Marathon 7

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Chapter 7 – Sets, Relations, Functions

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Questions Based on Sets

Question

$\left\{1-(-1)^{x}\right\}$ for all integral x is the set:

(a) {0} (b) {2} (c) {0, 2} (d) None

Question

The set {0, 2, 4, 6, 8, 10} can be written as:

(a) $\left\{2x \mid 0 < x < 5\right\}$ (b) $\left\{x : 0 < x < 5\right\}$ (c) $\left\{2x : 0 \le x \le 5\right\}$ (d) None

Question

The null set is represented by:

(a) $\{\phi\}$ (b) $\{0\}$ (c) ϕ (d) None

Question

If $A = \{1, 2, 3, 5, 7\}$, and $B = \{x^2 : x \in A\}$, then:

(a) $n(B) = n(A)$ (b) $n(B) > n(A)$ (c) $n(A) = n(B)$ (d) $n(A) < n(B)$

Question

The sets $V = \{x \mid x + 2 = 0\}$, $R = \{x \mid x^2 + 2x = 0\}$, and $S = \{x : x^2 + x - 2 = 0\}$ are equal to one another if x is equal to:

(a) –2 (b) 2 (c) ½ (d) None

Question

If R is the set of positive rational number and E is the set of real numbers then:

(a) $R \subseteq E$ (b) $R \subset E$ (c) $E \subset R$ (d) None

Question

If I is the set of isosceles triangles and E is the set of equilateral triangles, then:

(a) $I \subset E$ (b) $E \subset I$ (c) $E = I$ (d) None

Question

If R is the set of isosceles right-angled triangles and I is set of isosceles triangles, then:

(a) $R = I$ (b) $R \supset I$ (c) $R \subset I$ (d) None

Question

Two finite sets respectively have x and y number of elements. The total number of subsets of the first is 56 more than the total number of subsets of the second. The value of x and y respectively?

(a) 6 and 3 (b) 4 and 2 (c) 2 and 4 (d) 3 and 6

Question

The numbers of proper subsets of the set {3, 4, 5, 6, 7} is:

(a) 32
(b) 31
(c) 30
(d) 25

Question

Let $A=\{a, b\}$. Set of subsets of A is called power set of A denoted by $P(A)$. Now, $n(P(A))$ is:

(a) 2 (b) 4 (c) 3 (d) None

Question

If E is a set of positive even numbers and O is a set of positive odd numbers, then $E \cup O$ is a:

(a) set of whole numbers (b) N (c) set of rational numbers (d) None

Question

$A \cup A$ is equal to:

(a) A (b) E (c) ϕ (d) None

Question

$A \cup E$ is equal to (E is a superset of A):

(a) A (b) E (c) ϕ (d) None

Question

$E \cup E$ is equal to (E is a superset of A):

(a) E (b) ϕ (c) $2E$ (d) None

Question

$A \cap A$ is equal to:

(a) ϕ (b) A (c) E (d) None

Question

$A \cap E$ is equal to (E is a superset of A):

(a) A (b) E (c) ϕ (d) None

Question

$A \cap \phi$ is equal to (E is a superset of A):

(a) A (b) E (c) ϕ (d) None

Question

If $A \Delta B = (A - B) \cup (B - A)$, and $A = \{1, 2, 3, 4\}$, $B = \{3, 5, 7\}$ then $A \Delta B$ is:

(a) {1, 2, 4, 5, 7} (b) {3} (c) {1, 2, 3, 4, 5, 7} (d) None

Question

$A \cap E'$ is equal to (E is a superset of A)

(a) E (b) ϕ (c) A (d) None

Question

$A \cup A'$ is equal to (E is a superset of A)

(a) E (b) ϕ (c) A (d) None

Question

If the universal set E = {x | x is a positive integer < 25}, A = {2, 6, 8, 14, 22}, B = {4, 8, 10, 14}, then

(a) $(A \cap B)' = A' \cup B'$ (b) $(A \cap B)' = A' \cap B'$ (c) $(A' \cap B)' = \phi$ (d) None

Question

A survey shows that 74% of the Indians like grapes, whereas 68% like bananas. What percentage of the Indians like both grapes and bananas?

(a) 36% (b) 42% (c) 55% (d) None

Question

In a class of 60 students, 40 students like Maths, 36 like Science, and 24 like both the subjects. Find the number of students who like either Maths or Science.

(a) 36 (b) 42 (c) 52 (d) None

Question

In a class of 60 students, 40 students like Maths, 36 like Science, and 24 like both the subjects. Find the number of students who like neither Maths nor Science.

(a) 8 (b) 60 (c) 52 (d) None

Question

At a certain conference of 100 people there are 29 Indian women and 23 Indian men. Out of these Indian people 4 are doctors and 24 are either men or doctors. There are no foreign doctors. The number of women doctors attending the conference is:

(a) 2 (b) 4 (c) 1 (d) None

Question

In a class of 60 students, 40 students like Maths, 36 like Science, and 24 like both the subjects. Find the number of students who Maths only.

(a) 16 (b) 42 (c) 52 (d) None

Question

In a survey of 300 companies, the number of companies using different media – Newspapers (*N*), Radio (*R*) and Television (*T*) are as follows: $n(N)=200$, $n(R)=100$, $n(T)=40$, $n(N\cap R)=50$, $n(R\cap T)=20$, $n(N\cap T)=25$, $n(N\cap R\cap T)=5$. Find the number of companies using none of these media.

(a) 20 (b) 250 (c) 30 (d) 50

Question

Out of 2000 employees in an office, 48% preferred Coffee (*C*), 54% liked Tea (*T*), 64% used to smoke (*S*). Out of the total 28% used *C* and *T*, 32% used *T* and *S* and 30% preferred *C* and *S*, only 6% did none of these. The number having all the three is:

(a) 360 (b) 300 (c) 380 (d) None

Question

Out of a group of 20 teachers in a school, 10 teach Mathematics, 9 teach Physics and 7 teach Chemistry. 4 teach Mathematics and Physics but none teach both Mathematics and Chemistry. How many teach Chemistry and Physics? How many teach only Physics?

(a) 3; 2 (b) 2; 3 (c) 4; 5 (d) None

Question

Let Z be the universal set for two sets – A and B. If $n(A)=300$, $n(B)=400$ and $n(A\cap B)=200$, then $n(A'\cap B')$ is equal to 400 provided $n(Z)$ is equal to:

(a) 900 (b) 800 (c) 700 (d) 600

Question

The number of integers from 1 to 100 which are neither divisible by 3 nor by 5 nor by 7 is:

(a) 67 (b) 55 (c) 45 (d) 33

Questions Based on Relations

Question

Let $P = \{1, 3, 6\}$ and $Q = \{3, 5\}$, find $P \times Q$.

(a) $\{(1, 3), (1, 5), (3, 3), (5, 5), (6, 3), (6, 5)\}$
(b) $\{(1, 3), (1, 5), (3, 3), (3, 5), (6, 3), (5, 6)\}$
(c) $\{(1, 3), (1, 5), (3, 3), (3, 5), (6, 3), (6, 5)\}$
(d) None

Question

Given $A = \{2, 3\}$, $B = \{4, 5\}$, $C = \{5, 6\}$ then $A \times (B \cap C)$ is:

(a) $\{(2, 5), (3, 5)\}$ (b) $\{(5, 2), (5, 3)\}$ (c) $\{(2, 3), (5, 5)\}$ (d) None

Question

If $A \times B = \{(3, 2), (3, 4), (5, 2), (5, 4)\}$, find A and B.

(a) $A = \{3, 5\}; B = \{2, 4\}$ (b) $A = \{2, 4\}; B = \{3, 5\}$ (c) $A = \{1\}; B = \{2\}$ (d) None

Question

If the set P has 3 elements, Q four and R two then the set $P \times Q \times R$ contains:

(a) 9 elements (b) 20 elements (c) 24 elements (d) None

Question

If $A = \{1, 2, 3, 4\}$ and $B = \{5, 6, 7,6\}$, then cardinal number of the set $A \times B$ is:

(a) 7 (b) 1 (c) 16 (d) None

Question

For the relation $R = \{(1, 2), (1, 4), (3, 2), (3, 4)\}$, find the Domain and Range.

(a) $Dom(R) = \{1, 3\}; Range(R) = \{2, 4\}$

(b) $Dom(R) = \{1, 4\}; Range(R) = \{2, 4\}$

(c) $Dom(R) = \{1, 3\}; Range(R) = \{2, 3\}$

(d) None

Question

Consider the relation $R = \{(1, 1), (2, 2), (3, 3)\}$ on set $A = \{1, 2, 3\}$. This relation is:

(a) Identity Relation (b) Reflexive Relation (c) Transitive Relation (d) None

Question

Let $A = \{1, 2, 3\}$, then $R_1 = \{(1, 1), (2, 2), (3, 3), (1, 2)\}$

(a) Only Reflexive

(b) Reflexive & Symmetric

(c) Reflexive & Transitive

(d) Equivalence

Question

Let $A = \{1, 2, 3\}$, then $R_2 = \{(1, 1), (2, 2), (1, 2), (2, 1)\}$

(a) Only Symmetric

(b) Reflexive & Symmetric

(c) Reflexive & Transitive

(d) Symmetric & Transitive

Question

Let $A = \{1, 2, 3\}$, then $R_3 = \{(1, 1), (2, 2), (3, 3), (1, 2), (2, 1), (2, 3), (3, 2)\}$

(a) Only Symmetric

(b) Reflexive & Symmetric

(c) Reflexive & Transitive

(d) Symmetric & Transitive

Question

“is perpendicular to” over the set of straight lines in a given plane is:

(a) Reflexive (b) Symmetric (c) Transitive (d) Equivalence

Question

“is the reciprocal of” over the set of non-zero real numbers is:

(a) Symmetric (b) Reflexive (c) Transitive (d) None

Question

"Is smaller than" over the set of eggs in a box is:

(a) Transitive (b) Symmetric (c) Reflexive (d) Equivalence

Question

"Is parallel to" over the set of straight lines is:

(a) Transitive (b) Symmetric (c) Reflexive (d) Equivalence

Question

“Is equal to” over the set of all rational numbers is

(a) Transitive (b) Symmetric (c) Reflexive (d) Equivalence

Question

“has the same father as” over the set of children:

(a) Reflexive (b) Symmetric (c) Transitive (d) Equivalence

Question

$\{(x,\ y): y = x\}$ is:

(a) Reflexive (b) Symmetric (c) Transitive (d) Equivalence

Question

$\{(x, y) : x + y = 2x$ where x and y are positive integers$\}$, is:

(a) Reflexive (b) Symmetric (c) Transitive (d) Equivalence

Question

“Is the square of” over *n* set of real numbers is:

(a) Reflexive (b) Symmetric (c) Transitive (d) Equivalence

Question

Let $A = \{1, 2, 3\}$ and $R = \{(1, 2), (2, 2), (3, 1), (3, 2)\}$. Find the Domain and Range of R^{-1}.

(a) $Dom\left(R^{-1}\right)=\{2, 1\}$; $Range\left(R^{-1}\right)=\{1, 2, 3\}$

(b) $Dom\left(R^{-1}\right)=\{2, 3\}$; $Range\left(R^{-1}\right)=\{1, 2, 3\}$

(c) $Dom\left(R^{-1}\right)=\{1, 3\}$; $Range\left(R^{-1}\right)=\{1, 2, 3\}$

(d) None

Questions Based on Functions

Question

If $f(x) = x^2 - 1$, and $g(x) = \frac{x+1}{2}$, then $\frac{f(3)}{f(3)+g(3)}$ is:

(a) 5/4 (b) 4/5 (c) 3/5 (d) 5/3

Question

If $f(x)=\left(\dfrac{x^2-4}{x-2}\right)$, then $f(2)$ is:

(a) 0 (b) 2 (c) 4 (d) 1

Question

If $f(x) = x+3,\ g(x) = x^2$, then $f(x).g(x)$ is:

(a) $(x+3)^2$

(b) x^2+3

(c) x^3+3x^2

(d) None

Question

Let $f : R \to R$ be defined by:

$$f(x) = \begin{cases} 2x \text{ for } x > 3 \\ x^2 \text{ for } 1 < x \leq 3 \\ 3x \text{ for } x \leq 1 \end{cases}$$

The value of $f(-1) + f(2) + f(4)$ is:

(a) 9 (b) 14 (c) 5 (d) 6

Question

Let N be the set of all natural numbers; then is the rule $f: N \to N : f(x) = 2x \forall x \in N$ a function?

(a) Yes (b) No (c) Can't Say (d) None

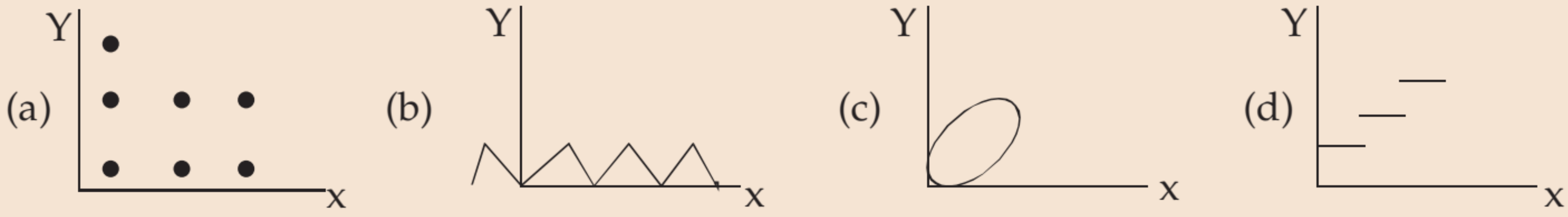
Question

Let $X = \{1, 2, 3, 4\}$ and $Y = \{1, 2, 3\}$. Is the relation $\{(1, 2), (1, 3), (2, 3)\}$ a function from X to Y?

(a) Yes (b) No (c) Can’t Say (d) None

Question

Which of the diagram is graph of a function



Question

Let A = {1, 2, 3, 4} and B = {1, 4, 9, 16, 25}. Consider the rule $f(x) = x^2$. Find the domain and range of the function.

(a) Domain = {1, 2, 3, 4}; Range = {1, 4, 9, 16}
(b) Domain = {1, 2, 3, 4}; Range = {1, 4, 9, 16, 25}
(c) Domain = {1, 2, 3, 4}; Range = {1, 4, 9}
(d) None

Question

The domain and range of $\left\{ (x,\ y) : y = x^2 \right\}$ where $x, y \in R$ is:

(a) (Reals, Natural Numbers)

(b) (Reals, Non-Negative Reals)

(c) (Reals, Reals)

(d) None

Question

The range of {(3, 0), (2, 0), (1, 0), (0, 0)} is:

(a) {0, 0}   (b) {0}   (c) {0, 0, 0, 0}   (d) None

Question

The range of the function $f(x) = \log_{10}(1+x)$ for the domain of real values of x when $0 \leq x \leq 9$ is:

(a) $[0, 1]$ (b) $[0, 1, 2]$ (c) $\{0, -1\}$ (d) None

Question

For the function $h(x)=10^{1+x}$, the domain of real values of x where $0 \le x \le 9$, the range is:

(a) $10 \le h(x) \le 10^{10}$ (b) $0 \le h(x) \le 10^{10}$ (c) $0 < h(x) < 10$ (d) None

Question

Let A = {1, 2, 3} and B = {2, 4, 6}. Consider $f : A \to B : f(x) = 2x$. Is this a one-one function?

(a) Yes (b) No (c) Can't Say (d) None

Question

$\left\{(x,\ y) \mid x+y=5\right\}$ where $x, y \in R$ is:

(a) Not a function (b) Composite function (c) One-one mapping (d) None

Question

The function $f(x) = 2^x$ is:

(a) One-one mapping (b) One-many (c) Many-one (d) None

Question

Let N be the set of all natural numbers and E be the set of all even natural numbers. Then, the function $f : N \rightarrow E : f\left(x\right) = 2x \forall x \in N$ is:

(a) Onto (b) Into (c) Can’t Say (d) None

Question

Let A = {2, 3, 5, 7}, B = {0, 1, 3, 5, 7}. Then, the function $f : A \rightarrow B : f(x) = x - 2$ is:

(a) Onto (b) Into (c) Can't Say (d) None

Question

Let A = {1, 2, 3}, B = {5, 7, 9}. Then, the function $f: A \to B: f(x) = 5$ for all $x \in A$ is:

(a) One-one (b) Onto (c) Constant function (d) None

Question

If $f(x) = 1/1 - x$ and $g(x) = (x-1)/x$, then $fog(x)$ is:

(a) x (b) $1/x$ (c) $-x$ (d) None

Question

If $f(x) = 1/1 - x$ and $g(x) = (x-1)/x$, then $gof(x)$ is:

(a) $x - 1$ (b) x (c) $1/x$ (d) None

Question

If $f(x) = x + 3$, and $g(x) = x^2$, then $fog(x)$

(a) $x^2 + 3$ (b) $x^2 + x + 3$ (c) $(x+3)^2$ (d) None

Question

If $f(x) = x + 3,\ g(x) = x^2$, then $gof(x)$ is:

(a) $(x+3)^2$ (b) $x^2 + 3$ (c) $x^2(x+3)$ (d) None

Question

Find gof for the functions $f(x) = \sqrt{x}$, $g(x) = 2x^2 + 1$

(a) $2x^2 + 1$ (b) $2x + 1$ (c) $(2x^2 + 1)(\sqrt{x})$ (d) $\sqrt{x}$

Question

Let R be the set of real numbers such that the function $f: R \to R$ and $g: R \to R$ are defined by $f(x) = x^2 + 3x + 1$ and $g(x) = 2x - 3$. Find (fog).

(a) $4x^2 + 6x + 1$ (b) $x^2 + 6x + 1$ (c) $4x^2 - 6x + 1$ (d) $x^2 - 6x + 1$

Question

If $A = \{1, 2, 3, 4\}$; $B = \{2, 4, 6, 8\}$; $f(1) = 2$; $f(2) = 4$; $f(3) = 6$; $f(4) = 8$; and $f : A \rightarrow B$, then find f^{-1}.

(a) $f^{-1} = \{(2, 1), (4, 2), (6, 3), (8, 4)\}$

(b) $f^{-1} = \{(2, 1), (4, 2), (6, 3), (3, 4)\}$

(c) $f^{-1} = \{(3, 1), (4, 2), (6, 3), (3, 4)\}$

(d) None

Question

Find the inverse of $f(x) = 2x$ is:

(a) $1/2x$ (b) $\frac{x}{2}$ (c) $1/x$ (d) None

Question

The inverse h^{-1} when $h(x) = \log_{10} x$ is:

(a) $\log_{10} x$ (b) 10^x (c) $\log_{10}(1/x)$ (d) None

Question

If $f\left(x\right)=1/1-x$, then $f^{-1}\left(x\right)$ is:

(a) $1-x$ (b) $\left(x-1\right)/x$ (c) $x/\left(x-1\right)$ (d) None

Question

The inverse function f^{-1} of $f(y) = 3y$ is:

(a) $1/3y$

(b) $y/3$

(c) $-3y$

(d) $1/y$

Question

A function $f(x)$ is an even function, if:

(a) $-f(x) = f(x)$ (b) $f(-x) = f(x)$ (c) $f(-x) = -f(x)$ (d) None