CUET Mathematics Test

Chapter: Relations, Functions, and Inverse Trigonometric Functions

SOLUTIONS

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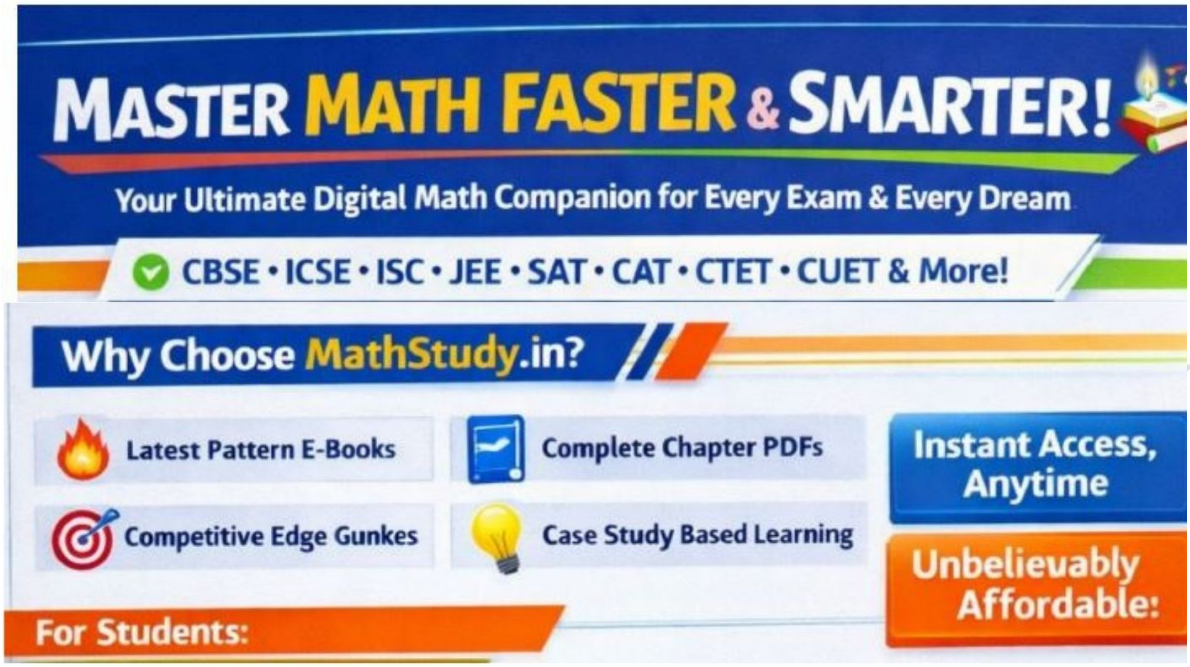

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Solutions

1. **Solution:** $a + 3b = 12 \Rightarrow a = 12 - 3b$. For $a, b \in \mathbb{N}$: If $b = 1, a = 9$; $b = 2, a = 6$; $b = 3, a = 3$. For $b \geq 4, a \leq 0$. Domain is $\{3, 6, 9\}$. **Correct Option: (A)**

2. **Solution:** Reflexive as $(1,1), (2,2), (3,3) \in R$. Symmetric as $(1,2) \in R \Rightarrow (2,1) \in R$. Transitive check: $(1,2), (2,1) \in R \Rightarrow (1,1) \in R$. **Correct Option: (C)**

3. **Solution:** $f(x) = x^4$ is even, so $f(1) = f(-1)$, not one-one. Range is $[0, \infty)$, not $\mathbb{R}$, so not onto. **Correct Option: (D)**

4. **Solution:** For $n = 3$, Bell number $B_3 = 5$. **Correct Option: (C)**

5. **Solution:** Onto functions formula: $4^5 - \binom{4}{1}3^5 + \binom{4}{2}2^5 - \binom{4}{3}1^5 = 1024 - 972 + 192 - 4 = 240$. **Correct Option: (B)**

6. **Solution:** $\cos^{-1}(\cos(7\pi/6)) = \cos^{-1}(\cos(2\pi - 5\pi/6)) = 5\pi/6$. **Correct Option: (B)**

7. **Solution:** $-1 \leq \sqrt{x-1} \leq 1 \Rightarrow 0 \leq x - 1 \leq 1 \Rightarrow 1 \leq x \leq 2$. **Correct Option: (A)**

8. **Solution:** Principal value branch of $\sin^{-1} x$ is $[-\pi/2, \pi/2]$. **Correct Option: (B)**

9. **Solution:** $\pi/3 - (\pi - \pi/3) = \pi/3 - 2\pi/3 = -\pi/3$. **Correct Option: (B)**

10. **Solution:** Reflexive and transitive verified; symmetric fails since $(1,2) \in R$ but $(2,1) \notin R$. **Correct Option: (B)**

11. **Solution:** $f(x) = 3x$ is a bijection on $\mathbb{R}$. **Correct Option: (A)**

12. **Solution:** Range of $\cot^{-1} x$ is $(0, \pi)$. **Correct Option: (A)**

13. **Solution:** Total bijections $= n!$. **Correct Option: (C)**

14. **Solution:** $(x + y)/(1 - xy) = \tan(\pi/4) = 1 \Rightarrow x + y = 1 - xy$. **Correct Option: (B)**

15. **Solution:** $\sin(\pi/3 - (-\pi/6)) = \sin(\pi/2) = 1$. **Correct Option: (D)**

16. **Solution:** Congruence modulo n is a standard equivalence relation. **Correct Option: (D)**

17. **Solution:** Domain of $\sec^{-1} x$ is $(-\infty, -1] \cup [1, \infty)$. **Correct Option: (B)**

18. **Solution:** For finite sets of equal cardinality, injectivity implies surjectivity. **Correct Option: (C)**

19. **Solution:** $\pi/3 + 2(\pi/6) = 2\pi/3$. **Correct Option: (B)**

20. **Solution:** $L_1 \perp L_2 \Rightarrow L_2 \perp L_1$ (Symmetric); $L_1 \not\perp L_1$ (Not reflexive). **Correct Option: (B)**