

Class 12 Revision Test:
Relations and Functions, Inverse Trigonometric Functions and Matrices and Determinants
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Duration: 90mins

Maximum Marks: 40

Section A: 1 marks Questions

1. The relation $R = \{(1,1), (2,2), (3,3)\}$ on the set $\{1, 2, 3\}$ is
 - (a) symmetric only
 - (b) reflexive only
 - (c) an equivalence relation
 - (d) transitive only
2. If $4 \cos^{-1} x + \sin^{-1} x = \pi$, then the value of x is
 - (a) $\frac{3}{2}$
 - (b) $\frac{1}{\sqrt{2}}$
 - (c) $\frac{\sqrt{3}}{2}$
 - (d) $\frac{2}{\sqrt{3}}$
3. The function $f: R \rightarrow R, f(x) = x^2$ is
 - (a) injective but not surjective
 - (b) surjective but not injective
 - (c) injective as well as surjective
 - (d) neither injective nor surjective
4. The value of $\sin^{-1} \left(\cos \frac{33\pi}{5} \right)$ is
 - (a) $\frac{3\pi}{5}$
 - (b) $\frac{-\pi}{10}$
 - (c) $\frac{\pi}{10}$
 - (d) $\frac{7\pi}{5}$
5. If A is 3×4 matrix and B is a matrix such that $A^T B$ and BA^T are both defined. Then, B is of the type
 - (a) 3×4
 - (b) 3×3
 - (c) 4×4
 - (d) 4×3
6. If A is a square matrix such that $A^2 = I$, then $(A - I)^3 + (A + I)^3 - 7A$ is equal to
 - (a) A
 - (b) $I - A$
 - (c) $I + A$
 - (d) $3A$
7. If $A = \begin{bmatrix} 1 & 2 & -1 \\ -1 & 1 & 2 \\ 2 & -1 & 1 \end{bmatrix}$, then the $\det(adj(adj A))$ is
 - (a) 14^4
 - (b) 14^3
 - (c) 14^2
 - (d) 14

Section B: 2 marks Questions

8. Let R be the equivalence relation in the set $A = \{0, 1, 2, 3, 4, 5\}$ given by $R = \{(a, b): 2 \text{ divides } (a - b)\}$. Write the equivalence class $[0]$.
9. Draw the graph of $\cos^{-1} x$ and mark all the critical points on the graph. State its domain and (principal value) range.
10. Evaluate $\sin \left(2 \tan^{-1} \frac{2}{3} \right) + \cos(\tan^{-1} \sqrt{3})$

Section C: 3 marks Questions

11. Check whether the relation R defined on the set $A = \{1, 2, 3, 4, 5, 6\}$ as $R = \{(a, b): b = a + 1\}$ is reflexive, symmetric or transitive

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12. Prove that: $\tan\left(\sin^{-1}\frac{5}{13} + \cos^{-1}\frac{3}{5}\right) = \frac{63}{16}$
13. If $X - Y = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$ and $X + Y = \begin{bmatrix} 3 & 5 & 1 \\ -1 & 1 & 4 \\ 11 & 8 & 0 \end{bmatrix}$, find X and Y .
14. Find values of k , if area of triangles is 4 square units whose vertices are $(-2, 0)$, $(0, 4)$ and $(0, k)$.

Section D: 5 marks Questions

15. If $\tan^{-1}\left\{\frac{\sqrt{1+x^2}-\sqrt{1-x^2}}{\sqrt{1+x^2}+\sqrt{1-x^2}}\right\} = A$, then prove that $x^2 = \sin 2A$.
16. If $A = \begin{bmatrix} 2 & 3 & 1 \\ 1 & 2 & 2 \\ -3 & 1 & -1 \end{bmatrix}$, find A^{-1} . Using A^{-1} solve the system of linear equations
- $$\begin{aligned} 2x + y - 3z &= 13 \\ 3x + 2y + z &= 4 \\ x + 2y - z &= 8 \end{aligned}$$

Section E: Case Study Questions (5 marks each)

17. In a village a giant fair is being conducted every year. It is center of entertainment of many nearby villagers also. A toy-train is center of attraction of all the children. Madhav and his family visited the famous fair and noticed that the path of the train is a circle. If we write the path as a function of x then it is of the form

$$f(x) = \sqrt{4 - x^2}$$

answer the following questions using the information given above.

- Let $f: Z \rightarrow Z$ be defined as $f(x) = \sqrt{4 - x^2}$, then f is
 (a) Surjective (b) Injective (c) Bijective (d) None of the above
- Let $f: [-2, 2] \rightarrow [0, 2]$ be defined as $f(x) = \sqrt{4 - x^2}$, then f is
 (a) Surjective (b) Injective (c) Bijective (d) None of the above
- Let $f: R \rightarrow R$ be defined as $f(x) = \sqrt{4 - x^2}$, then range is
 (a) $[0, 2]$ (b) $\{0, 2\}$ (c) $(0, 2)$ (d) z
- Let $f: N \rightarrow R$ be defined as $f(x) = \sqrt{4 - x^2}$, then domain is
 (a) $[0, 2]$ (b) $\{1, 2, 3, 4\}$ (c) $\{1, 2\}$ (d) $\{1, 4\}$
- If center of the path of the toy-train is origin, and position of Madhav in the train w.r.t origin is taken as (a, b) , then at a certain moment if $a=1$, then find the value of b .
 (a) $b = \sqrt{3}$ (b) $b = -\sqrt{3}$ (c) $b = \pm\sqrt{3}$
 (d) b is any point on the path

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