

Symbol No:.....

7:30am



PABSON, Kathmandu
PABSON PRE-BOARD EXAM-2074

Subject: Opt. I Mathematics

Full Marks: 100

Time: 3.00 hrs

Candidates are required to give their answers according to the given instruction.

Attempt all the questions:

Group A [8×(2+2)=32]

1. a. If $f(x) = \frac{2x+3}{2}$, then find the value of $f^{-1}(x)$.
b. If $x-5$ is a factor of x^3+px^2+4x+5 , find the value of p .
2. a. If the arithmetic mean between 4 and x is 34, find their geometric mean.
b. If the inverse of matrix $\begin{bmatrix} m & 2 \\ 7 & 3 \end{bmatrix}$ is the matrix $\begin{bmatrix} 3 & -2 \\ -7 & m \end{bmatrix}$, find the value of m .
3. a. If the inverse of the matrix $\begin{bmatrix} x & 3 \\ 7 & 2 \end{bmatrix}$ can not be defined, find the value of x .
b. Find the slope of the line perpendicular to the straight line $3x-4y=10$.
4. a. Find the value of k if the pair of lines represented by $3x^2-6xy+(k+4)y^2=0$ are coincident to each other.
b. Find the centre and radius of a circle having the equation $x^2+y^2-10x-4y=7$.
5. a. Without using calculator or table, find the value of $\sin 105^\circ$.
b. If $\cos \frac{\theta}{2} = \frac{1}{2} \left(p + \frac{1}{p} \right)$, prove that: $\cos \theta = \frac{1}{2} \left(p^2 + \frac{1}{p^2} \right)$.
6. a. Prove that: $\sin 51^\circ + \cos 81^\circ - \cos 21^\circ = 0$
b. Solve: $4-3\sec^2 A = 0$ [$0^\circ \leq A \leq 90^\circ$]
7. a. If $10\vec{i}-7\vec{j}$ and $a\vec{i}+10\vec{j}$ are perpendicular to each other, find the value of a .
b. The position vector of A and B are $9\vec{i}+7\vec{j}$ and $\vec{i}-3\vec{j}$ respectively. If M is the mid-point of AB, find the position vector of M.
8. a. T denotes the translation with $\begin{pmatrix} -1 \\ -2 \end{pmatrix}$ and E denotes the enlargement with centre origin and scale factor 2. Find the coordinates of the image of the point A(-2,1) under the combined transformation $T \circ E$.

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- b. Find the transformation represented by the matrix $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$. Use the matrix to transform the point (-4,-3)

Group B [17×4=68]

9. IF $f(x)=3x+4$ and $g(x)=2(x+1)$, then prove that $(f \circ g)(x)=(g \circ f)(x)$
10. Solve: $6x^3=4-13x^2$
11. There are n arithmetic means between 4 and 24. If the ratio of third mean to the last mean is 4:5 then find the number of terms in the series.
12. Solve graphically: $y=x^2, y=2-x$
13. Solve by matrix method: $\frac{10}{x} + \frac{12}{y} = 6$ and $\frac{25}{x} - \frac{2}{y} = 2$
14. A (3,2), B(1,-1) and C(5,-5) are the vertices of a triangle ABC. Find the equation of a straight line passing through the centroid of ABC and parallel to the side BC.
15. Find the equation of two lines through the origin and perpendicular to the lines $5x^2-8xy+3y^2=0$
16. Find the centre and radius of a circle passing through (0,0), (2,0) and (0,4).

17. Prove: $\frac{\sin 2A + \sin 5A - \sin A}{\cos 2A + \cos 5A + \cos A} = \tan 2A$

18. If $A+B+C=180^\circ$, Prove:

$$\sin^2 \frac{A}{2} - \sin^2 \frac{B}{2} - \sin^2 \frac{C}{2} + 1 = 2 \sin \frac{A}{2} \cdot \cos \frac{B}{2} \cdot \cos \frac{C}{2}$$

19. Solve: $\sqrt{3} \cos \theta - \sin \theta = \sqrt{3}$ [$0^\circ \leq \theta \leq 2\pi^\circ$]
20. Two pillars of equal height stand on either side of a road way which is 40m wide. At a point on the road way between the pillars the elevations of the tops of pillars are 60° and 30° , find the height and the position of the point.
21. Prove vectorially that the median of an isosceles triangle is perpendicular to the base.
22. Let R denotes the reflection in X-axis and E denotes the enlargement of centre in the origin and scale factor 2. If the vertices of triangle ABC are A(2,3), B(4,5) and C(6,2), find the co-ordinates image of the triangle under combined transformation $R \circ E$. Show them in graph too.
23. A square WXYZ whose vertices are W(0,3), X(1,1), Y(3,2) and Z(2,4) is mapped to the parallelogram W'X'Y'Z' by 2×2 matrix, so that the vertices of the parallelogram are W'(6,-6), X'(3,-1), Y'(7,-1) AND Z'(10,-6). Find the 2×2 matrix.

24. Find the average deviation from the given data:

CI	5-15	5-25	5-35	5-45	5-55
F	2	5	11	16	20

25. Find the standard deviation and its coefficient from the given data:

wages Rs	120	130	140	150	160	170
No. of Workers	5	9	14	5	8	9

