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MATHS

9

This special guide is prepared on the basis of New Syllabus and Govt. Key

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நூலினுள் புகுமுன்.....

1. 9ம் வகுப்பு கணிதம் மாணவ / மாணவியர் எளிதில் புரியும் வண்ணம் எழுதப்பட்டுள்ளது.
2. ஒவ்வொரு தலைப்புகளில் உள்ள கணக்குகள் அனைத்தும் எளிய முறையில் செய்து காட்டப்பட்டுள்ளது.
3. தேவைக்கேற்ப கூடுதல் வினாக்கள் கொடுக்கப்பட்டுள்ளன.
4. 6ம் வகுப்பு முதல் 9ம் வகுப்பு வரை அனைத்து நூல்களும் அரசுத் தேர்வை நோக்கியே எழுதப்பட்டுள்ளது.

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அன்புடன்

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CONTENTS

Unit 1 SET LANGUAGE

Summary

- A set is a well defined collection of objects.
- Sets are represented in three forms
  i) Descriptive form ii) Set – builder form iii) Roster form.

Exercise – 1.1

1. Which of the following are sets?

i) The collection of prime numbers upto 100
ii) The collection of rich people in India
iii) The collection of all rivers in India
iv) The collection of good Hockey players

Ans: (i), (iii) are sets (ii) , (iv) Not a set

2. List the set of letters of the following words in Roster form.

i) INDIA ii) PARALLELOGRAM
iii) MISSISSIPPI iv) CZECHOSLOVAKIA

Ans:

(i) A = { I , N , D , A }
(ii) B = { P , A , R , L , E , G , O , M }
(iii) C = { M , I , S , P }
(iv) D = { C , Z , E , H , O , S , L , V, A , K , I}

3. Consider the following sets A = {0, 3, 5, 8}, B = {2, 4, 6, 10} and C = {12, 14, 18, 20}

(a) State whether True or False:

(i) 18 $\in$ C (ii) 6 $\notin$ A (iii) 14 $\notin$ C
(iv) 10 $\in$ B (v) 5 $\in$ B (vi) 0 $\in$ B

(b) Fill in the blanks:

(i) 3 $\in$ ____ (ii) 14 $\in$ ____ (iii) 18 ____ B
(iv) 4 ____ B

Ans: a) (i) True (ii) True (iii) False
(iv) True (v) False (vi) False
b) (i) A (ii) C (iii) $\notin$ (iv) $\in$

4. Represent the following sets in Roster form

(i) A = The set of all even natural numbers less than 20.
(ii) $B = \{y : y = \frac{1}{2n}, n \in N, n \leq 5\}$
(iii) C = {x : x is perfect cube, $27 < x < 216$}
(iv) D= {x : x $\in$ Z, $-5 < x \leq 2$}

Ans:

(i) A = {2, 4, 6, 8, 10, 12, 14, 16, 18}
(ii) $B = \{\frac{1}{2}, \frac{1}{4}, \frac{1}{6}, \frac{1}{8}, \frac{1}{10}\}$
(iii) C = {64, 125}
(iv) D = {–4, –3, –2, –1, 0, 1, 2}

5. Represent the following sets in set builder form.

(i) B = The set of all Cricket players in India who scored double centuries in One Day Internationals
(ii) $C = \{\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, ...\}$
(iii) D = The set of all tamil months in a year.
(iv) E = The set of odd Whole numbers less than 9.

Ans:

(i) B = {x : x is an Indian player who scored double centuries in One Day International}

(ii) $C = \{x : x = \frac{n}{n+1}, n \in N\}$

(iii) D = {x : x is a tamil month in a year}

(iv) E = {x : x is an odd whole number less than 9} (or) E = {x : x = 2n +1, n ∈ w, n<4}

6. Represent the following sets in descriptive form.

(i) P = {January, June, July}

(ii) Q = {7,11,13,17,19,23,29}

(iii) R = {x: x∈N, x < 5}

(iv) S = {x:x is a consonant in English alphabets}

Ans:

(i) P = The set of English months starting with letter J

(ii) Q = The set of Prime numbers between 5 and 31

(iii) R = The set of natural numbers less than 5

(iv) S = The set of English consonants

SUMMARY

- The number of elements in a set is called the cardinal number of the set.
- A set consisting of no element is called the empty set. ϕ or { }.
- If the number of elements in a set is zero or finite, it is a finite set. Otherwise it is an infinite set.
- Two finite sets A and B are said to be equivalent if they contain the same number of elements.
- Two sets A and B are said to be equal when they contain the same elements.
- If every element of A is also an element of B, then A is called a subset of B.
- If $A \subseteq B$ and $A \neq B$, then A is a proper subset of B.
- The power set of the set A contains all the subsets of A and it is denoted by P(A)
- The numbers of subsets of a set with m elements is 2^m.
- The number of proper subsets of a set with m elements is $n(P(A)) = 2^m - 1$.

Exercise – 1.2

1. Find the cardinal number of the following sets.

(i) M = {p, q, r, s, t, u}

(ii) P = {x : x = 3n + 2, n ∈ W and x < 15}

(iii) $Q = \{y : y = \frac{4}{3n}, n \in N \text{ and } 2 < n \leq 5\}$

(iv) R = {x : x is an integers, x ∈ Z and $-5 \leq x < 5$}

(v) S = The set of all leap years between 1882 and 1906.

Ans:

Cardinal number means total elements in a set.

(i) n(M) = 6

(ii) P = {2, 5, 8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44}

n(P) = 15

(iii) $Q = \left\{\frac{4}{9}, \frac{4}{12}, \frac{4}{15}\right\}$

n(Q) = 3

(iv) R = {−5, −4, −3, −2, −1, 0, 1, 2, 3, 4}

n(R) = 10

(v) S = {1884, 1888, 1892, 1896, 1900, 1904}

n(S) = 5

2. Identify the following sets as finite or infinite.

(i) X = The set of all districts in Tamilnadu.

(ii) Y = The set of all straight lines passing through a point.

(iii) A = { x : x ∈ Z and x <5}

(iv) $B = \{x : x^2 - 5x + 6 = 0, x \in N\}$

Ans:

(i) Finite (ii) Infinite (iii) Infinite

(iv) Finite

3. Which of the following sets are equivalent or unequal or equal set?

(i) A = The set of vowels in the English alphabets.
B = The set of all letters in the word "VOWEL"

(ii) C = {2, 3, 4, 5}
D = { x : x ∈ W, 1 < x<5}

(iii) X = { x : x is a letter in the word "LIFE"}
Y = {F,I,L,E}

(iv) G = {x : x is a prime number and 3<x<23}
H = {x : x is a divisor of 18}

Ans:

(i) A = {a, e, i, o, u}; B = {V, O, W, E, L}
n(A) = 5; n(B) = 5
Equivalent sets

(ii) C = {2, 3, 4, 5}; D = { 0, 1, 2, 3, 4}
n(C) = 4; n(D) = 5
Unequal sets

(iii) X = { L, I, F, E}; Y = {F, I, L, E}
n(X) = 4; n(Y) = 4
Equal sets

(iv) G = {5, 7, 11, 13, 17, 19};
H = {1,2,3,6,9,18}
n(G) = 6; n(H) = 6
Equivalent sets

4. Identify the following sets as null set or singleton set.

(i) A = {x : x ∈ N, 1 < x < 2}
(ii) B = The set of all even natural numbers which are not divisible by 2
(iii) C = {0}.
(iv) D = The set of all triangles having four sides.

Ans:

(i) A = {} Null set
(ii) B = {} Null set
(iii) C = {0} Singleton set
(iv) D = {} Null set

5. State which pairs of sets are disjoint or overlapping?

i) A = {f, i, a, s} and B = {a, n, f, h, s}
ii) C = {x : x is a prime number, x > 2} and D = { x : x is an even prime number }
iii) E = {x : x is a factor of 24 } and F = { x : x is a multiple of 3, x < 30}

Ans:

(i) A = {f, i, a, s}
B = {a, n, f, h s}
A ∩ B = {f, a, s}
A and B are overlapping sets.

ii) C = {3,5,7,11,13,.....}
D = {2}
C ∩ B = ϕ
C and D are disjoint sets

iii) E = {2, 4, 6, 8, 12, 24}
F = {3, 6, 9, 12, 15, 18, 21, 24, 27}
E ∩ F = {6, 12, 24}
E and F are overlapping sets

6. If S= {square, rectangle, circle, rhombus, triangle}. List the elements of the following subset of S.

(i) The set of shapes which have 4 equal sides.
(ii) The set of shapes which have radius.
(iii) The set of shapes in which the sum of all interior angles is 180º
(iv) The set of shapes which have 5 sides.

Ans:

(i) {square, rhombus} (ii) {circle}
(iii) {triangle} (iv) { }

7. If A = {a, {a,b} }, write all the subsets of A.

Ans:

A = {a, {a,b} }
Subsets of A are ϕ ,{a}, {a,b}, {a, {a,b} }

8. Write down the power set of the following sets.

(i) A = {a, b} (ii) B= {1, 2, 3}
(iii) D = {p, q, r, s} (iv) E = Ø

Ans:

(i) P(A) = { Ø, {a}, {b}, {a, b}}
(ii) P(B) = { { }, {1}, {2}, {3}, {1, 2}, {1, 3}, {2, 3}, {1, 2, 3}}
(iii) P(D) = {{ }, {p}, {q}, {r}, {s}, {p, q}, {p, r}, {p, s}, {q, r}, {q, s}, {r, s}, {p, q, r}, {p, q, s}, {p, r, s}, {q, r, s}, {p, q, r, s} }
(iv) P(E) = { {} }

9. Find the number of subsets and the number of proper subsets of the following sets.

(i) W = {red, blue, yellow}
(ii) X={x^2: x ∈ N, $x^2 \leq 100$}

Ans:

(i) No of subsets = 2^m
n(W) = m = 3
No of subsets = $2^m = 2^3 = 8$
No of proper subsets = $2^m - 1$
$= 2^3 - 1 = 8 - 1 = 7$

(ii) x = {1,4,9,16,25,36,49,64,81,100}
n(x) = 10
m = 10
No of Subsets = 2^m
$= 2^{10} = 1024$
No of proper Subsets = $2^{10} - 1$
$= 1024 - 1 = 1023$

10. (i) If n(A) = 4, find n[P(A)].
(ii) If n(A)=0, find n[P(A)].
(iii) If n[P(A)] = 256, find n(A).

Ans:

[Hint: n(A) = m, n(P(A)) = 2^m]

(i) n(A) = 4 = m
n(A) = m
n[p(A)] = 2^m
$= 2^4$
$= 2 \times 2 \times 2 \times 2 = 16$

(ii) n(A) = 0 = m
n[p(A)] = 2^m
$= 2^0 = 1$

(iii) n[p(A)] = 256 = 2^m
$2^m = 256$

2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

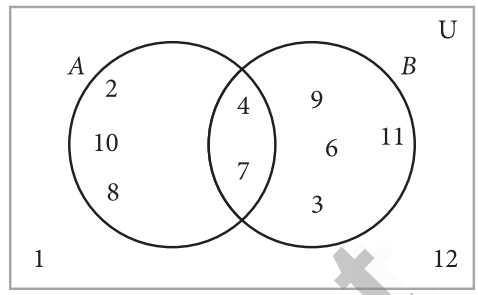
Take LCM
$2^m = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$
$2^m = 2^8$
m = 8
n(A) = m
n(A) = 8

SUMMARY

- The complement A′ of the set A contains all the elements of the universal set except that of A.
- The union of two sets A and B is the set of all elements which are either in A or in B or in both.
- The set of all common elements of the sets A and B is called the intersection of the sets A and B.
- If A∩B = Ø then A and B are disjoint sets. If A∩B ≠ Ø then A and B are overlapping.
- The difference of two sets A and B is the set of all elements in A but not in B.
- The symmetric difference of two sets A and B is the union of A–B and B–A
- Universal set is an set of all elements.

Exercise – 1.3

1. Using the given Venn diagram, write the elements of



(i) A (ii) B (iii) A∪B
(iv) A∩B (v) A–B (vi) B–A
(vii) A′ (viii) B′ (ix) U

Ans:

(i) A = {2, 4, 7, 8, 10}
(ii) B = {3, 4, 6, 7, 9, 11}
(iii) A∪B = {2, 3, 4, 6, 7, 8, 9, 10, 11}
(iv) A∩B = {4, 7}
(v) A – B = {2, 8, 10}
(vi) B – A = {3, 6, 9, 11}
(vii) A' = U – A
A' = {1,2,3,4,6,7,8,9,10,11,12,}
– {2,4,7,8,10}
= {1,3,6,9,11,12}

(viii) B' = U − B
= {1, 2, 3, 4, 6, 7, 8, 9, 10,11,12}
– {3,4,6,7,9,11}
= {1,2,8,10,12}

(ix) U = {1,2,3,4,6,7,8,9,10,11,12}

2. Find A∪B, A∩B, A–B and B–A for the following sets.

(i) A = {2, 6, 10, 14} and B={2, 5, 14, 16}
(ii) A = {a, b, c, e, u} and B={a, e, i, o, u}
(iii) A = {x:x∈ N, x≤10} and B={x:x∈ W, x<6}
(iv) A = Set of all letters in the word "mathematics" and
B = Set of all letters in the word "geometry"

Ans:

(i) A = {2, 6, 10, 14}
B = {2, 5, 14, 16}
A∪B = {2, 5, 6, 10, 14, 16}
A∩B = {2, 14}
A – B = {6, 10}
B – A = {5, 16}

(ii) A = { a, b, c, e, u } B= {a,e,i,o,u}
A∪B = {a,b,c,e,i,o,u}
A∩B = {a,e,u}
A – B = {b,c}
B – A = {i,o}

(iii) A = {x:x∈N, x≤10}
A= {1,2,3,4,5,6,7,8,9,10}
B = {x:x∈W, x<6}
B = {0,1,2,3,4,5}
A∪B = {0,1,2,3,4,5,6,7,8,9,10}
A∩B = {1,2,3,4,5}
A – B = {6,7,8,9,10}
B – A = {0}

(iv) A = {m,a,t,h,e,i,c,s}
B = {g,e,o,m,t,r,y}
A∪B = {m,a,t,h,e,i,c,s,g,o,r,y}
A∩B = {t,m,e,}
A – B = {a,h,i,c,s}
B – A = {g,o,r,y}

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3. If U=*{a, b, c, d, e, f, g, h}*, A=*{b, d, f, h}* and B=*{a, d, e, h}*, find the following sets.

(i) A′ (ii) B′ (iii) A′ ∪ B′
(iv) A′∩B′ (v) (A∪B)′ (vi) (A∩B)′
(vii) (A′)′ (viii) (B′)′

Ans:

(i) A′ = U – A = {a,b,c,d,e,f,g,h} – {b,d,f,h}
= {a, c, e, g}

(ii) B′ = U – B = {a,b,c,d,e,f,g,h} – {a,d,e,h}
= {b, c, f, g}

(iii) A′ U B′ = {a, b, c, e, f, g}

(iv) A′ ∩B′ = {c, g}

(v) AUB = {a, b, d, e, f, h}
(AUB)′ = U – (AUB) = {c, g}

(vi) A∩B = {d, h}
(A∩B)′ = U – (A∩B)
(A∩B)′ = {a, b, c, e, f, g}

(vii) (A′)′ = U – (A′) = {b, d, f, h}

(viii) (B′)′ = U – (B′) = B
= {a, d, e, h}

---

4. Let U= {0, 1, 2, 3, 4, 5, 6, 7}, A = {1, 3, 5, 7} and B = {0, 2, 3, 5, 7}, find the following sets.

(i) A′ (ii) B′ (iii) A′ ∪ B′
(iv)A′ ∩B′ (v)(A∪B)′ (vi) (A∩B)′
(vii) (A′)′ (viii) (B′)′

Ans:

(i) A′ = U – A
= {0, 2, 4, 6}

(ii) B′ = U – B = {1, 4, 6}

(iii) A′ UB′ = {0, 1, 2, 4, 6}

(iv) A′ ∩B′ = {4, 6}

(v) (AUB)′ = {U – (AUB)}
AUB = {0, 1, 2, 3, 5, 7}
(AUB)′ = U – (AUB)
= {4, 6}

(vi) (A∩B)′ = U – (A∩B)
A∩B = {3, 5, 7}
= {0, 1, 2, 4, 6}

(vii) (A′)′ = A = U – (A′)
= {1, 3, 5, 7}

(viii) (B′)′ = U – (B′) = B
= {0, 2, 3, 5, 7}

---

5. Find the symmetric difference between the following sets.

(i) P = {2,3,5,7,11} and Q = {1,3,5,11}

(ii) R = {l,m,n,o,p} and S = {j,l,n,q}

(iii) X = {5, 6, 7} and Y = {5, 7, 9, 10}

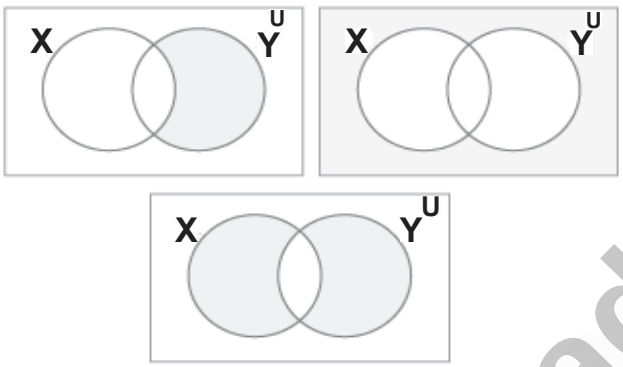
Ans:

(i) P = {2,3,5,7,11} Q = {1,3,5,11}
PΔQ = (P – Q) ∪ (Q – P)
P – Q = {2, 7}
Q – P = {1}
PΔQ = {1, 2, 7}

(ii) R = {l,m,n,o,p}
S = {j,l,n,q}
RΔS = (R – S) $\cup$ (S – R)
R – S = {m, o, p}
S – R = {j, q}
RΔS = {m, o, p, j, q}

(iii) X = {5, 6, 7} Y = {5, 7, 9, 10}
XΔY = (X – Y) $\cup$ (Y – X)
X – Y = {6}
Y – X = {9, 10}
XΔY = {6, 9, 10}

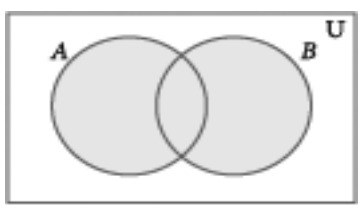
6. Using the set symbols, write down the expressions for the shaded region in the following



Ans:
(i) Y – X
(ii) (XUY)′
(iii) (XUY) U (Y – X)

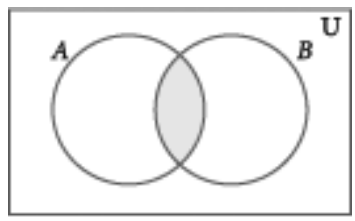
7. Let A and B be two overlapping sets and the universal set be U. Draw appropriate Venn diagram for each of the following.
(i) A$\cup$B (ii) A$\cap$B (iii) (A$\cap$B)′
(iv) (B–A)′ (v) A′$\cup$B′ (vi) A′$\cap$B′
(vii) What do you observe from the Venn diagram (iii) and (v)?

Ans:
(i)



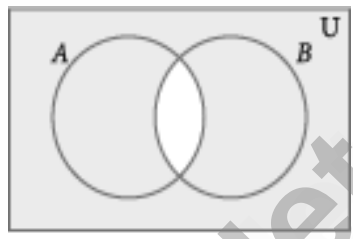
$A \cup B$

(ii)



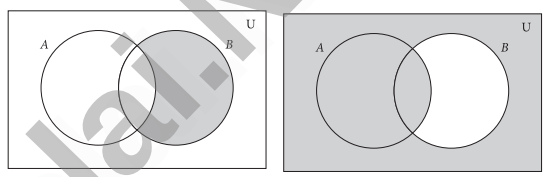
$A \cap B$

(iii)



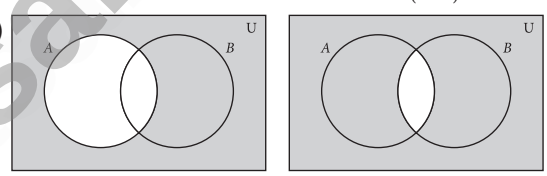
$(A \cap B)'$

(iv)



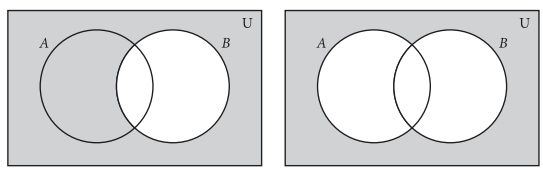
$B-A$ $(B-A)'$

(v)



A' $A' \cup B'$

(vi)



B' $A' \cap B'$

(vii) (A$\cap$B)′ = A′$\cup$B′

SUMMARY

Commutative Property :
For any two sets A and B
(i) A$\cup$B = B$\cup$A (ii) A$\cap$B =B$\cap$A

Associative Property
(i) A$\cup$(B$\cup$C) = (A$\cup$B)$\cup$C
(ii) A$\cap$(B$\cap$C) = (A$\cap$B)$\cap$C

De Morgan's Laws for Set Difference:
(i) A−(B$\cup$C) = (A−B)$\cap$(A−C)
(ii) A−(B$\cap$C) = (A−B)$\cup$(A−C)

De Morgan's laws for complementation:
(i) (A$\cup$B)′ = A′$\cap$B′
(ii) (A$\cap$B)′ = A′$\cup$B′

Distributive Property

➢ For any three sets A, B and C

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

[Intersection over union]

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

[Union over Intersection]

Exercise – 1.4

1. If P = {1, 2, 5, 7, 9}, Q = {2, 3, 5, 9, 11}, R = {3, 4, 5, 7, 9} and S = {2, 3, 4, 5, 8} then find

i) $(P \cup Q) \cup R$

ii) $(P \cap Q) \cap S$

iii) $(Q \cap S) \cap R$

Solution :

P = {1, 2, 5, 7, 9}, Q = {2, 3, 5, 9, 11},
R = {3, 4, 5, 7, 9}, S = {2, 3, 4, 5, 8}

i) $P \cup Q$ = {1, 2, 3, 5, 7, 9, 11}

$(P \cup Q) \cup R$ = {1, 2, 3, 5, 7, 9, 11} ∪ {3, 4, 5, 7, 9}

= {1, 2, 3, 4, 5, 7, 9, 11}

ii) $P \cap Q$ = {2, 5, 9}

$(P \cap Q) \cap S$ = {2, 5, 9,} ∩ {2, 3, 4, 5, 8}

= {2, 5}

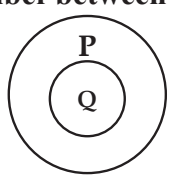
iii) $Q \cap S$ = {2, 3, 5}

$(Q \cap S) \cap R$ = {2, 3, 5,} ∩ {3, 4, 5, 7, 9}

= {3, 5}

---

2. Test for the commutative property of union and intersection of the sets
P = { x:x is a real number between 2 and 7} and Q = { x:x is an rational number between 2 and 7}



Solution :

Commutative Property of union

$P \cup Q = Q \cup P$

using Venn diagram

$P \cup Q = P = Q \cup P$

Commutative Property of intersection

$P \cap Q = Q \cap P$

using Venn diagram

$P \cap Q = Q = Q \cap P$

3. If A = {p, q, r, s}, B = {m, n, q, s, t}, and C = {m, n, p, q, s}, then verify the associative property of union of sets.

Solution :

A = {p, q, r, s}, B = {m, n, q, s, t},
C = {m, n, p, q, s}

$B \cup C$ = {m, n, q, p, s, t}

Associative Property of union

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

$A \cup (B \cup C)$ = {r, p, q, s, } ∪ {m, n, q, p, s,t}

= {m, n, p, q, r, s, t} .....(1)

$A \cup B$ = {m, n, p, q, r, s, t}

$(A \cup B) \cup C$ = {m, n, p, q, r, s, t} ∪ {m, n, p, q, s}

= {m, n, p, q, r, s, t} .....(2)

From (1) and (2)

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

---

4. Verify the associative property of intersection of sets for A = $\{-11, \sqrt{2}, \sqrt{5}, 7\}$, B = $\{\sqrt{3}, \sqrt{5}, 6, 13\}$ and C = $\{\sqrt{2}, \sqrt{3}, \sqrt{5}, 9\}$

Solution :

Associative Property of intersection

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

$B \cap C = \{\sqrt{3}, \sqrt{5}\}$

$A \cap (B \cap C) = \{\sqrt{5}\}$ ..... (1)

$A \cap B = \{\sqrt{5}\}$

$(A \cap B) \cap C = \{\sqrt{5}\}$ ..... (2)

From (1) and (2)

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

---

5. If A = {x : x = 2^n, n ∈ W and n <4}, B = {x :x = 2n, n ∈ N and n ≤ 4} and C = {0, 1, 2, 5, 6}, then verify the associative property of intersection of sets. ,

Solution :

[Hint: $2^0 = 1$]

A = {1, 2, 4, 8}, B = {2, 4, 6, 8},
C = {0, 1, 2, 5, 6}

$B \cap C$ = {2, 6}

$A \cap (B \cap C) = \{2\}$ ..... (1)

$A \cap B = \{2, 4, 8\}$

$(A \cap B) \cap C = \{2\}$ ..... (2)

From (1) and (2)

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

Exercise – 1.5

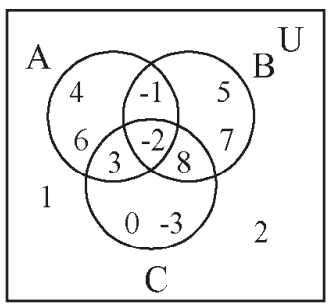
1. Using the adjacent Venn diagram, find the following sets :

i) A – B **ii) B – C**

iii) $A' \cup B'$ **iv) $A' \cap B'$**

v) $(B \cup C)'$ **vi) A – (B ∪ C)**

vii) A – (B ∩ C)



Solution :

i) $A - B = \{3, 4, 6\}$

ii) $B - C = \{-1, 5, 7\}$

$\cup = \{-3,-2,-1,0,1,2,3,4,5,6,7,8\}$

$A' = \cup - A$

$= \{-3,-2,-1,0,1,2,3,4,5,6,7,8\} - \{-2,-1,3,4,6\}$

$A' = \{-3,0,1,2,5,7,8\}$

$B' = \cup - B$

$= \{-3,-2,-1,0,1,2,3,4,5,6,7,8\} - \{-2,-1,5,7,8\}$

$B' = \{-3,0,1,2,3,4,6\}$

iii) $A' \cup B' = \{-3,0,1,2,3,4,5,6,7,8\}$

iv) $A' \cap B' = \{-3,0,1,2\}$

v) $(B \cup C)' = \cup - (B \cup C)$

$(B \cup C) = \{-3,-2,-1,0,3,5,7,8\}$

$(B \cup C)' = \{1,2,4,6\}$

vi) $A - (B \cup C) = \{4,6\}$

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

$(B \cap C) = \{-2,-1,5,7,8\} \cap \{-3,0,3,-2,8\}$

$= \{-2, 8\}$

$A - (B \cap C) = \{-1,3,4,6\}$

2. If K = {a, b, d, e, f}; L = {b, c, d, g} and M = {a, b, c, d, h} then find the following :

i) $K \cup (L \cap M)$

ii) $K \cap (L \cup M)$

iii) $(K \cup L) \cap (K \cup M)$

iv) $(K \cap L) \cup (K \cap M)$

and verify distributive laws.

Solution :

i) $L \cap M = \{b, c, d\}$

$K \cup (L \cap M) = \{a, b, c, d, e, f\}$

ii) $L \cup M = \{a, b, c, d, g, h\}$

$K \cap (L \cup M) = \{a, b, d\}$

iii) $K \cup L = \{a, b, c, d, e, f, g\}$

$K \cup M = \{a, b, c, d, e, f, h\}$

$(K \cup L) \cap (K \cup M) = \{a, b, c, d, e, f\}$

iv) $K \cap L = \{b, d\}$

$K \cap M = \{a, b, d\}$

$(K \cap L) \cup (K \cap M) = \{a, b, d\}$

3. If $A=\{x : x \in Z, -2 < x \leq 4\}$, $B = \{x : x \in W, x \leq 5\}$, $C = \{-4, -1, 0, 2, 3, 4\}$ then verify $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$.

Solution :

$A = \{-1, 0, 1, 2, 3, 4\}$, $B = \{0, 1, 2, 3, 4, 5\}$,

$C = \{-4, -1, 0, 2, 3, 4\}$

LHS:

$B \cap C = \{0, 2, 3, 4\}$

$A \cup (B \cap C) = \{-1, 0, 1, 2, 3, 4\}$ .....(1)

RHS:

$A \cup B = \{-1, 0, 1, 2, 3, 4, 5\}$

$A \cup C = \{-4, -1, 0, 1, 2, 3, 4\}$

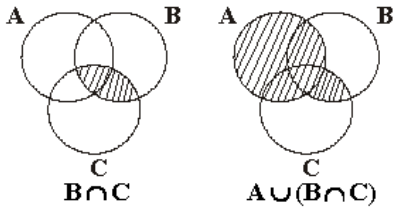
$(A \cup B) \cap (A \cup C) = \{-1, 0, 1, 2, 3, 4\}$ ..... (2)

From (1) and (2)

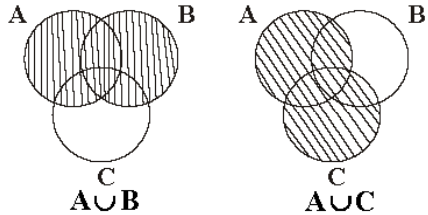
$A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

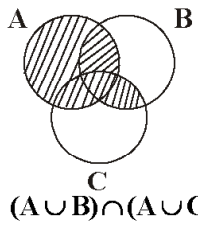
4. Verify $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$ using venn diagrams.

Solution :



.....(1)





..... (2)

5. If A = {b,c, e, g, h}, B = {a, c, d, g, i} and C = {a, d, e, g, h} then show that $A - (B \cap C) = (A - B) \cup (A - C)$.

Solution :

$B \cap C = \{a, d, g\}$

$A - (B \cap C) = \{b, c, e, g, h\} - \{a, d, g\}$

$= \{b, c, e, h\}$ ..... (1)

$A - B = \{b, e, h\}$

$A - C = \{b, c\}$

$(A - B) \cup (A - C) = \{b, c, e, h\}$ ..... (2)

From (1) and (2)

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

6. If $A = \{x : x = 6n, n \in W$ and $n < 6\}$, $B = \{x : x = 2n, n \in N$ and $2 < n \leq 9\}$, and $C = \{x : x = 3n, n \in N$ and $4 \leq n < 10\}$, then show that $A - (B \cap C) = (A - B) \cup (A - C)$.

Solution :

$A = \{0, 6, 12, 18, 24, 30\}$

$B = \{6, 8, 10, 12, 14, 16, 18\}$

$C = \{12, 15, 18, 21, 24, 27\}$

$B \cap C = \{12, 18\}$

$A - (B \cap C) = \{0, 6, 24, 30\}$ ..... (1)

$A - B = \{0, 24, 30\}$

$A - C = \{0, 6, 30\}$

$(A - B) \cup (A - C) = \{0, 6, 24, 30\}$ ..... (2)

From 1 and 2

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

7. If $A = \{-2, 0, 1, 3, 5\}$, $B = \{-1, 0, 2, 5, 6\}$ and $C = \{-1, 2, 5, 6, 7\}$ then show that $A - (B \cup C) = (A - B) \cap (A - C)$.

Solution :

$B \cup C = \{-1, 0, 2, 5, 6, 7\}$

$A - (B \cup C) = \{-2,0,1,3,5\} - \{-1,0,2,5,6,7\}$

$A - (B \cup C) = \{-2, 1, 3\}$ ..... (1)

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

$A - C = \{-2, 0, 1, 3\}$

$(A - B) \cap (A - C) = \{-2, 1, 3\}$ ..... (2)

From 1 and 2

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

8. If $A = \{y : y = \frac{a+1}{2}$, $a \in W$ and $a \leq 5\}$, $B = \{y : y = \frac{2n-1}{2}$, $n \in W$ and $n < 5\}$ and $C = \left\{-1, -\frac{1}{2}, 1, \frac{3}{2}, 2\right\}$ then show that $A - (B \cup C) = (A - B) \cap (A - C)$.

Solution :

$A = \left\{\frac{1}{2}, \frac{2}{2}, \frac{3}{2}, \frac{4}{2}, \frac{5}{2}, \frac{6}{2}\right\} = \left\{\frac{1}{2}, 1, \frac{3}{2}, 2, \frac{5}{2}, 3\right\}$

$B = \left\{\frac{-1}{2}, \frac{1}{2}, \frac{3}{2}, \frac{5}{2}, \frac{7}{2}\right\}$

$C = \left\{-1, \frac{-1}{2}, 1, \frac{3}{2}, 2\right\}$

$B \cup C = \left\{-1, \frac{-1}{2}, 1, \frac{1}{2}, \frac{3}{2}, 2, \frac{5}{2}, \frac{7}{2}\right\}$

$A - (B \cup C) = \left\{\frac{1}{2}, 1, \frac{3}{2}, 2, \frac{5}{2}, 3\right\} - (B \cup C)$

$A - (B \cup C) = \{3\}$ ..... (1)

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

$A - C = \left\{\frac{1}{2}, \frac{5}{2}, 3\right\}$

$(A - B) \cap (A - C) = \{3\}$ ..... (2)

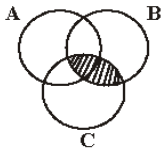
From (1) and (2)

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

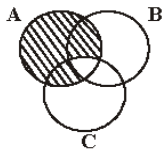
Proved.

9. Verify A – (B ∩ C) = (A – B) ∪ (A – C) using venn diagrams.

Solution :

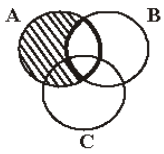


B∩C

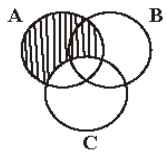


A – (B∩C)

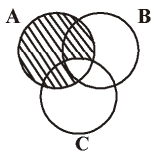
..... (1)



A – B



A – C



..... (2)

(A – B)∪(A – C)

From (1) and (2)

Proved.

10. If U = {4, 7, 8, 10, 11, 12, 15, 16}, A = {7, 8, 11, 12} and B = {4, 8, 12, 15} then verify De Morgan's laws for complementation.

Solution :

De Morgan's laws for complementation.

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

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

$A \cup B = \{4, 7, 8, 11, 12, 15\}$

$(A \cup B)' = U - (A \cup B)$

$= \{10, 16\}$ ..... (1)

$A' = U - A$

$= \{4, 10, 15, 16\}$

$B' = \{7, 10, 11, 16\}$

$A' \cap B' = \{10, 16\}$ ..... (2)

From (1) and (2)

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

$A \cap B = \{8, 12\}$

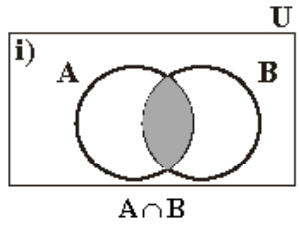
$(A \cap B)' = \{4, 7, 10, 11, 15, 16\}$ ..... (3)

$A' \cup B' = \{4, 7, 10, 11, 15, 16\}$ ..... (4)

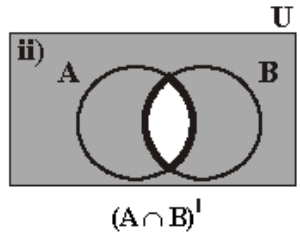
From (3) and (4)

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

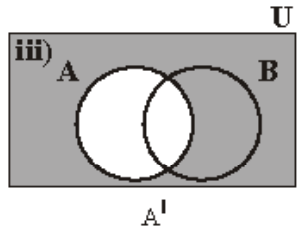
11. Verify $(A \cap B)' = A' \cup B'$ using Venn diagrams



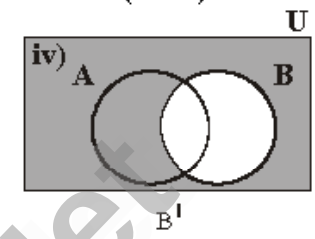
$A \cap B$



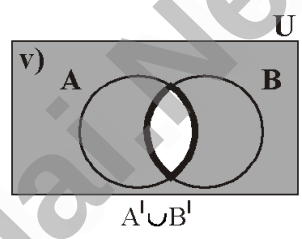
$(A \cap B)'$



A'



B'



$A' \cup B'$

SUMMARY

❖ For any two finite sets A and B, we have

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

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

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

(iv) $n(B - A) = n(B) - n(A \cap B)$

(v) $n(U) = n(A) + n(A')$

❖ For any three finite sets A, B and C

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

Exercise – 1.6

1. (i) If n(A) = 25, n(B) = 40, n(A∪B) = 50 and n(B′) = 25 , find n(A∩B) and n(U).

(ii) If n(A) = 300, n(A∪B) = 500, n(A∩B) = 50 and n(B′) = 350, find n(B) and n(U).

Ans:

(i) n(A) = 25, n(B) = 40, n(AUB) = 50

$n(A \cap B) = n(A) + n(B) - n(AUB)$

$= 25 + 40 - 50 = 65 - 50 = 15$

$n(U) = n(B) + n(B')$

$= 40 + 25 = 65$

(ii) $n(A) = 300, n(A \cup B) = 500,$
$n(A \cap B) = 50, n(B') = 350$
$n(A \cap B) = n(A) + n(B) - n(A \cup B)$
$50 = 300 + n(B) - 500$
$50 = n(B) - 200$
$n(B) = 50 + 200 = 250$
$n(U) = n(B) + n(B')$
$= 250 + 350 = 600$

2. If $U = \{x : x \in N, x \leq 10\}$, $A = \{2,3,4,8,10\}$ and $B = \{1,2,5,8,10\}$, then verify that $n(A \cup B) = n(A) + n(B) - n(A \cap B)$

Ans:

LHS:

$U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$
$A = \{2, 3, 4, 8, 10\}$
$n(A) = 5$
$B = \{1, 2, 5, 8, 10\}$
$n(B) = 5$
$A \cup B = \{1, 2, 3, 4, 5, 8, 10\}$
$n(A \cup B) = 7$ .....(1)

RHS:

$(A \cap B) = \{2, 8, 10\}$
$n(A \cap B) = 3$
$n(A \cup B) = n(A) + n(B) - n(A \cap B)$
$= 5 + 5 - 3$
$= 10 - 3 = 7$
$n(A \cup B) = 7$ .....(2)

From (1) and (2)

LHS = RHS (verified)

3. Verify $n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(A \cap C) + n(A \cap B \cap C)$ for the following sets.

i) $A = \{a, c, e, f, h\}$, $B = \{c, d, e, f\}$ and $C = \{a, b, c, f\}$

ii) $A = \{1, 3, 5\}$, $B = \{2, 3, 5, 6\}$ and $C = \{1, 5, 6, 7\}$

Solution :

i) $A = \{a, c, e, f, h\}$
$B = \{c, d, e, f\}$
$C = \{a, b, c, f\}$
$n(A) = 5$
$n(B) = 4$
$n(C) = 4$
$A \cap B = \{c, e, f\}$
$n(A \cap B) = 3$
$(B \cap C) = \{c, f\}$
$n(B \cap C) = 2$
$(A \cap C) = \{a, c, f\}$
$n(A \cap C) = 3$
$A \cup B \cup C = \{a, b, c, d, e, f, h\}$
$n(A \cup B \cup C) = 7$
$A \cap B \cap C = \{c, f\}$
$n(A \cap B \cap C) = 2$
$n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(A \cap C) + n(A \cap B \cap C)$
$7 = 5 + 4 + 4 - 3 - 2 - 3 + 2$
$7 = 15 - 8$
$7 = 7$ (Verified)

ii) $A = \{1, 3, 5\}$
$B = \{2, 3, 5, 6\}$
$C = \{1, 5, 6, 7\}$
$n(A) = 3$
$n(B) = 4$
$n(C) = 4$
$A \cap B = \{3, 5\}$
$n(A \cap B) = 2$
$B \cap C = \{5, 6\}$
$n(B \cap C) = 2$
$A \cap C = \{1, 5\}$
$n(A \cap C) = 2$
$(A \cup B \cup C) = \{1, 2, 3, 5, 6, 7\}$
$n(A \cup B \cup C) = 6$
$(A \cap B \cap C) = \{5\}$
$n(A \cap B \cap C) = 1$
$n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(A \cap C) + n(A \cap B \cap C)$
$6 = 3 + 4 + 4 - 2 - 2 - 2 + 1$
$6 = 12 - 6$
$6 = 6$ (Verified)

4. In a class, all students take part in either music or drama or both. 25 students take part in music, 30 students take part in drama and 8 students take part in both music and drama. Find

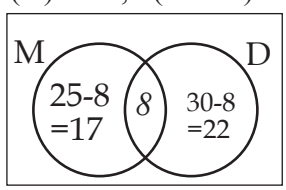
(i) The number of students who take part in only music.

(ii) The number of students who take part in only drama.

(iii) The total number of students in the class.

Ans:

n(M) = 25, n(D) = 30, n(M∩D) = 8



Let M = Music, D = Drama

(i) The number of students who take part only in Music

$n(M - D) = n(M) - n(M \cap D)$

$= 25 - 8 = 17$

(ii) The number of students who take part only in drama

$n(D - M) = n(D) - n(M \cap D)$

$= 30 - 8 = 22$

(iii) The total number of students in the class

$n(MUD) = n(M) + n(D) - n(M \cap D)$

$= 25 + 30 - 8$

$= 55 - 8 = 47$

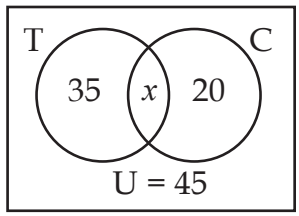
5. In a party of 45 people, each one likes tea or coffee or both. 35 people like tea and 20 people like coffee. Find the number of people who

(i) like both tea and coffee

(ii) do not like Tea

(iii) do not like coffee

Ans:



(i) n(U) = 45

Let tea = T

n(T) = 35

Let coffee = C

n(TUC) = 45 n(C) = 20

$n(T \cap C) = x$

$n(TUC) = n(T) + n(C) - n(T \cap C)$

$45 = 35 + 20 - x$

$45 = 55 - x$

$= 55 - 45 = 10$

$n(T \cap C) = 10$

Number of people who like both tea and coffee = 10

(ii) No of people who do not like tea

$n(C - T) = n(C) - n(T \cap C)$

$= 20 - 10$

$n(C - T) = 10$

(iii) No of people who do not like coffee

$n(T - C) = n(T) - n(T \cap C)$

$= 35 - 10$

$n(T - C) = 25$

6. In an examination 50% of the students passed in Mathematics and 70% of students passed in Science while 10% students failed in both subjects. 300 students passed in both the subjects. Find the total number of students who appeared in the examination, if they took examination in only two subjects.

Ans :

$n(\cup) = 100\%$

$n(M \cup S) = 100 - 10 = 90\%$

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

$90 = 50 + 70 - x$

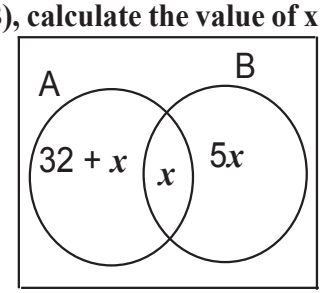
$90 = 120 - x$

$x = 120 - 90 = 30\%$

$\text{Students appeared} = \frac{100}{\cancel{30}} \times \overset{10}{\cancel{300}} = 1000 \text{ Students}$

7. A and B are two sets such that n(A–B) = 32 + x, n(B – A) = 5x and n(A∩B)=x. Illustrate the information by means of a Venn diagram. Given that n(A) = n(B), calculate the value of x

Ans:



(i) Given that

n(A) = n(B)

32 + 2x = 6x

32 = 4x

4x = 32

$$x = \frac{32}{4}$$
$$x = 8$$

8. 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?

Ans:

$n(A) = 400$

$n(B) = 200$

$n(A \cap B) = 50$

$n(A \cup B) = 500$

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

$500 = 400 + 200 - 50$

$500 \neq 550$

But $n(A \cup B) = 500$

No, this data is not correct

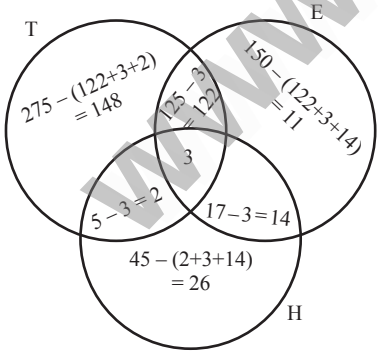
9. In a colony, 275 families buy Tamil newspaper, 150 families buy English newspaper, 45 families buy Hindi newspaper, 125 families buy Tamil and English newspapers, 17 families buy English and Hindi newspapers, 5 families buy Tamil and Hindi newspapers and 3 families buy all the three newspapers. If each family buy atleast one of these newspapers then find

i) Number of families buy only one newspaper

ii) Number of families buy atleast two newspapers

iii) Total number of families in the colony.

Solution :



Let T = Tamil News Paper = 275

E = English News Paper = 150

H = Hindi News paper = 45

$n(T) = 148$

$n(E) = 11$

$n(H) = 26$

$n(T \cap E) = 125$

$n(E \cap H) = 17$

$n(T \cap H) = 5$

$n(T \cap E \cap H) = 3$

i) Number of families buy only one newspaper

$= 148 + 11 + 26 = 185$

ii) Number of families buy atleast two newspapers

$= 122 + 3 + 14 + 2 = 141$

iii) Total number of families in the colony

$n(T \cup E \cup H) = n(T) + n(E) + n(H) - n(T \cap E) - n(E \cap H) - n(T \cap H) + n(T \cap E \cap H)$

$= 275 + 150 + 45 - 125 - 17 - 5 + 3$

$= 473 - 147$

$= 326$

10. A survey of 1000 farmers found that 600 grew paddy, 350 grew ragi, 280 grew corn, 120 grew paddy and ragi, 100 grew ragi and corn, 80 grew paddy and corn. If each farmer grew atleast any one of the above three, then find the number of farmers who grew all the three.

Solution :

Let A, B and C represent the sets of farmers who grew paddy, ragi and corn respectively.

$n(A \cup B \cup C) = 1000$

$n(A) = 600$

$n(B) = 350$

$n(C) = 280$

$n(A \cap B) = 120$

$n(B \cap C) = 100$

$n(A \cap C) = 80$

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

$1000 = 600 + 350 + 280 - 120 - 100 - 80 + n(A \cap B \cap C)$

$1000 = 1230 - 300 + (A \cap B \cap C)$

$1300 - 1230 = n(A \cap B \cap C)$

$70 = n(A \cap B \cap C)$

The number of farmers who grew all the three = 70

11. In the adjacent diagram, if n (U) = 125, y is two times of x and z is 10 more than x, then find the value of x, y and z.

Solution :

n (U) = 125

y = 2 x

Z = x + 10

n (U) = x + y + z + 4 + 6 + 3 + 17 + 5

125 = x + 2x + x + 10 + 35

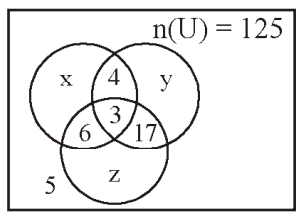
125 = 4x + 45

4x = 125 – 45

4x = 80

$x = \frac{80}{4}$

x = 20



y = 2x

y = 2 × 20

y = 40

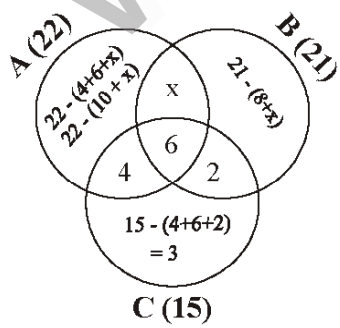
Z = x + 10

Z = 20 + 10

Z = 30

12. Each student in a class of 35 plays atleast one game among chess, carrom and table tennis. 22 play chess, 21 play carrom, 15 play table tennis, 10 play chess and table tennis, 8 play carrom and table tennis and 6 play all the three games. Find the number of students who play i) chess and carrom but not table tennis ii) only chess iii) only carrom (Hint : Use Venn diagram)

Solution :



Let A, B and C represent sets of students who play chess, carrom and table tennis respectively

n (A ∪ B ∪ C) = 35

n (A) = 22

n (B) = 21

n (C) = 15

n (A ∩ C) = 10

n (A ∩ B ∩ C) = 6

n (B ∩ C) = 8

n (A ∩ B) = x + 6

n (A ∪ B ∪ C) = n (A) + n (B) + n (C) – n (A ∩ B) – n (B ∩ C) – n(A ∩ C) + n (A ∩ B ∩ C)

35 = 22 + 21 + 15 – (x +6) – 8 – 10 + 6

35 = 58 – (x +6) – 18 + 6

35 = 58 – (x + 6) – 12

35 = 58 – 12 – (x + 6)

35 = 46 – x – 6

35 = 40 – x

x = 40 – 35

x = 5

i) Number of students who play chess and carrom but not table tennis = 5

ii) Number of students who play only chess

= 22 – (10 + x)

= 22 – (10 + 5)

= 7

iii) Number of students who play only carrom

= 21 – (8 + x)

= 21 – (8 + 5)

= 21 – 13

= 8

13. In a class of 50 students, each one come to school by bus or by bicycle or on foot. 25 by bus, 20 by bicycle, 30on foot and 10 students by all the three. Now how many students come to school exactly by two modes of transport?

Solution :

Let A, B and C represent the sets of students who come to school by bus, by bicycle and by foot respectively.

$n(A \cup B \cup C) = 50$

$n(A) = 25$

$n(B) = 20$

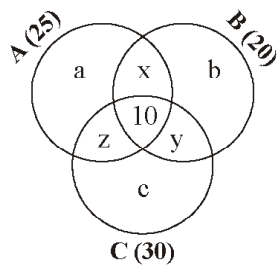
$n(C) = 30$

$n(A \cap B \cap C) = 10$

$n(A \cap B) = x + 10$

$n(B \cap C) = y + 10$

$n(A \cap C) = z + 10$



Number of students who come to school exactly by two modes of transport = x + y + z

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

$50 = 25 + 20 + 30 - (x + 10) - (y + 10) - (z + 10) + 10$

$50 = 75 - x - 10 - y - 10 - z - 10 + 10$

$50 = 75 - (x + y + z + 10) - 10$

$x + y + z + 10 = 75 - 50 - 10$

$x + y + z + 10 = 75 - 60$

$x + y + z + 10 = 15$

$x + y + z = 15 - 10$

$x + y + z = 5$

Number of students who come to school exactly by two modes of transport = 5

Exercise – 1.7

Multiple Choice Questions:

1. Which of the following is correct?

(1) $\{7\} \in \{1,2,3,4,5,6,7,8,9,10\}$
(2) $7 \in \{1,2,3,4,5,6,7,8,9,10\}$
(3) $7 \notin \{1,2,3,4,5,6,7,8,9,10\}$
(4) $\{7\} \not\subseteq \{1,2,3,4,5,6,7,8,9,10\}$

Ans: (2) $7 \in \{1,2,3,4,5,6,7,8,9,10\}$

2. The set $P = \{x \mid x \in Z, -1 < x < 1\}$ is a

(1) Singleton set (2) Power set
(3) Null set (4) Subset

Ans: (1) Singleton set

3. If $U = \{x \mid x \in N, x < 10\}$ and $A = \{x \mid x \in N, 2 \leq x < 6\}$ then (A')' is

(1) {1,6,7,8,9} (2) {1,2,3,4}
(3) {2,3,4,5} (4) { }

Ans: (3) {2,3,4,5}

4. If $B \subseteq A$ then $n(A \cap B)$ is

(1) n(A – B) (2) n(B)
(3) n(B – A) (4) n(A)

Ans: (2) n(B)

5. If A = {x,y,z} then the number of non–empty subsets of A is

(1) 8 (2) 5 (3) 6 (4) 7

Ans: (4) 7

6. Which of the following is correct?

(1) $\varnothing \subseteq \{a, b\}$ (2) $\varnothing \in \{a, b\}$
(3) $\{a\} \in \{a, b\}$ (4) $a \subseteq \{a, b\}$

Ans: (1) $\varnothing \subseteq \{a, b\}$

7. If $A \cup B = A \cap B$, then

(1) $A \neq B$ (2) $A = B$
(3) $A \subset B$ (4) $B \subset A$

Ans: (2) A = B

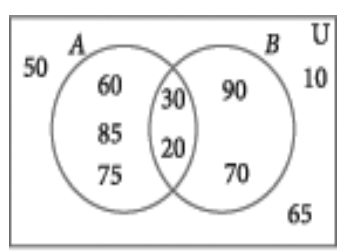
8. If B – A is B, then. $A \cap B$ is

(1) A (2) B (3) U (4) $\varnothing$

Ans: (4) $\varnothing$

9. From the adjacent diagram $n[P(A \Delta B)]$ is

(1) 8 (2) 16 (3) 32 (4) 64



Ans: (3) 32

10. If n(A) = 10 and n(B) = 15, then the minimum and maximum number of elements in $A \cap B$ is

(1) 10,15 (2) 15,10
(3) 10,0 (4) 0,10 **Ans: (4) 0,10**

11. Let A = {∅} and B = P(A), then A∩B is
(1) {∅ , {∅ } } (2) {∅}
(3) ∅ (4) {0}
Ans: (2) {∅}

12. In a class of 50 boys, 35 boys play Carrom and 20 boys play Chess then the number of boys play both games is
(1) 5 (2) 30 (3) 15 (4) 10
Ans: (1) 5

13. If U = {x : x ∈ N and x < 10}, A = {1, 2, 3, 5, 8} and B = {2, 5, 6, 7, 9}, then n [(A∪B)'] is
(1) 1 (2) 2 (3) 4 4) 8
Ans : 1) 1

14. For any three sets P, Q and R, P – (Q∪ R) is
(1) P – (Q∪R) (2) (P∩Q) –R
(3) (P – Q) ∪ (P – R) (4) (P – Q) ∩ (P – R)
Ans : 3) (P – Q) ∪ (P – R)

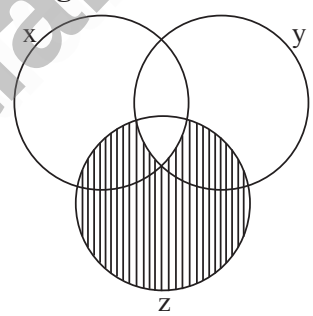
15. Which of the following is true?
(1) A – B = A ∩ B
(2) A – B = B – A
(3) (A ∪ B)' = A' ∪ B'
(4) (A ∩B)' = A' ∪ B'
Ans : 4) (A ∩ B)' = A' ∪B'

16. If n (A∪B∪C) = 100, n(A) = 4x, n(B) = 6x, n (C) = 5x, n (A∩B) = 20, n (B∩C) = 15, n (A∩C) = 25 and n (A∩B∩C) = 10, then the value of x is
(1) 10 (2) 15 (3) 25 (4) 30
Ans : 1) 10

17. For any three sets A, B and C, (A – B) ∩ (B – C) is equal to
(1) A only (2) B only
(3) C only (4) ϕ **Ans : 4) ϕ**

18. If J = Set of three sided shapes, K = Set of shapes with two equal sides and L = Set of shapes with right angle, then J∩K∩L is
(1) Set of isoceles triangles
(2) Set of equilateral triangles
(3) Set of isoceles right triangles
(4) Set of right angled triangles
Ans : 3) Set of isosceles right triangles

19. The shaded region in the Venn diagram is



(1) Z–(X∪Y) (2) (X∪Y)∩Z
(3) Z – (X∩Y) (4) Z∪(X∩Y)
Ans: (3) Z – (X∩Y)

20. In a city, 40% people like only one fruit, 35% people like only two fruits, 20% people like all the three fruits. How many percentage of people do not like any one of the above three fruits?
(1) 5 (2) 8 (3) 10 (4) 15
Ans : (1) 5