता लगाउनुहोस् ।

27. Find a 2×2 matrix that transform a unit square to a parallelogram

$$\begin{bmatrix} 0 & 1 & 4 & 3 \\ 0 & 2 & 6 & 4 \end{bmatrix}$$

एकाई वर्गलाई समानान्तर चर्तुभुज $\begin{bmatrix} 0 & 1 & 4 & 3 \\ 0 & 2 & 6 & 4 \end{bmatrix}$ मा स्थानान्तरण गराउने 2×2 मेट्रिक्स पत्ता लगाउनुहोस् ।

28. Compute the mean deviation from median of following data.

तल दिइएको तथ्याङ्कबाट मध्यिकाको प्रयोग गरी मध्यक भिन्नता पत्ता लगाउनुहोस् ।

Age in years	10-20	20-30	30-40	40-50	50-60	60-70
No. of People	6	8	11	14	8	3

29. Compute standard deviation from the following data by constructing a frequency table with one class interval (0 - 4).

पहिलो वर्गान्तर (0 - 4) लिइ बारम्बारता तालिका बनाई स्तरीय भिन्नता निकाल्नुहोस् ।

1, 3, 2, 3, 4, 5, 6, 7, 6, 8, 9, 10, 12, 15, 16

[$4 \times 4 = 16$]

30. The maximum value of objective function $Z = 3x + y + p$, where $p > 0$ under the following constraints is 25, then find the value of p .

तलका शर्तहरूको आधारमा उद्देश्य फलन $Z = 3x + y + p$ जहाँ $p > 0$ को अधिकतम् मान 25 भए p को मान पता लगाउनुहोस ।

$$2y \geq x - 1, x + y \leq 4, x \geq 0, y \geq 0$$

31. Find the single equation of pair of straight lines passes through origin and perpendicular to the lines represented by the equation $3x^2 + xy - 10y^2 = 0$.

समिकरण $3x^2 + xy - 10y^2 = 0$ ले प्रतिनिधित्व गर्ने जोडारेखाहरूसँग लम्ब हुने र उद्गम बिन्दु भएर जाने जोडारेखाहरूको एकल समिकरण निकाल्नुहोस ।

32. In an isosceles triangle ΔCAT having $CA = CT$, prove by vector method that median CP is perpendicular to side AT .

$CA = CT$ भएको समद्विबाहु त्रिभुज ΔCAT मा खिचिएको मध्यिका CP आधारभुजा AT संग लम्ब हुन्छ भनि भेक्टर विधिद्वारा प्रमाणित गर्नुहोस ।

33. ΔRED with vertices $R(5, 3)$, $E(4, 0)$ and $D(2, 1)$ is translated by $\begin{pmatrix} 1 \\ 3 \end{pmatrix}$ and the image so obtained is reflected on the line $x + y = 0$ to get its final image. Write down the coordinates of images so formed. Also show both the object and its images on the same graph paper.

शिर्षविन्दुहरू $R(5, 3)$, $E(4, 0)$ र $D(2, 1)$ भएको ΔRED लाई $\begin{pmatrix} 1 \\ 3 \end{pmatrix}$ ले विस्थापन गराई प्राप्त हुने प्रतिविम्बलाई रेखा $x + y = 0$ ले परावर्तन गराउँदा प्राप्त हुने प्रतिविम्बको शिर्षविन्दुहरूको निर्देशाङ्कहरू लेख्नुहोस । साथै ΔRED र यसका प्रतिविम्बहरूलाई लेखाचित्रमा प्रस्तुत गर्नुहोस ।

* With The Best Wishes *

Note: 2 graph papers are needed for each student.



PABSON SEE Preparatory Examination -2082

Time : 3 hours Subject: Additional Mathematics Full Marks: 75

दिइएका निर्देशनका आधारमा आपले शैलीमा सिर्जनात्मक उत्तर दिनुहोस् :

सबै प्रश्नहरू अनिवार्य छन्। (Answer all the questions)

समूह 'क' (Group) 'A'

[$10 \times 1 = 10$]

1. संयुक्त फलनलाई परिभाषित गर्नुहोस्।

Define composite function.

2. यदि एउटा गुणोत्तर श्रेणीको पहिलो पद a अन्तिम पद / र समान अनुपात r भए पहिलो n ओटा पदहरूको योगफल कति हुन्छ? लेख्नुहोस्।

If the first term of a geometric series is a , last term / and the common ratio is r , what is the sum of first n terms? Write it.

3. कुन अवस्थामा फलन $f(x)$ विन्दु $x = a$ मा निरन्तर हुन्छ? लेख्नुहोस्।

In which condition a function $f(x)$ is continuous at $x = a$? Write it,

4. एकल मेट्रिक्सको डिट्रमिन्यान्ट कति हुन्छ? लेख्नुहोस्।

What is the determinant of a singular matrix? Write it.

5. दुई सरल रेखाहरू L_1 र L_2 को झुकावहरू क्रमशः m_1 र m_2 भए ती रेखाहरू आपसमा लम्ब हुने अवस्था लेख्नुहोस्। FB - Tuition Class of Rajan Shrestha

The slopes of two straight lines L_1 and L_2 are m_1 and m_2 respectively. Write the condition of perpendicularity of the lines.

6. यदि प्रतिच्छेदित सतह समकोणी सोलीको अक्षसँग समानान्तर भए कुन शारिकक भाग बन्दछ? लेख्नुहोस्। FB - Tuition Class of Rajan Shrestha

If the intersected plane is parallel to the axis of a right circular cone, then what conic section is formed? Write it.

7. $\sin \theta$ लाई $\tan \frac{\theta}{2}$ को रूपमा व्यक्त गर्नुहोस्।

Express $\sin \theta$ in terms of $\tan \frac{\theta}{2}$.

8. $\cos C - \cos D$ लाई गुणनफलको रूपमा लेख्नुहोस्।

Write $\cos C - \cos D$ in the product form.

9. यदि दुई भेक्टरहरू $\vec{a} = \begin{pmatrix} x_1 \\ y_1 \end{pmatrix}$ र $\vec{b} = \begin{pmatrix} x_2 \\ y_2 \end{pmatrix}$ भए \vec{a} र \vec{b} बिचको स्केलर गुणनफल पत्ता

लगाउने सूत्र लेख्नुहोस्।

If two vectors $\vec{a} = \begin{pmatrix} x_1 \\ y_1 \end{pmatrix}$ and $\vec{b} = \begin{pmatrix} x_2 \\ y_2 \end{pmatrix}$ write the formula to find the scalar product of \vec{a} and \vec{b} .

10. विपरीत स्थानान्तरणमा, उत्कम वृत्तको केन्द्रमा विन्दु P पर्छ भने P को उत्कम विन्दु P' कुन भागमा पर्दछ ? लेखउनुहोस्।

In an inversion transformation, if a point P lies on the centre of the inversion circle then where does the inverse point P' of the point P lie ? Write it.

समूह 'ब' (Group 'B') [8 × 2 = 16]

11. यदि $f(2x + 1) = 6x + 5$ भए $f \circ f(2)$ को मान को मान पत्ता लगाउनुहोस्।

If $f(2x + 1) = 6x + 5$, find the value of $f \circ f(2)$.

12. वर्ग समीकरण $y = x^2 + 5x + 6$ बाट बने पाराबोलाको शिर्षविन्दु पत्ता लगाउनुहोस्।

Find the vertex of parabola formed from the quadratic equation $y = x^2 + 5x + 6$. FB - Tuition Class of Rajan Shrestha

13. यदि मैट्रिक्सहरू $A = \begin{bmatrix} -5 & 0 \\ -6 & 1 \end{bmatrix}$ र $B = \begin{bmatrix} 4 & 7 \\ 3 & 1 \end{bmatrix}$ भए $|AB|$ को मान पत्ता लगाउनुहोस्।

If the matrices $A = \begin{bmatrix} -5 & 0 \\ 6 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & 7 \\ 3 & 1 \end{bmatrix}$, find the value of $|AB|$.

14. रेखाहरू $3x + 4y - 7 = 0$ र $3y + kx - 9 = 0$ एक आपसमा लम्ब छन् भने k को मान पत्ता लगाउनुहोस्।

If the lines $3x + 4y - 7 = 0$ and $3y + kx - 9 = 0$ are perpendicular to each other, find the value of k. FB - Tuition Class of Rajan Shrestha

15. यदि $\cos 30^\circ = \frac{\sqrt{3}}{2}$ भए $\cos 15^\circ = \frac{\sqrt{3}+1}{2\sqrt{2}}$ हुन्छ भनी देखाउनुहोस्।

If $\cos 30^\circ = \frac{\sqrt{3}}{2}$, then prove that $\cos 15^\circ = \frac{\sqrt{3}+1}{2\sqrt{2}}$.

16. हल गर्नुहोस् (solve): $\sin \theta = \cos \theta$ $[0^\circ \leq \theta \leq 90^\circ]$

17. विन्दुहरू A र B का स्थिति भेक्टरहरू क्रमशः $4\vec{i} + 5\vec{j}$ र $-2\vec{i} + 3\vec{j}$ छन् भने रेखाखण्ड AB लाई भित्रपट्टीबाट 1:2 को अनुपातमा विभाजन गर्ने विन्दु C को स्थिति भेक्टर पत्ता लगाउनुहोस्। FB - Tuition Class of Rajan Shrestha

The position vectors of the points A and B are $4\vec{i} + 5\vec{j}$ and $-2\vec{i} + 3\vec{j}$ respectively. Find the position vector of the point C which divides the line segment AB internally in the ratio of 1:2.

18. यदि एउटा निरन्तर श्रेणीको तेस्रो चतुर्थांश 70 र चतुर्थांशीय विस्तार 60 छ भने चतुर्थांशीय विचलनको गुणाङ्क पत्ता लगाउनुहोस्।

If the third quartile of a continuous series is 70 and inter-quartile range is 60, find the coefficient of quartile deviation.

19. हल गर्नुहोस् (Solve): $m^3 - 39m + 70 = 0$
20. 1 र 64 का विचमा पर्ने गुणोत्तर मध्यमाहरूको सदृश्या निकाल्नुहोस् जसको पहिलो र अन्तिम मध्यमाको अनुपात $1 : 16$ छ।
Find the number of geometric means inserted between 1 and 64 in which the ratio of first mean to the last mean is $1 : 16$.
21. फलन $f(x) = \begin{cases} 2x - 3, & x \leq 2 \\ 3x - 5, & x > 2 \end{cases}$ छन्।
Function $f(x) = \begin{cases} 2x - 3, & x \leq 2 \\ 3x - 5, & x > 2 \end{cases}$ are given.
- (i) तालिका बनाएर $f(x)$ को $x = 2$ मा वायाँ तर्फको सिमान्त मान पत्ता लगाउनुहोस्।
Find the left hand limit of $f(x)$ at $x = 2$ using table.
- (ii) तालिका बनाएर $f(x)$ को $x = 2$ मा दायाँ तर्फको सिमान्त मान पत्ता लगाउनुहोस्।
Find the right hand limit of $f(x)$ at $x = 2$ using table.
- (iii) के फलन $f(x), x = 2$ मा निरन्तर छ? कारण दिनुहोस्।
Is the function $f(x)$ continuous at $x = 2$? Give reason.
22. कामरको नियम प्रयोग गरी हल गर्नुहोस् (Solve using Cramer's rule):

$$\frac{5}{x} - \frac{2}{y} = 4, \quad \frac{4}{y} + \frac{3}{x} = 18$$
23. समीकरण $x^2 + 4xy + y^2 = 0$ ले प्रतिनिधित्व गर्ने रेखाहरू बीचको कोण पत्ता लगाउनुहोस्। FB - Tuition Class of Rajan Shrestha
Find the angle between the lines represented by the equation $x^2 + 4xy + y^2 = 0$.
24. प्रमाणित गर्नुहोस् (Prove that): $\operatorname{cosec} 2A + \operatorname{cosec} 4A = \cot A - \cot 4A$
25. यदि $\alpha + \beta + \gamma = \pi^c$ भए प्रमाणित गर्नुहोस् (If $\alpha + \beta + \gamma = \pi^c$ then Prove that): FB - Tuition Class of Rajan Shrestha

$$\sin 2\alpha + \sin 2\beta - \sin 2\gamma = 4 \cos \alpha \cos \beta \sin \gamma$$
26. एउटा ठाडो खम्बालाई $9 : 1$ हुने गरी कुनै विन्दुले विभाजन गरेको छ। यदि उक्त खम्बाको दुवै भागहरूले खम्बाको फेददेखि 20 मिटरको दूरीमा रहेको कुनै एक विन्दुमा आपसमा बराबर कोणहरू बनाउँदछन् भने खम्बाको उचाइ पत्ता लगाउनुहोस्।
A vertical pole is divided by any point in the ratio of $9 : 1$. If both the segments of a pole subtend equal angles to each other at a distance of 20 m away from the foot of the pole, find the height of the pole.
27. एकाई वर्गलाई मेट्रिक्स $\begin{bmatrix} 2 & -3 \\ -4 & 1 \end{bmatrix}$ द्वारा स्थानान्तरण गर्नुहोस्।
Transform a unit square by the matrix $\begin{bmatrix} 2 & -3 \\ -4 & 1 \end{bmatrix}$.

28. दिइएको आँकडाको मध्यिकाबाट मध्यक भिन्नता पत्ता लगाउनुहोस् ।
Calculate the mean deviation from the median of the given data.

प्राप्ताङ्क (Marks obtained)	0-10	0-20	0-30	0-40	0-50
विद्यार्थीहरूको सङ्ख्या (No. of students)	5	7	16	18	20

29. दिइएको तथ्याङ्कबाट विचरणशीलताको गुणाङ्क पत्ता लगाउनुहोस् ।

Compute the Coefficient of Variation (C.V.) from the given data.

प्राप्ताङ्क (Marks obtained)	8-16	16-24	24-32	32-40	40-48
विद्यार्थीहरूको सङ्ख्या (No. of students)	2	3	5	4	1

समूह 'घ' (Group 'D')

[4 × 4 = 16]

30. शर्तहरू $x + y \leq 5, 2x - y \leq 4, x \geq 0, y \geq 0$ को आधारमा उद्देश्य फलन $Z = 7x + 3y$ को नून्यतम मान पत्ता लगाउनुहोस् ।

Find the minimum value of the objective function $Z = 7x + 3y$ under the constraints $x + y \leq 5, 2x - y \leq 4, x \geq 0, y \geq 0$

31. केन्द्र (3, 4) भएको एउटा वृत्त रेखाहरू $3x - y = 14$ र $2x - y = 7$ को प्रतिच्छेदन बिन्दु भएर जान्छ । सो वृत्तको समीकरण पत्ता लगाउनुहोस् ।

A circle having centre (3, 4) passes through the point of intersection of the lines $3x - y = 14$ and $2x - y = 7$. Find the equation of the circle.

32. अर्धवृत्तमा बनेको परिधि कोण एक समकोण हुन्छ भनि भेक्टर विधिबाट प्रमाणित गर्नुहोस् । Using vector method prove that the inscribed angle of a semi-circle is one right angle. FB - Tuition Class of Rajan Shrestha

33. यदि R_1 ले $y = 2$ रेखामा हुने परावर्तन र R_2 ले $x = 1$ रेखामा हुने परावर्तनलाई जनाउँछ । संयुक्त स्थानान्तरण $R_2 \circ R_1$ ले कुन एकल स्थानान्तरणलाई जनाउँछ ? लेख्नुहोस् । सोही एकल स्थानान्तरण प्रयोग गरी ΔABC को प्रतिविम्ब पत्ता लगाउनुहोस् जहाँ $A(2,3), B(4,1)$ र $C(5,3)$ छन् । साथै वस्तु र प्रतिविम्बलाई एउटै लेखाचित्रमा प्रस्तुत गर्नुहोस् । FB - Tuition Class of Rajan Shrestha

If R_1 represents the reflection on the line $y = 2$ and R_2 represents the reflection on the line $x = 1$, then which single transformation does combined transformation $R_2 \circ R_1$ represent? Write it. Using this single transformation find the image of ΔABC , where $A(2,3), B(4,1)$ and $C(5,3)$. Also present the object and the image on the same graph paper.

The End



PABSON SEE Preparatory Examination -2082

Time : 3 hours Subject: Additional Mathematics Full Marks: 75

दिइएका निर्देशनका आधारमा आफ्नै शैलीमा सिर्जनात्मक उत्तर दिनुहोस् :

सबै प्रश्नहरू अनिवार्य छन्। (Answer all the questions)

समूह 'क' (Group) 'A'

[$10 \times 1 = 10$]

1. संयुक्त फलनलाई परिभाषित गर्नुहोस्।

Define composite function.

2. यदि एउटा गुणोत्तर श्रेणीको पहिलो पद a अन्तिम पद l र समान अनुपात r भए पहिलो n ओटा पदहरूको योगफल कति हुन्छ? लेख्नुहोस्।

If the first term of a geometric series is a , last term l and the common ratio is r , what is the sum of first n terms? Write it.

3. कुन अवस्थामा फलन $f(x)$ विन्दु $x = a$ मा निरन्तर हुन्छ? लेख्नुहोस्।

In which condition a function $f(x)$ is continuous at $x = a$? Write it,

4. एकल मेट्रिक्सको डिट्रमिन्यान्ट कति हुन्छ? लेख्नुहोस्।

What is the determinant of a singular matrix? Write it.

5. दुई सरल रेखाहरू L_1 र L_2 को झुकावहरू क्रमशः m_1 र m_2 भए ती रेखाहरू आपसमा लम्ब हुने अवस्था लेख्नुहोस्।

The slopes of two straight lines L_1 and L_2 are m_1 and m_2 respectively. Write the condition of perpendicularity of the lines.

6. यदि प्रतिच्छेदित सतह समकोणी सोलीको अक्षसँग समानान्तर भए कुन शार्डिक भाग बन्दछ? लेख्नुहोस्।

If the intersected plane is parallel to the axis of a right circular cone, then what conic section is formed? Write it.

7. $\sin \theta$ लाई $\tan \frac{\theta}{2}$ को रूपमा व्यक्त गर्नुहोस्।

Express $\sin \theta$ in terms of $\tan \frac{\theta}{2}$.

8. $\cos C - \cos D$ लाई गुणनफलको रूपमा लेख्नुहोस्।

Write $\cos C - \cos D$ in the product form.

9. यदि दुई भेक्टरहरू $\vec{a} = \begin{pmatrix} x_1 \\ y_1 \end{pmatrix}$ र $\vec{b} = \begin{pmatrix} x_2 \\ y_2 \end{pmatrix}$ भए \vec{a} र \vec{b} विचको स्केलर गुणनफल पत्ता लगाउने सूत्र लेख्नुहोस्।

If two vectors $\vec{a} = \begin{pmatrix} x_1 \\ y_1 \end{pmatrix}$ and $\vec{b} = \begin{pmatrix} x_2 \\ y_2 \end{pmatrix}$ write the formula to find the scalar product of \vec{a} and \vec{b} .

10. विपरीत स्थानान्तरणमा, उत्कम वृत्तको केन्द्रमा विन्दु P पर्छ भने P को उत्कम विन्दु P' कुन भागमा पर्दछ ? लेखउनुहोस्।

In an inversion transformation, if a point P lies on the centre of the inversion circle then where does the inverse point P' of the point P lie ? Write it.

समूह 'ख' (Group 'B') [$8 \times 2 = 16$]

11. यदि $f(2x + 1) = 6x + 5$ भए $f \circ f(2)$ को मान को मान पत्ता लगाउनुहोस्।

If $f(2x + 1) = 6x + 5$, find the value of $f \circ f(2)$.

12. वर्ग समीकरण $y = x^2 + 5x + 6$ बाट बन्ने पाराबोलाको शिर्षविन्दु पत्ता लगाउनुहोस्।

Find the vertex of parabola formed from the quadratic equation $y = x^2 + 5x + 6$.

13. यदि मेट्रिक्सहरू $A = \begin{bmatrix} -5 & 0 \\ -6 & 1 \end{bmatrix}$ र $B = \begin{bmatrix} 4 & 7 \\ 3 & 1 \end{bmatrix}$ भए $|AB|$ को मान पत्ता लगाउनुहोस्।

If the matrices $A = \begin{bmatrix} -5 & 0 \\ -6 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & 7 \\ 3 & 1 \end{bmatrix}$, find the value of $|AB|$.

14. रेखाहरू $3x + 4y - 7 = 0$ र $3y + kx - 9 = 0$ एक आपसमा लम्ब छन् भने k को मान पत्ता लगाउनुहोस्।

If the lines $3x + 4y - 7 = 0$ and $3y + kx - 9 = 0$ are perpendicular to each other, find the value of k.

15. यदि $\cos 30^\circ = \frac{\sqrt{3}}{2}$ भए $\cos 15^\circ = \frac{\sqrt{3}+1}{2\sqrt{2}}$ हुन्छ भनी देखाउनुहोस्।

If $\cos 30^\circ = \frac{\sqrt{3}}{2}$, then prove that $\cos 15^\circ = \frac{\sqrt{3}+1}{2\sqrt{2}}$.

16. हल गर्नुहोस् (solve): $\sin \theta = \cos \theta$ $[0^\circ \leq \theta \leq 90^\circ]$

17. विन्दुहरू A र B का स्थिति भेक्टरहरू कमशः $4\vec{i} + 5\vec{j}$ र $-2\vec{i} + 3\vec{j}$ छन् भने रेखाखण्ड AB लाई भित्रपट्टीबाट 1:2 को अनुपातमा विभाजन गर्ने विन्दु C को स्थिति भेक्टर पत्ता लगाउनुहोस्।

The position vectors of the points A and B are $4\vec{i} + 5\vec{j}$ and $-2\vec{i} + 3\vec{j}$ respectively. Find the position vector of the point C which divides the line segment AB internally in the ratio of 1:2.

18. यदि एउटा निरन्तर श्रेणीको तेस्रो चतुर्थांश 70 र चतुर्थांशीय विस्तार 60 छ भने चतुर्थांशीय विचलनको गुणाङ्क पत्ता लगाउनुहोस्।

If the third quartile of a continuous series is 70 and inter-quartile range is 60, find the coefficient of quartile deviation.

19. हल गर्नुहोस् (Solve): $m^3 - 39m + 70 = 0$
20. 1 र 64 का विचमा पर्ने गुणोत्तर मध्यमाहरूको सद्द्या निकाल्नुहोस् जसको पहिलो र अन्तिम मध्यमाको अनुपात $1 : 16$ छ।
Find the number of geometric means inserted between 1 and 64 in which the ratio of first mean to the last mean is $1 : 16$.
21. फलन $f(x) = \begin{cases} 2x - 3, & x \leq 2 \\ 3x - 5, & x > 2 \end{cases}$ छन्।
Function $f(x) = \begin{cases} 2x - 3, & x \leq 2 \\ 3x - 5, & x > 2 \end{cases}$ are given.
- (i) तालिका बनाएर $f(x)$ को $x = 2$ मा बायाँ तर्फको सिमान्त मान पत्ता लगाउनुहोस्।
Find the left hand limit of $f(x)$ at $x = 2$ using table.
- (ii) तालिका बनाएर $f(x)$ को $x = 2$ मा दायाँ तर्फको सिमान्त मान पत्ता लगाउनुहोस्।
Find the right hand limit of $f(x)$ at $x = 2$ using table.
- (iii) के फलन $f(x), x = 2$ मा निरन्तर छ? कारण दिनुहोस्।
Is the function $f(x)$ continuous at $x = 2$? Give reason.
22. कामरको नियम प्रयोग गरी हल गर्नुहोस् (Solve using Cramer's rule):

$$\frac{5}{x} - \frac{2}{y} = 4, \frac{4}{y} + \frac{3}{x} = 18$$
23. समीकरण $x^2 + 4xy + y^2 = 0$ ले प्रतिनिधित्व गर्ने रेखाहरू बीचको कोण पत्ता लगाउनुहोस्।
Find the angle between the lines represented by the equation $x^2 + 4xy + y^2 = 0$.
24. प्रमाणित गर्नुहोस् (Prove that): $\operatorname{cosec} 2A + \operatorname{cosec} 4A = \cot A - \cot 4A$
25. यदि $\alpha + \beta + \gamma = \pi^c$ भए प्रमाणित गर्नुहोस् (If $\alpha + \beta + \gamma = \pi^c$ then Prove that):

$$\sin 2\alpha + \sin 2\beta - \sin 2\gamma = 4 \cos \alpha \cos \beta \sin \gamma$$
26. एउटा ठाडो खम्बालाई $9 : 1$ हुने गरी कुनै विन्दुले विभाजन गरेको छ। यदि उक्त खम्बाको दुवै भागहरूले खम्बाको फेददेखि 20 मिटरको दूरीमा रहेको कुनै एक विन्दुमा आपसमा बराबर कोणहरू बनाउँदछन् भने खम्बाको उचाइ पत्ता लगाउनुहोस्।
A vertical pole is divided by any point in the ratio of $9 : 1$. If both the segments of a pole subtend equal angles to each other at a distance of 20 m away from the foot of the pole, find the height of the pole.
27. एकाई वर्गलाई मेट्रिक्स $\begin{bmatrix} 2 & -3 \\ -4 & 1 \end{bmatrix}$ द्वारा स्थानान्तरण गर्नुहोस्।

Transform a unit square by the matrix $\begin{bmatrix} 2 & -3 \\ -4 & 1 \end{bmatrix}$.

28. दिइएको आँकडाको मध्यिकाबाट मध्यक भिन्नता पत्ता लगाउनुहोस् ।

Calculate the mean deviation from the median of the given data.

प्राप्ताङ्क (Marks obtained)	0-10	0-20	0-30	0-40	0-50
विद्यार्थीहरूको सङ्ख्या (No. of students)	5	7	16	18	20

29. दिइएको तथ्याङ्कबाट विचरणशीलताको गुणाङ्क पत्ता लगाउनुहोस् ।

Compute the Coefficient of Variation (C.V.) from the given data.

प्राप्ताङ्क (Marks obtained)	8-16	16-24	24-32	32-40	40-48
विद्यार्थीहरूको सङ्ख्या (No. of students)	2	3	5	4	1

समूह 'घ' (Group 'D')

$|4 \times 4 = 16|$

30. शर्तहरु $x + y \leq 5, 2x - y \leq 4, x \geq 0, y \geq 0$ को आधारमा उद्देश्य फलन $Z = 7x + 3y$ को नून्यतम मान पत्ता लगाउनुहोस् ।

Find the minimum value of the objective function $Z = 7x + 3y$ under the constraints $x + y \leq 5, 2x - y \leq 4, x \geq 0, y \geq 0$

31. केन्द्र $(3, 4)$ भएको एउटा वृत्त रेखाहरू $3x - y = 14$ र $2x - y = 7$ को प्रतिच्छेदन बिन्दु भएर जान्छ । सो वृत्तको समीकरण पत्ता लगाउनुहोस् ।

A circle having centre $(3, 4)$ passes through the point of intersection of the lines $3x - y = 14$ and $2x - y = 7$. Find the equation of the circle.

32. अर्धवृत्तमा बनेको परिधि कोण एक समकोण हुन्छ भनि भेक्टर विधिबाट प्रमाणित गर्नुहोस् । Using vector method prove that the inscribed angle of a semi-circle is one right angle.

33. यदि R_1 ले $y = 2$ रेखामा हुने परावर्तन र R_2 ले $x = 1$ रेखामा हुने परावर्तनलाई जनाउँछ । संयुक्त स्थानान्तरण $R_2 R_1$ ले कुन एकल स्थानान्तरणलाई जनाउँछ ? लेख्नुहोस् । सोही एकल स्थानान्तरण प्रयोग गरी ΔABC को प्रतिविम्ब पत्ता लगाउनुहोस् जहाँ $A(2,3), B(4,1)$ र $C(5,3)$ छन् । साथै वस्तु र प्रतिविम्बलाई एउटै लेखाचित्रमा प्रस्तुत गर्नुहोस् ।

If R_1 represents the reflection on the line $y = 2$ and R_2 represents the reflection on the line $x = 1$, then which single transformation does combined transformation $R_2 R_1$ represent? Write it. Using this single transformation find the image of ΔABC , where $A(2,3), B(4,1)$ and $C(5,3)$. Also present the object and the image on the same graph paper.

The End

NATIONAL PRIVATE AND BOARDING SCHOOLS' ASSOCIATION NEPAL
SEE PRE-BOARD EXAMINATION 2082



Class: Ten

Subject: Optional I Additional Maths Time: 3 hours

**F.M. 75.0
P.M. 26.25**

Candidates are required to write their answers according to the instructions.

Answer all the questions.

Group 'A'

$10 \times 1 = 10$

1. What is the minimum value of $y = \cos x$?

$y = \cos x$ को न्यूनतम मान लेख्नुहोस्।

2. Which function is the function $f(x) = 27$?

$f(x) = 27$ कुन प्रकारको फलन हो?

3. Write $-3 \leq x \leq 5$ in interval notion.

$-3 \leq x \leq 5$ लाई अन्तराल संकेतमा लेख्नुहोस्।

4. If matrix $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ then what is the value of $|A|$?

यदि म्याट्रिक्स $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ भएमा $|A|$ को मान लेख्नुहोस्।

5. Write the slope of the straight line $y = mx + c$.

सीधा रेखा $y = mx + c$ को ढलान (slope) लेख्नुहोस्।

6. Write the required condition of generating an ellipse when a cone is cut by a plane surface.

शंकुलाई समतल सतहले काट्दा दीर्घवृत्त (ellipse) बन्ने आवश्यक सर्त लेख्नुहोस्।

7. Express $\sin 2A$ in terms of $\cot A$.

$\sin 2A$ लाई $\cot A$ को रूपमा व्यक्त गर्नुहोस्।

8. Write $\cos A - \cos B$ in the product of Sum of sine and cosine.

$\cos A - \cos B$ लाई योग तथा अन्तरको गुणनफलको रूपमा लेख्नुहोस्।

9. If $\vec{a} = \begin{pmatrix} x_1 \\ y_1 \end{pmatrix}$ and $\vec{b} = \begin{pmatrix} x_2 \\ y_2 \end{pmatrix}$, then write the value of $\vec{a} \cdot \vec{b}$.

यदि $\vec{a} = \begin{pmatrix} x_1 \\ y_1 \end{pmatrix}$ र $\vec{b} = \begin{pmatrix} x_2 \\ y_2 \end{pmatrix}$ भएमा \vec{a}, \vec{b} को मान लेख्नुहोस्।

10. Define inversion transformation.

इनभर्सन रूपान्तर (Inversion Transformation) परिभाषित गर्नुहोस्।

11. If $f(x) = 2x + 5$, then find the value of $f \circ f(-1)$.

यदि $f(x) = 2x + 5$ भएमा $f \circ f(-1)$ को मान निकाल्नुहोस्।

12. Find the vertex of parabola formed from the quadratic equation

$$y = x^2 + 3x + 5.$$

द्विघात समीकरण $y = x^2 + 3x + 5$. बाट बनेको परवलयको शीर्ष बिन्दु (vertex) निकाल्नुहोस्।

13. If $A = \begin{pmatrix} 3 & 2 \\ 4 & x \end{pmatrix}$, $B = \begin{pmatrix} 3 & 5 \\ 7 & 9 \end{pmatrix}$ and $|AB| = -8$, find the value of x .

यदि $A = \begin{pmatrix} 3 & 2 \\ 4 & x \end{pmatrix}$, $B = \begin{pmatrix} 3 & 5 \\ 7 & 9 \end{pmatrix}$ र $|AB| = -8$, भएमा x को मान निकाल्नुहोस्।

14. If the straight line $kx + 3y - 12 = 0$ and $-3x + 4y + 5 = 0$ are perpendicular to each other, find the value of k .

यदि सीधा रेखाहरू $kx + 3y - 12 = 0$ र $-3x + 4y + 5 = 0$ एक-अकासँग लम्बवत् छन् भने k को मान निकाल्नुहोस्।

15. Prove that: $\frac{1+\sin\frac{A}{2}}{1+\cos A+\cos\frac{A}{2}} = \tan\frac{A}{2}$

प्रमाणित गर्नुहोस्: $\frac{1+\sin\frac{A}{2}}{1+\cos A+\cos\frac{A}{2}} = \tan\frac{A}{2}$

16. Find the value of A when $4\cos^2 A - 1 = 0$ ($0^\circ \leq A \leq 90^\circ$)

$4\cos^2 A - 1 = 0$ ($0^\circ \leq A \leq 90^\circ$) हुँदा A , को मान निकाल्नुहोस्।

17. If $\vec{a} + \vec{b} + \vec{c} = \mathbf{0}$ ($0, 0, 0$) and $|\vec{a}| = 6$, $|\vec{b}| = 3\sqrt{2}$ and $|\vec{c}| = 3\sqrt{2}$ units, then find the angle between \vec{a} and \vec{b} .

यदि $\vec{a} + \vec{b} + \vec{c} = \mathbf{0}$ ($0, 0, 0$) and $|\vec{a}| = 6$, $|\vec{b}| = 3\sqrt{2}$ and $|\vec{c}| = 3\sqrt{2}$ एकाइ भएमा \vec{a} र \vec{b} बीचको कोण निकाल्नुहोस्।

18. In a continuous series, the sum of first quartile and third quartile is 70 and difference between third quartile and first quartile is 30, then find the first quartile.

निरन्तर श्रेणीमा प्रथम क्वार्टाइल र तृतीय क्वार्टाइलको योग ७० र तिनीहरूको अन्तर ३० छ भने प्रथम क्वार्टाइल निकाल्नुहोस्।

19. Solve: $2x^3 - 3x^2 + 1 = 0$

समाधान गर्नुहोस्: $2x^3 - 3x^2 + 1 = 0$

20. The sum of first eight terms of an arithmetic series is 180 and its fifth term is five times the first term then find the first term and the common difference of the series.

एउटा समान्तर श्रेणीका पहिलो ८ पदहरूको योग १८० छ र पाँचौं पद पहिलो पदको पाँच गुणा छ भने पहिलो पद र समान अन्तर निकाल्नुहोस्।

21. Test whether the function $f(x) = 3x + 2$ is continuous or not by calculating left hand limit, right hand limit and functional value at $x = 3$.

बायों सीमा, दायों सीमा र फलनको मान प्रयोग गरी $f(x) = 3x + 2$ फलन $x = 3$ मा निरन्तर छ कि छैन जाँच गर्नुहोस्।

22. Solve using Cramer's rule:

$$\frac{2}{3}x + y = 1, \quad \frac{1}{2}x + y = \frac{1}{2}$$

क्रेमरको नियम प्रयोग गरी समाधान गर्नुहोस्:

$$\frac{2}{3}x + y = 1, \quad \frac{1}{2}x + y = \frac{1}{2}$$

23. Find the single equation of two lines passing through the origin and perpendicular to the lines represented by $2x^2 + 3xy - 2y^2 = 0$

मूलविन्दु हुँदै जाने $2x^2 + 3xy - 2y^2 = 0$ द्वारा प्रतिनिधित्व गरिएका रेखाहरूलाई लम्बवत् हुने दुई रेखाहरूको एकल समीकरण निकाल्नुहोस्।

24. Prove that:

$$(2\sin A - \sin 5A + \sin 3A) = 16(\sin^3 A \cdot \cos^2 A)$$

प्रमाणित गर्नुहोस् कि

$$(2\sin A - \sin 5A + \sin 3A) = 16(\sin^3 A \cdot \cos^2 A)$$

25. Prove that $1 - 2\sin \frac{A}{2} \cdot \sin \frac{B}{2} \cdot \sin \frac{C}{2} = \sin^2 \frac{A}{2} + \sin^2 \frac{B}{2} + \sin^2 \frac{C}{2}$,

If $A + B + C = 180^\circ$.

प्रमाणित गर्नुहोस् कि: $1 - 2\sin \frac{A}{2} \cdot \sin \frac{B}{2} \cdot \sin \frac{C}{2} = \sin^2 \frac{A}{2} + \sin^2 \frac{B}{2} + \sin^2 \frac{C}{2}$,

जब, $A + B + C = 180^\circ$.

26. The angle of elevation of an airplane from a point on the ground is 45° . After a flight for 30 seconds, the angle of elevation changes from 45° to 30° . If the airplane is flying at a constant height of 5,500 meters, find the speed of the airplane.

जमिनको एक विन्दुबाट विमानको उचाइ कोण 45° छ। 30 सेकेन्ड उडानपछि उचाइ कोण 30° हुन्छ। यदि विमान 5500 मिटरको स्थिर उचाइमा उडिरहेको छ भने विमानको वेग निकाल्नुहोस्।

27. If the matrix $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ transforms a unit square to the rectangle $\begin{pmatrix} 0 & 3 & 4 & 1 \\ 0 & 1 & 3 & 2 \end{pmatrix}$, find the values of a, b, c and d.

यदि म्याट्रिक्सले $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ एकाइ वर्गलाई $\begin{pmatrix} 0 & 3 & 4 & 1 \\ 0 & 1 & 3 & 2 \end{pmatrix}$, आयतमा रूपान्तरण गर्दछ भने a, b, c र d का मानहरू निकाल्नुहोस्।

28. Find the mean deviation from median of the given continuous data.
तल दिइएको निरन्तर तथ्याङ्कबाट माध्यिकबाट औसत विचलन निकाल्नुहोस्।

Marks obtained (x)	10-20	20-30	30-40	40-50	50-60	60-70
No .of Students(f)	6	8	11	14	8	3

29. Calculate the standard deviation from the given information.
तलको तथ्याङ्कबाट मानक विचलन निकाल्नुहोस्।

Marks obtained (x)	30-40	40-50	50-60	60-70	70-80	80-90
No .of Students(f)	4	8	10	16	8	6

Group 'D'

$$4 \times 4 = 16$$

30. The maximum value of the objective function $Z = 3x+2y+k$ where $k>0$ is 15 under the constraints $x-y \leq 0$, $x+y \geq 0$ and $y \leq 2$. Then find the value of k.

उद्देश्य फलन $Z = 3x+2y+k$ जहाँ $k > 0$ को अधिकतम मान 15 छ र सर्तहरू $x-y \leq 0$, $x+y \geq 0$ र $y \leq 2$ छन्। k को मान निकाल्नुहोस्।

31. Find the equation of a circle passing through the points $(4,1)$ $(6,5)$ and having its center on the straight line $4x+y -16= 0$.

बिन्दुहरू (4,1) र (6,5) हुँदै जाने र केन्द्र $4x + y - 16 = 0$ रेखामा पर्न वृतको समीकरण निकाल्नुहोस्।

32. If two median of a triangle are equal then prove vectorically that the given triangle is an isosceles triangle.

यदि त्रिभुजका दुई मध्यान्तर बराबर छन् भने भेक्टर विधिबाट प्रमाणित गर्नुहोस् कि उक्त त्रिभुज समद्विबाहु छ।

33. If the vertices of ΔABC are A(2,1), B(5,2) and C(3,5). It is first reflected at the line $x = 2$. Then the image so obtained is reflected in the other line $x = 5$. Find the single transformation to represent this combination of reflections and then use it to find the image of ΔABC . Also draw ΔABC and its image on the same graph paper.

यदि ΔABC का शिखरहरू A(2,1), B(5,2), C(3,5) छन् । पहिले यसलाई $x = 2$ रेखामा परावर्तन गरिन्छ र त्यसपछि प्राप्त प्रतिविम्बलाई $x = 5$ रेखामा पुनः परावर्तन गरिन्छ ।

क) यी परावर्तनहरूको एकल रूपान्तरण लेख्नुहोस्।

ख) सो रूपान्तरण प्रयोग गरी ΔABC को अन्तिम प्रतिविम्ब निकाल्नुहोस्।

ग) एउटै ग्राफ कागजमा ΔABC र यसको प्रतिविम्ब कोर्नुहोस्।
