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Class: XII
Subject: Maths
Topic: Sets, Relations and Functions
No. of Questions: 25

Q1. Let A = {1, 2, 3}, B = {4, 5, 6, 7} and f = {(1,4), (2,5)(3,6)} be a function from A to B. state whether f is one-one or not. [All India 2011]

Q2. Write fog, if f : R → R and g : R → R are given by f(x) = |x| and g(x) = |5x – 2| [Foreign 2011]

Q3. The domain of $f(x) = \sin\left(\log\left(\sqrt{\frac{4-x^2}{1-x}}\right)\right)$ is

(A) $(-2,1)\cup(2,\infty)$ (B) $(-2,\infty)$

(C) $(2,\infty)$ (D) None of these.

Q4. The period of $f(x) = \sin 3\pi\{x\} + \tan\pi[x]$ is :

(A) 0 (B) 1

(C) π (D) None of these.

Q5. If $f(x)=\left(3-x^7\right)^{\frac{1}{7}}\ \forall x\in R$, then f(f(x)) =

(A) x (B) x^2

(C) x^7 (D) $x - x^7$

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Q6. If R is a relation from a non-empty set A to a non-empty set B, then

A. $R=A\cup B$
B. $R=A\times B$
C. $R\subset A\times B$.
D. $R=A\cap B$

Q7. Let* be a binary operation on N given by a*b = LCM(a, b) for all a, b ∈ N. find 5 * 7.
[Delhi 2012; Foreign 2008]

Q8. *Let* $R\{(x,y): x^2+y^2=1, x,y\in R\}$ be a relation in R. The relation R is :

(A) reflexive
(B) symmetric
(C) transitive
(D) anti-symmetric

Q9. If $A=\{(x,y): y=e^x, x\in R\}$ and $B=\{(x,y): y=x, x\in R\}$, then

(A) $A\subseteq B$
(B) $A\subseteq B$
(C) $A\cap B=\phi$
(D) $A\cap B\neq\phi$.

Q10 If $x=\dfrac{\left(7+5\sqrt{2}\right)^{\frac{1}{3}}}{2+2\sqrt{2}}$, then x belongs to:

(A) (2, 3)
(B) (0,1)
(C) (– 1, 0)
(D) (3,4)

Q11. Solution set of the inequality $5^{x+2}>\left(\dfrac{1}{25}\right)^{\frac{1}{x}}$ is:

(A) (– 2,0)
(B) (0, ∞)
(C) (– 5,5)
(D) (– 2,2)

Q12. If $(\log_5 x)^2 + \log_5 x < 2$, then x belong to:

(A) $\left(\frac{1}{25}, 5\right)$ (B) $\left(\frac{1}{5}, \frac{1}{\sqrt{5}}\right)$

(C) $(1, \infty)$ (D) none of these

Q13. Let A = {p, q, r, s} and B ={1, 2, 3} . Which of the following relations from A to B is not a function?

(A) $R_1 = \{(p, 1), (q, 2), (r, 1), (s, 2)$ (B) $R_2 = \{(p, 1), (q, 1), (r, 1), (s, 1)$

(C) $R_3 = \{(p, 1), (q, 2), (r, 2), (s, 2)$ (D) $R_1 = \{(p, 2), (q, 3), (r, 2), (s, 2)$

Q14. If the binary operation*, defined on Q, is defined as a*b = 2a + b –ab, for all as b ∈ Q find the value of 3*4.

Q15. Let* is the binary operation on N given by a*b = HCF (a, b) where, a, b ∈ N. write the value of 22*4.

Q16. Let *: R × R → R is defined as a*b = 2a + b. find (2*3)*4.

Q17. If f : R is defined by f(x) = 3x + 2, then define f[f(x)].

Q18. What is the range of the function $f(x) = \frac{|x-1|}{x-1}, x \neq 1$?

[Hots Delhi 2010]

Q19. If f : R → R be defined by $f(x) = (3-x^3)^{1/3}$, then find fof(x).

Q20. If f is an invertible function, defined as $f(x) = \frac{3x-4}{5}$, then write $f^{-1}(x)$.

Q21. Prove that the relation R in Set A = {1, 2, 3, 4, 5,} Given by R = {(a , b) : $|a - b|$ is even} is an equivalence relation. [Delhi 2009]

Q22. Consider f : $R_+ \rightarrow [4, \infty)$ given by f (x) = x^2+4. Show that f is invertible with the inverse f^{-1} of f given by $f^{-1}(y) = \sqrt{y-4, where\ R_+}$ is the set of all non-negative real numbers.
[Hots: All India 2013; Foreign 2011]

23. Show that the function f : W $\rightarrow$ W defined by f(n) $= \begin{Bmatrix} n+1, if\ n\ is\ even \\ n-1, if\ n\ is\ odd \end{Bmatrix}$ is a bijective function. [All India 2011C]

24. Let Z be the set of all integers and R is the relation on Z defined as R = {(a, b): a, b ∈ Z and a– b is divisible by 5 } Prove that R is an equivalence relation. [HOTS; Delhi 2010]

25. Show that relation R in the set of real numbers, defined as R = {(a, b): a ≤ b^2} is neither reflexive, nor symmetric nor transitive. [Foreign 2009]