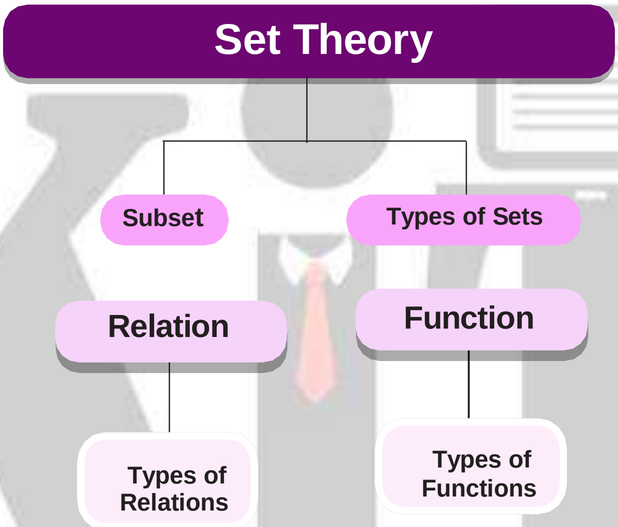
CHAPTER - 7
SETS, RELATIONS AND FUNCTIONS



<table>
<tr><td>SET</td><td>A set is defined to be a collection of well – defined distinct objects. This collection may be listed or described. Each object is called an element of the set. We usually denote sets by capital letters and their elements by small letters

<table>
<tr><td>Singleton set</td><td>A set containing one element is called singleton</td></tr>
<tr><td>Equal set</td><td>Two sets A & B are said to be equal, written as A = B if every element of A is in B and every element of B is in A.</td></tr>
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<tr><td>VENN DIAGRAMS</td><td></td></tr>
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<tr>
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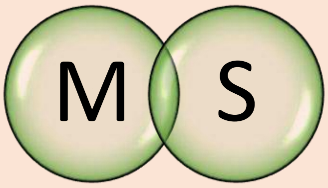
<td>A venn diagram is a diagram that shows all possible logical relation between a fine collections of different sets. These diagram depict elements as point in the plane, and sets as region inside closed curves.
</td>
</tr>
<tr>
<td>EQUIVALENT SET</td>
<td>Two finite sets A & B are said to be equivalent if n (A) = n (B).</td>
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<tr>
<td>POWER SET</td>
<td>The collection of all possible subsets of a given set A is called the power set of A, to be denoted by P (A).
1. A set containing n elements has 2^n subsets.
2. A set containing n elements has 2^{n-1} proper subsets</td>
</tr>
<tr>
<td>PRODUCT SETS</td>
<td><table>
<tr><td>Ordered Pair</td><td>Two elements a and b, listed in a specific pair, denoted by (a, b).</td></tr>
<tr><td>Cartesian Product of sets</td><td>If A and B are two non-empty sets, then the set of all ordered pairs (a, b) such that a belongs to A and b belongs to B, is called the Cartesian product of A and B, to be denoted by A × B. Thus, A × B = {(a, b) : a : A and b : B} If</td></tr>
</table></td>
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<tr>
<td>RELATION AND FUNCTION</td>
<td>Any subset of the product set X,Y is said to define a relation from X to Y and any relation from X to Y in which no two different ordered pairs have the same first elements is called a function.
Let A and B be two non-empty sets. Then, a rule or a correspondence f which associates to each element x of A, a unique element, denoted by f(x) of B is called a function or mapping from A to B and we write f : A=B</td>
</tr>
<tr>
<td>DOMAIN & RANGE OF A FUNCTION</td>
<td>Let f: A= B then, A is called the domain of f, while B is called the co-domain off.
The set f (A) = {f(x): x =A} is called the range of f.</td>
</tr>
</table>

VARIOUS TYPES OF FUNCTION

IDENTITY FUNCTION	•Let A be a non-empty set . Then, the function I defined by I : A * A : I (x) = x for all x =A is called an identity function on A
EQUAL FUNCTION	•Two functions f and g are said to be equal, written as f = g if they have the same domain and they satisfy the condition f(x) = g(x), for all x.
INVERSE FUNCTION	•Let f be a one-one onto function from A to B. Let y be an arbitrary element of B. Then f being onto, there exists an element x in A such that f (x) = y A function is invertible if and only if f is one-one onto.

ONE -ONE FUNCTION	•Let f : A*B. If different elements in A have different images in B, then f is said to be a one-one or an injective function or mapping
ONTO or SURJECTIVE FUNCTION	•Let f : A*B. If every element in B has at least one pre- image in A, then f is said to be an onto function. If f is onto, then corresponding to each y = B, we must be able to find at least one element x A such that y = f (x)Clearly, f is onto if and only if range of f = B
BIJECTION FUNCTION	•A one-one and onto function is said to be bijective

Different types of relations	Let S = {a, b, c, ...} be any set then the relation R is a subset of the product set S×S **i)** If R contains all ordered pairs of the form (a, a) in S×S, then R is called reflexive. In are *flexible* relation 'a' is related to itself. For example, 'Is equal to' is a reflexive relation for a = a is true. **ii)** If (a, b) =R =(b, a) R for every a, b*S then R is called symmetric For Example, a = bb = a. Hence the relation 'is equal to' is a symmetric relation. ***iii)*** If (a, b) =R and (b, c) =R (a, c) R for every a, b, c, S then R is called transitive. For Example a = b, b = c, a = c. Hence the relation 'is equal to' is a transitive relation. A relation which is reflexive, symmetric and transitive is called an *equivalence relation* or simply equivalence. 'is equal to' is an equivalence relation. Similarly, the relation "is parallel to" on the set S of all straight lines in a plane is an equivalence relation.
Domain & Range of a	If R is a relation from A to B, then the set of all first co-

relation	ordinates of elements of R is called the domain of R, while the set of all second co-ordinates of elements of R is called the range of R.

Question1

Which of the following statements is used to create an empty set?

(a) { }

(b) Set ( )

(c) [ ]

(d) **( )**

Answer: b

Explanation:

{ } Creates a dictionary not a set. Only set ( ) creates an empty set.

Question 2

What is the output of the following piece of code when executed in the python shell?

(a) { 2, 3}

(b) Error, duplicate item present in list

(c) Error, no method called Intersection update for set data type

(d) { 1, 4, 5 }

Answer: a

Explanation:

The method intersection update returns a set which is an intersection of both the sets.

Question 3

Which of the following lines code will result is an error?

(a) {abs}

(b) s = {4, ‘abc’, (1,2) }

(c) { 1, 2, 5, 9}

(d) {1, 5, 7, 9, 11}

Answer: d

Explanation:
The line: s= {san} will result is an error because 'san' is not defined. The line s= {abs} does not result in an error because abs is a built – in function. The other sets shown do not result in an error because all the items are has h able.

Question 4
What is the output of the code shown below?
S=set ([1, 2, 3,])
S, union ([4, 5})
S|([4, 5])
(a) {1, 2, 3, 4, 5} {1, 2, 3, 4, 5}
(b) Error {1, 2, 3, 4, 5}
(c) {1, 2, 3, 4, 5} Error
(d) Error
Answer: c
Explanation:
The first function in the code shown above returns the set { 1, 2, 3, 4, 5}. This is because the method of the function union allows any alterable. However, the second function results in an error because f unsupported data type that is list and set.

Question 5
What is the output of the line of code shown below, if s1 = {1, 2, 3} Is subset (s1?)
(a) True
(b) Error
(c) No output
(d) Proposition

Answer: a
Explanation:
Every set is a subset of itself and hence the output of this line of code is true.

Question 6
A _____ is an ordered collection of objects.
(a) Relation
(b) Function
(c) Set
(d) Proposition

Answer: c
Explanation:
A set is an ordered collection of objects.

Question 7

The set of odd positive integers less than 10 can be expressed by _____

(a) {1, 2, 3}
(b) {1, 3, 5, 7, 9}
(c) {1, 2, 5, 9}
(d) {1, 5, 7, 9, 11}

Answer: b

Explanation:

Odd numbers less than 10 is {1, 3, 5, 7, 9}.

Question 8

Power set of empty set has exactly ____ subset.

(a) 1
(b) 2
(c) 0
(d) 3

Answer: a

Explanation:

Power set of null set has exactly one subset which is empty set.

Question 9

What is the Cartesian product of A = {1, 2} and B = {a, b}?

(a) {(1, a), (1, b), (2, a), (b, b)}
(b) {(1, 1), (2, 2), (a, a), (b, b)}
(c) {(1, a), (2, a), (1, b), (2, b)}
(d) {(1, 1), (a, a), (2, a), (1, b)}

Answer: c

Explanation:

A subset R of the Cartesian Product A x B is a relation from the set A to the set B.

Question 10

The Cartesian product B x A is equal to the Cartesian product A x B. Is it True or False?

(a) True
(b) False
(c) Partial true
(d) Not sure

Answer: b

Explanation:

Let A = {1, 2} and B = {a, b}. The Cartesian product A x B = {(1, a), (1, b), (2, a), (2, b)} and the Cartesian product B x A = {(a, 1), (a, 2), (b, 1), (b, 2)}. This is not equal to A x B

Question 11

What is the cardinality of the set of odd positive integers less than 10?

(a) 10
(b) 5
(c) 3
(d) 20

Answer: b

Explanation:

Set S of odd positive an odd integer less than 10 is {1, 3, 5, 7, 9}. Then Cardinality of set S = $|S|$ which is 5.

Question 12

Which of the following two sets are equal?

(a) A = {1, 2} and B = { 1 }
(b) A = {1, 2} and B = {1, 2, 3}
(c) A = {1, 2, 3} and B = {2, 1, 3}
(d) A = {1, 2, 4} and B = {1, 2, 3}

Answer: c

Explanation:

Two set are equal if and only if they have the same elements.

Question13

The set of positive integers is ________-

(a) Infinite
(b) Finite
(c) Subset
(d) Empty

Answer: a

Explanation:

The set of positive integers is not finite

Question 14

What is the Cardinality of the power set of the set {0, 1, 2}.

(a) 8
(b) 6
(c) 7
(d) 9

Answer: a

Explanation:

Power set P ({0, 1, 2}) is the set of all subsets of {0, 1, 2}. Hence, P ({0, 1, 2}) = {null, {0}, {1}, {2}, {0, 1}, {0, 2}, {0, 1, 2}}.

Question15

The members of the set S = {x |x is the square of an integer and x < 100} is _________

(a) {0, 2, 4, 5, 9, 58, 49, 56, 99,12}
(b) {0, 1, 4, 9, 16, 25, 36, 49, 64, 81}
(c) {1, 4, 9, 16, 25, 36, 64, 81, 85, 99}
(d) {0, 1, 4, 9, 16, 25, 36, 49, 64, 121}

Answer: b

Explanation:

The set S consist of the square of an integer less than 10.

Question16

Let the set A is the {1, 2, 3} and B is {2, 3, 4}. Then number of elements in A U B is

(a) 4 (b) 5
(c) 6 (d) 7

Answer: a

Explanation:

AUB is {1, 2, 3, 4}

Question 17

Let the set A is {1, 2, 3} and B is {2, 3, 4}. Then number of elements in A ∩ B is

(a) 1 (b) 2
(c) 3 (d) 4

Answer: b

Explanation:

A ∩ B is {2, 3}

Question 18

Let the set A is {1, 2, 3} and B is {2, 3, 4}. Then the set A – B is

(a) {1, -4} (b) {1,2,3}
(C) {1} (d) {2, 3}

Answer: c

Explanation:

In A – B the common elements get cancelled.

Question 19

In which of the following sets A - B is equal to B – A

(a) A = {1,2,3}, B = {2,3,4} (b) A = {1, 2, 3}, B = {1,2,3,4}
(c) A = {1, 2, 3}, B = {2, 3, 1} (d) A = {1, 2, 3, 4, 5, 6}, B = {2, 3, 4, 5, 1

Answer: c

Explanation:

A-B = B-A = Empty set.

Question 20

Let A be set of all prime numbers; B be the set of all even prime numbers. C be the set of all odd prime numbers, then which of the following is true?

(a) A = B ∪ C
(b) B is a single on set
(c) A = C ∪ {2}
(d) All of the mentioned

Answer: d

Explanation:

2 is the only even prime number.

Question 21

If A has 4 elements B has 8 elements, then the minimum and maximum number of elements in A ∪ B are respectively

(a) 4, 8
(b) 8, 12
(C) 4, 12
(d) None of the mentioned

Answer: b

Explanation:

Minimum would be when 4 elements are sane as in 8, maximum would be when all are distinct.

Question 22

If A is {{Φ}, {Φ, {Φ}}, then the power set of A has how many elements?

(a) 2
(b) 4
(c) 6
(d) 8

Answer: b

Explanation:

The set A has got 2 elements so n (P (A)) = 4.

Question 23

Two sets A and B contains a and b elements respectively. If power ser of A contains 16 more elements than that of B, value of 'b' and 'a' are respectively

(a) 5, 4
(b) 6, 7
(c) 2, 3
(d) None of the mentioned

Answer: a

Explanation:

32 – 16 = 16, hence a=5, b=4

Question 24

Let A be {1, 2, 3, 4}, U be set of all natural numbers, then U-A' (complement of A) is given by set.

(a) {1, 2, 3, 4, 5, 6, …….}
(b) {5, 6, 7, 8, 9, …….}
(c) {1, 2,3, 4}
(d) All of the mentioned

Answer: c

Explanation:

U-A' = A.

Question 25

Which sets are not empty?

(a) {x:x is a even prime greater than 3}
(b) {x:x is a multiple of 2 and is odd}
(c) {x:x is an even number and x+3 is even}
(d){x:x is a prime number is less than 5 and is odd}

Answer: d

Explanation:

Because the set is {3}

Question 26

If A, B and C are any three sets, then A-(B∩C) is equal to

(a) (A – B) ∪ (A – C)
(b) (A – B) ∩ (A – C)
(c) (A – B) ∪ C
(d) None

Answer: a

Explanation:

From De Morgan's Law, A – (B ∩ C) = (A – B) ∪ (A – C)

Question 27

Which of the following is the empty set?

(a) {x:x is a real number and $x^2 - 1 = 0$
(b) {x:x is a real number and $x^2 + 1 = 0$
(c) {x : x is a real number and $x^2 - 9 = 0$
(d) {x : x is a real number and $x^2 = x + 2$

Answer: d

Explanation:

Since $x^2 - 1 = 0$, given $x^2 = -1$

$x = \pm 1$

$\therefore$ No value of x is possible

Question 28

If a set A has n elements, then the total number of subsets of A is

(a) n (b) n^2

(c) 2^n (d) 2n

Answer: c

Explanation:

Number of subsets of A = n_{c_0} + n_{c_1} ....+n_{c_n} = 2^n

Question 29

If A and B are any two sets, then A∪(A∩B) is equal to

(a) A (b) B

(c) A^c (d) B^c

Answer: a

Explanation:

A∩B⊆A. Hence A∪ (A∩B) = A

Question 30

If two sets A and B are having 99 elements in common, then the number of elements common to each of the sets A x B and B x A are

(a) 2^{99} (b) 99^2

(c) 100 (d) 18

Answer: b

Explanation:

n ((A x B)∩(B x A))

=n ((A∩B) x (B∩A)) = n (A∩B).n (B∩A)

= n (A∩B).n (A∩B) = (99) (99) = 99^2

Question 31

If A = {x : x is a multiple of 4} and B = { x : x is a multiple of 6} then A∩B consists of all multiples of?

(a) 16 (b) 12

(c) 8 (d) 4

Answer: b

Explanation:

A = {4, 8, 12, 16, 20, 24 ......}

B = {6, 12, 18, 24, 30, ... A⊂B = {12, 24, ...}

= { x : x is a multiple of 12}.

Question 32

If A = {1, 2, 3, 4, 5}, B = {2, 4, 6}, C = {3, 4, 6}, Then (A∪B)∩C is

(a) {3, 4, 6}
(b) {1, 2, 3}
(c) {1, 4, 3}
(d) None of these

Answer: a

Explanation:

A∪B = {1, 2, 3, 4, 5, 6} \ (A∪B) ∩C = {3, 4, 6}

Question 33

If n (A) =4, n (B) =3, n (A×B×C) =24, then n(C) =

(a) 288
(b) 1
(c) 2
(d) 17

Answer: c

Explanation:

n(A)=4, n(B)=3n(A)×n(B)×n(C)=n(A×B×C)4×3×n(C)=24

$n(C)=\frac{24}{12} = 2$

Question 34

If A = {2, 3, 5}, B = {2, 5, 6}, then (A – B) × (A ∩ B) is

(a) {(3, 2), (3, 3), (3, 5)}
(b) {(3, 2), (3, 5), (3, 6)}
(c) {(3, 2), (3, 5)}
(d) None of these

Answer: c

Explanation:

A-B = {3}, A∩B = {2, 5}

(A – B)× (A∩B) = {(3, 2); (3, 5)}

Question 35

The set of intelligent students in a class is [AMU 1998]

(a) A null set
(b) A singleton set
(c) A finite set
(d) Not a well definite collection

Answer: d

Explanation:

Since, intelligence is not defined for students in a class i.e. Not a well defined collection.

Question 36

If A and B be any two sets, then (A∩B)' is equal to

(a) A'∩B'
(b) A'∪B'

(c) $A \cap B$ (d) $A \cup B$

Answer: b

Explanation:

From De' Morgan's Law, $(A \cap B)' = A' \cup B'$

Question 37

In a class of 100 students, 55 students have passed in Mathematics and 67 students have passed in physics. Then the number of students who have passed in Physics only is

(a) 22 (b) 33

(c) 10 (d) 45

Answer: d

Explanation:

$n(M) = 55$, $n(P) = 67$, $n(M \cup P) = 100$ Now,

$n(M \cup P) = n(M) + n(P) - n(M \cap P)$

$100 = 55 + 67 - n(M \cap P)$\n $(M$?$P) = 122 - 100 = 22$

Now $n(P \text{ only}) = n(P) - n(M \cap P) = 67 - 22 = 45$

Question 38

20 teachers of a school either teach mathematics or physics. 12 of them teach mathematics while 4 teach both the subjects. Then the number of teachers teaching physics only is

(a) 12 (b) 8

(c) 16 (d) None of these

Answer: a

Explanation:

Let n (P) = Number of teachers in Physics. n (M)

= Number of teachers in Math's $n(P \cup M) = n(P) + n(M) - n(P \cap M)$

$20 = n(P) + 12 - 4$

$= n(P) = 12$

Question 39

In a battle 70% of the combatants lost one eye, 80% an ear, 75% an arm, 85% a leg, x% lost all the four limbs. The maximum value of x is

(a) 10 (b) 12

(c) 15 (d) None of these

Answer: a

Explanation:
Minimum value of 1+ba>0
= 100 – 90 =10

Question 40

If A and B are not disjoint sets, then $n(A\cup B)$ is equal to [Kerala (Engg.) 2001]

(a) $n(A)+n(B)$
(b) $n(A)+n(B)-n(A\cap B)$
(c) $n(A)+n(B)+n(A\cap B)$
(d) $n(A)n(B)n(A)-n(B)$

Answer: b

Explanation:
$n(A\cup B) = n(A) + n(B) - n(A\cap B)$

Question 41

Let A and B be two sets such that $n(A)=0.16$, $n(B)=0.14$, $n(A\cup B)=0.25$. Then $n(A\cap B)$ is equal to

(a) 0.3
(b) 0.5
(c) 0.05
(d) None of these

Answer: c

Explanation:
$n(A\cup B) = n(A)+n(B)-n(A\cap B)$
$0.25=0.16+0.14-n(A\cap B)$
$n(A\cap B) = 0.30-0.25=0.05$

Question 42

Let A and B be two sets then $(A\cup B)'\cup(A'\cap B)$ is equal to

(a) A'
(b) A
(C) B'
(d) None of these

Answer: a

Explanation:
From Venn-Euler's Diagram
$\therefore (A\cup B)'\cup(A'\cap B) = A'$

Question 43

If A and B are two sets then $(A - B) \cup (B - A) \cup (A \cap B)$ is equal to

(a) $A \cup B$
(b) $A \cap B$
(c) A
(d) B'

Answer: a

Explanation:

From Venn-Euler's diagram
$\therefore$ (A – B)∪(B – A) ∪ (A∩B)

Question: 44

The shaded region in the given figure is:

(a) A ∩ (B ∪ C)
(b) A ∪ (B ∩ C)
(c) A ∩ (B – C)
(d) A – (B ∪ C)

Answer: d

Explanation:

From Venn-Euler's diagram, A – (B ∪ C)

Question 45

If A and B are two sets, then A∪B=A∩B

(a) A×B
(b) B+A
(c) A = B
(d) None of these

Answer: c

Explanation:

Let X∈A → X∈A∪B, [∴A⊆A∪B]
= X∈A∩B, [∴A∪B = A∩B]
= X∈A and X∈B
P × ∈B, \A⊆B
Similarly X∈B
= X∈A\B⊆A Now A⊆B, B⊆A
= A=B

Question 46

The number of non-empty subsets of the set {1, 2, 3, 4} is

(a) 15
(b) 14
(c) 16
(d) 17

Answer: a

Explanation:

The number of non – empty subsets = 2^n -1
2^4 – 1 = 16 – 1 = 15

Question 47

Which set is the subset of all given sets

(a) {1, 2, 3, 4, …….}
(b) {1}
(c) {0}
(d) { }

Answer: d

Explanation:
Null set is the subset of all given sets.

Question 48
A = {x: x ≠ x} represents
(a) {0} (b) { }
(c) {1} (d) {x}
Answer: b
Explanation:
It is fundamental concept.

Question 49
If A= {2, 4, 5}, B= {7, 8, 9}, then n (A × B) is equal to
(a) 6 (b) 9
(c) 3 (d) 0
Answer: b
Explanation:
A × B = {(2, 7), (2, 8), (2, 9), (4, 7), (4, 8), (4, 9), (5, 7), (5, 8), (5, 9)} n (A × B) = n
n = 3 × 3 = 9.

Question 50
In a city 20 percent of the population travels by car, 50 percent travels by bus and 10 percent travels by both car and bus. Then persons travelling by car or bus are
(a) 80 percent (b) 40 percent
(c) 60 percent (d) 70 percent
Answer: c
Explanation:
n(c) = 20, n(B)= 50, n (C∪B) = 10 Now n (C∩B) = n(C)+ n(B) – n(C∪B) = 20 + 50 -10 = 60
Hence the required number of persons = 60%

Question 51
At a certain conference of 100 people there are 29 Indians women and 23 Indian men, out of these Indian people 4 are doctors and 24 are either men or doctor. There are no foreign doctors. The numbers of women doctors attending the conference is:
(a) 2 (b) 4

(c) 1 (d) None of these

Answer: c

Explanation:

Let, M = Indian men, W = Indian women, D = Indian doctors.

According to question, n (M ∪ D) = 24, n (M) = 23, n (W) = 29, n (D) = 4.

As per the set rule, n (M ∪ D) = n (M) + n (D) – n (M ∩ D). This implies, n (M∩D) = 3.

Since, three men are doctors, therefore, number of women doctors = 4-3 =1

Question 52

The minimum value of the function f(x) = x^2 – 6x + 10 is:

(a) 1 (b) 2

(c) 3 (d) 10

Answer: a

Explanation:

F(x) = x^2 – 6x + 10

F(x) = 2x - 6

F(x) = 0 → 2x = 6 → x = 3

F (3) 3^2 – 6 × 3 + 10 = 19 -18 =1

Question 53

If (x) = $x^3 + \frac{1}{x^4}$ then value of f(x)-f (1/x) is equal to

(a) 0 (b) 1

(c) $x^3 + \frac{1}{x^4}$ (d) None of these

Answer: a

Explanation:

$x^3 + \frac{1}{x^4} - \frac{1}{x^3} + x^4$

$\frac{x^3}{x^3} + \frac{x^4}{x^4}$

-1+1 = 0

Question 54

"Is parallel to " over the set of straight line in a given plane is:

(a) Reflexive (b) Symmetric

(c) Transitive (d) Equivalence Relation

Answer: d

Explanation:

Equivalent relation: An equivalent relation on a set S, is a relation on S which is reflexive, symmetric and transitive. Example: Let S = Z and define R = {(x, y) x and y have the same parity} i.e. x and y are either both even or both odd.

PREPARE FOR WORST

Question 1

If A = [(x, y): x2 + y2 = 25] and B = [(x, y) : x2 + 9y2 = 144], then A ∩ B contains ______ points.

(a) 6 (b) 8
(c) 16 (d) 4

Question 2

In a college of 300 students, every student reads 5 newspapers and every newspaper is read by 60 students. The number of newspapers is

(a) 25 (b) 18
(c) 16 (d) 78

Question 3

If f(x) = $\frac{x-3}{x+1}$, then f[f{f(x)}] equals _____ .

(a) f ([3+x] /[1-x]) (b) f ([89+x] /[1-x])
(c) f ([3-x] /[1-x]) (d) none

Question 4

Let f: R → R be defined by f (x) = 2x + |x|, then f (2x) + f (−x) − f (x) = ______.

(a) 4x (b) 2|x|
(c) 3|x| (d) none

Question 5

.If f (x) =$\frac{x^2-1}{x^2+1}$, for every real number. Then what is the minimum value of f?

(a) 1 (b) 2
(c) 3 (d) 4

Question 6

The Cartesian product A × A has 9 elements among which are found (–1, 0) and (0, 1). Find the set A and the remaining elements of A × A.

(a) (-1, -1), (-1, 1), (0, -1), (0, 0), (1, -1), (1,0) and (1, 1)
(b) (-1, 1), (1, 1), (0, -1), (0, 0), (1, -1), (1, -1) and (1, 1).
(c) Neither a or b
(d) can't Justify

Question 7

Express the function f: A—R.f(x) = x2 – 1. Where A = {-4, 0, 1, 4) as a set of ordered pairs.

(a) {(-4, 15), (0, -1), (1, 0), (4, 15)}
(b) (-1, 1), (1, 1), (0, -1), (0, 0), (1, -1), (1, -1) and (1, 1).
(c) Neither a or b
(d) . {(4, 15), (1, 1), (1, 0), (4, -15)}

Question 8

Assume that A = {1, 2, 3… 14}. Define a relation R from A to A by R = {(x, y): 3x – y = 0, such that x, y , A}. Determine and write down its range, domain, and codomain.

Question 9

If R = {(a, a^3): a is a prime number less than 5} ne a relation. Find the Range of R.

(a) {8,27}
(b) {-8,27}
(c) Neither a or b
(d) Both a & b

Question 10

If R = {(x, y): x+2y = 8} is a relation on N, then write the range of R.

(a) {8,2,7}
(b) {3,2,1}
(c) Neither a or b
(d) Both a & b

Question 11

If A= {1,2,3}; {4,5,6,7} and f={(1,4), (2,5),(3,6) is a function from A to B. State whether f is one- one or not

(a) One - One
(b) One- Two
(C) One to Many
(d) Many to One

ANSWERS AVAILABLE ON:

- **TELEGRAM CHANNEL: t.me/KINSHUKInstitute**
- **WEBSITE : WWW.KITest.IN**
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Past Examination Questions

MAY - 2018

Question 1

Let N be the set of all natural numbers; E be the set of all even natural numbers then the function

F: N = E defined as f(x) = 2x – VxEN is =

(a) One-one-into (b) Many-one-into

(c) One-one onto (d) Many-one-onto

Answer: c

Given

N = {1, 2, 3, 5, 6 ………… ∞}

E = {2, 4, 6, 8 …………∞}

F: N → E

f(x) = 2x – V × EN

F(x) = -2x

F (1) = 2 X 1 = 2

F (2) = 2 X 2 = 4

F (3) = 2 X 3 = 6

Range of function = {2, 4, 6, ……..} = E

And / (X1) = f) X2)

2 ×1 = 2 × 2 = X2

So f(x) function is one-one and onto.

Question 2

In a town of 20,000 families it was found that 40% families buy newspaper. A_1 20% families buy newspaper B and 10% families buy newspaper c, 5% families buy A and B, 3% buy B and C and A and C if 2% families buy all the three newspapers, then the number of families which by A only is :

(a) 6600 (b) 6300

(c) 5600 (d) 600

Answer: a

Explanation:

Total Families n (u) = 20000

No. of families who buy Newspapers 'A' n (A) = 40% of 20000 = 8000

No. of families who buy Newspapers 'B' n (B) = 20% OF 2000 = 4000

No. of families who buy Newspapers 'C'
N(c) = 10% of 20000 = 2000
No. of families who buy Newspapers A & B
N (A ∩ B) = 5% OF 20000 = 1000
No. of families who buy Newspapers B & C
n (B ∩ C) = 3% OF 20000 = 600
No. of families who buy Newspapers C & A
n(C ∩ A) = 4% OF 20000 = 800
No. of families who buy all Newspapers n (A∩B∩C) = 2% OF 20000 = 400
No. of families who buy Newspapers 'A' only
= n (A ∩ B ∩ C)
= n (A) – n (A n B) – n (A n C) + n (n B n C)
= 8000-1000-800+400 = 6600

Question 3

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

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

Answer: b

A = {3, 4, 5, 6, 7}
n (A)' = 5
No. of proper set = 2^{n-1}
= $2^5 - 1$
= 32-1
= 31

NOV - 2018

Question 1

A is [1, 2, 3, 4} and B is {1, 4, 9, 16, and 25} if a function f is defined from to B where f(x) = x2 then the range of f is:

(a) {1, 2, 3,4} (b) {1, 4, 9, 16}
(c) {1, 4, 9, 16, 25} (d) None of these

Answer: b

Explanation:

Given
A = {1, 2, 3, 4}
B = {1, 4, 9, 16, 25}
If f : A – B and f (x) = x^2

$F(1) = (1)^2 = 1$

$F(2) = (2)^2 = 4$

$F(3) = (3)^2 = 9$

$F(4) = (4)^2 = 16$

Range off = {1, 4, 9, and 16}

Question 2

If A = {1, 2} and B:; {3, 4}. Determined the number of relations from A and B

(a) 3 (b) 16

(c) 5 (d) 6

Answer: b

Explanation:

Given

A = {1, 2}

B = {3, 4}

A x B = {1, 2} x {3, 4}

= {(1, 3) (1, 4) (2, 3) (2, 4)}

n (A×B) = 4

No. of relation from A and B = 2^n

= 2^4

=16

Or

A Shortcut:

A = {1,2}, n (A) = 2

B = {3, 4}, n (B) = 2

No. of relation from A and B = $2^{m\times n}$

$2^{2\times 2}$

= 2^4 = 16

Question 3

If A = {1, 2, 3, 4, 5, 6, 7} and B = {2, 4, 6, 8}. Cardinal member of A – B is:

(a) 4 (b) 3

(c) 9 (d) 7

Answer: a

Explanation:

A = {1, 2, 3, 4, 5, 6, 7}

B = {2, 4, 6, 8}

A – B = {1, 2, 3, 4, 5, 6, 7} – {2, 4, 6, 8}

= {1, 3, 5, 7}

n (A-B) = 4

Question 4

Identify the function from the following:

(a) {(1,1), (1,2), (1,3)} (b) {(1, 1), (2, 1), (2, 3)}

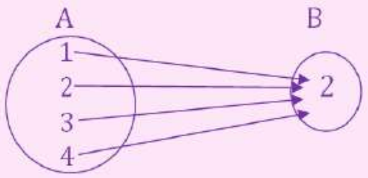
(c) {(1, 2), (2,2), (3,2), (4,2)} (d) None of these

Answer: c

Explanation:

{(1, 2), (2,2), (3,2), (4,2)} is the function

Many one function



MAY - 2019

Question 1

If A = {1, 2, 3, 4, 5, 6, 7, 8, 9}

B = {1, 3, 5, 7, 8}; C= {2, 6, 8,} then find = (A – B) U C

(a) {2, 6} (b) {2, 6, 8}

(c) {2, 6, 8, 9} (d) None of these

Answer: c

Explanation:

A = {1, 2, 3, 4, 5, 6, 7, 8, 9,}

B ={1, 3, 4, 5, 7, 8, }

C = {2, 6, 8}

A-B = {2, 6, 9}

(A – B) U C = {2, 6, 8, 9}

Question 2

If (x) = x² and x=g(x) $\sqrt{x}$ then

(a) go, f(3) = 3 (b) go f (-3) = 9

(c) go, f(9) = 3 (d) go f (-9) = 3

Answer: a

Explanation:

gof = g (f(x)) = $\sqrt{x^2}$

gof = x .... (1)

Put this equations in above objectives
Option first:
go, f(3) =3
Hence option 1 is correct

Question 3

A = {1, 2, 3, 4,…………10} a relation on A, R = $\left\{\frac{(x,y)}{x+y}\right.$ = 10, x ≥ A, y≥A, X ≥ Y}

then Domain of R-1 is

(a) {1, 2, 3, 4, 5} (b) {0, 3, 5, 7, 9}

(c) {1, 2, 4, 5, 6, 7} (d) None of these

Answer: a

Explanation:

{1, 2, 3, 4, 5}

Question 4

If A = {a, b, c, d}: B = {p, q, r, s} which of the following relation is a function from A to B

(a) R_1 = {(a, p), (b, q), (c, s)} (b) R_2 = {(p, a), (b, r), (d, s)}
(c) R_3 = {(b, p), (c, s), (b, r)} (d) R_4 = {(a, p)(b, r)(c, q), (d, s)}

Answer: d

Explanation:

Unique mapping: A map is way of associating unique objects to every element in a given set. So a map from to is a function such that for every, there is a unique object. The terms function and mapping are synonymous for map.

Question 5

The no of subsets of the set {3, 4, 5} is:

(a) 4 (b) 8
(c) 16 (d) 32

Answer: b

Explanation:

Here, A = {3,4, 5}
N (A) = 3
No. of subset = 2^n
= 2^3
= 8

NOV - 2019

Question 1

$(\mathbf{A^T})^\mathbf{T}$ =?

(a) A (b) A^T

(c) $A^T.A^T$ (d) A^{2T}

Answer: a

Explanation:

(a) $(AT)^T = A$

Example $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$

$A^T = \begin{pmatrix} 1 & 3 \\ 2 & 4 \end{pmatrix}$

$(A^T)^T = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} = A$

So, $(A^T)^T = A$

Question 2

F (n) = f (n-1) + f (n-2) when n = 2, 3, 4 ……….f (0) = 0, F (1) = 1 then f (7) =?

(a) 3 (b) 5

(c) 8 (d) 13

Answer: d

Explanation:

(d) F (n) = f (n-1) + f (n-2)

F (2) = f (1) + f (0) = 1 + 0 = 1 = f (2)

F (3) = f (2) + f (1) = 1 + 1 = 2 = f (3)

F (4) = f (3) + f (2) = 2+1 = 3

Similarly,

f (7) = f(6) + f(5)

f (7) = [f(5) + f(4) + [f(4) + f(3)]

f (7) = [f(4) + f(3) + f(4)] + (f(4) + f(3)]

f(7) = [3 + 2 +3] + [3 + 2]

r (7) = 13

Question 3

f(x) = x + $\frac{x+1}{x}$ **find** $f^{-1}(y)$

(a) $\frac{1}{(x-1)}$ (b) $\frac{1}{(y-1)}$

(c) 1_1 (d) x

Answer: a

Explanation:

(a) F(x) = $\frac{x+1}{x}$ ………..Equation (1)

Let f(x) = y

X = $f^{-1}(y)$

Further Solving ………..Equation (1)

Y = $\frac{x+1}{x}$

XY = x + 1 => xy – x = 1 =>x (y – 1) = 1

X = $\frac{1}{(y-1)}$

f^{-1} (y) = $\frac{1}{(y-1)}$

f^{-1}(y) = $\frac{1}{(x-1)}$

DEC - 2020

Question 1

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 no. of sub sets of the second. The values of x,y are respectively ____

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

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

Answer: d

Explanation:

Let A has x elements

Let B has y elements

Total number of students of A=2^m

Total number of students of B=2^n

It is given ⇒2^m-2^n=56

2y(2x−y−1)=56

⇒2^y=even and $2^{x-y}-1$=0 Basic odd

Now,

56=8×7=2^3× 7

⇒2^y ($2^{x-y}-1$) =2^3×7

⇒n=3

Now, 8($2^{y-3}-1$) =8×7

⇒$2^{y-3}-1$=7

⇒2^y-3=8=2^3

⇒y−3=3

⇒y=6.

Question 2

The number of items in the set A is 40, in the Set B is 32; in the Set C is 50; in both A and B is 4; in both A and C is 5; in both B and C is 7; in all the set is 2. How many are in only one set?

(a) 96 (b) 110

(c) 106 (d) 84

Answer: d

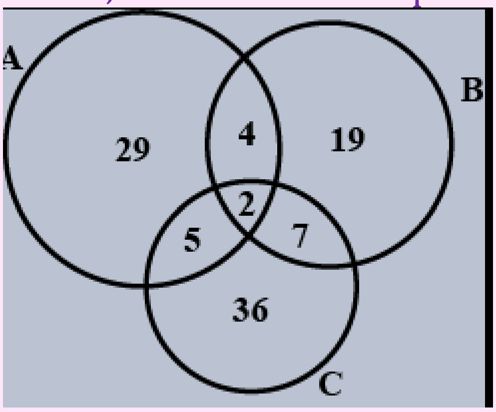
Explanation:

∴ In only one set,

There are 29 + 19 + 36

= 84

Hence, D is the correct option.



Question 3

The set of cubes of natural numbers is

(a) Null set (b) Finite set

(c) Infinite set (d) A finite set of three numbers

Answer: c

Explanation:

A set is countable infinite if its elements can be put in one-to-one correspondence with the set of natural numbers. For example, the set of integers {0, 1, −1, 2, −2, 3, −3,} is clearly infinite.

Question 4

The inverse function f^{-1} of F(y) = 3x is ______

(a) 1/3y (b) y/3

(c) -3y (d) 1/y

Answer: b

Explanation:

F(y) = 3x

y=3x

x= $y/3$

$y = \frac{x}{3}$ so $x = \frac{y}{3}$

Jan - 2021

Question: 1

The set of cubes of natural number is

(a) Null set
(b) A finite set
(c) An infinite set
(d) Singleton set

Answer: c

Explanation:

The set of cubes of the natural numbers is an infinite set.

Question: 2

In the set of all straight lines on a plane which of the following is Not True?

(a) 'Parallel to' an equivalent relation
(b) 'Perpendicular to' is a symmetric relation
(c) 'Perpendicular to' is an equivalence relation
(d) 'Parallel to' is a reflexive relation.

Answer: c

Explanation:

Perpendicular to' is an equivalence relation

Question: 3

Let F. R ➔ R be defined by

$$F(x) = \begin{cases} 2x \; for & x > 3 \\ x^2 \; for & 1 < x \leq 3 \\ 3x \; for & x \leq 1 \end{cases}$$

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

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

Answer: a

Explanation:

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

$f(-1) = 3(-1) = -3$

$f(2) = 2^2 = 4$
$f(4) = 2(4) = 8$
$= -3 + 4 + 8 = 9$

July – 2021

Question 1

Let U be the universal set, A and B are the subsets of U. If n (U) = 650, n (A) =310, n (A∩B) = 95 and n (B) = 190, then $n(\overline{A} \cap \overline{B})$ is equal to ($\overline{A}$ and $\overline{B}$ are the complete of A and B respectively)

(a) 400
(b) 300
(c) 200
(d) 245

Answer: Options (d)

Explanation:

Let
n (U) = 650, n(A) = 310, n(A∩B) = 95, n(B) = 190
n (A∩B) = 95, n(A′ ∩ B’)
Now,
n (A∩B) = n (AUB)
= n (U) - n (AUB)
= n (U) – {n (A) + n (B) + n(A∩B) }
= 650 – {310 + 190 – 95}
= 650 - 450
= 245

Question 2

The range of function f defined by f (x) = $\sqrt{16 - x^2}$ is

(a) [-4,0]
(b) [-4,4]
(c) [0,4]
(d) (-4,4)

Answer: Options (b)

Explanation:

Here f (x) = $\sqrt{16 - x^2}$
Y = $\sqrt{16 - x^2}$
On squaring both side
$y^2 = 16 - x^2$
$x^2 = 16 - y^2$
X = $\sqrt{16 - y^2}$ $16 - y^2 \geq 0$
$16 \geq y^2$

$\pm 4 \geq y$

Range of function = [-4,4]

Question 3

Let A = R – {3} and B = R – {1}. Let f A→B defined by f (x) = $\frac{x-2}{x-3}$ what is value of $f^{-1}\left(\frac{1}{2}\right)$?

(a) 2/3 (b) 3/4

(c) 1 (d) -1

Answer: Options (c)

A = R -3, B = R -1

F(x) = $\frac{x-2}{x-3}$

f: A → B is defined as

Let, x, y ∈ A such that f(x) = f(y)

$\Rightarrow \frac{x-2}{x-3} = \frac{y-2}{y-3}$

⇒ x – 2y – 3 = y - 2x -3

⇒ xy – 3x – 2y + 6 = xy – 3y – 2x + 6

⇒ - 3x – 2y = -3y – 2x

⇒ 3x – 2x = 3y – 2y

⇒ x = y

∴ f is one – one.

Question 4

If f (x) = x^2 -1 and g (x) = |2x + 3|, then $f_o g$ (3) – $g_o f$ (-3) =

(a) 71 (b) 61

(c) 41 (d) 51

Answer: Options (b)

Explanation:

Here f(x) = x^2 – 1 and g (x) = $|2x - 3|$

F (x) = 3^2- 1 = 8 f(-3) = 8, g (3) = 9, x (-3) = 3

Fog (3) = f{g(3)}

= 9^2- 1

= 81 – 1 = 80

g of (-3) = g{f(-3)}

= g {8}

= $|2 \times 8 + 3|$

= 19

Fog (3) – g of (-3) = 80 – 19

$= 61$