



MATHS

BOOKS - ICSE

SETS

Example

1. Write the following sets in tabular form :

(i) $x : x = \frac{2n}{n+2}, n \in W \text{ and } n < 3$

(ii) $\{x : x = 5y - 3, y \in Z \text{ and } -2 \leq y < 2\}$

(iii) $\{x : x \in W \text{ and } 8x + 5 < 23\}$



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2. Express the following sets in set-builder form :

(i) $\left(\frac{7}{8}, \frac{8}{9}, \frac{9}{10}, \frac{10}{11}, \frac{11}{12} \right)$,

(ii) $\{0, 3, 5, 6, 9, 12, 15, 18\}$

(iii) $\left\{ \frac{1}{3}, \frac{1}{9}, \frac{1}{17}, \frac{1}{81}, \frac{1}{243} \right\}$

(iv) $[x : x^2 - 6x - 7 = 0]$



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3. Given the universal set

, $\sum = \{x : x \in N, 15 < x \leq 26\}$, list the

elements of the following sets:

(i) $A = \{x : x > 20\}$, (ii) $B = \{x : x \leq 21\}$



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4. If $A = \{\text{factors of } 24\}$ and $B = \{\text{factors of } 36\}$, find, (i)

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



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5. For two overlapping sets A and B , draw Venn-diagrams to represent the set



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6. Use Venn-diagrams to prove that:

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



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7. Given, $\zeta = \{x : x \in N, 12 \leq x \leq 20\}$

$A = \{x : x \text{ is divisible by } 3\}$ and $B = \{12, 14, 15, 16\}$

Draw a Venn-diagram to show the relationship between the given sets.



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Exercise 6 A

1. Write the following sets in roster (Tabular) form

:

(i) $A_1 = \{x : 2x + 3 = 11\}$,

(ii) $A_2 = \{x : x^2 - 4x - 5 = 0\}$,

(iii) $A_3 = \{x : x \in \mathbb{Z}, -3 \leq x < 4\}$

(iv) $A_4 = \{x : x \text{ is a two digit number and sum of the digits of } x \text{ is } 7\}$

(v) $A_5 = \{x : x = 4n, n \in \mathbb{W} \text{ and } n < 4\}$

(vi) $A_6 = \left\{ x : x = \frac{n}{n+2}, n \in \mathbb{N} \text{ and } n > 5 \right\}$



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2. Write the following sets in set-builder (Rule Method) form :

$$(i) B_1 = \{6, 9, 12, 15, \dots\}$$

$$(ii) B_2 = \{11, 13, 17, 19\}$$

$$(iii) B_3 = \left\{ \frac{1}{3}, \frac{3}{5}, \frac{5}{7}, \frac{7}{9}, \frac{9}{11}, \dots \right\}$$

$$(iv) B_4 = \{8, 27, 64, 125, 216\}$$

$$(v) B_5 = \{-5, -4, -3, -2, -1\}$$

$$(vi) B_6 = \{\dots, -6, -3, 0, 3, 6, \dots\}$$



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3. Is $\{1,2,4,16,64\} = \{x: x \text{ is a factor of } 32\}$? Give reason.

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4. Is $\{x : x \text{ is a factor of } 27\} \neq \{3, 9, 27, 54\}$? Give reason.

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5. Write the set of even factors of 124.

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6. Write the set of odd factors of 72.



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7. Write the set of prime factors of 3234.



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8. Is $\{x : x^2 - 7x + 12 = 0\} = \{3, 4\}$?



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9. Is $\{x : x^2 - 5x - 6 = 0\} = \{2, 3\}$?



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10. Write the following sets in Roster form :

The set of letters in the word 'MEERUT'.



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11. The set of letters in the word 'UNIVERSAL'.



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12. $A = \{x, x = y + 3, y \in N \text{ and } y > 3\}$



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13. $B = \{p: p \in W \text{ and } p^2 < 20\}$



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14. $C = \{x: x \text{ is a composite number and } 5 \leq x \leq 21\}$



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15. List the elements of the following sets:

$$x^2 - 2x - 3 = 0$$



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16. $\{x : x = 2y + 5, y \in N \text{ and } 2 \leq y < 6\}$



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17. $\{x : x \text{ is a factor of } 24\}$



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18. $\{x : x \in \mathbb{Z} \text{ and } x^2 \leq 4\}$



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19. $\{x : 3x - 2 \leq 10 \text{ and } x \in \mathbb{N}\}$



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20. $\{x : 4 - 2x > -6, x \in \mathbb{Z}\}$



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Exercise 6 B

1. Find the cardinal number of the following sets:

$$A_1 = \{-2, -1, 1, 3, 5\}$$



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2. $A_2 = \{x : x \in N \text{ and } 3 \leq x < 7\}$



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3. $A = \{p : p \in W \text{ and } 2p - 3 < 8\}$





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4. $A_4 = \{b : b \in \mathbb{Z} \text{ and } -7 < 3b - 1 \leq 2\}$



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5. If $P = \{p : p \text{ is a letter in the word 'PERMANENT'}\}$,
find $n(P)$.



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

$$A = \{x : x \in \mathbb{Z} \text{ and } x < 10\}$$



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$$7. B = \{x : x \in \mathbb{W} \text{ and } 5x - 3 \leq 20\}$$



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$$8. P = \{y : y = 3x - 2, x \in \mathbb{N} \text{ and } x > 5\}$$



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9. Check whether it is finite or not

$$M = \left\{ r : r = \frac{3}{n}, n \in W \text{ and } 6 < n \leq 15 \right\}$$



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10. Find, which of the following sets are singleton sets :

The set of points of intersection of two non-parallel straight lines on the same plane.



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11. Find, which of the following sets are singleton sets :

$$A = \{x : 7x - 3 = 11\}$$



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12. $B = \{y : 2y + 1 < 3 \text{ and } y \in W\}$



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13. Find, which of the following sets are empty :

The set of points of intersection of two parallel

lines.



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$$14. A = \{x : x \in N \text{ and } 5 < x \leq 6\}$$



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$$15. B = \{x : x^2 + 4 = 0 \text{ and } x \in N\}$$



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16. $C = \{\text{even numbers between 6 and 10}\}$.



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17. $D = \{\text{prime numbers between 7 and 11}\}$.



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18. Are the sets $A = \{4, 5, 6\}$ and

$B = \{x : x^2 - 5x - 6 = 0\}$ disjoint?



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19. Are the set $A = \{b, c, d, e\}$ and $B = \{x : x \text{ is a letter in the word 'MASTER'}\}$ joint?



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20. State, whether the following pairs of sets are equivalent or not:

$A = \{x : x \in N \text{ and } 11 \geq 2x - 1\}$ and

$B = \{y : y \in W \text{ and } 3 \leq y \leq 9\}$



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21. State, whether the following pairs of sets are equivalent or not:

Set of integers and set of natural numbers.



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22. State, whether the following pairs of sets are equivalent or not:

Set of whole numbers and set of multiples of 3.



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23. State, whether the following pairs of sets are equivalent or not:

$$P = \{5, 6, 7, 8\} \quad \text{and}$$

$$M = \{x : x \in W \text{ and } x \leq 4\}$$



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24. State, whether the following pairs of sets are equal or not:

$$A = \{2, 4, 6, 8\} \quad \text{and}$$

$$B = \{2n : n \in N \text{ and } n \leq 4\}$$



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25. State, whether the following pairs of sets are equal or not:

$$M = \{x : x \in W \text{ and } x + 3 < 8\} \quad \text{and}$$

$$N = \{y : y = 2n - 1, n \in N \text{ and } n < 5\}$$



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26. State, whether the following pairs of sets are equal or not:

$$E = \{x : x^2 + 8x - 9 = 0\} \text{ and } F = \{1, -9\}$$



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27. State, whether the following pairs of sets are equal or not:

$$A = \{x : x \in N, x < 3\} \quad \text{and}$$

$$B = \{y : y^2 - 3y + 2 = 0\}$$



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28. State whether each of the following sets is a finite set or an infinite set:

The set of multiples of 8



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29. State whether each of the following sets is a finite set or an infinite set:

The set of integers less than 10.



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30. State whether each of the following sets is a finite set or an infinite set:

The set of whole numbers less than 12.



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31. State whether each of the following sets is a finite set or an infinite set:

$$\{x : x = 3n - 2, n \in W, n \leq 8\}$$



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32. State whether each of the following sets is a finite set or an infinite set:

$$\{x : x = 3n - 2, n \in Z, n \leq 8\}$$



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33. $\left\{ x : x = \frac{n - 2}{n + 1}, n \in W \right\}$



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34. Answer, whether the following statements are true or false. Give reasons.

The set of even natural numbers less than 21 and the set of odd natural numbers less than 21 are equivalent sets.



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35. If $E = \{\text{factors of } 16\}$ and $F = \{\text{factors of } 20\}$, then $E = F$.

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36. The set $A = \{\text{integers less than } 20\}$ is a finite set.

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37. If $A = \{x: x \text{ is an even prime number}\}$, then set A is empty.

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38. The set of odd prime numbers is the empty set.



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39. The set of squares of integers and the set of whole numbers are equal sets.



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40. If $n(P) = n(M)$, then $P \rightarrow M$.



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41. If set $P = \text{set } M$, then $n(P) = n(M)$.



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42. $n(A) = n(B) \Rightarrow A = B$



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Exercise 6 C

1. Find all the subsets of each of the following sets

:

(i) $A = \{5, 7\}$, (ii) $B = \{a, b, c\}$

(iii) $C = \{x, x \in W, x \leq 2\}$, (iv) $\{p: p \text{ is a letter in the word 'poor'}\}$



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2. If C is the set of letters in the word 'cooler', find:

(i) $\text{set } C$ (ii) $n(C)$

(iii) number of its subsets (iv) number of its proper subsets



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3. If $T = \{x: x \text{ is a letter in the word 'TEETH'}\}$, find all its subsets.

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4. Given the universal set = $\{-7, -3, -1, 0, 5, 6, 8, 9\}$, find :

(i) $A = \{x: x < 2\}$, (ii) $B = \{x: -4 < x < 6\}$

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5. Given the universal set

$$= \{x : x \in N \text{ and } x < 20\}, \text{ find:}$$

(i) $A = \{x : x = 3p, p \in N\}$

(ii) $B = \{y : y = 2n + 3, n \in N\}$

(iii) $C = \{x : x \text{ is divisible by } 4\}$



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6. Find the proper subsets of

$$\{x : x^2 - 9x - 10 = 0\}.$$



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7. Given, $A = \{\text{Triangles}\}$, $B = \{\text{Isosceles triangles}\}$, $C = \{\text{Equilateral triangles}\}$. State whether the following are true or false. Give reasons.

(i) $A \subset B$, (ii) $B \subseteq A$, (iii) $C \subseteq B$, (iv) $B \subset A$, (v) $C \subset A$, (vi) $C \subseteq B \subseteq A$



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8. Given, $A = \{\text{Quadrilaterals}\}$, $B = \{\text{Rectangles}\}$, $C = \{\text{Squares}\}$, $D = \{\text{Rhombuses}\}$. State, giving reasons, whether the following are true or false.

(i) $B \subset C$, (ii) $D \subset B$, (iii) $C \subseteq B \subseteq A$, (iv)
 $D \subset A$, (v) $B \supseteq C$, (iv) $A \supseteq B \supseteq C$

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9. Given, universal set
 $= \{x : x \in N, 10 \leq x \leq 35\}$, $A = \{x \in N : x \leq 16\}$
and $B = \{x : x > 29\}$. Find: (i) A' , (ii) B'

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10. Given, universal set $= \{x \in Z : -6 < x \leq 6\}$,
 $N = \{n : n \text{ is a non-negative number}\}$ and $P = \{x : x \text{ is a}$

non-positive number}. Find:

(i) N' , (ii) P'



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11. Let $M = \{\text{letters of the word REAL}\}$ and $N = \{\text{letters of the word LARE}\}$. Write sets M and N in roster form and then state whether:

(i) $M \subseteq N$ is true.

(ii) $N \subseteq M$ is true.

(iii) $M = N$ is true.



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Exercise 6 D

1. Given $A = \{x : x \in N \text{ and } 3 < x \leq 6\}$ and

$B = \{x : x \in W \text{ and } x < 4\}$. Find :

(i) sets A and B in roster form:

(ii) $A \cup B$, (ii) $A \cap B$, (iii) $A - B$, (iv) $B - A$



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2. If $P = \{x : x \in W \text{ and } 4 \leq x \leq 8\}$ and

$Q = \{x : x \in N \text{ and } x < 6\}$. Find :

(i) $P \cup Q$ and $P \cap Q$

(ii) Is $(P \cup Q) \supset (P \cap Q)$?



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3. If $A = \{5, 6, 7, 8, 9\}$,

$B = \{x : 3 < x < 8 \text{ and } x \in W\}$ and

$C = \{x : x \leq 5 \text{ and } x \in N\}$. Find :

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

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

(iii) $A \cap B$ and $(A \cap B) \cap C$

(iv) $B \cap C$ and $A \cap (B \cap C)$

Is $(A \cup B) \cup C = A \cup (B \cup C)$?

Is $(A \cap B) \cap C = A \cap (B \cap C)$?



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4. Given $A = \{0, 1, 2, 4, 5\}$, $B = \{0, 2, 4, 6, 8\}$ and $C = \{0, 3, 6, 9\}$. Show that:

(i) $A \cup (B \cup C) = (A \cup B) \cup C$ i.e., the union of the sets is associative.

(ii) $A \cap (B \cap C) = (A \cap B) \cap C$ i.e., the intersection of sets is associative.



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5. If

$A = \{x \in W : 5 < x < 10\}$, $B = \{3, 4, 5, 6, 7\}$

and $C = \{x = 2n, n \in N \text{ and } n \leq 4\}$. Find:

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

(iii) $B \cup (A \cap C)$, (iv) $(A \cap B) \cup (A \cap C)$

Name the sets which are equal.



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6. If $P = \{\text{factors of } 36\}$ and $Q = \{\text{factors of } 48\}$, find :

(i) $P \cup Q$, (ii) $P \cap Q$, (iii) $Q - P$, (iv) $P' \cap Q$



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7. If $A = \{6, 7, 8, 9\}$, $B = \{4, 6, 8, 10\}$ and

$C = \{x : x \in N : 2 < x \leq 7\}$, find:

(i) $A - B$, (ii) $B - C$, (iii) $B - (A - C)$, (iv) $A - (B \cup C)$

(v) $B - (A \cap C)$, (vi) $B - B$



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8. If $A = \{1, 2, 3, 4, 5\}$, $B = \{2, 4, 6, 8\}$ and $C = \{3, 4, 5, 6\}$,

verify:

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

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



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9. Given $A = \{x \in N : x < 6\}$, $B = \{3, 6, 9\}$ and $C = \{x \in N : 2x - 5 \leq 8\}$. 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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Exercise 6 E

1. From the given diagram find:

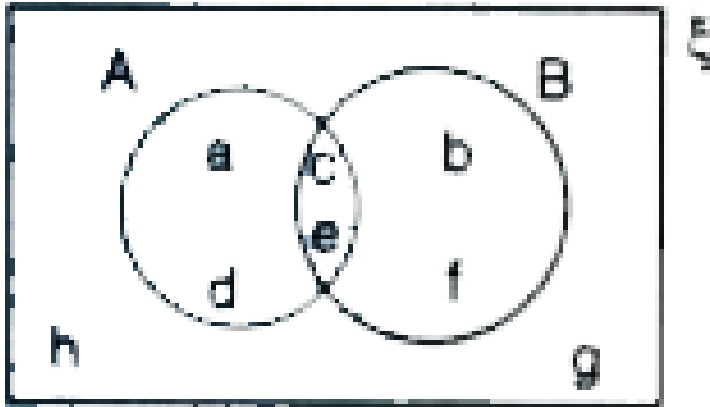
(i) $A \cup B$

(ii) $A' \cap B$

(iii) $A - B$

(iv) $B - A$

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

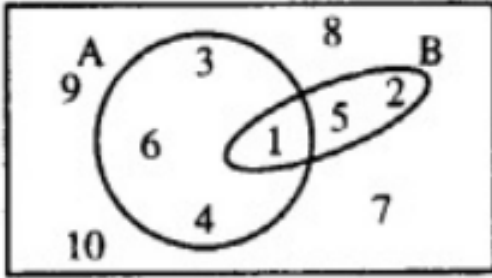


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2. From the given diagram, find:

(i) A' , (ii) B' , (iii) $A' \cup B'$, (iv) $(A \cap B)'$

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



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3. Use the given diagram to find:

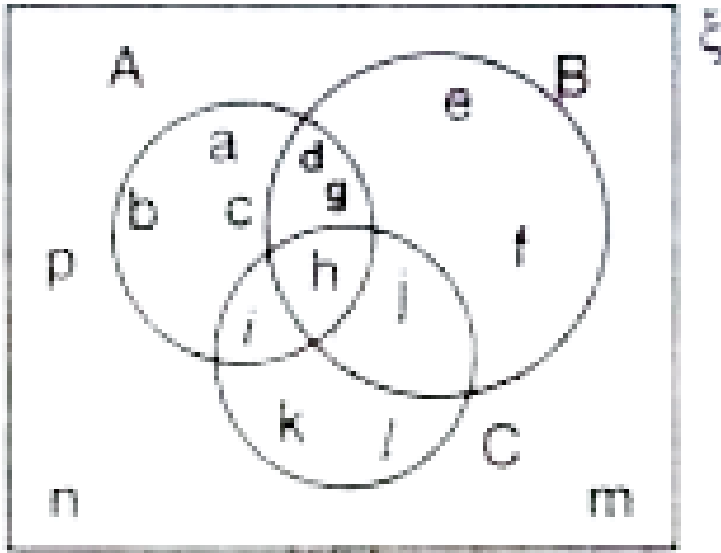
(i) $A \cup (B \cap C)$

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

(iii) $A - B$

(iv) $A \cap B'$

is $A \cap B' = A - B$?



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4. Use the given Venn-diagram to find:

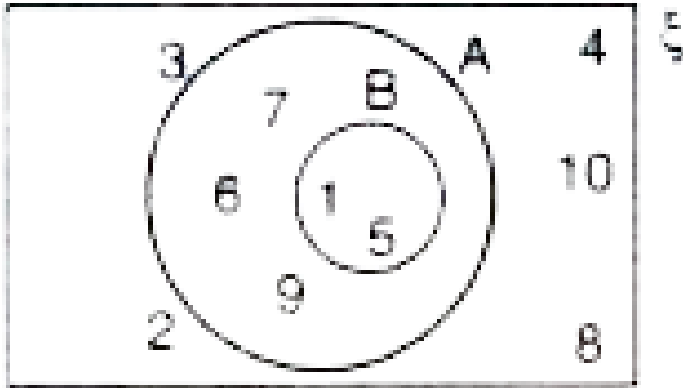
(i) $B - A$

(ii) A

(iii) B'

(iv) $A \cap B$

(v) $A \cup B$



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5. Draw a Venn-diagram to show the relationship between two overlapping sets A and B. Now shade

the region representing :

(i) $A \cap B$, (ii) $A \cup B$, (iii) $B - A$



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6. Draw a Venn-diagram to show the relationship between sets A and B , such that $A \subseteq B$. Now shade the region representing :

(i) $A \cup B$, (ii) $B' \cap A$, (iii) $A \cap B$, (iv) $(A \cup B)'$



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7. Two sets A and B are such that $A \cap B = \pi$.

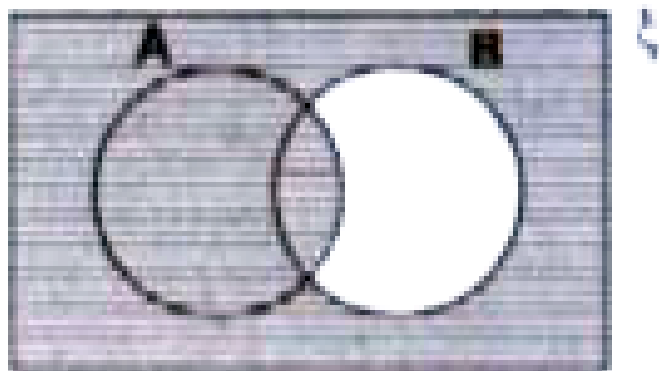
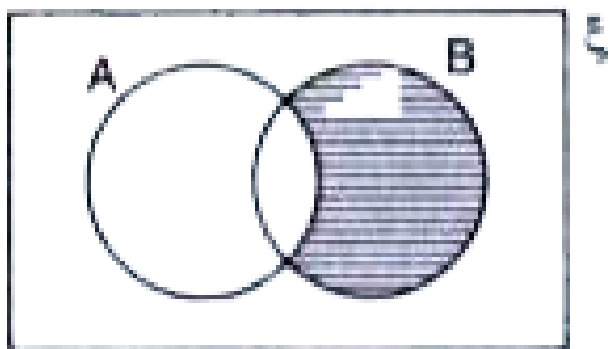
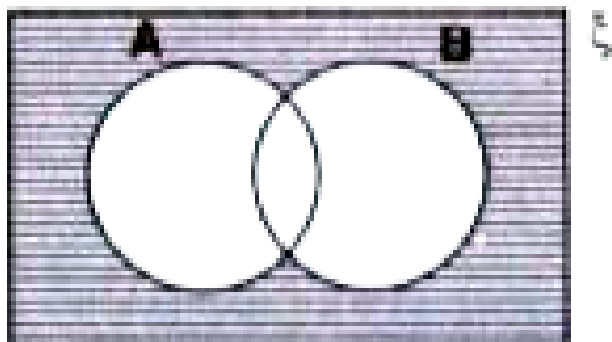
Draw a Venn-diagram to show the relationship between A and B. Shade the region representing :

(i) $A \cup B$, (ii) $(A \cup B)'$, (iii) B-A, (iv) $B \cap A'$



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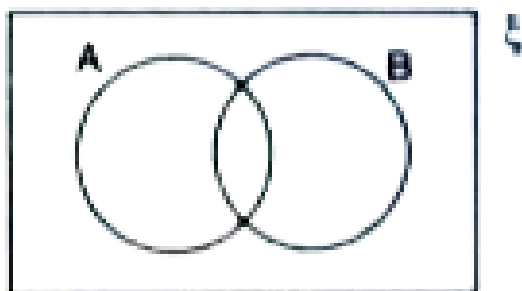
8. State the sets represented by the shaded portion of the following Venn-diagrams :



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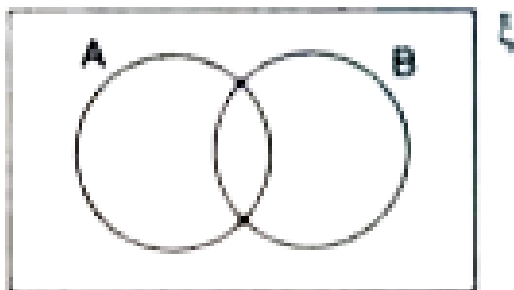
9. In each of the given diagrams, shade the region which represents the set given underneath the diagram :

(i)



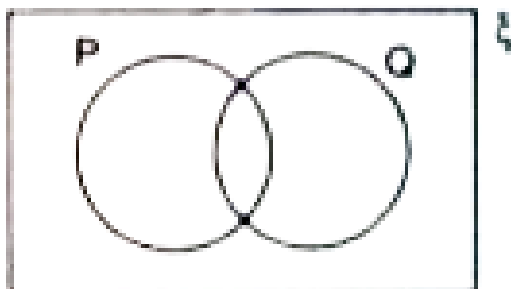
$$(B - A)'$$

(ii)



$$(A \cap B)'$$

(iii)



$$(P \cup Q)'$$



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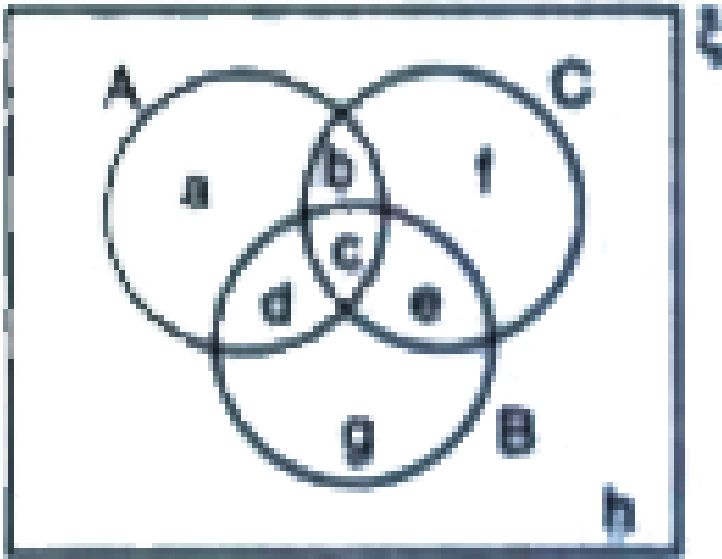
10. From the given diagram, find:

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

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

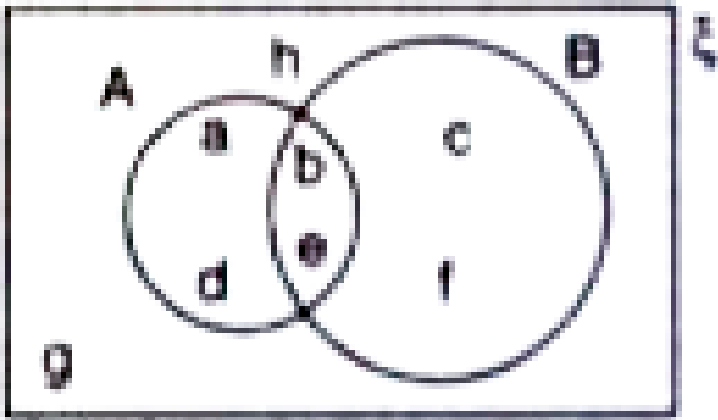
(iii) $(B \cap C) \cup A$

Verify: $A - (B \cap C) = (A - B) \cup (A - C)$



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11. Using the given diagram, express the following sets in terms of set A and B.



(i) $\{a,d\}$, (ii) $\{a,d,c,f\}$, (iii) $\{a,d,c,f,g,h\}$, (iv) $\{a,d,g,h\}$, (v) $\{g,h\}$



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