MATHS

NCERT - FULL MARKS MATHEMATICS(TAMIL)

SETS

Example Solution

1. Write the solution set of the equation $x^2 + x - 2 = 0$ in roster form.

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2. Write the set {x : x is a positive integer and $x^2 < 40$} in the roster form.

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3. Write the set A = {1, 4, 9, 16, 25, . . . }in set-builder form.

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4. Write the set $\left\{\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \frac{5}{6}, \frac{6}{7}\right\}$ in the set-builder form.

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5. Match each of the set on the left described in the roster form with the same set on the right described in the set-builder form :

(i) {P, R, I, N, C, A, L} (a) { x : x is a positive integer and is a divisor of 18}

(ii) { 0 } (b) { x : x is an integer and $x^2 - 9 = 0$}

(iii) {1, 2, 3, 6, 9, 18} (c) {x : x is an integer and $x + 1 = 1$}

(iv) $\{3, -3\}$ (d) {x : x is a letter of the word PRINCIPAL}

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6. State which of the following sets are finite or infinite :

(i) $\{x : x \in N \text{ and } (x-1)(x-2) = 0\}$

(ii) $\{x : x \in N \text{ and } x^2 = 4\}$

(iii) $\{x : x \in N \text{ and } 2x-1 = 0\}$

(iv) $\{x : x \in N \text{ and } x \text{ is prime}\}$

(v) $\{x : x \in N \text{ and } x \text{ is odd}\}$

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7. Find the pairs of equal sets, if any, give reasons:

$A = \{0\}, B = \{x : x > 15 \text{ and } x < 5\},$

$C = \{x : x-5 = 0\}, D = \{x : x^2 = 25\},$

E = {x : x is an integral positive root of the equation $x^2-2x-15 = 0$}.

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8. Which of the following pairs of sets are equal? Justify your answer.

(i) X, the set of letters in “ALLOY” and B, the set of letters in “LOYAL”.

(ii)

$A = \{n : n \in Z \text{ and } n^2 \leq 4\}$ and $B = \{x : x \in R \text{ and } x^2 - 3x + 2 = 0\}$

.

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9. Consider the sets

$\varphi, A = \{1, 3\}, B = \{1, 5, 9\}, C = \{1, 3, 5, 7, 9\}.$

Insert the symbol $\subset$ or $\not\subset$ between each of the following pair of sets:

(i) $\varphi \ldots B$ (ii) $A \ldots B$ (iii) $A \ldots C$ (iv) $B \ldots C$

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10. Let $A = \{a, e, i, o, u\}$ and $B = \{a, b, c, d\}$. Is A a subset of B ? No. (Why?). Is B a subset of A? No. (Why?)

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11. Let A, B and C be three sets. If $A \in B$ and $B \subset C$, is it true that $A \subset C$?. If not, give an example.

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12. Let $A = \{2, 4, 6, 8\}$ and $B = \{6, 8, 10, 12\}$. Find $A \cup B$.

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13. Let $A = \{a, e, i, o, u\}$ and $B = \{a, i, u\}$. Show that $A \cup B = A$

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14. Let X = {Ram, Geeta, Akbar} be the set of students of Class XI, who are in school hockey team. Let Y = {Geeta, David, Ashok} be the set of students from Class XI who are in the school football team. Find $X \cup Y$ and interpret the set.

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15. Consider the sets A and B of Example 12. Find $A \cap B$.

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16. Consider the sets X and Y of Example 14. Find $X \cap Y$.

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17. Let $A = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ and $B = \{2, 3, 5, 7\}$. Find $A \cap B$ and hence show that $A \cap B = B$.

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18. Let $A = \{1, 2, 3, 4, 5, 6\}$, $B = \{2, 4, 6, 8\}$. Find $A - B$ and $B - A$.

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19. Let $V = \{a, e, i, o, u\}$ and $B = \{a, i, k, u\}$. Find $V - B$ and $B - V$

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20. Let $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ and $A = \{1, 3, 5, 7, 9\}$. Find A'.

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21. Let U be universal set of all the students of Class XI of a coeducational school and A be the set of all girls in Class XI. Find A'.

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22. Let $U = \{1, 2, 3, 4, 5, 6\}$, $A = \{2, 3\}$ and $B = \{3, 4, 5\}$.

Find A', B', $A' \cap B'$, $A \cup B$ and hence show that $(A \cup B)' = A' \cap B'$.

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23. If X and Y are two sets such that $X \cup Y$ has 50 elements, X has 28 elements and Y has 32 elements, how many elements does $X \cap Y$ have ?

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24. In a school there are 20 teachers who teach mathematics or physics. Of these, 12 teach mathematics and 4 teach both physics and mathematics. How many teach physics ?

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25. In a class of 35 students, 24 like to play cricket and 16 like to play football. Also, each student likes to play at least one of the two games. How many students like to play both cricket and football ?

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26. In a survey of 400 students in a school, 100 were listed as taking apple juice, 150 as taking orange juice and 75 were listed as taking both apple as well as orange juice. Find how many students were taking neither apple juice nor orange juice.

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27. There are 200 individuals with a skin disorder, 120 had been exposed to the chemical C_1, 50 to chemical C_2, and 30 to both the chemicals C_1 and C_2. Find the number of individuals exposed to

(i) Chemical C_1 but not chemical C_2

(ii) Chemical C_2 but not chemical C_1

(iii) Chemical C_1 or chemical C_2

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28. Show that the set of letters needed to spell " CATARACT " and the set of letters needed to spell " TRACT" are equal.

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29. List all the subsets of the set $\{-1, 0, 1\}$.

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30. Show that $A \cup B = A \cap B$ implies $A = B$

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31. For any sets A and B, show that

$P(A \cap B) = P(A) \cap P(B)$.

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32. A market research group conducted a survey of 1000 consumers and reported that 720 consumers like product A and 450 consumers like

product B, what is the least number that must have liked both products?

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33. Out of 500 car owners investigated, 400 owned car A and 200 owned car B, 50 owned both A and B cars. Is this data correct?

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34. A college awarded 38 medals in football, 15 in basketball and 20 in cricket. If these medals went to a total of 58 men and only three men got medals in all the three sports, how many received medals in exactly two of the three sports ?

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Exercise 1 1

1. Which of the following are sets ? Justify your answer.

The collection of all the months of a year beginning with the letter J.

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2. Which of the following are sets ? Justify your answer.

The collection of ten most talented writers of India.

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3. Which of the following are sets ? Justify your answer.

A team of eleven best-cricket batsmen of the world.

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4. Which of the following are sets ? Justify your answer.

The collection of all boys in your class.

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5. Which of the following are sets ? Justify your answer.

The collection of all natural numbers less than 100.

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6. Which of the following are sets ? Justify your answer.

A collection of novels written by the writer Munshi Prem Chand.

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7. Which of the following are sets ? Justify your answer.

The collection of all even integers.

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8. Which of the following are sets ? Justify your answer.

The collection of questions in this Chapter.

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9. Which of the following are sets ? Justify your answer.

A collection of most dangerous animals of the world.

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10. Let $A = \{1, 2, 3, 4, 5, 6\}$. Insert the appropriate symbol $\in$ or $\notin$ in the blank spaces:

$5 \ldots A$

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11. Let $A = \{1, 2, 3, 4, 5, 6\}$. Insert the appropriate symbol $\in$ or $\notin$ in the blank spaces:

$8 \ldots A$

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12. Let $A = \{1, 2, 3, 4, 5, 6\}$. Insert the appropriate symbol $\in$ or $\notin$ in the blank spaces:

$0 \ldots A$

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13. Let $A = \{1, 2, 3, 4, 5, 6\}$. Insert the appropriate symbol $\in$ or $\notin$ in the blank spaces:

$4 \ldots A$

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14. Let $A = \{1, 2, 3, 4, 5, 6\}$. Insert the appropriate symbol $\in$ or $\notin$ in the blank spaces:

$2 \ldots A$

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15. Let $A = \{1, 2, 3, 4, 5, 6\}$. Insert the appropriate symbol $\in$ or $\notin$ in the blank spaces:

$10 \ldots A$

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16. Write the following sets in roster form:

A = {x : x is an integer and $-3 \leq x < 7$}

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17. Write the following sets in roster form

(i) B= {x:x is a natural number smaller than 6}

(ii) C= {x:x is a two-digit natural number such that the sum of its digits is 8).

(iii) D= {x : x is a prime mimber which is a divisor of 60}.

(iv) E= {x:x is an alphabet in BETTER}.

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18. Write the following sets in roster form:

C = {x : x is a two-digit natural number such that the sum of its digits is 8}

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19. Write the following sets in roster form:

D = {x : x is a prime number which is divisor of 60}

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20. Write the following sets in roster form:

E = The set of all letters in the word TRIGONOMETRY

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21. Write the following sets in roster form:

F = The set of all letters in the word BETTER

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22. Write the following sets in the set-builder form :

$(3, 6, 9, 12\}$

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23. Write the following sets in the set-builder form :

$\{2, 4, 8, 16, 32\}$

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24. Write the following sets in the set-builder form :

$\{5, 25, 125, 625\}$

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25. Write the following sets in the set-builder form :

$\{2, 4, 6, \ldots\}$

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26. Write the following sets in the set-builder form :

$\{1, 4, 9, \ldots, 100\}$

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27. List all the elements of the following sets :

A = {x : x is an odd natural number}

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28. List all the elements of the following sets :

B = {x : x is an integer, $-\frac{1}{2} < x < \frac{9}{2}$}

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29. List all the elements of the following sets :

C = {x : x is an integer, $x^2 \leq 4$}

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30. List all the elements of the following sets :

D = {x : x is a letter in the word “LOYAL”}

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31. List all the elements of the following sets :

E = {x : x is a month of a year not having 31 days}

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32. List all the elements of the following sets :

F = {x : x is a consonant in the English alphabet which precedes k }.

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33. Match each of the set on the left in the roster form with the same set on the right described in set-builder form:

(i) $\{1, 2, 3, 6\}$ (a) {x : x is a prime number and a divisor of 6}

(ii) $\{2, 3\}$ (b) {x : x is an odd natural number less than 10}

(iii) $\{M, A, T, H, E, I, C, S\}$ (c) {x : x is natural number and divisor of 6}

(iv) $\{1, 3, 5, 7, 9\}$ (d) {x : x is a letter of the word MATHEMATICS}.

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Exercise 1 2

1. Which of the following are examples of the null set

Set of odd natural numbers divisible by 2

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2. Which of the following are examples of the null set

Set of even prime numbers

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3. Which of the following are examples of the null set

{ x : x is a natural numbers, $x < 5$ and $x > 7$ }

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4. Which of the following are examples of the null set

{ y : y is a point common to any two parallel lines}

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5. Which of the following sets are finite or infinite

The set of months of a year

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6. Which of the following sets are finite or infinite

$\{1, 2, 3, \ldots\}$

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7. Which of the following sets are finite or infinite

$\{1, 2, 3, \ldots 99, 100\}$

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8. Which of the following sets are finite or infinite

The set of positive integers greater than 100

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9. Which of the following sets are finite or infinite

The set of prime numbers less than 99

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10. State whether each of the following set is finite or infinite:

The set of lines which are parallel to the x-axis

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11. State whether each of the following set is finite or infinite:

The set of letters in the English alphabet

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12. State whether each of the following set is finite or infinite:

The set of numbers which are multiple of 5

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13. State whether each of the following set is finite or infinite:

The set of animals living on the earth

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14. State whether each of the following set is finite or infinite:

The set of circles passing through the origin (0,0)

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15. In the following, state whether A = B or not:

$A = \{a, b, c, d\} B = \{d, c, b, a\}$

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16. In the following, state whether A = B or not:

$A = \{4, 8, 12, 16\} B = \{8, 4, 16, 18\}$

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17. In the following, state whether A = B or not:

$A = \{2, 4, 6, 8, 10\}$ B = { x : x is positive even integer and $x \leq 10$}

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18. In the following, state whether A = B or not:

A = { $x : x$ is a multiple of 10}, $B = \{10, 15, 20, 25, 30, \ldots\}$

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19. Are the following pair of sets equal ? Give reasons.

$A = \{2, 3\}$, B = {x : x is solution of $x^2 + 5x + 6 = 0$}

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20. Are the following pair of sets equal ? Give reasons.

A = { x : x is a letter in the word FOLLOW}

B = { y : y is a letter in the word WOLF}

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21. From the sets given below, select equal sets :

$A = \{2, 4, 8, 12\}, B = \{1, 2, 3, 4\}, C = \{4, 8, 12, 14\}, D = \{3, 1, 4, 2\}$

$E = \{-1, 1\}, F = \{0, a\}, G = \{1, -1\}, H = \{0, 1\}$

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Exercise 1 3

1. Make correct statements by filling in the symbols $\subset$ or $\not\subset$ in the blank spaces :

$\{2, 3, 4\} \ldots \{1, 2, 3, 4, 5\}$

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2. Make correct statements by filling in the symbols $\subset$ or $\not\subset$ in the blank spaces :

$\{a, b, c\} \ldots \{b, c, d\}$

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3. Make correct statements by filling in the symbols $\subset$ or $\not\subset$ in the blank spaces :

$\{x : x$ is a student of Class XI of your school$\}$. . .$\{x : x$ student of your school$\}$

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4. Make correct statements by filling in the symbols $\subset$ or $\not\subset$ in the blank spaces :

$\{x : x$ is a circle in the plane$\}$ . . .$\{x : x$ is a circle in the same plane with radius 1 unit$\}$

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5. Make correct statements by filling in the symbols $\subset$ or $\not\subset$ in the blank spaces :

$\{x : x$ is a triangle in a plane$\} \ldots \{x : x$ is a rectangle in the plane$\}$

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6. Make correct statements by filling in the symbols $\subset$ or $\not\subset$ in the blank spaces :

$\{x : x$ is an equilateral triangle in a plane$\} \ldots \{x : x$ is a triangle in the same plane$\}$

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7. Make correct statements by filling in the symbols $\subset$ or $\not\subset$ in the blank spaces :

$\{x : x$ is an even natural number$\} \ldots \{x : x$ is an integer$\}$

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8. Examine whether the following statements are true or false:

$\{a, b\} \not\subset \{b, c, a\}$

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9. Examine whether the following statements are true or false:

$\{a, e\} \subset \{x : x$ is a vowel in the English alphabet$\}$

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10. Examine whether the following statements are true or false:

$\{1, 2, 3\} \subset \{1, 3, 5\}$

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11. Examine whether the following statements are true or false:

$\{a\} \subset \{a, b, c\}$

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12. Examine whether the following statements are true or false:

$\{a\} \in \{a, b, c\}$

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13. Examine whether the following statements are true or false:

$\{x : x$ is an even natural number less than 6$\} \subset \{x : x$ is a natural number which divides 36$\}$

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14. Let $A = \{1, 2, \{3, 4\}, 5\}$. Which of the following statements are incorrect and why?

$\{3, 4\} \subset A$

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15. Let $A = \{1, 2, \{3, 4\}, 5\}$. Which of the following statements are incorrect and why?

$\{3, 4\} \in A$

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16. Let $A = \{1, 2, \{3, 4\}, 5\}$. Which of the following statements are incorrect and why?

$\{\{3, 4\}\} \subset A$

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17. Let $A = \{1, 2, \{3, 4\}, 5\}$. Which of the following statements are incorrect and why?

$1 \in A$

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18. Let $A = \{1, 2, \{3, 4\}, 5\}$. Which of the following statements are incorrect and why?

$1 \subset A$

Watch Video Solution

19. Let $A = \{1, 2, \{3, 4\}, 5\}$. Which of the following statements are incorrect and why?

$\{1, 2, 5\} \subset A$

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20. Let $A = \{1, 2, \{3, 4\}, 5\}$. Which of the following statements are incorrect and why?

$\{1, 2, 5\} \in A$

Watch Video Solution

21. Let $A = \{1, 2, \{3, 4\}, 5\}$. Which of the following statements are incorrect and why?

$\{1, 2, 3\} \subset A$

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22. Let $A = \{1, 2, \{3, 4\}, 5\}$. Which of the following statements are incorrect and why?

$\varphi \in A$

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23. Let $A = \{1, 2, \{3, 4\}, 5\}$. Which of the following statements are incorrect and why?

$\varphi \subset A$

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24. Let $A = \{1, 2, \{3, 4\}, 5\}$. Which of the following statements are incorrect and why?

$\{\varphi\} \subset A$

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25. Write down all the subsets of the following sets

$\{a\}$

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26. Write down all the subsets of the following sets

$\{a, b\}$

Watch Video Solution

27. Write down all the subsets of the following sets

$\{1, 2, 3\}$

Watch Video Solution

28. Write down all the subsets of the following sets

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29. How many elements has P(A), if $A = \varphi$?

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30. Write the following as intervals :

$\{x : x \in R, -4 < x \leq 6\}$

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31. Write the following as intervals :

$\{x : x \in R, -12 < x < -10\}$

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32. Write the following as intervals :

$\{x : x \in R, 0 \leq x < 7\}$

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33. Write the following as intervals :

$\{x : x \in R, 3 \leq x \leq 4\}$

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34. Write the following intervals in set-builder form :

$(-3, 0)$

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35. Write the following intervals in set-builder form :

$[6, 12]$

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36. Write the following intervals in set-builder form :

$(6, 12]$

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37. Write the following intervals in set-builder form :

$[-23, 5)$

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38. What universal set(s) would you propose for each of the following :

The set of right triangles.

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39. What universal set(s) would you propose for each of the following :

The set of isosceles triangles.

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40. Given the sets $A = \{1, 3, 5\}, B = \{2, 4, 6\}$ and $C = \{0, 2, 4, 6, 8\}$, which of the following may be considered as universal set (s) for all the three sets A, B and

$\{0, 1, 2, 3, 4, 5, 6\}$

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41. Given the sets $A = \{1, 3, 5\}, B = \{2, 4, 6\}$ and $C = \{0, 2, 4, 6, 8\}$, which of the following may be considered as universal set (s) for all the three sets A, B and

ϕ

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42. Given the sets $A = \{1, 3, 5\}, B = \{2, 4, 6\}$ and $C = \{0, 2, 4, 6, 8\}$, which of the following may be considered as universal set (s) for all the three sets A, B and

$\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

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43. Given the sets $A = \{1, 3, 5\}, B = \{2, 4, 6\}$ and $C = \{0, 2, 4, 6, 8\}$, which of the following may be considered as universal set (s) for all the three sets A, B and

$\{1, 2, 3, 4, 5, 6, 7, 8\}$

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44. Suppose that 120 are studying in 4 sections of eleventh standard in a school. Let A denote the set of students and B denote the set of the sections. Define a relation from A to B as x related to y if the student x belongs to the section y. Is this relation a function? What can you say about the inverse relatioin. Explain your answer.

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45. Write the values of at -4,1,-2,7,0 if

$$f(x) = \begin{cases} -x+4 & \text{if} -\infty < x \leq -3 \\ x+4 & \text{if} -3 < x < -2 \\ x^2 - x & \text{if} -2 \leq x < 1 \\ x - x^2 & \text{if} 1 \leq x < 7 \\ 0 & \text{otherwise} \end{cases}$$

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46. Write the vaues of f at -3,5,2-1,0 if

$$f(x) = \begin{cases} x^2 + x - 5 & \text{if} x \in (-\infty, 0) \\ x^2 + 3x - 2 & \text{if} x \in (3, \infty) \\ x^2 & \text{if} x \in (0, 2) \\ x^2 - 3 & \text{otherwise} \end{cases}$$

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47. State whether the following relations are functions or not. If it is a function check for one to oneness and ontoness. If it is not a function, state why?

(i) If $A = \{a, b, c\}$ and $f = \{(a, c), (b, c), (c, b)\}, (f: A \to A)$

(ii) If $X = \{x, y, z)$ and $f = \{(x, y), (x, z), (z, x)\}, (f: X \to X)$

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48. Let $A = \{1, 2, 3, 4\}$ and $B = \{a, b, c, d\}$. Give a function from $A \to B$ for each of the following:

(i) neither one to one nor onto

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49. Let $A = \{1, 2, 3, 4\}$ and $B = \{a, b, c, d\}$. Give a function from $A \to B$ for each of the following:

not one to one but onto.

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50. Let $A = \{1, 2, 3, 4\}$ and $B = \{a, b, c, d\}$. Give a function from $A \to B$ for each of the following:

one to one but not onto.

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51. Let $A = \{1, 2, 3, 4\}$ and $B = \{a, b, c, d\}$. Give a function from $A \to B$ for each of the following:

one to one and onto.

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52. Find the domain of $\frac{1}{1-2\sin x}$

View Text Solution

53. Find the largest possible domain of the real valued function $f(x)=\frac{\sqrt{4-x^2}}{\sqrt{x^2-9}}$

View Text Solution

54. Find the range of the function $\frac{1}{2\cos x-1}$

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55. Show that the relation $xy=-2$ is a function for a suitable domain.

Find the domain and the range of the function.

View Text Solution

56. If $f, g: R \to R$ are defined by $f(x) = |x| + x$ and $g(x) = |x| - x$ find g o f and f o g.

View Text Solution

57. If $f: \mathbb{R} \to \mathbb{R}$ is defined by $f(x) = 3x - 5$, prove that f is a bijection and find its inverse.

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58. The weight of the muscles of a man is a function of his body weight x and can be expressed as $W(x) = 0.35x$. Determine the domain of this function.

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59. The total cost of airfare on a given route is comporised of the base cost C and the fuel surcharge S in rupee. Both C and S are functions of the mileage$m, C(m) = 0.4m + 5$ and $S(m) = 0.03m$. Determine a function for the total cost of a ticket in terms of the mileage and find the airfare for flying 1600 miles.

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60. A sales person whose annual earnings can be represented by the function $A(x) = 30,000 + 0.4x,$ where x is the rupee value of the merchandise he sells. His on is also in sales and his earnings are represented by the function $S(x) = 25,000 + 0.05x$. Find $(A + S)(x)$ and determine the total family income if they each sell Rupees 1,50,00,000 worth of merchandise.

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61. The function for exchanging Americal dollars for Singapore Dollar on a given day isd $f(x) = 1.23x$, where x represents the number of Americal dollars. On the same day the function for exchanging Singapore Dollar to Indian Rupee is $g(y) = 50.50y$, where y represents the number of Singapore dollars. Write a function which will give exchange rate of Americal dollars in terms of Indian rupee.

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62. The owner of a small restaurant can prepare a particular meal at a csot of Rupees 100. He estimates that if the menu price of the meal is x rupees, then the number of customers who will order that meal at that price in an evening is given by the function $D(x) = 200 - x$. Express his day revenue, total cost and profit on this meal as functions of x.

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63. The formula for converting from Fahrenheit to Celsius temperautee is $y = \frac{5x}{9} - \frac{160}{9}$. Find the inverse of this function and determine whether the invere is also a function.

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64. A simple cipher takes a number and codes it, using the function $f(x) = 3x - 4$. Find the inverse of this function determine whether the inverse is also a function and verify the symmetrical property about the line y=x (by drawing the lines).

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Exercise 1 4

1. Find the union of each of the following pairs of sets :

$X = \{1, 3, 5\} Y = \{1, 2, 3\}$

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2. Find the union of each of the following pairs of sets :

$A = [a, e, i, o, u\} B = \{a, b, c\}$

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3. Find the union of each of the following pairs of sets :

A = $\{x : x$ is a natural number and multiple of 3$\}$

B = $\{x : x$ is a natural number less than 6$\}$

Watch Video Solution

4. Find the union of each of the following pairs of sets :

A = $\{x : x$ is a natural number and $1 < x \leq 6\}$

B = $\{x : x$ is a natural number and $6 < x < 10\}$

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5. Find the union of each of the following pairs of sets :

$A = \{1, 2, 3\}, B = \varphi$

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6. Let $A = \{a, b\}, B = \{a, b, c\}$. Is $A \subset B$? What is $A \cup B$?

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7. If A and B are two sets such that $A \subset B$, then what is $A \cup B$?

Watch Video Solution

8. If

$A = \{1, 2, 3, 4\}, B = \{3, 4, 5, 6\}, C = \{5, 6, 7, 8\}$ and $D = \{7, 8, 9, 10\}$

, find

$A \cup B$

Watch Video Solution

9. If $A = \{1, 2, 3, 4\}, B = \{3, 4, 5, 6\}, C = \{5, 6, 7, 8\}$ and $D = \{7, 8, 9, 10\}$, find

$A \cup C$

Watch Video Solution

10. If $A = \{1, 2, 3, 4\}, B = \{3, 4, 5, 6\}, C = \{5, 6, 7, 8\}$ and $D = \{7, 8, 9, 10\}$, find

$B \cup C$

Watch Video Solution

11. If $A = \{1, 2, 3, 4\}, B = \{3, 4, 5, 6\}, C = \{5, 6, 7, 8\}$ and $D = \{7, 8, 9, 10\}$

, find

$B \cup D$

Watch Video Solution

12. If

$A = \{1, 2, 3, 4\}, B = \{3, 4, 5, 6\}, C = \{5, 6, 7, 8\}$ and $D = \{7, 8, 9, 10\}$

, find

$A \cup B \cup C$

Watch Video Solution

13. If

$A = \{1, 2, 3, 4\}, B = \{3, 4, 5, 6\}, C = \{5, 6, 7, 8\}$ and $D = \{7, 8, 9, 10\}$

, find

$A \cup B \cup D$

Watch Video Solution

14. If

$A = \{1, 2, 3, 4\}, B = \{3, 4, 5, 6\}, C = \{5, 6, 7, 8\}$ and $D = \{7, 8, 9, 10\}$

, find

$B \cup C \cup D$

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15. Find the intersection of each pair of sets of question 1 above.

Watch Video Solution

16. If

$A = \{3, 5, 7, 9, 11\}, B = \{7, 9, 11, 13\}, C = \{11, 13, 15\}$ and $D = \{15, 17\}$

, find

$A \cap B$

Watch Video Solution

17. If

$A = \{3, 5, 7, 9, 11\}, B = \{7, 9, 11, 13\}, C = \{11, 13, 15\}$ and $D = \{15, 17\}$

, find

$B \cap C$

Watch Video Solution

18. If

$A = \{3, 5, 7, 9, 11\}, B = \{7, 9, 11, 13\}, C = \{11, 13, 15\}$ and $D = \{15, 17\}$

, find

$A \cap C \cap D$

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19. If

$A = \{3, 5, 7, 9, 11\}, B = \{7, 9, 11, 13\}, C = \{11, 13, 15\}$ and $D = \{15, 17\}$

, find

$A \cap C$

Watch Video Solution

20. If

$A = \{3, 5, 7, 9, 11\}, B = \{7, 9, 11, 13\}, C = \{11, 13, 15\}$ and $D = \{15, 17\}$

, find

$B \cap D$

Watch Video Solution

21. If

$A = \{3, 5, 7, 9, 11\}, B = \{7, 9, 11, 13\}, C = \{11, 13, 15\}$ and $D = \{15, 17\}$

, find

$A \cap (B \cup C)$

Watch Video Solution

22. If

$A = \{3, 5, 7, 9, 11\}, B = \{7, 9, 11, 13\}, C = \{11, 13, 15\}$ and $D = \{15, 17\}$

, find

$A \cap D$

Watch Video Solution

23. If

$A = \{3, 5, 7, 9, 11\}, B = \{7, 9, 11, 13\}, C = \{11, 13, 15\}$ and $D = \{15, 17\}$

, find

$A \cap (B \cup D)$

Watch Video Solution

24. If

$A = \{3, 5, 7, 9, 11\}, B = \{7, 9, 11, 13\}, C = \{11, 13, 15\}$ and $D = \{15, 17\}$

, find

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

Watch Video Solution

25. If

$A = \{3, 5, 7, 9, 11\}, B = \{7, 9, 11, 13\}, C = \{11, 13, 15\}$ and $D = \{15, 17\}$

, find

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

Watch Video Solution

26. If A = $\{x : x$ is a natural number $\}$, B = $\{x : x$ is an even natural number$\}$

C = $\{x : x$ is an odd natural number$\}$ and D = $\{x : x$ is a prime number $\}$, find

$A \cap B$

Watch Video Solution

27. If A = $\{x : x$ is a natural number $\}$, B = $\{x : x$ is an even natural number$\}$

C = $\{x : x$ is an odd natural number$\}$ and D = $\{x : x$ is a prime number $\}$, find

$A \cap C$

Watch Video Solution

28. If A = $\{x : x$ is a natural number $\}$, B = $\{x : x$ is an even natural number$\}$

C = $\{x : x$ is an odd natural number$\}$ and D = $\{x : x$ is a prime number $\}$, find

$A \cap D$

Watch Video Solution

29. If A = $\{x : x$ is a natural number $\}$, B = $\{x : x$ is an even natural number$\}$

C = $\{x : x$ is an odd natural number$\}$ and D = $\{x : x$ is a prime number $\}$, find

$B \cap C$

Watch Video Solution

30. If A = $\{x : x$ is a natural number $\}$, B = $\{x : x$ is an even natural number$\}$

C = $\{x : x$ is an odd natural number$\}$ and D = $\{x : x$ is a prime number $\}$, find

$B \cap D$

Watch Video Solution

31. If A = $\{x : x$ is a natural number $\}$, B = $\{x : x$ is an even natural number$\}$

C = $\{x : x$ is an odd natural number$\}$ and D = $\{x : x$ is a prime number $\}$, find

$C \cap D$

Watch Video Solution

32. Which of the following pairs of sets are disjoint

$\{1, 2, 3, 4\}$ and $\{x : x$ is a natural number and $4 \leq x \leq 6\}$

Watch Video Solution

33. Which of the following pairs of sets are disjoint

$\{a, e, i, o, u\}$ and $\{c, d, e, f\}$

Watch Video Solution

34. Which of the following pairs of sets are disjoint

$\{x : x$ is an even integer $\}$ and $\{x : x$ is an odd integer$\}$

Watch Video Solution

35. If $A = \{3, 6, 9, 12, 15, 18, 21\}$, $B = \{4, 8, 12, 16, 20\}$,

$C = \{2, 4, 6, 8, 10, 12, 14, 16\}$, $D = \{5, 10, 15, 20\}$, find

$A - B$

Watch Video Solution

36. If $A = \{3, 6, 9, 12, 15, 18, 21\}$, $B = \{4, 8, 12, 16, 20\}$,

$C = \{2, 4, 6, 8, 10, 12, 14, 16\}$, $D = \{5, 10, 15, 20\}$, find

$A - C$

Watch Video Solution

37. If $A = \{3, 6, 9, 12, 15, 18, 21\}$, $B = \{4, 8, 12, 16, 20\}$,

$C = \{2, 4, 6, 8, 10, 12, 14, 16\}$, $D = \{5, 10, 15, 20\}$, find

$A - D$

Watch Video Solution

38. If $A = \{3, 6, 9, 12, 15, 18, 21\}$, $B = \{4, 8, 12, 16, 20\}$,

$C = \{2, 4, 6, 8, 10, 12, 14, 16\}$, $D = \{5, 10, 15, 20\}$, find

$B - A$

Watch Video Solution

39. If $A = \{3, 6, 9, 12, 15, 18, 21\}$, $B = \{4, 8, 12, 16, 20\}$,

$C = \{2, 4, 6, 8, 10, 12, 14, 16\}$, $D = \{5, 10, 15, 20\}$, find

$C - A$

Watch Video Solution

40. If $A = \{3, 6, 9, 12, 15, 18, 21\}$, $B = \{4, 8, 12, 16, 20\}$,

$C = \{2, 4, 6, 8, 10, 12, 14, 16\}$, $D = \{5, 10, 15, 20\}$, find

$D - A$

Watch Video Solution

41. If $A = \{3, 6, 9, 12, 15, 18, 21\}$, $B = \{4, 8, 12, 16, 20\}$,

$C = \{2, 4, 6, 8, 10, 12, 14, 16\}$, $D = \{5, 10, 15, 20\}$, find

$B - C$

Watch Video Solution

42. If $A = \{3, 6, 9, 12, 15, 18, 21\}$, $B = \{4, 8, 12, 16, 20\}$,

$C = \{2, 4, 6, 8, 10, 12, 14, 16\}$, $D = \{5, 10, 15, 20\}$, find

$B - D$

Watch Video Solution

43. If $A = \{3, 6, 9, 12, 15, 18, 21\}$, $B = \{4, 8, 12, 16, 20\}$,

$C = \{2, 4, 6, 8, 10, 12, 14, 16\}$, $D = \{5, 10, 15, 20\}$, find

$C - B$

Watch Video Solution

44. If $A = \{3, 6, 9, 12, 15, 18, 21\}$, $B = \{4, 8, 12, 16, 20\}$,

$C = \{2, 4, 6, 8, 10, 12, 14, 16\}$, $D = \{5, 10, 15, 20\}$, find

$D - B$

Watch Video Solution

45. If $A = \{3, 6, 9, 12, 15, 18, 21\}$, $B = \{4, 8, 12, 16, 20\}$,

$C = \{2, 4, 6, 8, 10, 12, 14, 16\}$, $D = \{5, 10, 15, 20\}$, find

$C - D$

Watch Video Solution

46. If $A = \{3, 6, 9, 12, 15, 18, 21\}$, $B = \{4, 8, 12, 16, 20\}$,

$C = \{2, 4, 6, 8, 10, 12, 14, 16\}$, $D = \{5, 10, 15, 20\}$, find

$D - C$

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47. If $X = \{a, b, c, d\}$ and $Y = \{f, b, d, g\}$, find

$X - Y$

Watch Video Solution

48. If $X = \{a, b, c, d\}$ and $Y = \{f, b, d, g\}$, find

$Y - X$

Watch Video Solution

49. If $X = \{a, b, c, d\}$ and $Y = \{f, b, d, g\}$, find

$X \cap Y$

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50. If R is the set of real numbers and Q is the set of rational numbers, then what is $R - Q$?

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51. State whether each of the following statement is true or false. Justify your answer.

$\{2, 3, 4, 5\}$ and $\{3, 6\}$ are disjoint sets.

Watch Video Solution

52. State whether each of the following statement is true or false. Justify your answer.

$\{a, e, i, o, u\}$ and $\{a, b, c, d\}$ are disjoint sets.

Watch Video Solution

53. State whether each of the following statement is true or false. Justify your answer.

$\{2, 6, 10, 14\}$ and $\{3, 7, 11, 15\}$ are disjoint sets.

Watch Video Solution

54. State whether each of the following statement is true or false. Justify your answer.

$\{2, 6, 10\}$ and $\{3, 7, 11\}$ are disjoint sets.

Watch Video Solution

Exercise 1 5

1. Let

$U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}, A = \{1, 2, 3, 4\}, B = \{2, 4, 6, 8\}$ and $C = \{3,$

.

Find A'

Watch Video Solution

2. Let

$U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}, A = \{1, 2, 3, 4\}, B = \{2, 4, 6, 8\}$ and $C = \{3,$

.

Find B'

Watch Video Solution

3. Let

$U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}, A = \{1, 2, 3, 4\}, B = \{2, 4, 6, 8\}$ and $C = \{3,$

.

Find $(A \cup C)'$

Watch Video Solution

4. Let

$U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}, A = \{1, 2, 3, 4\}, B = \{2, 4, 6, 8\}$ and $C = \{3,$

.

Find $(A \cup B)'$

Watch Video Solution

5. Let

$U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}, A = \{1, 2, 3, 4\}, B = \{2, 4, 6, 8\}$ and $C = \{3,$

.

Find $(A')'$

Watch Video Solution

6. Let

$U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}, A = \{1, 2, 3, 4\}, B = \{2, 4, 6, 8\}$ and $C = \{3,$

.

Find $(B - C)'$

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7. If $U = \{a, b, c, d, e, f, g, h\}$, find the complements of the following sets :

$A = \{a, b, c\}$

Watch Video Solution

8. If $U = \{a, b, c, d, e, f, g, h\}$, find the complements of the following sets :

$B = \{d, e, f, g\}$

Watch Video Solution

9. If $U = \{a, b, c, d, e, f, g, h\}$, find the complements of the following sets :

$C = \{a, c, e, g\}$

Watch Video Solution

10. If $U = \{a, b, c, d, e, f, g, h\}$, find the complements of the following sets :

$D = \{f, g, h, a\}$

Watch Video Solution

11. Taking the set of natural numbers as the universal set, write down the complements of the following sets:

$\{x : x$ is an even natural number$\}$

Watch Video Solution

12. Taking the set of natural numbers as the universal set, write down the complements of the following sets:

$\{x : x$ is an odd natural number $\}$

Watch Video Solution

13. Taking the set of natural numbers as the universal set, write down the complements of the following sets:

$\{x : x$ is a positive multiple of 3$\}$

Watch Video Solution

14. Taking the set of natural numbers as the universal set, write down the complements of the following sets:

$\{x : x$ is a prime number $\}$

Watch Video Solution

15. Taking the set of natural numbers as the universal set, write down the complement of the set:

{x:x is a natural number divisible by 3 and 5}

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16. Taking the set of natural numbers as the universal set, write down the complements of the following sets:

$\{x : x$ is a perfect square $\}$

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17. Taking the set of natural numbers as the universal set, write down the complements of the following sets:

$\{x : x$ is a perfect cube$\}$

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18. Taking the set of natural numbers as the universal set, write down the complements of the following sets:

$\{x : x + 5 = 8\}$

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19. Taking the set of natural numbers as the universal set, write down the complement of the set:

{x:2x+5=9}

Watch Video Solution

20. Taking the set of natural numbers as the universal set, write down the complement of the set:

$\{x:x \geq 7\}$

Watch Video Solution

21. Taking the set of natural numbers as the universal set, write down the complements of the following sets:

$\{x : x \in N \text{ and } 2x + 1 > 10\}$

Watch Video Solution

22. If $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{2, 4, 6, 8\}$ and $B = \{2, 3, 5, 7\}$. Verify that

$(A \cup B)' = A' \cap B'$

Watch Video Solution

23. If $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{2, 4, 6, 8\}$ and $B = \{2, 3, 5, 7\}$.

Verify that

$(A \cap B)' = A' \cup B'$

Watch Video Solution

24. Draw appropriate Venn diagram for each of the following :

$(A \cup B)'$

Watch Video Solution

25. Draw appropriate Venn diagram for each of the following :

$A' \cap B'$

Watch Video Solution

26. Draw appropriate Venn diagram for each of the following :

$(A \cap B)'$

Watch Video Solution

27. Draw appropriate Venn diagram for each of the following :

$A' \cup B'$

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28. Let U be the set of all triangles in a plane. If A is the set of all triangles with at least one angle different from 60^{o}, what is A'?

Watch Video Solution

29. Fill in the blanks to make each of the following a true statement :

$A \cup A' = \ldots$

Watch Video Solution

30. Fill in the blanks to make each of the following a true statement :

$\varphi' \cap A = \ldots$

Watch Video Solution

31. Fill in the blanks to make each of the following a true statement :

$A \cap A' = \ldots$

Watch Video Solution

32. Fill in the blanks to make each of the following a true statement :

$U' \cap A = \ldots$

Watch Video Solution

33. If $A = \{(x, y) : y = e^x, x \in R\}$ and $B = \{(x, y), : y = e^{-x}, x \in R\}$ then $n(A \cap B)$ is

A. Infinity

B. 0

C. 1

D. 2

Answer: C

View Text Solution

34. If $A = \{(x, y) : y = \sin x, x \in R\}$ and $B = \{(x, y) : y = \cos x, x \in R\}$ then $A \cap B$ contains

A. no element

B. infinitely many elements

C. only one element

D. cannot be determined.

Answer: B

View Text Solution

35. The relation R defined on a set $A = \{0, -1, 1, 2\}$ by x Ry if $|x^2 + y^2| \leq 2$ then which one of the following is true?

A. $R = \{(0, 0), (0, -1), (0, 1), (-1, 0), (-1, 1), (1, 2), (1, 0)\}$

B. $R^{-1} = \{(0, 0), (0, -1), (0, 1), (-1, 0), (1, 0)\}$

C. Domain of R is $\{0, -1, 1, 2\}$

D. Range of R is $\{0, -1, 1\}$

Answer: D

View Text Solution

36. If $f(x) = |x-2| + |x+2|, x \in R$ then

A. $f(x) = \begin{cases} -2x & \text{If } x \in (-\infty, -2] \\ 4 & \text{if } x \in (-2, 2] \\ 2x & \text{if } x \in (2, \infty) \end{cases}$

B. $f(x) = \begin{cases} 2x & \text{If } x \in (-\infty, -2] \\ 4 & \text{if } x \in (-2, 2] \\ -2x & \text{if } x \in (2, \infty) \end{cases}$

C. $f(x) = \begin{cases} -2x & \text{If } x \in (-\infty, -2] \\ -4x & \text{if } x \in (-2, 2] \\ -2x & \text{if } x \in (2, \infty) \end{cases}$

D. $f(x) = \begin{cases} -2x & \text{If } x \in (-\infty, -2] \\ 2x & \text{if } x \in (-2, 2] \\ 2x & \text{if } x \in (2, \infty) \end{cases}$

Answer: A

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37. Let $\mathbb{R}$ be the set of all real numbers. Consider the following subsets of the plane $\mathbb{R} \times \mathbb{R}$

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

$T = \{(x, y) : x - y \text{is an integer}\}$

Then which of the following is true?

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

B. Neither S nor T is an equivalence relation

C. Both S and T are equivalence relatioin

D. S is an equivalence relation but T is not an equivalcne relation.

Answer: A

View Text Solution

38. Let A and B be subsets of the universal set $\mathbb{N}$, the set of natural numbers. Then $A' \cup [(A \cap B) \cup B']$ is

A. A

B. A'

C. B

D. $\mathbb{N}$

Answer: D

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39. The number of students who take both the subjects Mathematics and Chemistry is 70. This represents 10% of the enrollment in Mathematics and 14% of the enrollment in Chemistry. The number of student take at least one of these two subjects is

A. 1120

B. 1130

C. 1100

D. insufficient data

Answer: B

View Text Solution

40. If $n((A \times B) \cap (A \times C)) = 8$ and $n(B \cap C) = 2$ then $n(A)$ is

A. 6

B. 4

C. 8

D. 16

Answer: B

View Text Solution

41. If $n(A) = 2$ and $n(B \cup C) = 3$ then $n[(A \times B) \cup (A \times C)]$ is

A. 2^3

B. 3^2

C. 6

D. 5

Answer: C

View Text Solution

42. If two sets A and B have 17 elements in common, then the number of elements common to the set $A \times B$ and $B \times A$ is

A. 2^{17}

B. 17^2

C. 34

D. insufficient data

Answer: B

View Text Solution

43. For non empty set A and B if $A \subset B$ then $(A \times B) \cap (B \times A)$ is equal to

A. $A \cap B$

B. $A \times A$

C. $B \times B$

D. None of these

Answer: B

View Text Solution

44. The number of relations on a set containing 3 elements is

A. 9

B. 81

C. 512

D. 1024

Answer: C

View Text Solution

45. Let R be the universal relation on a set X with more than one element.

Then R is

A. not reflexive

B. not symmetric

C. transitive

D. None of the above

Answer: C

View Text Solution

46. Let $X = \{1, 2, 3, 4\}$ and $R = \{(1, 1), (1, 2), (1, 3), (2, 2), (3, 3), (2, 1), (3, 1), (1, 4), (4, 1)\}$.

Then R is

A. reflexive

B. symmetric

C. transitive

D. equivalence

Answer: B

View Text Solution

47. The range of the function $\frac{1}{1-\sin x}$ is

A. $(-\infty, -1) \cup \left(\frac{1}{3}, \infty\right)$

B. $\left(-1, \frac{1}{3}\right)$

C. $\left[-1, \frac{1}{3}\right]$

D. $(-\infty, -1] \cup \left[\frac{1}{3}, \infty\right)$

Answer: D

View Text Solution

48. The range of the function $f(x) = |\lfloor(x) - x|, x \in \mathbb{R}$ is

A. $[0, 1]$

B. $[0, \infty)$

C. $[0, 1)$

D. $(0, 1)$

Answer: C

View Text Solution

49. The rule $f(x) = x^2$ is a bijectionif the domain and the co domain are given by

A. $\mathbb{R}, \mathbb{R}$

B. $\mathbb{R}, (0, \infty)$

C. $(, \infty), \mathbb{R}$

D. $[0, \infty), [0, \infty)$

Answer: D

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50. The number of constant functions from a set containing m elements to a set containing n elements is

A. mn

B. m

C. n

D. m+n

Answer: C

View Text Solution

51. The function $f: [0, 2\pi] \to [-1, 1]$ defined by f(x)=sin x is

A. one to one

B. onto

C. bijection

D. cannot be determined.

Answer: B

View Text Solution

52. If the function $f:[-3,3] \to S$ defined by $f(x) = x^2$ is onto then S is

A. $[-9,9]$

B. $\mathbb{R}$

C. $[-3,3]$

D. $[0,9]$

Answer: D

View Text Solution

53. Let $X = \{1, 2, 3, 4\}, Y = \{a, b, c, d\}$ and $f = \{(1, a), (4, b), (2, c), (3, d), (2, d)\}$. Then f is

A. an one to one function

B. an onto function

C. a function which is not one to one

D. not a function

Answer: D

View Text Solution

54. The inverse of $f(x) = \begin{cases} x & \text{if } x < 1 \\ x^2 & \text{if } 1 \leq x \leq 4 \\ 8\sqrt{x} & \text{if } x > 4 \end{cases}$ is

A. $f^{-1}(x) = \begin{cases} x & \text{if } x < 1 \\ \sqrt{x} & \text{if } 1 \leq x \leq 16 \\ \frac{x^2}{64} & \text{if } x > 16 \end{cases}$

B. $f^{-1}(x) = \begin{cases} -x & \text{if } x < 1 \\ \sqrt{x} & \text{if } 1 \leq x \leq 16 \\ \frac{x^2}{64} & \text{if } x > 16 \end{cases}$

C. $f^{-1}(x) = \begin{cases} x^2 & \text{if } x < 1 \\ \sqrt{x} & \text{if } 1 \leq x \leq 16 \\ \frac{x^2}{64} & \text{if } x > 16 \end{cases}$

D. $f^{-1}(x) = \begin{cases} 2x & \text{if } x < 1 \\ \sqrt{x} & \text{if } 1 \leq x \leq 16 \\ \frac{x^2}{8} & \text{if } x > 16 \end{cases}$

Answer: A

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55. Let $f: \mathbb{R} \to \mathbb{R}$ be defined by $f(x) = 1 - |x|$. Then the range of f is

A. $\mathbb{R}$

B. $(1, \infty)$

C. $(-1, \infty)$

D. $(-\infty, 1]$

Answer: D

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56. The function $f: \mathbb{R} \to \mathbb{R}$ is defined by $f(x) = \sin x + \cos x$ is

A. an odd function

B. neither an odd function nor an even function

C. an even function

D. both odd function and even function.

Answer: B

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57. The function $f: \mathbb{R} \to \mathbb{R}$ is defined by

$$f(x) = \frac{\left(x^2 + \cos x\right)\left(1 + x^4\right)}{(x - \sin x)(2x - x^3)} + e^{-|x|} \text{ is}$$

A. an odd function

B. neither an odd function nor an even function

C. an even function

D. both odd function and even function.

Answer: C

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Exercise 1 6

1. If X and Y are two sets such that $n(X) = 17, n(Y) = 23$ and $n(X \cup Y) = 38$, find $n(X \cap Y)$.

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2. If X and Y are two sets such that $X \cup Y$ has 18 elements, X has 8 elements and Y has 15 elements , how many elements does $X \cap Y$ have?

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3. In a group of 400 people, 250 can speak Hindi and 200 can speak English. How many people can speak both Hindi and English?

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4. If S and T are two sets such that S has 21 elements, T has 32 elements, and $S \cap T$ has 11 elements, how many elements does $S \cup T$ have?

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5. If X and Y are two sets such that X has 40 elements, $X \cup Y$ has 60 elements and $X \cap Y$ has 10 elements, how many elements does Y have?

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6. In a group of 70 people, 37 like coffee, 52 like tea and each person likes atleast one of the two drinks. How many people like both coffee and tea?

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7. In a group of 65 people, 40 like cricket, 10 like both cricket and tennis. How many like tennis only and not cricket? How many like tennis?

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8. In a committee, 50 people speak French, 20 speak Spanish and 10 speak both Spanish and French. How many speak at least one of these two languages?

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Miscellaneous Exercise On Chapter 1

1. Decide, among the following sets, which sets are subsets of one and another:

A = $\{x : x \in R \text{ and } x \text{ satisfy } x^2 - 8x + 12 = 0\}$,

$B = \{2, 4, 6\}, C = \{2, 4, 6, 8, \ldots\}, D = \{6\}$.

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2. Determine whether the statement is true or false. If it is true, prove it. If ir false, give an example.

If x $\in$ A and A $\in$ B, then x $\in$ B

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3. In each of the following, determine whether the statement is true or false. If it is true, prove it. If it is false, give an example.

If $A \subset B$ and $B \in C$, then $A \in C$

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4. Determine whether the statement is true or false. If it is true, prove it. If ir false, give an example.

If A $\subset$ B and B $\subset$ C, then A $\subset$ C

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5. In each of the following, determine whether the statement is true or false. If it is true, prove it. If it is false, give an example.

If $A \not\subset B$ and $B \not\subset C$, then $A \not\subset C$

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6. In each of the following, determine whether the statement is true or false. If it is true, prove it. If it is false, give an example.

If $x \in A$ and $A \not\subset B$, then $x \in B$

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7. In each of the following, determine whether the statement is true or false. If it is true, prove it. If it is false, give an example.

If $A \subset B$ and $x \notin B$, then $x \notin A$

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8. Let $A, B,$ and C be the sets such that $A \cup B = A \cup C$ and $A \cap B = A \cap C$. Show that $B = C$.

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9. Show that the following four conditions are equivalent :

$A \subset B$

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10. Show that the following four conditions are equivalent :

$A - B = \varphi$

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11. Show that the following four conditions are equivalent :

$A \cup B = B$

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12. Show that the following four conditions are equivalent :

$A \cap B = A$

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13. Show that if $A \subset B$, then $C - B \subset C - A$.

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14. Assume that $P(A) = P(B)$. Show that $A = B$

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15. Is it true that for any sets A and B, $P(A) \cup P(B) = P(A \cup B)$?

Justify your answer.

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16. Show that for any sets A and B,

$A = (A \cap B) \cup (A - B)$ and $A \cup (B - A) = (A \cup B)$

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17. Using properties of sets, show that

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

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18. Using properties of sets, show that

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

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19. Show that $A \cap B = A \cap C$ need not imply $B = C$.

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20. Let A and B be sets. If $A \cap X = B \cap X = \phi$ and $A \cup X = B \cup X$ for some set X, show that A=B.

(Hints $A = A \cap (A \cup X)$, $B = B \cap (B \cup X)$ and use distributive law)

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21. Find sets A, B and C such that $A \cap B$, $B \cap C$ and $A \cap C$ are non-empty sets and $A \cap B \cap C = \phi$.

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22. In a survey of 600 students in a school, 150 students were found to be taking tea and 225 taking coffee, 100 were taking both tea and coffee. Find how many students were taking neither tea nor coffee?

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23. In a group of students, 100 students know Hindi, 50 know English and 25 know both. Each of the students knows either Hindi or English. How many students are there in the group?

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24. In a survey of 60 people, it was found that 25 people read newspaper H, 26 read newspaper T, 26 read newspaper I, 9 read both H and I, 11 read both H and T, 8 read both T and I, 3 read all three newspapers. Find:

the number of people who read at least one of the newspapers.

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25. In a survey of 60 people, it was found that 25 people read newspaper H, 26 read newspaper T, 26 read newspaper I, 9 read both H and I, 11 read both H and T, 8 read both T and I, 3 read all three newspapers. Find:

the number of people who read exactly one newspaper.

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26. In a survey it was found that 21 people liked product A, 26 liked product B and 29 liked product C. If 14 people liked products A and B, 12 people liked products C and A, 14 people liked products B and C and 8 liked all the three products. Find how many liked product C only.

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Example

1. Find the number of subsets of A if $A = \{(x : x = 4n + 1, 2 \leq n \leq 5, n \in \mathbb{N})\}$.

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2. In a survey of 5000 persons in a town, it was found that 45% of the persons know language A, 25% know language B, 10% know Language C, 5% know Language A and B, 4% know Languages Band C, and 4% now Languages A and C. If 3% of the persons know all the three Languages find the number of persons who knows only Language A.

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3. Prove that

$((A \cup B' \cup C) \cap (A \cap B' \cap C')) \cup ((A \cup B \cup C') \cap (B' \cap C''))) = B' \cap$

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4. If $X = \{1, 2, 3. \ldots \ldots \ldots .10\}$ and $A = \{1, 2, 3, 4, 5\}$ find the number of sets $B \subseteq X$ such that $A - B = \{4\}$.

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5. If A and B are two sets so that $n(B - A) = 2n(A - B) = 4n(A \cap B)$ and if $n(A \cup B) = 14$, then find $n(\mathscr{P}(A))$.

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6. Two sets have m and k elements. If the total number of subsets of the first set is 112 more than that of the second set, find the values of m and k.

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7. If $n(A) = 10$ and $n(A \cap B) = 3$ find $n((A \cap B)' \cap A)$

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8. If $A = \{1, 2, 3, 4\}$ and $B = \{3, 4, 5, 6\}$ find $n((A \cup B) \times (A \cap B) \times (A \Delta B))$.

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9. If $\mathscr{P}(A)$ denotes the power set of A then find $n(\mathscr{P}(\mathscr{P}(\mathscr{P}(\emptyset))))$.

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10. Check the relation $R = \{(1, 1), (2, 2), (3, 3), \ldots\ldots, (n, n)\}$ defined on the set $S = \{1, 2, 3, \ldots\ldots\ldots\ldots, n\}$ for the three basic realtions.

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11. Let $S = \{1, 2, 3\}$ and $\rho = \{(1, 1), (1, 2), (2, 2), (1, 3), (3, 1)\}$.

(i) If ρ refelxive? If not, state the reason and write the minimum set of ordered pairs to be included to ρ so as to make it reflexive.

(ii) Is ρ symmetric ? If not, state the reason, write minimum number of ordered pairs to be included to ρ so as to make it symmetric and write minimum number of ordered pairs to be deleted from ρ so as to make it symmetric.

(iii) Is ρ transitive? If not, state the reason, write minimum number of ordered pairs to be included to ρ so as to make it transitive and write minimum number of ordered pairs to be deleted from ρ so as tomake it transitive.

(iv) Is ρ an equivalence relation? If not, write the minimum ordered pairs to be included to ρ so as to make it an equivalence relation.

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12. Let $A = \{0, 1, 2, 3\}$. Construct relations on A of the following types: not reflexive, not symmetric, not transitive

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13. Let $A = \{0, 1, 2, 3\}$. Construct relations on A of the following types:

not reflexive, not symmetric, transitive

View Text Solution

14. Let $A = \{0, 1, 2, 3\}$. Construct relations on A of the following types:

not reflexive, symmetric, not transitive

View Text Solution

15. Let $A = \{0, 1, 2, 3\}$. Construct relations on A of the following types:

not reflexive, symmetric, transitive

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16. Let $A = \{0, 1, 2, 3\}$. Construct relations on A of the following types:

reflexive, not symmetric, not transitive

View Text Solution

17. Let $A = \{0, 1, 2, 3\}$. Construct relations on A of the following types:

reflexive, not symmetric, transitive

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18. Let $A = \{0, 1, 2, 3\}$. Construct relations on A of the following types:

reflexive, symmetric, non transitive

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19. In the set $\mathbb{Z}$ of integers, define m Rn if m-n is multiple of 12. Prove that R is an equivalence relation.

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20. Check whether of the following functions are one to one and onto.

(i) $f: \mathbb{N} \to N$ defined $f(n) = n + 2$

(ii) $f: \mathbb{N} \cup \{-1, 0\} \to \mathbb{N}$ defined by $f(n) = n + 2$.

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21. Check the following functions for one to oneness and onto ness and ontoness.

(i) $f: \mathbb{N} \to \mathbb{N}$ defined by $f(n) = n^2$

(ii) $f: R \to R$ defined by $f(n) = n^2$

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22. Check whether the following for one to one ness and ontoness.

(i) $f: \mathbb{R} \to R$ defined by $f(x) = \dfrac{1}{x}$

(ii) $f: R - \{0\} \to \mathbb{R}$ defined by $f(x) = \dfrac{1}{x}$

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23. If $f: \mathbb{R} - \{-1, 1\} \to \mathbb{R}$ is defined by $f(x) = \frac{x}{x^2 - 1}$, verify whether f is one to one or nto.

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24. If $f: R \to R$ is defined as $f(x) = 2x^2 - 1$ find the pre images of 17,4 and -2.

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25. If $f: [-2, 2] \to B$ is given by $f(x) = 2x^3$ then find B so that f is onto.

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26. Check whether the function $f(x) = x|x|$ defined on $[-2, 2]$ is one to one or not. If it is one to one find a suitable co domain so that the function becomes a bijection.

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27. Find the largest possible domain for the real valued function f defined by $f(x) = \sqrt{x^2 - 5x + 6}$

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28. Find the domain of $f(x) = \dfrac{1}{1 - 2\cos x}$

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29. Find the range of the function $f(x) = \dfrac{1}{1 - 3\cos x}$

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30. Find the largest possible domain for the real valued function given by

$$f(x) = \frac{\sqrt{9 - x^2}}{\sqrt{x^2 - 1}}$$

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31. Let $f = \{(1, 2), (3, 4), (2, 2)\}$ and $g = \{(2, 1), (3, 1), (4, 2)\}$ Find g o f and f o g.

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32. Let $f = \{(1, 4), (2, 5), (3, 5)\}$ and $g = \{(4, 1), (5, 2), (6, 4)\}$. Find g o f. Can you find f o g ?

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33. Let f and g be the two functions from $\mathbb{R}$ to $\mathbb{R}$ defined by $f(x) = 3x - 4$ and $g(x) = x^2 + 3$. Find g o f and f o g

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34. Show that the statement.

if f and g of are one to one then g is one to one is not true.

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35. Let $f, g: \mathbb{R} \to \mathbb{R}$ be defined as $f(x) = 2x - |x|$ and $g(x) = 2x + |x|$. Find f o g .

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36. If $f: \mathbb{R} \to \mathbb{R}$ is defined by $f(x) = 2x - 3$ prove that f is a bijection and find its inverse.

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Exercise 1 1

1. Write the following in roster form.

$\{x \in N : x^2 < 121 \text{ and } x \text{ is a prime}\}$

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2. Write the following in roster form.

the set of all positive roots of the equation $(x-1)(x+1)\left(x^2-1\right)=0$

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3. Write the following in roster form.

$\{x \in \mathbb{N} : 4 \times 9 < 53\}$

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4. Write the following in roster form.

$$\left\{x : \frac{x-4}{x+2} = 3, x \in \mathbb{R} - \{-2\}\right\}$$

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5. Write the set {-1,1} is set builder form.

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6. State whether the following sets are finite or infinite.

$\{x \in \mathbb{N} : x \text{is an even prime number}\}$

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7. State whether the following sets are finite or infinite.

$\{x \in \mathbb{N} : x \text{is an odd prime number}\}$

View Text Solution

8. State whether the following sets are finite or infinite.

$\{x \in \mathbb{Z} : \text{x is even and less than } 10\}$

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9. State whether the following sets are finite or infinite.

$\{x \in \mathbb{R} : \text{x is rational number}\}$

View Text Solution

10. State whether the following sets are finite or infinite.

$\{x \in \mathbb{N} : \text{x is rational number}\}$

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11. Jusify the trueness of the statement

An element of a set can never be a subset of itself.

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12. If $n(A \cap B) = 3$ and $n(A \cup B) = 10$, then find $n(\mathscr{P}(A \Delta B))$

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13. For a set A, $A \times A$ contains 16 elements and two of its elements are (1,3) and (0,2). Find the element of A.

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14. Let A and B be two such that $n(A) = 3$ and $n(B) = 2$. If $(x, 1), (y, 2), (z, 1)$ are in $A \times B$, find A and B where x, y, z are distinct elements.

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15. If $A \times A$ has 16 elements $A = \{(a, b) \in A \times A : a < \}$, $(-1, 2)$ and (0,1) are two elements of S, then find the remaining element of S.

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Exercise 1 2

1. Discuss the following relations for reflexivity, symmetricity and transitivity:

The relation R defined on the set of all positive integers by mRn if m divides n.

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2. Discuss the following relations for reflexivity, symmetricity and transitivity:

Let P denote the set of al straight lines in a plane. The relation R defined by l Rnm if l is perpendicular to m.

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3. Discuss the following relations for reflexivity, symmetricity and transitivity:

let A be the consisting of all the members of a family. The relation R defined by a Rb if a is not a sister of b.

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4. Discuss the following relations for reflexivity, symmetricity and transitivity:

Let A be the set consisting of all the female members of a family. The relation R defined by a Rb if a is not a sister of b.

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5. Discuss the following relations for reflexivity, symmetricity and transitivity:

On the set of natural numbers the relation R defined by x Ry if $x + 2y = 1$.

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6. Let $X = \{a, b, c, d\}$ and $R = \{(a, a), (b, b), (a, c)\}$. Write doen the minimum number of ordered pairs to be included to R to make it

(i) reflexive (ii) symmetric (iii) transitive (iv) equivalence

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7. Let $A = \{a, b, c\}$ and $R = \{(a, a), (b, b), (a, c)\}$. Write down the minimum number of ordered pairs to be included to R to make it

(i) reflexive (ii) symmetric (iii) transitive (iv) equivalence

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8. On the set of natural numbers let R be the relation defined by a Rb if $2a + 3b = 30$. Write down the relation by listing all the pairs. Check whether it is

(i) reflexive (ii) symmetric (iii) transitive (iv) equivalence

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9. On the set of natural numbers let R be the relatioin defined by aRb if $a + b \leq 6$. Write down the relation by listing all the pairs. Check whether it is

(i) reflexive (ii) symmetric (iii) transitive (iv) equivalence

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10. Let $A = \{a, b, c\}$. What is the equivalence relation of smallest cardinality of A? What is the equivalence relationi of largest cardinality on A?

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