



MATHS

BOOKS - NAGEEN PRAKASHAN ENGLISH

SETS

Solved Examples

1. Check, which of the following is a set :

- (i) A collection of all students in your school
- (ii) A collection of 5 best writers of India
- (iii) A collection of natural number upto 50
- (iv) A collection of all even integers
- (v) A collection of first 10 prime numbers
- (vi) A collection of dangerous animals of the world.



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2. Write the following sets in Roaster form :

(i) $A = \{x : x \text{ is a natural number and } x < 10\}$

(ii) $B = \{x : x \text{ is a prime number which are the factor of } 60\}$

(iii) $C = \text{set of all letters of the word 'MATHEMATICS'}$.

(iv) $D = \{x : x \text{ is an even natural number}\}$

(v) $E = \{x : x \text{ is an integers and } x^2 \leq 10\}$

(vi) $F = \left\{ x : x \text{ is an integer and } -\frac{3}{2} < x < \frac{5}{2} \right\}$.



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3. Write the following sets in set builder form :

(i) $A = \{1, 4, 9, 16, \dots\}$

(ii) $B = \left\{ \frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \dots \right\}$

(iii) $C = \{-1, \dots\}$

(iv) $D = \text{set of all odd positive inetgers}$

(v) $E = \{3, 6, 9, 12, \dots\}$

(vi) $F = \left\{ \frac{1}{3}, \frac{2}{6}, \frac{3}{11}, \frac{4}{18}, \dots \right\}$.



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4. Which of the following sets are empty sets and which are singleton sets ?

(i) Set of even prime numbers

(ii) $\{x : x + 2 = -1 \text{ and } x \in \mathbb{N}\}$

(iii) Set months starting with D

(iv) $(x : x \text{ is a common point in two parallel lines})$.



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5. Which of the following sets are finite and which are infinite ?

(i) Set of days of a week

(ii) Set of odd positive integers

(iii) Set of irrational numbers between two natural numbers

(iv) Set of prime numbers less than 50.



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6. Select the pair of equal of equal sets from the following :

$$A = \{0\}$$

$$B = \{x : x > 15 \text{ and } x < 5, x \in N\}$$

$$C = \{x : x - 5 = 0\}$$

$$D = \{x : x^2 = 25\}$$

$$E = \{x : x \text{ is positive root of } x^2 - 2x - 15\} = 0.$$



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7. Show that the set of letters of the word 'CATARACI' and the set of letters of the word 'TRACT' are same.



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8. State whether the given statement are true and false ?

(i) $\{2, 3, 4, 5\}$ and $\{3, 6\}$ are disjoint

(ii) $\{2, 6, 10, 14\}$ and $\{3, 7, 11, 15\}$ are disjoint

(iii) $\{2, 6, 10\}$ and $\{3, 7, 11\}$ are disjoint.





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9. If $A = \{1, 2, 3, 4\}$, $B = \{1, 2, 3\}$ and $C = \{2, 4\}$, the find all sets X such that

(i) $X \subset B$ and $X \subset C$

(ii) $X \subset A$ and $X \not\subset B$.



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10. Write the set of the letter of the word 'ALLAGABAD'. Also find the number of subsets of this set.



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11. If $S = \{1, 3, 5, 7, 11, 13\}$, then which of the following are the subsets of S ?

$A = \{2, 4\}$, $B = \{5, 7\}$, $C = \{5, 11, 13\}$, $D = \{1, 2, 5\}$



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12. Write the power set for the set $A = \{5, 9, 11\}$.

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13. If $A = \{0, \{1, 2\}\}$, then find $P(A)$.

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14. If $X = \{4^n - 3n - 1 : n \in N\}$ and $\{9(n - 1) : n \in N\}$, then prove that $X \subset Y$.

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15. If $A = \{1, 3, 5, 7, 9\}$ and $B = \{1, 2, 3, 4, 5\}$ then find $A \cup B$ and $A \cap B$.

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16.

If

$A = \{x : x = 2n, n \text{ is a positive integer}\}$ and $B = \{x = x = 3n, n, \text{ is po}$

then find $A \cap B$.



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17. If $A = \{1, 2, 3\}$, $B = \{3, 4\}$ and $C = \{4, 5, 6\}$, then find the each of the following :

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

(ii) $(A - B) \cup C$

(iii) $(A \cup B) - C$

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



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18. If $A = \{2, 3, 5, 8, 10\}$, $B = \{3, 4, 10, 12\}$ and $C = \{4, 5, 8, 14\}$, then find each of the following :

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

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



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19. If $A = \{1, 2, 3, 4\}$, $B = \{2, 3, 4, 5\}$ and $C = \{4, 5, 6, 7\}$, then find each of the following :

$$(i) A - (B - C)$$

$$(ii) (A - B) - C.$$



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20. If $U = \{1, 2, 3, 4, 5, 6, 7, 8\}$, $A = \{3, 4, 5, 6\}$ and $B = \{1, 3, 5, 7\}$, then find each of the following :

$$(i) A' \cup B'$$

$$(ii) A' \cap B'$$

$$(iii) (A \cup B)'$$

$$(iv) A' - B'.$$



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21. If $A = \{1, 4, 6, 7\}$ and $B = \{4, 7, 9, 10\}$, then find $A \oplus B$.

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22. If $A = \{1, 2, 3\}$ and $B = \{2, 3, 5, 6\}$, then represent both sets on a Venn diagram.

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23. If A and B are two sets, then prove that :

$$A \cup B = A \cap B \Leftrightarrow A = B.$$

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24. For any two sets A and B , prove that :

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

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



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25. For any 3 sets A, B and C, prove that :

$$(i) A - (B \cup C) = (A - B) \cap (A - C)$$

$$(ii) A - (B \cap C) = (A - B) \cup (A - C)$$

$$(iii) A \cap (B - C) = (A \cap B) - (A \cap C)$$

$$(iv) (A \cup B) - C = (A - C) \cup (B - C)$$

$$(v) A \cap (B \Delta C) = (A \cap B) \Delta (A \cap C).$$



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26. If A and B are two sets, then prove that the sets $A - B$, $B - A$ and $A \cap B$ are mutually disjoint.



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27. For any two sets A and B, prove that :

(i) $(A \cup B) - A = B - A$

(ii) $(A - B) \cap A = A \cap B'$

(iii) $A \cap B' = \phi \Rightarrow A \subseteq B$

(iv) $A' \cup B = U \Rightarrow A \subseteq B.$



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28. If A and B are two sets such that $A \cup B$ has 60 elements, A has 32 elements and B has 36 elements. Find the number of elements in $A \cap B$.



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29. In a committee, 40 person can speak Hindi 20 can speak English and 10 can speak both languages. Find how many persons can speak atleast one language ?



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30. If A and B are two sets such that $n(A) = 15$, $n(A \cup B) = 40$ and $n(A \cap B) = 5$, then find each of the following :

(i) $n(B)$

(ii) $n(A - B)$

(iii) $n(B - A)$

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31. There are 12 teachers in a school who can teach Maths or Physics. Out of these, 6 teach Maths and 4 teach Physics and Maths both. Find how many teachers teach Physics ?

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32. 200 persons have a skin disease, out of which 120 persons are effected with chemical C_1 , 50 with chemical C_2 and 30 with chemical C_1 and C_2 both. Find the number of persons who

(i) are effected with C_1 or C_2

(ii) are effected with C_1 but not C_2

(iii) are effected with C_2 but not C_1 .



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33. In a school, 21 student read Maths, 26 reads Physics and 29 read Chemistry. If 14 students read Maths and Physics, 15 read Physics and Chemistry, 12 read Chemisry and Maths and 8 read all three subjects, then find the total students in the school.



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34. There are 175 students in a class, out of which 100 students opt Maths, 70 opt Physics and, 23 opt Physics and Chemisty, 28 opt Chemistry and Maths and 18 opt of all three subjects. Now find each of the following

:

No. of students who opt why only Maths

(ii) No. of students who opt only Physics

(iii) No. of students who opt only Chemistry

(iv) No. of students who opt Physics and Chemistry but not Maths

(v) No. of students who opt Maths and Physics but not Chemistry

(vi) No. of students who opt only one subject

(viii) No. of students who opt at least one subject

(viii) No. of student who do not opt any subject.



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Exercise 1 A

1. If $A = \{1, 2, 3, 4, 5, 6\}$, the fill up with 'in or cancel in :

(i) $2 \in A$

(ii) $7 \in A$

(iii) $0 \in A$

(iv) $5 \in A$.



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2. Which of the following collections represent a set :

- (i) The collection of women prime ministers of India
- (ii) The collection of first 5 natural numbers
- (iii) The collection of intelligent girls of class XI.
- (iv) The collection of best eleven batsman of the world.

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3. Write each of the following sets in tabular form :

(i) $A = \{x : x \text{ is a perfect square and } x < 40\}$

(ii) $B = \{x : x \text{ is an integer and } x^2 - x - 2 = 0\}$

(iii) C is the set of all letters of the word 'SERIES'.

(iv) $D = \{x : x \text{ is a two digit number in which sum of digits is } 6\}$

(v) $E = \{x : x, \text{ is natural number less than } 6\}$

$F = \{x : x^2 = 4, x \in R\}$

(vii) H is the set of letters of the word 'TRIGONOMETRY'.

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

(i) $A = \{2, 4, 6, 8, 10\}$

(ii) $B = \{1, 2, 3, 4, 6, 12\}$

(iii) $C = \{1, 3, 5, 7, 9, \dots\}$

(iv) $D = \left\{ \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \dots \right\}$

(v) $E = \{2, 4, 8, 16, 32, 64\}$.



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5. Write the following in symbolical form (set-builder form) :

(i) Set of all even natural numbers

(ii) Set of roots of the equation $3x^2 - 5x - 2 = 0$

(iii) Set of all positive integers greater than 3 and smaller than 8

(iv) Set of alphabets of the word 'ENGLISH'.



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6. Write the set $A = \{a_n : n \in N, a_{n+1} = 3a_n, a_1 = 1\}$ in tabular form.



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7. Write the set $B = \{a_n : n \in N, a_{n+2} = a_{n+1} + a_n \text{ and } a_1 = a_2 = 1\}$ in tabular form.



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Exercise 1 B

1. Which of the following are the examples of empty set ?

(i) $\{x : x \in N, x < 7 \text{ and } x > 9\}$

(ii) $\{x : x \text{ is a common point of two perpendicular lines}\}$

(iii) $\{x : x \text{ is an even natural number divisible by 3}\}$

(iv) $\{x : x^2 = 4 \text{ and } x \text{ is an odd number}\}$.



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2. If R is the set of real numbers, then which elements are presented by the set $\{x \in R: x^2 + 2x + 2 = 0\}$

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3. Is $\{x: x^3 + 1 = 0, x \in N\} = \phi$ true where N is the set of positive integers ?

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4. Which of the following is singleton set ?

(i) $A = \{x: x \text{ is a letter in English alphabet, comes after Z}\}$

(ii) $B = \{0\}$

(iii) $C = \{x: x + 4 = 4\}$

(iv) $D = \{x: x^2 - 4x + 4 = 0\}$

(v) $E = \{x: x \in N, 6 < x < 9\}$.

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5. Write the empty and singleton set from the following sets :

(i) $A = \{x : x + 2 = 5\}$

(ii) $B = \{x : x^2 - 8x + 16 = 0\}$

(iii) $C = \{x : x + 2 = 3 \text{ and } 2x = 1\}$

(iv) $D = \{x : x < x\}$.



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6. Write the finite and infinite sets from the following sets :

(i) Set of all natural numbers

(ii) Set of all positive integers less than 100

(iii) $\{x : x = x^2\}$

(iv) Set of all lines parallel to x-axis

(v) Set of all prime numbers less than 100

(vi) $\{x : x^2 = 16\}$

(vii) $\{x : x \in \mathbb{R}, 1 \leq x \leq 10\}$

(viii) Set of all negative integers less than 50.



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7. From the following pairs, write whether $A = B$ or not :

(i) $A = \{2, 4, 8, 12\}$, $B = \{8, 4, 2, 12\}$

(ii) $A = \{3, 4\}$, $B = \{x : x \text{ is a root of } x^2 - 7x + 12 = 0\}$

(iii) $A = \{x : x \text{ is a multiple of } 10\}$, $B = \{10, 15, 20, 25, 30, \dots\}$

(iv)

$A = \{x : x \text{ is a letter of the word 'FOLLOW'}\}$, $B = \{x : x \text{ is a letter of the word 'WOLLOF'}\}$

(v) $A = \{x : 2x^2 - 5x + 2 = 0\}$, $B = \{x : 2x^3 - 5x^2 + 2x = 0\}$

(vi) $A = \{x : x \in N, 1 \leq x \leq 3\}$, $B = \{x : 3x = 9, 2x = 2, x - 1 = 1\}$.



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8. Which pairs from the following pairs are equal ?

(i) $A = \{3, 5, 7\}$, $B = \{1, b, c\}$

(ii) $A = \{x : x \in N, x + 5 = 6\}$, $B = \phi$

(iii) $A =$ Set of the letters of the word 'ALLOY', $B =$ Set of letters of the word 'LOYAL'.



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9. Find the sets which are equal, from the following sets :

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

$$B = \{x : x^3 - 6x^2 + 11x - 6 = 0\}$$

$$C = \{0, 1\}, D = \{a, b\}$$

$$E = \{x : x^2 - x = 0\}$$

$$F = \{x : (x - a)(x - b) = 0\}.$$



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10. Which of the following sets are disjoint ?

$$A = \{2, 3\}, B = \{4, 5, 6\}$$

$$C = \{3, 5, 8\}, D = \{1, 5, 7\}.$$



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1. Write the following statements in set notation :

(i) A is not a subset of B

(ii) P is a superset of Q

(iii) E is a proper subset of F.



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2. Fill up with \subset or $\not\subset$ to form a correct statement :

(i) $\{2, 5\} \hat{=} \hat{=} \{2, 3, 5\}$

(ii) $\{x : x \text{ is a triangle in a plane}\} \hat{=} \hat{=} \{x : x \text{ is an equilateral triangle in a plane}\}$

(iii) $\{2, 4, 6\} \dots\dots \{1, 4, 6\}$

(iv) $\{x : x \text{ is a whole numbe}\} \dots\dots \{x : x \text{ is an integer}\}$.



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3. 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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4. Write the following sets in the form of an interval

(i) $\{x : x \in R, 2 < x \leq 5\}$

(ii) $\{x : x \in R, -5 < x < 3\}$

(iii) $\{x : x \in R, 1 < x < 8\}$

(iv) $\{x : x \in R, -7 < x < 4\}$



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5. Write the following intervals in set builder form :

(i) $(-3, 2)$

(ii) $(-3, 5]$

(iii) $[1, 3)$

(iv) $[2, 12]$



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6. Write all subset of each of the following sets :

(i) $\{5, 6\}$

(ii) $\{4, 5, 6\}$

(iii) $\{\phi\}$.



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7. Write all proper subsets of each of the set

(i) $\{2, 3\}$, (ii) $\{1, 3, 5\}$.



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8. Write the power set of each of the set (i) $\{a, b\}$, (ii) $\{a, b, c\}$.



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9. Write all subsets of the set $\{\{1, 2\}, 3\}$.



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10. If $A = \phi$, then find each of the following :

(i) $P(A)$

(ii) $P(P(A))$

(iii) $P\{P(P(A))\}$.



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11. If $A = \{1, 2, 3, 4\}$, $B = \{2, 3, 4\}$ and $C = \{1, 3\}$, then find the set X such that :

(i) $X \subset B$ and $X \subset C$

(ii) $X \subset B$ and $X \not\subset C$

(iii) $X \subset A$, $X \subset B$ and $X \subset C$.



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12. Prove that :

(i) $A \subseteq B$, $B \subseteq C \Rightarrow A \subseteq C$

(ii) $A \subseteq \phi, \Leftrightarrow A = \phi$



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13. If $X = \{8^n - 7n - 1, n \in N\}$ and $Y = \{49(n - 1), n \in N\}$. Prove that X is a subset of Y .



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14. Check, whether the following statements are true or false :

(i) $\{1, 2\} \not\subseteq \{1, 2, 3\}$

(ii) $\{a, b\} \subset \{x : x \text{ is a letter of English alphabet}\}$

(iii) $\{x : x \text{ is an odd natural number}\} \subseteq \{x : x \text{ is a positive integer}\}$

(iv) $\{a\} \in \{a, b\}$.



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15. Let B be a subset of a set A and let $P(A : B) = [X \in P(A) : X \subset B]$.

(i) Show that: $P(A : \phi) = P(A)$ (ii) If $A = \{a, b, c, d\}$ and $B = \{a, b\}$.

List all the members of the set $P(A : B)$



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16. Write the number of proper subsets of the set of formed by the letter of the word 'DELHI'.



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Exercise 1 D

1. (i) If A and B sets have 2 and 5 elements respectively, then find the minimum and maximum number of elements in $A \cup B$

(ii) If A and B have 4 and 6 elements respectively, then find the minimum and maximum number of elements in $A \cap B$.



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2. If $A = \{1, 2, 3, 4\}$, $B = \{3, 4, 5\}$, $C = \{1, 5, 6\}$, then find of the following :

(i) $A \cup B$

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

(ii) $A - B$

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



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3. If $A = \{x : x = 3n, n \in N\}$ and $B = \{x : x = 4n, n \in N\}$, then find $A \cap B$.



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4. If $A = \{1, 2, 3, 4\}$, $B = \{2, 4, 6, 8\}$ and $C = \{3, 4, 5, 6\}$, then find each of the following ,

(i) $(A - B) \cap C$

(ii) $(A \cap B) - C$

(iii) $A - (B - C)$

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



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5. If A and B are two sets, then find $(A \cap B) \cup B$.



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6. If A and B are two sets such that $A \subseteq B$, then find

(i) $A \cup B$

(ii) $A \cap B$.



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7. If $A = \{1, 2, 3, 4, 5\}$, $B = \{2, 4, 6, 8\}$ and $C = \{3, 6, 7, 8\}$, then show that :

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

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

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8. (i) If $aN = \{2x : x \in N\}$, then find $3N \cap 2N$.

(ii) If $A = \{2, 3, 4\}$, $B = \{4, 5\}$ and $C = \{5, 6, 7\}$, then find $A \cup (B \cap C)$

(iii) If $X = \{1, 3, 5, 7, 9\}$, $Y = \{1, 2, 3, 4, 5\}$, then find $(X - Y) \cup X$.

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9. If

$A = \{x : x \leq 4, x \in N\}$, $B = \{x : x \leq 8, x \in N\}$ and $C = \{x : x \in N, 2 <$

, then show that :

$$(i) A - (B \cap C) = (A - B) \cup (A - C)$$

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

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10.

If

$$U = \{11, 12, 13, 14, \dots, 20\}, A = \{11, 12, 13, 14\} \text{ and } B = \{14, 16, 18, 20\}$$

, then find each of the following :

$$(i) A \cap B'$$

$$(ii) A' \cup B'$$

$$(iii) (A \cup B)'$$

$$(iv) (A \cap B)'$$

$$(v) A' - B'$$

$$(vi) B - A'.$$

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11. If $A = \{1, 2, 3\}$ and $B = \{3, 5, 7\}$, the find $A \oplus B$.



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12. Find $(A - B) \cup (B - A)$ from each of the following :

(i) $A = \{x, y, z\}$, $B = \{a, x, y, d\}$

(ii) $A = \{2, 4, 6, 8\}$, $B = \{1, 3, 5\}$

(iii) $A = \{1, 2, 3, 4\}$, $B = \{3, 4, 5, 6, 7\}$.



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13. If $A = \{2, 4, 6, 8, 10\}$, $B = \{3, 4, 5, 6\}$ and $C = \{5, 6, 7, 8\}$, the show that :

(i) $B \oplus C = C \oplus B$

(ii) $A \oplus (B \oplus C) = (A \oplus B) \oplus C$.



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14. For any set A show that $A \oplus A = \phi$.



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15. If $A = \{x : x \text{ is a natural number}\}$

$B = \{x : x \text{ is an even natural number}\}$

$C = \{x : x \text{ is an odd natural number}\}$

$D = \{x : x \text{ is a prime number}\}$

then find each of the following :

(i) $(A \cap B)$

(ii) $(A \cap C)$

(iii) $(A \cap D)$

(iv) $(B \cap C)$

(v) $(B \cap D)$

(vi) $(C \cap D)$.



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16. Draw the Venn diagram for each of the following :

(i) $(A \cap B)'$

(ii) $(A \cup B)'$

(iii) $A' \cup B'$

(iv) $A' \cap B'$.



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17. (i) If $A = \{x : x^2 - 2x + 1 = 0\}$ and $B = \{x : x^3 - x^2 - 2x = 0\}$,

then find $A \cup B$ and $A \cap B$

(ii) If $A = \{1, 2, 3, 4\}$, $B = \{2, 4, 6, 8\}$ and $U = \{1, 2, 3, \dots, 9\}$, then

verify that :

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

(iii) If $A = \{1, 2, 3\}$, $B = \{2, 3, 4\}$ and $U = \{1, 2, 3, 4, 5\}$, then find

$$A' \cap B'.$$



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18. If A and B are two sets, then prove that :

(i) $(A - B) \cup B = A \Leftrightarrow B \subseteq A$

(ii) $A \subset A \cup B$.



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19. For any three sets A, B and C , prove that,

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

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20. If A, B and C are three sets such that $A \cup B = C$ and $A \cap B = \phi$, then prove $A = C - B$.

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21. 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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22. For any two sets A and B, prove that :

$$P(A) = P(B) \Rightarrow A = B$$

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23. For any two sets A and B, prove that :

(i) $(A - B) \cup B = A \cup B$

(ii) $(A - B) \cap B = \phi$

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24. For any two sets A and B, prove that :

(i) $A - (A - B) = A \cap B$

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

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25. If A , B and C are three sets such that $A \cup B = A \cup C$ and $A \cap B = A \cap C$, then prove that $B = C$.



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26. Fill in the blanks :

(i) $A \cup A' = \dots\dots\dots$

(ii) $A \cap A' = \dots\dots\dots$

(iii) $\phi' \cap A = \dots\dots\dots$

(iv) $U' \cap A = \dots\dots\dots$



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27. If $U = \{1, 2, 3, \dots, 9\}$, $A = \{1, 3, 5, 7, 9\}$ and $B = \{2, 3, 5, 7\}$, then show that

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

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



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28. Represent (i) $A \cap (B \cup C)$ and (ii) $(A \cap B) \cup C$ by venn diagram.

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Exercise 1 E

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

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2. If A and B are two sets such that No. of elements in A , B and $A \cap B$ are 20, 35 and 12 respectively, then find the number of elements in $A \cup B$.

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3. If set A and B has 3 and 6 elements respectively. Find the maximum and minimum number of elements in $A \cup B$.

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4. Out of 500 car drivers, 400 are the owners of Maruti and 200 are the owners of Hundai. If 50 are the owners of both, then find the whether the datas are correct or not ?

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5. In a class of 35 students, 24 students like cricket and 16 like football. If each student plays atleast one game, find how many students like both games ?

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6. In a group of 400 persons 250 can speak Hindi and 200 can speak English. Each person speak atleast one language. Find how many persons can speak both languages ?



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7. It is known from a survey that 60% American like mangoes and 70% like apples. How many per cent of Americans like both mangoes and apples ?



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8. In a survey of 400 students of a school, it is found that 100 students like apple juice, 150 like orange juice and 75 like both. Find how many students do like neither apple not orange juice ?



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9. In a group of 70 persons, 37 like coffee and 52 like tea. Each person like atleast one drink. Find how many persons like both drink ?



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10. In a class of 35 students, 18 students opt Maths, 12 students opt Maths but not Science. Find the number of students who opt both subjects. Also find the number of students who opt Science but not Maths. It is given that each student opt atleast one subject.



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11. In a group of 25 people, 17 drink tea. Out of these 10 drink only tea. Find how many people drink coffee but not tea ? It is given that each one takes atleast one drink.



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12. In a group of 50 persons, 40 speak Hindi and 25 speak English and Hindi both. Find how many persons speak only English ? Also find how many persons speak English ?



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13. In a survey of 60 persons, it is found that 25 read newspaper H, 26 read T, 26 read I, 9 read H and I, 11 and H and T, 8 read T and I and 3 read all three newspaper. Find :

- (a) No. of persons who read atleast one newspaper.
- (b) No. of persons who read exactly one newspaper.



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14. In check up of 100 injured persons, injured in an accident in an industry, the number of injured persons by eye, hand and leg are respectively 20, 50 and 70. The 44 injured persons are injured by eye and

hand or hand and leg or eye and leg. Find the number of injured persons who are injured by all eye, hand and leg.



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15. If $A = \{1, 2, 3, 4, 5\}$ and $B = \{4, 5, 6, 7, 8\}$, then deduce the result for these sets :

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



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Exercise 1 F

1. If $A = \{x : x \in N \text{ and } 3 \leq x < 7\}$, then $A = ?$

A. $\{4, 5, 6, 7\}$

B. $\{3, 4, 5, 6\}$

C. $\{4, 5, 6\}$

D. None of these

Answer: B



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2. If $A \subseteq B$ and $B \subset X$, the the correct option is :

A. $A \subset X$

B. $A \subseteq X$

C. $X \subset A$

D. $X \subseteq A$

Answer: A



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3. If $A = \{2, 3, 5\}$, then the number of subsets of A are :

A. 3

B. 32

C. 6

D. 8

Answer: D



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4. If there are 4 elements in A , then number of proper subsets of A are :

A. 15

B. 18

C. 14

D. 16

Answer: A



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5. If $A \subset B$, then $A \cap B = ?$

A. ϕ

B. A

C. B

D. None of these

Answer: B



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6. If $A \subset B$, then $A \cup B = ?$

A. ϕ

B. A

C. B

D. None of these

Answer: C



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7. If A, B, C be three sets, then $A \cap (B \cup C) = ?$

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

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

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

D. None of these

Answer: A



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8. For three sets A, B, C , $A - (B \cup C) = ?$

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

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

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

D. None of these

Answer: B

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9. If $A = \{2, 3, 4, 5\}$ and $B = \{4, 5, 7\}$, then $n(A \cap B) = ?$

A. 2

B. 5

C. $\{4, 5\}$

D. None of these

Answer: A

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10. If $n(A) = 8$, $n(B) = 6$ and $n(A \cap B) = 3$, then $n(A \cup B) = ?$

A. 6

B. 17

C. 10

D. None of these

Answer: D



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11. For any two sets A and B, $B' - A' = ?$

A. $A \cap B$

B. $A \cup B$

C. $A - B$

D. $B - A$

Answer: C



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12. If A and B are disjoint sets, then $n(A \cap B) = ?$

A. ϕ

B. $n(A) + n(B)$

C. $n(A)$

D. $n(B)$

Answer: A



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1. If $n(A) = 4$ and $n(B) = 6$, then maximum number of elements in $A \cup B$ is :

A. 2

B. 4

C. 6

D. 10

Answer: C



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2. If $n(A) = 3$ and $n(B) = 5$, then maximum number of elements in $A \cap B$ is :

A. 3

B. 5

C. 2

D. None of these

Answer: A



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3. $A - (A - B) = ?$

A. $A \cup B$

B. $A \cap B$

C. $B - A$

D. None of these

Answer: B



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4. If $n(A) = p$ and $n(B) = q$ and no. of subsets of A are 48 more than the no. of subsets of B then :

A. $p = 6, q = 5$

B. $p = 6, q = 4$

C. $p = 5, q = 6$

D. $p = 4, q = 6$

Answer: B



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5. Which of the following is the empty set?

A. $\{x : x \in R, x^2 - 1 = 0\}$

B. $\{x : x \in N, x^2 - 4 = 0\}$

C. $\{x : x \in R, x^2 - x - 1 = 0\}$

D. $\{x : x \in N, x^2 + 4x + 3 = 0\}$

Answer: D



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6. If $A = \{1, 2, 3\}$ and $B = \{2, 3, 4\}$, then the symmetric difference of A and B is :

A. $\{1, 4\}$

B. $\{2, 3\}$

C. $\{4\}$

D. $\{1\}$

Answer: A



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7. Which of the following is incorrect ?

A. $B - A = B \cap A'$

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

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

D. $A - B = A - B'$

Answer: D

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8. There are 600 elements in universal set U. If A and B are subsets of U and $n(A) = 300$, $n(B) = 250$ and $n(A \cap B) = 50$, then $n(A' \cap B')$ is :

A. 50

B. 100

C. 150

D. 200

Answer: B



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Exercise 1 1

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

- (i) The collection of all the months of a year beginning with the letter J
- (ii) The collection of ten most talented writers of India
- (iii) A team of eleven best-cricket batsman of the world
- (iv) The collection of all body in your class
- (v) The collection of all natural numbers less than 100
- (vi) A collection of novels written by the writer Munshi Premchand
- (vii) The collection of all even integers
- (viii) The collection of questions in this Chapter
- (ix) A collection of most dangerous animals of the world.



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

(i) $5 \dots\dots A$

(ii) $8 \dots\dots A$

(iii) $0 \dots\dots A$

(iv) $4 \dots\dots A$

(v) $2 \dots\dots A$

(vi) $10 \dots\dots A$.



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3. Write the following sets in roster form:

(i) $A = \{x : x \text{ is an integer and } 3 < x < 7\}$

(ii) $B = \{x : x \text{ is a natural number less than } 6\}$

(iii) $C = \{x : x \text{ is a two digit natural number such that the sum of its digits is } 1\}$

(iv) $D = \{x : x \text{ is a prime number which is divisor of } 60\}$

(v) E = The set of all letters in the word TRIGONOMETRY

(vi) F = The set of all letters in the word BETTER



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

(i) $\{3, 6, 9, 12\}$

(ii) $\{2, 4, 8, 16, 32\}$

(iii) $\{5, 25, 125, 625\}$

(iv) $\{2, 4, 6, \dots\}$

(v) $\{1, 4, 9, \dots, 100\}$.



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5. List all the elements of the following sets :

(i) $A = \{x : x \text{ is an odd natural number}\}$

(ii) $B = \{x : x \text{ is an integer, } x \text{ lies b/w } -1/2 \text{ and } 9/2\}$

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

(iv) $D = \{x : x \text{ is a letter in the word loyal}\}$

(v) $E = \{x : x \text{ is a month of a year not having 31 days}\}$

(vi) $F = \{x : x \text{ is a consonant in the English alphabet which precedes } k\}$.

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6. 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) $\{x : x \text{ is a prime number and a divisor of } 6\}$
(ii) $\{2, 3\}$	(b) $\{x : x \text{ is an odd natural number less than } 10\}$
(iii) $\{M, A, T, H, E, I, C, S\}$	(c) $\{x : x \text{ is natural number and divisor of } 6\}$
(iv) $\{1, 3, 5, 7, 9\}$	(d) $\{x : x \text{ is a letter of the word MATHEMATICS}\}$

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

(i) Set of odd natural numbers divisible by 2

(ii) Set of even prime numbers

(iii) $\{x : x \text{ is a natural numbers, } x < 5 \text{ and } x > 7\}$

(iv) $\{y : y \text{ is a point common to any two parallel lines}\}$.



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2. Which of the following sets are finite or infinite ?

(i) The set of months of a year

(ii) $\{1, 2, 3, \dots\}$

(iii) $\{1, 2, 3, \dots, 99, 100\}$

(iv) The set of positive integers greater than 100

(v) The set of prime numbers less than 99.



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

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

(ii) The set of letters in the English alphabet

(iii) The set of number which are multiple of 5

(iv) The set of animals living on the earth

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



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

(i) $A = \{a, b, c, d\}$

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

(ii) $A = \{2, 4, 6, 8, 10\}$

$B = \{x : x \text{ is positive even integer and } x \leq 10\}$

(iii) $A = \{x : x \text{ is a multiple of } 10\}$

$B = \{10, 15, 20, 25, 30, \dots\}$.



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

(i) $A = \{2, 3\}$

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

(ii) $A = \{x : x \text{ is a letter in the word FOLLOW}\}$

$B = \{y : y \text{ is a letter in the word WOLF}\}$.



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

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



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Exercise 13

1. Make correct statements by filling in the symbols \subset or in the blank

spaces : (i) $\{2, 3, 4\} \subset 1, 2, 3, 4, 5$ (ii) $\{a, b, c\} \subset b, c, d$ (iii) $\{x : x \text{ is a student of}$

Class XI of your school}



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2. Examine whether the following statements are true or false:(i)

$\{a, b\} \subset \{b, c, a\}$ (ii) $\{a, e\} \subset \{x : x \text{ is a vowel in the English alphabet}\}$ (iii)

$\{1, 2, 3\} \subset \{1, 3, 5\}$ (iv) $\{a\} \subset \{a, b, c\}$



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

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



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4. Write down all the subsets of the following sets :

(i) $\{a\}$

(b) $\{a, b\}$

(c) $\{1, 2, 3\}$

(d) ϕ



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5. How many elements has $P(A)$, if $A = \phi$?



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6. Write the following as intervals :

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

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

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

(iv) $\{x : x \in R, 3 \leq x \leq 4\}$.



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

(i) $(-3, 0)$

(ii) $[6, 12]$

(iii) $(6, 12]$

(iv) $[-23, 5)$.



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8. What universal set(s) would you propose for each of the following ?

(i) The set of right triangles

(ii) The set of isosceles triangles.



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9. Given the set $A=\{1,3,5\}$, $B=\{2,4,6\}$ 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 C

ϕ



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Exercise 1 4

1. Find the union of each of the following pairs of sets :(i) $X = \{1, 3, 5\}$
 $Y = \{1, 2, 3\}$ (ii) $A = [a, e, i, o, u]$ $B = [a, b, c]$ (iii) $A = \{x : x \text{ is a natural number and multiple of } 3\}$ $B = \{x : x \text{ is a na$

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

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

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4.

If

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

, find :

(i) $A \cup B$

(ii) $A \cup C$

(c) $B \cup C$

(iv) $B \cup D$

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

(vi) $A \cup B \cup D$

(vii) $B \cup C \cup D$.



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



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6.

If

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

find :

(i) $A \cap B$

(ii) $B \cap C$

(iii) $A \cap C \cap D$

(iv) $A \cap C$

(v) $B \cap D$



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

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

$C \cap D$



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8. Which of the following pairs of sets are disjoint ?

(i) $\{1, 2, 3, 4\}$ and $\{x : x \text{ is natural number and } 4 \leq x \leq 6\}$

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

(iii) $\{x : x \text{ is an even inetger}\}$ and $\{x : x \text{ is an odd inetger}\}$.



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9.

A

$A = \{3, 6, 9, 12, 15, 18, 21\}$, $B = \{4, 6, 12, 16, 20\}$, $C = \{2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22\}$

, Find :

(i) $A - B$

(ii) $A - C$

(iii) $A - D$

(iv) $B - A$

(v) $C - A$

(vi) $D - A$

(vii) $B - C$

(viii) $B - D$

(ix) $C - B$

(x) $D - B$

(xi) $C - D$

(xii) $D - C$.



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10. If $X = \{a, b, c, d\}$ and $Y = \{f, b, d, g\}$, find (i) $X - Y$ (ii) $Y - X$ (iii) $X \cap Y$



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11. 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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12. State whether each of the following statement is true or false. Justify your answer. (i) $\{2, 3, 4, 5\}$ and $\{3, 6\}$ are disjoint sets, (ii) $\{a, e, i, o, u\}$ and $\{a, b, c, d\}$ are disjoint sets, (iii) $\{2, 6, 10, 14\}$ and $\{3, 7, 11, 15\}$ are disjoint sets (iv) $\{2, 6, 10\}$ and $\{3, 7, 11\}$ are disjoint sets.



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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 $C = \{3, 5, 7, 9\}$

Find :

(i) A'

(ii) B'

(iii) $(A \cup C)'$

(iv) $(A \cap B)'$

(v) $(A')'$

(vi) $(B - C)'$.



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2. If $U = \{a, b, c, d, e, f, g, h\}$, find the complements of the following sets : (i) $A = \{a, b, c\}$ (ii) $B = \{d, e, f, g\}$ (iii) $C = \{a, c, e, g\}$ (iv) $D = \{f, g, h, a\}$



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3. Taking the set of natural numbers as the universal set, write down the complements of the following sets: (i) $\{x : x \text{ is an even natural number}\}$ (ii) $\{x : x \text{ is an odd natural number}\}$ (iii) $\{x : x \text{ is a positive multiple of 3}\}$ (iv) $\{x : x \text{ is a prime number}\}$



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4. Let $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{2, 4, 6, 8\}$ and $B = \{2, 3, 5, 7\}$. Verify that: (i) $(A \cup B)' = A' \cap B'$ (ii) $(A \cap B)' = A' \cup B'$



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5. Draw appropriate Venn diagram for each of the following : (i) $(A \cup B)'$
(ii) $A' \cap B'$ (iii) $(A \cap B)'$ (iv) $A' \cup B'$

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6. 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° , what is A' ?

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7. Fill in the blanks to make each of the following a true statement : (i)
 $A \cup A' = \dots$ (ii) $A' \cap A = \dots$ (iii) $A \cap A' = \dots$ (iv) $U' \cap A = \dots$

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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 at least 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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Misc Exercise

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

$A = \{x : x \text{ satisfies } x^2 - 8x + 12 = 0\}$, $B = \{2, 4, 6\}$, $C = \{2, 4, 6, 8\}$, $D = \{6\}$.



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2. 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. (i)

If $x \in A$ and $A \in B$, then $x \in B$ (ii) If "A sub B" and "B in C," then "A sub C"



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3. 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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4. Show that the following four conditions are equivalent :

(i) $A \subset B$

(ii) $A - B = \phi$

(iii) $A \cup B = B$

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



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5. Show that if $A \subset B$, then $C \cap A \subset C \cap B$ and $B \cap C \subset A \cap C$.



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

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7. 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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8. 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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9. Using properties of sets, show that (i) $A \cup (A \cap B) = A$ (ii) $A \cap (A \cup B) = A$.

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



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11. Let A and B be sets. If $A \cap X = B \cap X = \varnothing$ 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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12. Find sets A , B and C such that $A \cap B$, $B \cap C$ and $A \cap C$ are nonempty sets and $A \cap B \cap C = \varnothing$.



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13. 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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14. 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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15. 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: (i) the number of people who read at least one of the newspapers. (ii) the number of people who read exactly one newspaper



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16. 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 products C only?

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