MATHS

BOOKS - BITSAT GUIDE

SETS, RELATIONS AND FUNCTIONS

Practice Exercise

1. The number of proper subsets of $\{1, 2, 3\}$ is
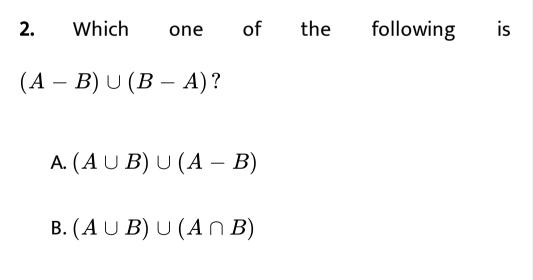
    A. 8

    B. 7

C. 6

D. 5

Answer: B

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2. Which one of the following is $(A - B) \cup (B - A)$?

A. $(A \cup B) \cup (A - B)$

B. $(A \cup B) \cup (A \cap B)$

C. $(A \cup B) - (A \cap B)$

D. $(A - B) \cap (B - A)$

Answer: C

3. Let $A = \{x : x$ is a prime factor of $240\}$, $B = \{x : x$

is the sum of any two prime factors of $\square\ 240\}$, then

A. $5 \notin A \cap B$

B. $7 \in A \cap B$

C. $8 \in A \cap B$

D. $8 \in A \cup B$

Answer: D

4. If $A = \{x : x$ is a multiple of 4 and x $\in N\}$ and $B = \{x : x$ is a multiple of 6 and x $\in N\}$, then $A \cap B$ consists of all multiples of

    A. 16

    B. 12

    C. 8

    D. 4

Answer: B

5. If A and B are 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

6. $If X = \{8^n - 7n - 1 : n \in N)$ and

$Y = \{49(n - 1) : n \in N\}$, then

A. $X \subset Y$

B. $Y \subset X$

C. X=Y

D. None of these

Answer: A

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7. In a town of 10,000 families it was found that 40% families buy newspaper A, 20% families buy newspaper B and 10% families buy news-paper C. 5% families buy A and B, 3% buy B and C and 4% buy A and C. If 2% families buy all the three mewspapers, find the number of families which buy (i) A only

A. 3100

B. 3300

C. 2900

D. 1400

Answer: B

8. If X and Y are two sets, then $X \cap (Y \cup X)$ equals

A. X

B. Y

C. φ

D. None of these

Answer: C

9. Which of the following cannot be the number of elements in the power set of any finite set ?

A. 26

B. 32

C. 64

D. 128

Answer: A

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10. If $A = \{x : x^2 = 1\}$ and $B = \{x : x^4 = 1\}$, then

$A \Delta B$ is equal to

A. $\{-i, i\}$

B. $\{-1, 1\}$

C. $\{-1, 1, i, -i\}$

D. $\{1, 1\}$

Answer: A

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11. A survey show that 63% of the Indians like cheese whereas 76% like apples. If x% of the Indians like both cheese and apples, then find the range of x.

A. x=39

B. x=63

C. $39 \leq x \leq 63$

D. None of these

Answer: C

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12. Two finite sets have m and n elements. The total number of subsets of the first set is 56 more than the total number of subsets of the second set. The value of m and n is

A. 7,6

B. 6,3

C. 5,1

D. 8,7

Answer: B

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13. Let U be the universal set for sets A and B such that

$n(A) = 200, n(B) = 300$ and $n(A \cap B) = 100.$

then $n(A' \cap B')$ is equal to $300,$ provided that $n(U)$

is equal to

   A. 600

   B. 700

   C. 800

   D. 900

Answer: B

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14. Let A and B be two sets that

$A \cap X = B \cap X = \phi$ and $A \cup X = B \cup X$ for

some set X. then

    A. A=B

    B. A=X

    C. B=X

    D. $A \cup B = X$

Answer: A

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15. If $f(x) = \cos(\log x)$, then

$$f(x)f(y) - \frac{1}{2}\left[f\left(\frac{x}{y}\right) + f(xy) \right] =$$

A. 0

B. $\dfrac{1}{2} f(x)f(y)$

C. $f(x + y)$

D. $f(x - y)$

Answer: A

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16. Let U be the universal set and $A \cup B \cup C = U$. Then $\{(A - B) \cup (B - C) \cup (C - A)\}$ is equal to -

A. $A \cup B \cup C$

B. $A \cup (B \cap C)$

C. $A \cap B \cap C$

D. $A \cap (B \cap C)$

Answer: C

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17. If $A = \{1, 2, 3\}$ and $B = \{3, 6, 8\}$, then $(A \cap B) \times A$ is equal to

A. $\{(1, 3), (2, 3), (3, 3)\}$

B. $\{(3, 1), (3, 2), (3, 3)\}$

C. $\{(1, 3), (3, 1)(3, 2)\}$

D. None of these

Answer: B

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18. Let R be a relation defined by $R = \{(1, 3), (2, 4), (5, 1)\}$ on the set of natural number N. Then R^{-1} is equal to

A. $\{(3, 1), (4, 2), (1, 5)\}$

B. $\{(5, 1), (4, 2), (1, 3)\}$

C. $\{(5, 1), (2, 4), (1, 3)\}$

D. None of these

Answer: A

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19. Let A and B be two finite sets having m and n elements respectively. Then the total number of mappings from A to B is

A. mn

B. 2^{mn}

C. m^n

D. n^m

Answer: D

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20. The function $f : N \to N$, N being the set of of natural numbers, defined by f(x)=2x+3 is

A. surjective

B. injective but not surjective

C. injective

D. None of these

Answer: B

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21. Let R be the real line. Consider the following subsets of the plane $R \times R$

$S = \{(x, y): yx + 1 \text{ and } 0 < x < 2\}$ and

$T = \{(x, y): x - y \text{ is an integer}\}$. Which one of the following is true?

A. T is an equivalence relation on R but S is not

B. Neither S nor T is an equivalence relation on R

C. Both S and T are equivalence relations on R

D. S is an equivalence relation on R but T is not

Answer: A

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22. A natural number a is said to be related to another natural number b, if $|a - b| < 4$. The relation is

    A. reflexive and symmetric

    B. reflexive and transitive

    C. symmetric and transitive

    D. None of these

Answer: A

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23. If $A = \{0, 1, 2, 3, 4, 5\}$ and a relation R defined by

(x)R(y), where $2x + y = 10$. Then R^{-1} is

A. $\{(3, 4), (4, 2), (5, 0)\}$

B. $\{(4, 3), (4, 2), (5, 0)\}$

C. $\{(4, 3), (4, 2), (5, 0)\}$

D. $\{(4, 3), (2, 4), (0, 5)\}$

Answer: D

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24. Given the relation $R = \{(1, 2)(2, 3)\}$ on the set $A = \{(1, 2, 3)\}$ the minimum number of ordered pairs which when added to R make it an equivalence relation is

A. 5

B. 6

C. 7

D. 8

Answer: C

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25. Let $A = \{1, 2, 3, 4, 5\}$ and R be a relation defined by $R = \{(x, y), x, y \in A, x + y = 5\}$. Then R is

A. reflexive and symmetric but not transitive

B. an equivalence relation

C. symmetric but neither reflexive nor transitive

D. neither reflexive nor symmetric but transitive

Answer: C

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26. Write the domain of the relation R defined on the set Z of integers as follows:

$(a, \ b) \in R \Leftrightarrow a^2 + b^2 = 25$

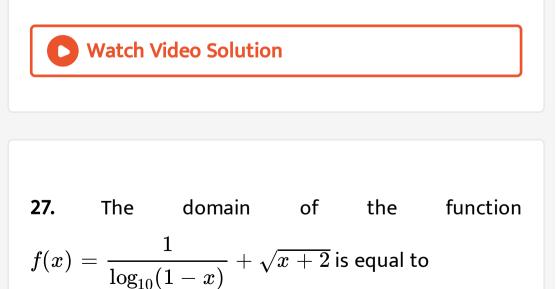A. $\{3, 4, 5\}$

B. $\{0, 3, 4, 5\}$

C. $\{0, \ \pm 3, 4, \ \pm 5\}$

D. None of these

Answer: C

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27. The domain of the function $f(x) = \dfrac{1}{\log_{10}(1 - x)} + \sqrt{x + 2}$ is equal to

A. $[-3, -2.5) \cup (-2.5, 2]$

B. $[-2, 0) \cup (0, 1]$

C. $[0, 1]$

D. None of these

Answer: B

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28. The range of the function $f(x) = \dfrac{x - 2}{2 - x}$ is

A. R

B. $R - \{1\}$

C. $\{-1\}$

D. $R - \{-1\}$

Answer: C

29. The function $f(x) = (\log)\dfrac{1+x}{1-x}$ satisfy the equation

A. $f(x_1). f(x)_2 = f(x_1 + x_2)$

B. $f(x+2) - 2f(x+1) + f(x) = 0$

C. $f(x) + f(x+1) = f(x^2 + x)$

D. $f(x_1) + f(x_2) = f\dfrac{x_1 + x_2}{1 + x_1 x_2}$

Answer: D

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30. Let f : R - {n} $\rightarrow$ R be a function defined by $f(x) = \dfrac{x - m}{x - n}$, where $m \neq n$. Then,

A. f is one-one and onto

B. f is one-one and into

C. f is many-one and onto

D. f is many-one and into

Answer: B

31. If $f: [1, \infty) \to [2, \infty)$ is given by $f(x) = x + \dfrac{1}{x}$

then f^{-1} (x) equals:

A. $\dfrac{x + \sqrt{x^2 - 4}}{2}$

B. $\dfrac{x}{1 + x^2}$

C. $\dfrac{x - \sqrt{x^2 - 4}}{2}$

D. $1 + \sqrt{x^2 - 4}$

Answer: A

32. The mapping f : $N \to N$ given by $f(n) = 1 + n^2$, $n \in N$, where N is the set of natural numbers, is

A. one-one and onto

B. onto but not one-one

C. one-one but not onto

D. Neither one-one nor onto

Answer: C

33. If $f: R \to R, f(x) = x^2$, then f is

    A. injective but not surjective

    B. surjective but not injective

    C. bijective

    D. None of the above

Answer: D

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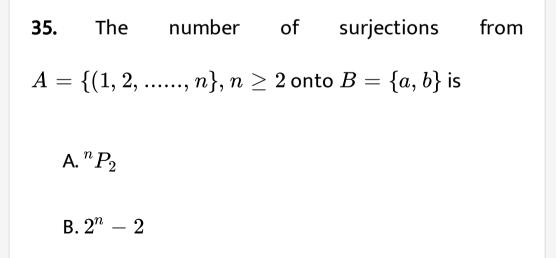
34. Let $g(x) = x^2 - 4x - 5$ then

    A. g is one-one on R

B. g is one-one on $(-\infty, 2)$

C. g is not one-one on $(-\infty, 4)$

D. None of the above

Answer: B

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35. The number of surjections from $A = \{(1, 2, \ldots, n)\}, n \geq 2$ onto $B = \{a, b\}$ is

A. $^{n}P_2$

B. $2^n - 2$

C. $2^n - 1$

D. None of these

Answer: B

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36. Given

$$f(x) = \log_{10}\left(\frac{1+x}{1-x}\right) \text{ and } g(x) = \frac{3x + x^3}{1 + 3x^2}, \text{ then}$$

fog(x) equals

A. $- f(x)$

B. 3f(x)

C. $[f(x)]^3$

D. None of these

Answer: B

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37. Let $f(x) = (x + 1)^2 - 1, (x \geq -1)$ then the set

S={x:f (x) = f^{-1} (x)} is

A. $0, \ -1, \ \dfrac{-3 + i\sqrt{3}}{2}, \ \dfrac{-3 - i\sqrt{3}}{2}$

B. $\{0, 1, \ -1\}$

C. $\{0, \ -1\}$

D. empty

Answer: C

38. A ral valued functin $f(x)$ satisfies the functional equation $f(x - y) = f(x)f(y) - f(a - x)f(x + y)$ where 'a' is a given constant and $f(0) = 1$, $f(2a - x)$ is equal to :

A. $f(-x)$

B. $f(a) + f(a - x)$

C. $f(x)$

D. $-f(x)$

Answer: D

39. If the function $f : [1, \infty) \to [1, \infty)$ is defined by $f(x) = 2^{x(x-1)}$ then f^{-1} is

A. $\left(\dfrac{1}{2} \right)^{x(x-1)}$

B. $\dfrac{1}{2} \left(1 + \sqrt{1 + 4 \log_2 x} \right)$

C. $\dfrac{1}{2} \left(1 - \sqrt{1 - 4 \log_2 x} \right)$

D. Not defined

Answer: B

40. If $f : R \to (-\infty, 1)$ such that $f(x) = 1 - 2^{-x}$

then $f^{-1}(x)$ is

A. $1 + \log_2(-x)$

B. $1 - \log_2(x)$

C. $\log_2(1 - x)$

D. $-\log_2(1 - x)$

Answer: D

41. Let a binary operation $*$ on Q (set of all rational numbers) be defined by a $*$ b=a+2b for all a,b $\in Q$. Then,

A. Q is closed under the given operation

B. the given operation is commutative

C. the given operation is associative

D. Q is not closed under the given operation

Answer: A

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42. Let Z be the set of integers and $*$ be a binary operation of Z defined as $a*b = a+b-ab$ for all a, b $\in Z$. The inverse of an element $a(\neq 1) \in Z$ is

A. $\dfrac{a}{a-1}$

B. $\dfrac{a}{1-a}$

C. $\dfrac{a-1}{a}$

D. None of the above

Answer: A

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1. If f (x) is an odd periodic function with period 2, then f (4) equals

    A. -4

    B. 4

    C. 2

    D. 0

Answer: D

2. Let R= {(3, 3),(6,6), (9,9), (12, 12),(6, 12),(3,9), (3, 12), (3, 6)} be a relation on the set A={3,6,9,12}. The relation is:

    A. an equivalence relation

    B. reflexive and symmetric

    C. reflexive and transitive

    D. only reflexive

Answer: C

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3. The total number of subsets of a finite set A has 56 more elements than the total number of subsets of another finite set B. What is the number of elements in the set A?

A. 5

B. 6

C. 7

D. 8

Answer: B

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4. Let R be the relation on the set R of all real numbers defined by a Rb Iff $|a - b| \leq 1$. Then R is

A. reflexive and symmetric only

B. reflexive and transitive only

C. equivalence

D. None of the above

Answer: A

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5. $A = \{x \in C : x^4 - 1 = 0\}$

$B = \{x \in C : x^2 - 1 = 0\}$

$$C = \{x \in C : x^2 + 1 = 0\}$$

where, C is complex plane. Then,

A. $A = B \cup C$

B. $C = A \cap B$

C. $B = A \cap C$

D. $A = B \cap C$

Answer: A

6. The function $f:(-\infty, -1)0, \overrightarrow{e^5}$ defined by

$f(x) = e^x \; ^\wedge \; (3 - 3x + 2)$ is many one and onto

many one and into one-one and onto one-one and into

A. many-one and onto

B. many-one and into

C. one-one and onto

D. one-one and into

Answer: D

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7. If the domain of the function $f(x) = x^2 - 6x + 7$ is $(-\infty, \infty)$, then the range of the function is

A. $(- \infty, \infty)$

B. $[- 2, \infty)$

C. $(- 2, 3)$

D. $(- \infty, - 2)$

Answer: B

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8. Let $f : R \to R, g : R \to R$ be two functions given by $f(x) = 2x - 3, g(x) = x^3 + 5$. Then $(fog)^{-1}$ is equal to

A. $\dfrac{x + 7^{1/3}}{2}$

B. $x - \dfrac{7^{1/2}}{2}$

C. $\dfrac{x - 2^{1/3}}{7}$

D. $\dfrac{x - 7^{1/3}}{2}$

Answer: D

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9. The inverse of the function $\dfrac{10^{x} - 10^{-x}}{10^{x} + 10^{-x}}$ is

A. $\log_{10}(2 - x)$

B. $\dfrac{1}{2}\log_{10}\dfrac{1 + x}{1 - x}$

C. $\dfrac{1}{2}\log_{10}(2x - 1)$

D. $\dfrac{1}{4}\log_{10}\dfrac{2x}{2-x}$

Answer: B

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10. If

$n(U) = 700, n(A) = 200, n(B) = 300, n(A \cap B) = 100$

, then $n(A' \cap B')$ is equal to

A. 300

B. 350

C. 400

D. 500

Answer: A

11. Let f be a function with domain [-3, 5] and let g (x) =

$|3x + 4|$, Then the domain of (fog) (x) is

A. $3, \ -\dfrac{1}{3}$

B. $3, \ \dfrac{1}{3}$

C. $-3, \ \dfrac{1}{3}$

D. $-3, \ -\dfrac{1}{3}$

Answer: C

12. If $f: R \to R$ and $g: R \to R$ are difined by $f(x) = |x|$ and $g(x) = [x - 3]$ for $x \in R$, then $g(f(x)): -\dfrac{8}{5} < x < \dfrac{8}{5}$ is equal to

A. $\{0, 1\}$

B. $\{1, 2\}$

C. $\{-3, -2\}$

D. $\{2, 3\}$

Answer: C

13. Let $R = \{(1, 3), (4, 2), (2, 4), (2, 3), (3, 1)\}$ be a relation on the set $A = \{1, 2, 3, 4\}$. Then relation R is

A. a function

B. transitive

C. not symmetric

D. reflexive

Answer: C

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14. Let $A = [-1, 1]$ and $f : A \to A$ be defined as $f(x) = x|x|$ for all $x \in A$, then f(x) is

A. many-one and into function

B. one-one and into function

C. many-one and into function

D. one-one and onto function

Answer: D

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15. If universal set

$$U = \{x \mid x^5 - 6x^4 + 11x^3 - 6x^2 = 0\}$$

$$A = \{x \mid x^2 - 5x + 6 = 0\}$$ and

$$B = \{x \mid x^2 - 3x + 2 = 0\}$$ Then, $(A \cap B)$ is equal to

A. $\{1, 3\}$

B. $\{1, 2, 3\}$

C. $\{0, 1, 3\}$

D. $\{0, 1, 2, 3\}$

Answer: C

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16. Which of the following statements is not correct for the relation R defined by aRb if and only if b lives within one kilometre from a?

    A. R is reflexive

    B. R is symmetric

    C. R is not anti-symmetric

    D. None of these

Answer: C

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17. Range of the function $f(x) = \dfrac{x^2}{x^2 + 1}$ is

    A. (-1,0)

    B. (-1,1)

    C. [0,1)

    D. (1,1)

Answer: C

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18. $x^2 = xy$ is a relation which is

A. symmetric

B. reflexive and transitive

C. transitive

D. None of these

Answer: C

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19. If $f(x) = ax^2 + bx + c$ and $g(x) + px^2 + qx$ with

$g(1) = f(1)$ $g(2) - f(2) = 1$ $g(3) - f(3) = 4$ then

$g(4) - f(4)$ is

A. 0

B. 5

C. 6

D. None of these

Answer:

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