Class 12
Relations and Functions and Inverse Trigonometric Functions
Test 1, 2026
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Maximum Marks 40 Duration: 90 mins

Section A

Questions 1 to 7 carry 1 marks each

1. A relation R is defined on N. Which one of the following is reflexive relation
   (A) $R = [(x, y): x > y,\ x, y \in N]$
   (B) $R = [(x, y): x + y = 10,\ x, y \in N]$
   (C) $R = [(x, y): xy\ is\ a\ square\ number,\ x, y \in N]$
   (D) $R = [(x, y): x + 4y = 10,\ x, y \in N]$
2. Let $f: R \to R$, be defined by $f(x) = \frac{1}{x}$, for all $x \in R$, then f is
   (A) onto (B) one-one (C) bijective (D) Not Defined
3. $\sin[\cot^{-1}\{\tan(\cos^{-1} x)\}]$ is equal to
   (A) x (B) $\sqrt{1 - x^2}$ (C) $\frac{1}{x}$ (D) None of these
4. The number of relations be defined on the set $A = \{3, 5, 7\}$ are
   (A) 9 (B) 512 (C) 256 (D) 2^6
5. Let the relation R in the set $A = \{x \in z: 0 \leq x \leq 12\}$, given by $R = \{(a, b): |a - b\ is\ a\ multiple\ of\ 4$, Then 1, the equivalence class containing 1 is
   (A) $\{1, 5, 9\}$
   (B) $\{3, 7, 11\}$
   (C) A
   (D) $\{0, 1, 2, 5\}$
6. If $\tan^{-1}(\cot A) = 2A$, then $A =$
   (A) $\pm\frac{\pi}{3}$ (B) $\pm\frac{\pi}{4}$ (C) $\pm\frac{\pi}{6}$ (D) None of these
7. Let $A = \{1, 2, 3\}, B = \{4, 5, 6, 7\}$ and let $f = \{(1,4), (2,5), (3,6)\}$ be a function from A to B. Based on the above information f is best defined as
   (A) Surjective Function
   (B) Injective Function
   (C) Bijective Function
   (D) None of these

Solution to the test

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Section B

Questions 4 to 11 carry 2 marks each

8. For the principal value evaluate $\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right) + \cos^{-1}\left(\frac{\sqrt{3}}{2}\right)$
9. Find the domain of $\cos^{-1}(x^2 - 4)$.
10. Evaluate $\sin^{-1}\left(\sin\frac{3\pi}{4}\right) + \cos^{-1}\left(\cos\frac{3\pi}{4}\right) + \tan^{-1} 1$
11. Draw the graph of $\cos^{-1} x$, where $x \in [-1,0]$. Also, write its range.

Section C

Questions 12 to 15 carry 3 marks each

12. Let, S be the set of all points in a plane and R be a relation on S defined as
    $R = \{(P, Q): Distance\ between\ P\ and\ Q\ is\ less\ than\ 2\ units\}$
    Show that R is reflexive and symmetric but not transitive
13. Evaluate $\tan\left(\cos^{-1}\frac{3}{5} + \tan^{-1}\frac{1}{4}\right)$
14. Check if the following function f is bijective: $f = Q - \{3\} \to Q$, defined by $f(x) = \frac{2x+3}{x-3}$
15. Find x if, $\tan^{-1}\left\{\frac{\sqrt{1+x^2}-\sqrt{1-x^2}}{\sqrt{1+x^2}+\sqrt{1-x^2}}\right\} = \alpha$

Section D

Questions 16 carries 5 marks

16. A relation R is defined on a set of real numbers **R** as
    $R = \{(x, y): x.y\ is\ an\ irrational\ number\}$
    Check whether R is reflexive, symmetric and transitive or not.

Section E (Case Study)

Questions 17 and 18 carry 4 marks (1+1+2) each

17. Students of Grade 9, planned to plant saplings along straight lines, parallel to each other to one side of the playground ensuring that they had enough play area. Let us assume that they planted one of the rows of the saplings along the line $y = x - 4$. Let L be the set of all lines which are parallel on the ground and R be a relation on L.

Solution to the test

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Answer the following using the above information.

(i) Let relation R be defined by $R = \{(L1, L2): L1 \,||\, L2 \; where \; L1, L2 \in L\}$ then is R an equivalence relation?

(ii) Let $R = \{(L1,\ L2): L1 \perp L2 \; where \; L1, L2 \in L\}$ Check if R Symmetric?

(iii) Check function f: R→R defined by $(x) = x - 4$ is bijective.

18. In a school project Sheetal was asked to construct a triangle and name it as ABC. Two angles A and B were given to be equal to $\tan^{-1}\frac{1}{2}$ and $\tan^{-1}\frac{1}{3}$ respectively.

(i) Find the value of $\sin A$.

(ii) If $B = \cos^{-1} x$, then find x.

(iii) Find the value of $A + B$