Sets, Functions, Relations

math

$a^2+b^2=c^2$

1. Set is a collection of Well-defined, Distinct objects

Examples : A = { 5, 8, 9, 10 }

B = { Accounts, Maths, Law BCR, Eco BCK}

C = { Atal Bihariji , Manmohan singh ji , Narendra ji }

D = {a , e , i , o , u}

E = {2, 3, 5, 7, 11, 13, 17, 19}

F = { Apple pencil, ipad, HDMI connector, charger }

2. (I) Any Living OR Non living thing can be called as objects/elements

(II) Generally various objects of set are written in curly Bracket

or OR Flowered Bracket $\Rightarrow \{ \; \}$

(III) Generally name of the set is denoted by $\boxed{\text{Capital Letters}}$

(IV) A = {5, 8, 9} B = {8, 9, 5}

Sets A, B are same as order of objects is not important.

order in which objects are written in curly bracket is of no relevance.

{10, 12, VR, a, 31} {12, 10, VR, a, a, a, 31} {VR, VR, a, a, 31, 10, 10, 12, VR}

These 3 sets are same OR Equal sets

$\therefore$ (1) order of objects is not important

(2) repetition of objects is of No relevance.

(V) A = {a, b, c, e, j} B = {c, b, a, e, c, c, a, a, a, e, j}

B = {a, b, c, e, j} These sets are same

Repetition of objects in a set is of No use OR No relevance .

3. Set is collection of well-defined, distinct objects

Either Listed OR Described

Listed	Described
A = { 1, 4, 9, 16, 25, 36, 49, 64, 81, 100 }	A = { x^2 : where $x \in N$ & $x \leq 10$}
B = { 7, 12, 28, 52 }	B = { $x^2 + 3$: where x is a prime number less than 10}
C = { Indira Gandhi }	C is a set of Indian Female Prime Ministers til 2022.
D = { Virendar Sehwag, Karun Nair }	D is a set of Indian cricketers who scored Triple century in a test match at international level till 2022

List Form,
Roster Form,
Braces Form.

Set Builder Form,
Description Form,
property Form.
OR
Rule Form
OR
Algebraic Form

math

4.

Set Builder Form	Roster Form
M is a set of first 25 prime Natural numbers	M = {2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97}
N is set of Indian prime Minister till 2022 from Maharashtra State	N = { } = ϕ = Null set = Empty set
Q is a set of Years in which India won Men's ICC cricket world cup till 2024	Q = {1983, 2007, 2011, 2024}
R is a set of vowels in English Alphabet	R = {a, e, i, o, u}
Z is a set of First 10 multiples of natural number 5	Z = {5, 10, 15, 20, 25, 30, 35, 40, 45, 50}
K is a set of Letters used in the name of VINOD REDDY	K = {V, I, N, O, D, R, E, Y}
M is a set of subjects for CA Final Nov exams (NOV-2024)	M = {FR, AFM, Auditing, DT, IDT, Elective paper}

5. A = {5, 13, 19, 20, 28, 30, 39}

There are 7 distinct elements in set A which can be written as n (A) = 7

OR CARDINAL VALUE of set A is 7.

Numbers of distinct elements of a set is known as its – Cardinal Value

K = {8, 18, 28, 8, 8, 7, 5, 8, 28, 7, 5, 28, 8, 28, 8, 7, 5, 28} → cardinal value of set K is 5. Here n(K) = 5

6. (i) B = {10, 13, 18, 10, 13, 10, 18, 20, 18, 10, 13, 18, 20, 10}. Find n (B).

→ n (B) = 4

⇓ B = {10, 13, 18, 20}

∴ Cardinal value of set B is 4 .

(ii) M = {a, c, d, m, a, d, m, c, k, l, x, c, d, a, m, d}. Find n (M).

→ M = { a, c, d, m, k, l, x } Here n(M) = 7 as there are 7 distinct elements in set M.

∴ n(M) = 7 . Cardinal value of set M is 7.

7. D = {1, 2, 3, 4, 5, 6, ...}. Find n (D).

→ n (D) = infinite = unlimited = uncountable

There are infinite no. of observations in set D

∴ D is an Infinite set

If No. of observations in a set are :
- Limited / countable → Finite set
- unlimited / uncountable → Infinite set

8. If cardinal value of a set is

Limited or Countable	Unlimited or Uncountable	Zero	One
Finite set	Infinite set	Null set OR Empty set OR Void set OR ϕ (phi)	Singleton set

Null sets, singleton set are also finite sets.

9. Null set is denoted by : ϕ OR phi OR $\{\ \}$

10. B = { 5, 7, 13, 200, 813 }

7 is one of the observation of set B

$7 \in B$: 7 belongs to set B.

$813 \in B$: 813 belongs to set B.

$5 \in B$: 5 belongs to set B.

$520 \notin B$: 520 does not belongs to set B.

$51 \notin B$: 51 does not belongs to set B.

If $D = \{x^2 : \text{where } x \in N \ \& \ x \leq 3\}$: Set Builder form

then $D = \{1, 4, 9\}$: Roster/List Form

11. A = {Infinity} , B = {ϕ}, C = {12}

A, B, C are singleton sets.

- Set of stars in sky is an infinite set are No. of obs^{n}s are uncountable
- Set of intelligent students is

(a) Finite set (b) Infinite set

(c) Null set ~~(d)~~ Not a well defined collection

12. A = {1, 2, 5} , B = {1, 2, 3, 4, 5, 6, 7}

→

Every observation of set-A belongs to Set-B also

$\therefore$ A is a subset of B OR

B is a super set of A.

Find All possible subsets of set {A = 1,2,3,4}

$\Rightarrow$ ϕ, {1}, {2}, {3}, {4}, {1,2}, {1,3}, {1,4}, {2,3}, {2,4}, {3,4}, {1,2,3}, {1,3,4}, {2,3,4} {1,2,4} } proper subsets

{1,2,3,4} = improper subset

13. C = {a, b, p, q, r} D = {a, p, r}

→ D is a subset of C, as every observation of set-D belongs to set-C also.

& C is a superset of D.

A is a subset of B : $A \subseteq B$

A is a proper subset of B : $A \subset B$

Null set is a subset of any other set

14. 1. Find All possible subsets of set A

If A = {10}

→ ϕ, $\{10\}$ No. of subsets = 2^1 = 2

2. Find All possible subsets of set A

If A = {10, 12}

No. of subsets = $2^2 = 4$

→ ϕ, $\{10\}$, $\{12\}$ ⟹ proper subsets

$\{10, 12\}$ ⟹ improper subset

3. Find All possible subsets of set A

If A = {10, 12, 20}

No. of subsets = $2^3 = 8$

→ Proper subsets = ϕ, $\{10\}$, $\{12\}$, $\{20\}$, $\{10,20\}$, $\{10,12\}$, $\{12,20\}$

Improper subset = $\{10, 12, 20\}$

4. Find All possible subsets of set A

If A = {10, 12, 20, 30}

No. of subsets = $2^4 = 16$

→ Proper subsets = ϕ, $\{10\}$, $\{12\}$, $\{20\}$, $\{30\}$, $\{10,12\}$, $\{10,20\}$, $\{10,30\}$, $\{12,20\}$, $\{12,30\}$, $\{20,30\}$, $\{10,12,20\}$, $\{10,12,30\}$, $\{10,20,30\}$, $\{12,20,30\}$

improper subset = $\{10,12,20,30\}$

Cardinal Value of set	No. of all possible subsets
1	$2^1 = 2$
2	$2^2 = 4$
3	$2^3 = 8$
4	$2^4 = 16$
n	2^n

15. Find all possible subsets of set Q = {1, 2, 3, 4, 5}

proper subsets : ϕ, {1}, {2}, {3}, {4}, {5}, {1,2}, {1,3}, {1,4}, {1,5}, {2,3}, {2,4}, {2,5}, {3,4}, {3,5}, {4,5}, {3,4,5}, {2,4,5}, {2,3,5}, {2,3,4}, {1,4,5}, {1,3,5}, {1,3,4}, {1,2,5}, {1,2,4}, {1,2,3}, {1,2,3,4}, {1,2,3,5}, {1,2,4,5}, {1,3,4,5}, {2,3,4,5}

$\boxed{\{1,2,3,4,5\}}$ → No. of Improper Subsets = 1

No. of Proper Subsets $= (2^5) - 1 = 31$

16. B = {60, 78, 90}

{ }, {60}, {78}, {90}, {60,78}, {60,90}, {78,90}

No. of Proper Subsets = $2^3 = 1 = 7$

{60, 78, 90}

No. of Improper Subsets = 1

17. K = {Calculator, Book} Find all possible subsets

Proper Subsets : {calculator}, {Book}, ϕ

Improper Subsets : {calculator, Book}

18. If Cardinal value of set is 'm' then,

No. of subsets	$= (2)^m$
No. of improper subsets	$= 1$
No. of proper subsets	$= (2^m) - 1$
No. of empty subsets	$= 1$
No. of Non- empty subsets	$= (2^m) - 1$
No. of Non-empty proper subsets	$= (2^m) - 1 - 1 = (2^m) - 2$

19. If Cardinal value of set is '12' then,

No. of subsets	$= (2)^{12} = 4096$
No. of improper subsets	$= 1$
No. of proper subsets	$= (2^{12}) - 1 = 4095$
No. of empty subsets	$= 1$
No. of Non- empty subsets	$= (2^{12}) - 1 = 4095$
No. of Non-empty proper subsets	$= (2^{12}) - 1 - 1 = (2^{12}) - 2 = 4094$

Find power set of A If $A = \{15, 20, k, 31\}$

$\Longrightarrow$ set of all possible subsets is known as power set

Power set of A $= \{ \phi, \{15\}, \{20\}, \{k\}, \{31\}, \{15,20\}, \{15,k\}, \{15,31\}, \{20,k\}, \{20,31\}, \{k,31\}, \{15,20,k\}, \{15,20,31\}, \{15,k,31\}, \{20,k,31\}, \{15,20,k,31\} \}$

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20. E = {5, 13}

All possible subsets = $\{5\}, \{13\}, \phi, \{5, 13\} = 2^2$

All proper subsets = $\{5\}, \{13\}, \phi = 2^2 - 1$

All improper subsets = $\{5, 13\} = 1$

All empty subsets = $\phi = 1$

All non-empty subsets = $\{5\}, \{13\}, \{5, 13\} = 2^2 - 1$

All non-empty proper subsets = $\{5\}, \{13\} = 2^2 - 2$

21. If set K = {p, q, 30}

All possible subsets = $\{p\}, \{q\}, \{30\}, \{p, q\}, \{p, 30\}, \{q, 30\}, \phi, \{p, q, 30\}$
(8)

All proper subsets = $\{p\}, \{q\}, \{30\}, \{p, q\}, \{p, 30\}, \{q, 30\}, \phi$
(7)

All improper subsets = $\{p, q, 30\}$
(1)

All empty subsets = ϕ
(1)

All non-empty subsets = $\{p\}, \{q\}, \{30\}, \{p, q\}, \{p, 30\}, \{q, 30\}, \{p, q, 30\}$
(7)

All non-empty proper subsets = $\{p\}, \{q\}, \{30\}, \{p, q\}, \{p, 30\}, \{q, 30\}$
(6)

math

$a^2+b^2=c^2$

22. If Cardinal value of set is K then,

No. of subsets = 2^k

No. of improper subsets = 1

No. of proper subsets = $(2^k) - 1$

No. of empty subsets = 1

No. of non-empty subsets = $(2^k) - 1$

No. of non-empty proper subsets = $(2^k) - 2$

23. 1) Find all Subsets of { }

$\implies$ All possible subsets : { }

2) Null set is a subsetof any other set.

3) Any other set is a superset of Null set

4) Null set also has a subsets: ϕ

5) Null set don't have a proper subset.

Null set has only one subset i.e. Null set only

If $D = \{2,3,5\}$

$E = \{5,3,2,8,9\}$

Here

~~(a)~~ $D \subset E$

(b) $E \subset D$

(c) $D \subseteq E$

(d) $E \subseteq D$

24. A is a subset of B $\longrightarrow$ $A \subseteq B$

A is a proper subset of B $\longrightarrow$ $A \subset B$

M is a proper subset of N $\longrightarrow$ $M \subset N$

25. **Universal Set**

1) Set of all observation under the scope of study/investigation is known as universal set.

2) It is denoted by U OR S = Sample space

3) Universal set is the super set of any other set.

4) Any other set is the subset of universal set.

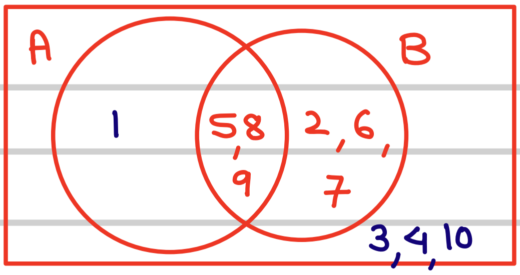
5) Universal set is represented by Rectangle in Venn diagrams

6) Corresponding term in probability is Sample space

26. Complementary Set

$A = \{1, 5, 8, 9\}$ $B = \{2, 5, 6, 7, 8, 9\}$

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



then

Complementary set of **A** = **A**^{c} = **A'** = $\{2, 6, 7, 3, 4, 10\}$

Complementary set of **B** = **B**^{c} = **B'** = $\{1, 3, 4, 10\}$

$n(A) + n(A') = 4 + 6 = 10 = n(U)$

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

$n(A') = n(U) - n(A)$

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

$n(A') = n(U) - n(A)$

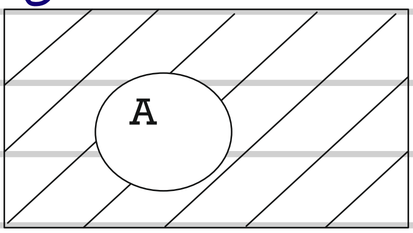
$n(B) = n(U) - n(B')$

(Cardinal value of a set) + (Cardinal value of its complementary set) = (cardinal value of universal set)

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

27.

U = universal set



Shaded area = A'

unshaded area = A

Shaded Area = A' = A^c

① $n(A) + n(A') = n(U)$

② $n(A) = n(U) - n(A')$

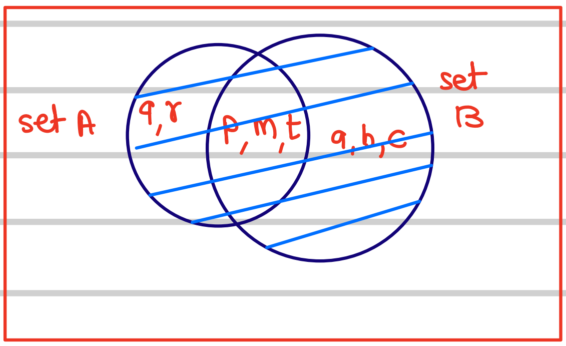
③ $n(A') = n(U) - n(A)$

28. Union Set

$A = \{p, q, r, m, t\}$ $B = \{a, b, c, m, t, p\}$

(A OR B) = (A U B) =

$= \{p, q, r, m, t, a, b, c\}$

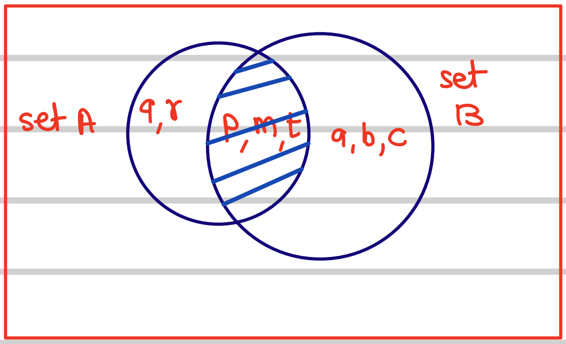


$n(A \cup B) = n(A) + n(B) - n(A \cap B)$

$8 = 5 + 6 - 3$

29. Intersection Set : $A = \{p, q, r, m, t\}$ $B = \{a, b, c, m, t, p\}$

$(A \text{ AND } B) = (A \cap B) = \{p, m, t\}$



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

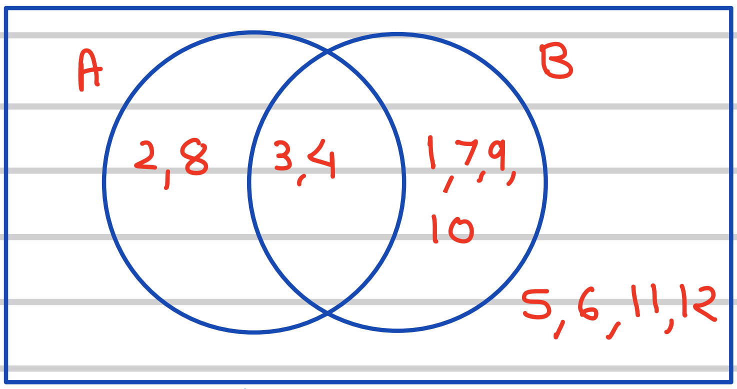
$n(A \cap B) = n(A) - n(A - B)$

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

30. $A = \{2, 3, 4, 8\}$ $B = \{1, 3, 4, 7, 9, 10\}$

$U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$

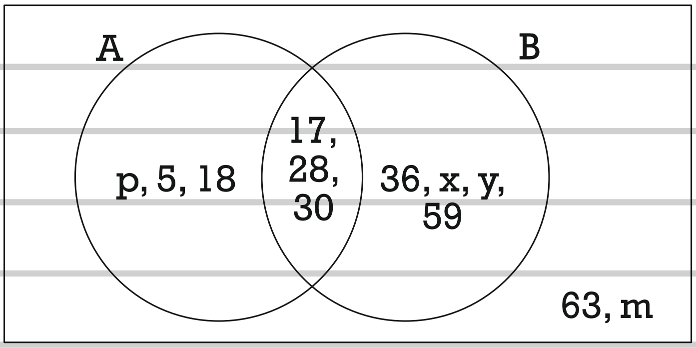
1. $A' = \{1, 5, 6, 7, 9, 10, 11, 12\}$
2. $B' = \{2, 5, 6, 8, 11, 12\}$
3. $(A \cup B) = \{2, 3, 4, 8, 1, 7, 9, 10\}$
4. $(A \cap B) = \{3, 4\}$
5. $(A \cap B') = \{2, 8\} = (A - B)$
6. $(B \cap A') = \{1, 7, 9, 10\} = (B - A)$
7. $(A' \cap B') = \{5, 6, 11, 12\}$
8. $(A \cup B') = \{2, 3, 4, 8, 5, 6, 11, 12\}$
9. $(B \cup A') = \{1, 3, 4, 7, 9, 10, 5, 6, 11, 12\}$
10. $(A' \cup B') = \{1, 5, 6, 7, 9, 10, 11, 12, 2, 8\}$



U = universal set

11. $(A \Delta B) = \{2, 8, 1, 7, 9, 10\}$

31.



U = Universal Set

Find Sets

$A = \{p, 5, 18, 17, 28, 30\}$

$A' = \{36, x, y, 59, 63, m\}$

$U = \{p, 5, 18, 17, 28, 30, 36, x, y, 59, 63, m\}$

$A \cup B = \{p, 5, 18, 17, 28, 30, 36, x, y, 59\}$

$B - A = B \cap A' = \{36, x, y, 59\}$

$A \cup B' = \{p, 5, 18, 17, 28, 30, 63, m\}$

$A' \cup B' = \{p, 5, 18, 36, x, y, 59, 63, m\}$

$U' = \phi$

$B = \{17, 28, 30, 36, x, y, 59\}$

$B' = \{p, 5, 18, 63, m\}$

$A \cap B = \{17, 28, 30\}$

$A - B = A \cap B' = \{p, 5, 18\}$

$A' \cap B' = (A \cup B)' = \{63, m\}$

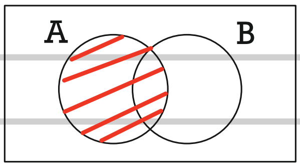
$B \cup A' = \{17, 28, 30, 36, x, y, 59, 63, m\}$

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

$= \{p, 5, 18, 36, x, y, 59\}$

$\phi' = U$

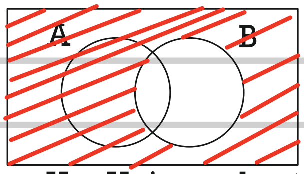
32\. 1.



U = Universal set

$n(A) = n(U) - n(A')$

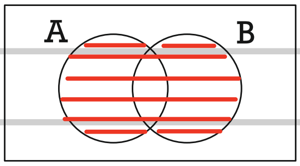
2\.



U = Universal set

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

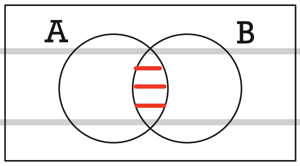
3\.



U = Universal set

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

4\.

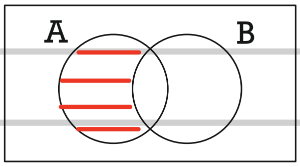


U = Universal set

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

$= n(A) - n(A-B) = n(B) - n(B-A)$

5\.

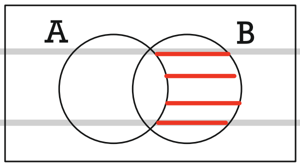


U = Universal set

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

$= n(A \cap B')$

6\.

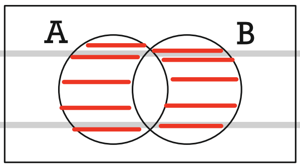


U = Universal set

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

$= n(B \cap A')$

7\.

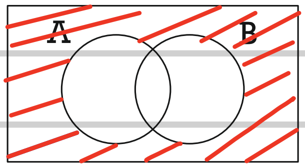


U = Universal set

$n(A \triangle B) = n(A-B) + n(B-A)$

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

8\.

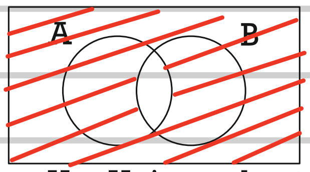


U = Universal set

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

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

9\.

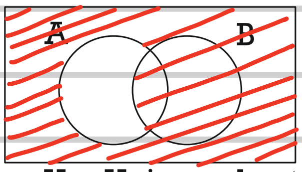


U = Universal set

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

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

10\.

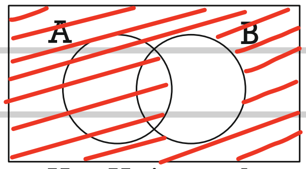


U = Universal set

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

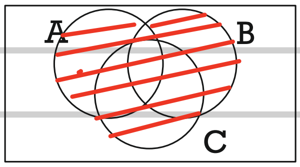
$= n(U) - [n(A) - n(A \cap B)]$

$= n(A') + n(A \cap B)$

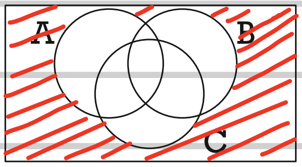
11. 

U = Universal set

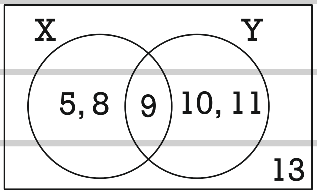
$n(A \cup B') = n(U) - n(B - A)$
$= n(B') + n(A \cap B)$

12. 

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

13. 

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

33. 

U = Universal set

$(X \Delta Y) = \{5, 8, 10, 11\}$

$X = \{5, 8, 9\}$	$X \cap Y = \{9\}$	$X' \cap Y' = \{13\}$ $(X' \cap Y') = (X \cup Y)'$
$Y = \{9, 10, 11\}$	$X \cup Y = \{5, 8, 9, 10, 11\}$	$X' \cup Y' = \{5, 8, 10, 11, 13\}$ $(X' \cup Y') = (X \cap Y)'$
$X' = \{10, 11, 13\}$	$X - Y = \{5, 8\}$ $= X \cap Y'$	$X \cup Y' = \{5, 8, 9, 13\}$
$Y' = \{5, 8, 13\}$	$Y - X = \{10, 11\}$ $= (Y \cap X')$	$Y \cup X' = \{9, 10, 11, 13\}$

34. If n(A) = 5783, n(B) = 4471, n(A ∩ B) = 2358, n(U) = 10,000. Find

1. n(A') = n(U) − n(A) = 10,000 − 5783 = 4217
2. n(B') = n(U) − n(B) = 5,529
3. n(A U B) = n(A) + n(B) − n(A∩B) = 7,896
4. n(A - B) = n(A) − n(A∩B) = 3,425
5. n(B - A) = n(B) − n(A∩B) = 2,113
6. n(A△B) = n(A−B) + n(B−A) = 3,425 + 2,113 = 5,538

   OR = n(AUB) − n(A∩B) = 7,896 − 2,358 = 5,538
7. n(A U B') = n(U) − n(B−A) = 10,000 − 2,113 = 7,887

   OR = n(B') + n(A∩B) = 5,529 + 2,358 = 7,887
8. n(A' ∩ B') = n(AUB)' = n(U) − n(AUB) = 10,000 − 7896

   = 2,104
9. n(B U A') = n(U) − n (A−B) = 10,000 − 3,425 = 6,575

   = n(A') + n(A∩B) = 4,217 + 2,358 = 6,575
10. n(A' U B') = n(A∩B)' = n(U) − n(A∩B) = 10,000 − 2,358

    = 7,642

35. A = {2, 3, 5, 6, 7} B = {p, q, r, s, t} C = {18, 25, 38, m, n}

Here n(A) = n(B) = n(C) = 5

∴ A, B, C are Equivalent sets.

2 or more sets are said to be equivalent if their Cardinal value of Same.

If $A \subseteq B$ & $B \subseteq A$ then A, B are said to be Equal sets

36. A = {2, 3, 5}   B = {2, 3, 5}
Here, A is a subset of B &
B is a subset of A
Therefore, A & B are improper subsets of each other.
Therefore, A & B are Equal sets

37. P = {m, n, x, y, z, 8} , Q = {x, n, m, z, y, 8}
Here $P \subseteq Q$ & $Q \subseteq P$; Therefore, P & Q are Equal sets
& Equivalent sets

38. All Equal sets are Equivalent also,
But All Equivalent sets are not necessarily Equal sets.

A = {5, 7, 8}, B = {5, 7, 8} , C = {2, 5, 10}
Here A, B are Equal sets. Therefore Equivalent also
B, C are Equivalent sets but not Equal sets
A, C are Equivalent sets but not Equal sets
A, B, C are equivalent sets.

39. When sets A, B are said to be

Equal sets?	Equivalent sets?
If A is a subset of B & B is a subset of A i.e. A, B are improper subsets of each other	(cardinal value of set A) = (cardinal value of set B) i.e. $n(A) = n(B)$

$A = \{2, 8, 9, 10, 13, 15, 20\}$ $B = \{20, 13, 15, 10, 8, 2, 9, 2, 9, 10\}$

Here $A \subseteq B$ & $B \subseteq A$ & $n(A) = n(B) = 7$

Here A, B are Equal sets as well as Equivalent sets.

40. $B = \{10, 15, 28, 35, 28, 10, 48, 36, 48, 10, 28, 15, 35\}$

Find cardinal value of set B.

→ $B = \{10, 15, 28, 35, 48, 36\}$ $\therefore n(B) = 6$

As there are 6 distinct elements in set B, cardinal value of set-B is 6.

41. 1. $M = \{5, 6, 7\}$ $N = \{7, 5, 5, 5, 6, 6, 7, 5, 7, 6\} = \{7, 5, 6\}$

Here M, N are Equal sets $\therefore$ Equivalent also.

2. $A = \{2, 3, 5\}$ $B = \{5, 8, Q\}$

Here A, B are Equivalent sets but not Equal sets

$n(A) = n(B) =$ 3

42. If $A = \{5, 100, 850\}$. Find power set of A.

→ Power set of A $= \left\{ \phi, \{5\}, \{100\}, \{850\}, \{5,100\}, \{5,850\}, \{100,850\}, \{5,100,850\} \right\}$

Set of all possible subsets is known as power set

43. If B = {V, I, N, O} . Find power set of B

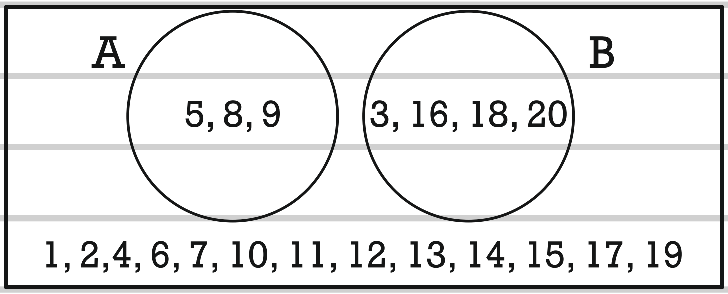
→

Power set of B =

$$\{\{\ \}, \{V\}, \{I\}, \{N\}, \{O\}, \{V,I\}, \{V,N\}, \{V,O\}, \{I,N\}, \{I,O\}, \{N,O\}, \{V,I,N\}, \{V,I,O\}, \{I,N,O\}, \{V,N,O\}, \{V,I,N,O\}\}$$

44. A = {5, 8, 9}   B = {3, 16, 18, 20}

U = {1, 2, 3, 4, ..., 20}



Here $(A \cap B) = \phi$

i.e. $n(A \cap B) = 0$ = zero

Therefore A, B are said to be Disjoint sets OR Mutually exclusive set

45. A = {5, 8, 10, 13}   B = {6, 7, 10, 15, 18, 20, 25}

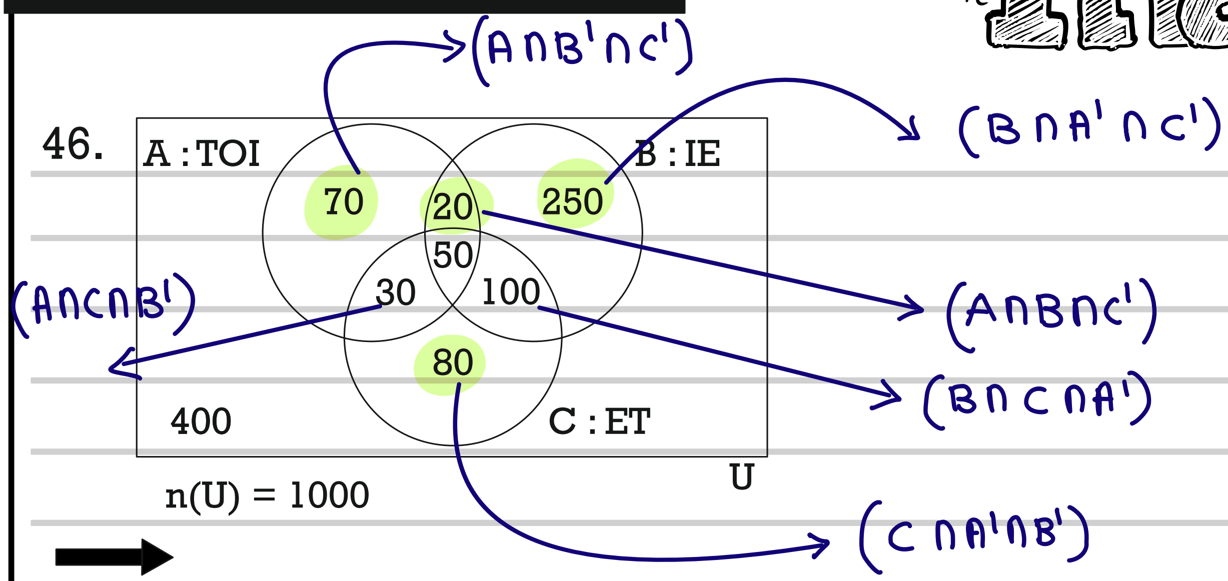
Whether A, B are disjoint sets?

→ As $A \cap B = \{10\}$ $\therefore n(A \cap B) \neq 0$

$\therefore$ A, B are not disjoint sets.

If $A \cap B = \phi$, $n(A \cap B) = 0$ then A, B are Disjoint sets

46.



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

$= 170 + 420 + 260 - 70 - 150 - 80 + 50$

$= 600$

2. $n(A \cup B) = n(A) + n(B) + - n(A \cap B) =$ $170 + 420 - 70 = 520$

3. $n(A-B) = n(A) - n(A \cap B)$ $= 170 - 70 = 100$

4. $n(A' \cap B' \cap C') = n(U) - n(A \cup B \cup C) =$ $1000 - 600$

$= 400$

5. $n(B \triangle C) = P(B \cup C) - n(B \cap C)$

$= [n(B) + n(C) - n(B \cap C)] - n(B \cap C)$

$= 420 + 260 - 150 - 150$

$= 380$

6. How many of them read only one news paper?

→ $= n(A \cap B' \cap C') + n(B \cap A' \cap C') + n(C \cap A' \cap B')$

$= 70 + 250 + 80 = 400$

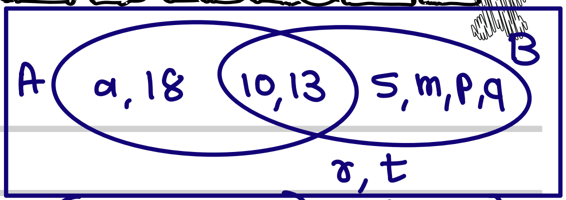
7. How many of them read only 2 news papers?

→ $= n(A \cap B \cap C') + n(B \cap C \cap A') + n(A \cap C \cap B')$

$= 20 + 100 + 30 = 150$

8. How many of them read atleast one news paper?

→ $= n(A \cup B \cup C) = 600$



47. $A = \{a, 10, 13, 18\}$ $B = \{5, 10, 13, m, p, q\}$
$U = \{a, 10, 13, 18, 5, m, p, q, r, t\}$ Find

$A' = \{5, m, p, q, r, t\}$

$B' = \{a, 18, r, t\}$

$(A \cup B) = \{a, 10, 13, 18, 5, m, p, q\}$

$(A \cap B) = \{10, 13\}$

$(A \cap B') = \{a, 18\} = (A - B)$

$(A \triangle B) = \{a, 18, 5, m, p, q\}$

$(B \cap A') = \{5, m, p, q\} = (B - A)$

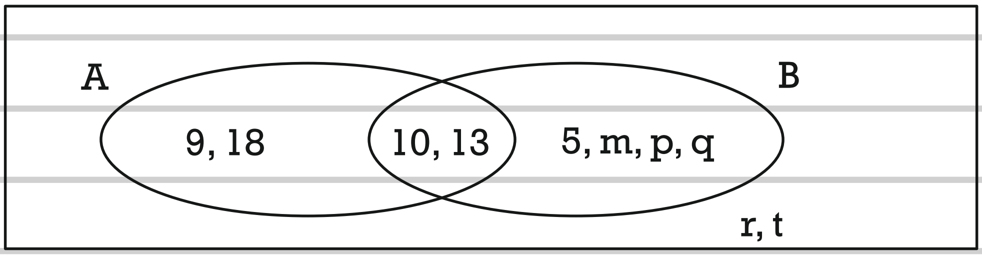
$(A' \cap B') = \{r, t\}$

$(A \cup B') = \{a, 10, 13, 18, r, t\}$

$(B \cup A') = \{5, 10, 13, m, p, q, r, t\}$

$(A' \cup B') = \{5, m, p, q, r, t, a, 18\}$

$n(A-B) = 2$
$n(B-A) = 4$
$n(A' \cap B') = 2$
$n(A' \cup B') = 8$



$n(A) = 4$
$n(B) = 6$
$n(A \cap B) = 2$
$n(A \cup B) = 8$
$n(U) = 10$

$n(A \triangle B) = 6$, $n(A') = 6$, $n(B') = 4$

48. $A = \{2, 10, 13, 18\}$ Find $U = \{2, 10, 13, 18, 5, 6\}$

$A \cup A = \{2, 10, 13, 18\} = A$

$A \cap A = \{2, 10, 13, 18\} = A$

$A \cup A' = U$

$A \cup \phi = A$

$A \cap A' = \phi$

$\phi \cup U = U$

$\phi \cap U = \phi$

$A \cup U = U$

$A \cap U = A$

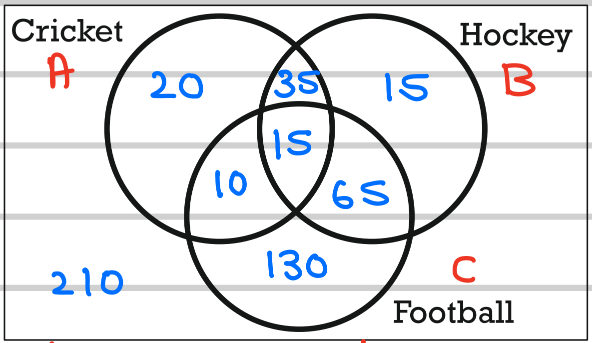
$(\phi)' = U$

$(U)' = \phi$

49.

1. $A \cup A = A$
2. $B \cup B = B$
3. $B \cap B = B$
4. $A \cup \phi = A$
5. $A \cap \phi = \phi$
6. $B \cup \phi = B$
7. $A \cup A' = U$
8. $A \cap A' = \phi$
9. $B \cup B' = U$
10. $B \cap B' = \phi$
11. $U \cup \phi = U$
12. $U \cup U = U$
13. $U \cap U = U$
14. $U \cap \phi = \phi$
15. $(\phi)' = U$
16. $(U)' = \phi$
17. $\phi \cup \phi = \phi$
18. $\phi \cap \phi = \phi$
19. $\phi \cup \phi' = U$
20. $\phi \cap \phi' = \phi$
21. $(A \cup B) \cup A = (A \cup B)$
22. $(A \cap B) \cup (A \cup B) = (A \cup B)$
23. $(A \cap B) \cap (A \cup B) = (A \cap B)$
24. $(A-B) \cup (B-A) = A \Delta B$
25. $(A-B) \cap (B-A) = \phi$
26. $(A \cup B) \cup (A' \cap B') = U$
27. $(A \cup B) \cap (A' \cap B') = \phi$
28. $(A-B) \cup A = A$
29. $(B-A) \cup B = B$
30. $(B-A) \cup A = (A \cup B)$
31. $(A \Delta B) \cup (A \cap B) = (A \cup B)$
32. $(A \Delta B) \cap (A \cap B) = \phi$
33. $(A-B) \cup (A' \cap B') = B'$
34. $A \cup (A' \cap B') = (A \cup B') = (B-A)'$
35. $(A' \cup B') \cup (A \cap B) = U$
36. $(A' \cup B') \cap (A \cap B) = \phi$
37. $(A \Delta B) \cup (A' \cap B') = (A \cap B)' = (A' \cup B')$
38. $(A \Delta B) \cap (A' \cap B') = \phi$
39. $[A \cup (B-A) \cup (A' \cap B')] = = U$
40. $[(A-B) \cup (B-A) \cup (A \cap B)] = (A \cup B)$
41. $(A \cup B) \cap (A-B) = (A-B)$
42. $(A \cap B) \cap (B-A) = \phi$
43. $(A' \cup B') \cup (A \cup B) = U$
44. $(A \cup B') \cup (B \cap A') = U$
45. $(B \cup A') \cap (A-B) = \phi$

50. In a college of 500 students. 80 play cricket, 130 play hockey, 220 play football, 50 play C & H, 80 play H & F, 25 play C & F, 15 play all 3 games.

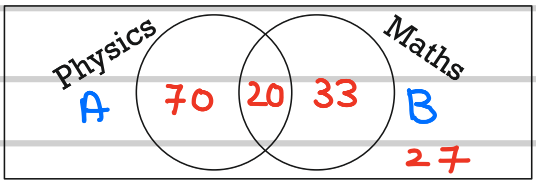


$U = 500$ students

Find No. of students who

1. Play atleast one game = $n(A \cup B \cup C)$
   $= 290$
2. Play one & only one game =
   $= n(A \cap B' \cap C') + n(B \cap A' \cap C') + n(C \cap A' \cap B') = 20 + 15 + 130 = 165$
3. Play exactly 2 games =
   $= n(A \cap B \cap C') + n(B \cap C \cap A') + n(A \cap C \cap B') = 35 + 65 + 10 = 110$
4. Play No game of these three =
   $= n(A' \cap B' \cap C') = n(U) - n(A \cup B \cup C) = 210$
5. Play cricket or hockey = 500 -210 -130 = 160
   $= n(A \cup B) = 80 + 130 - 50 = 160$
6. Play Hockey but not football =
   $= n(B - C) = n(B \cap C') = n(B) - n(B \cap C) = 130 - 80 = 50$

51. In a class of 150 students, 70 read Physics but not maths, 20 read physics & maths, 27 read neither physics not maths.



$U = 150$

Find No. of students who

1. Read Physics = $n(A) = 90$
2. Read Maths = $n(B) = 53$
3. Read Physics OR Maths = $n(A \cup B) = 123$
4. Read Maths but not Physics = $n(B - A) = n(B \cap A') = 33$
5. Read one & only one subject = $n(A \triangle B) = 103$
6. Don't read physics = $P(A') = 60$
7. Read physics but not maths = $A - B = 70$
8. Neither read physics nor maths = $(A' \cap B') = (A \cup B)' = 27$

If $A \subseteq B$ then $B' \subseteq A'$

52. If $A \subseteq B$ then

a. $B \subseteq A$ b. $B' \subseteq A$ ~~c.~~ $B' \subseteq A'$ d. $A' \subseteq B'$

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

Here A is a subset of B, $A' = \{4,5,6,7,8\}$ $B' = \{6,7,8\}$

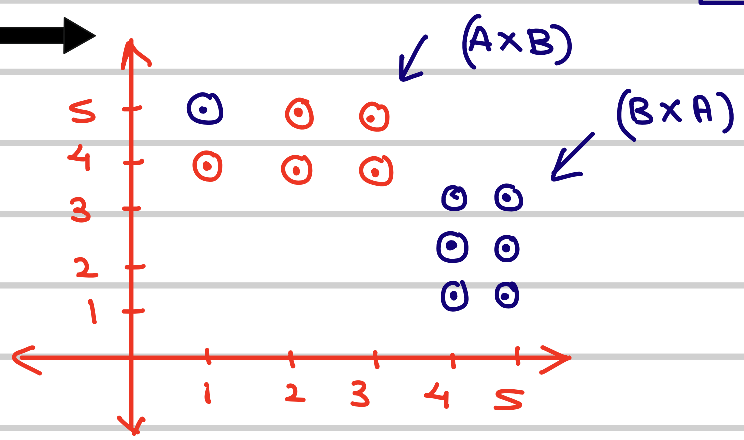
Now B' is a subset of A' $\therefore$ $B' \subseteq A'$

53. $A = \{1, 2, 3\}$ $B = \{4, 5\}$

Find $(A \times B)$ & $(B \times A)$

[Cartesian product of sets]

$(A \times B)$ is a set of all ordered pairs (m,n) where $m \in A$ & $n \in B$



$(B \times A)$ is a set of all ordered pairs (i,j) where $i \in B$ & $j \in A$

$(A \times B) = \{(1,4), (1,5), (2,4), (2,5), (3,4), (3,5)\}$

$(B \times A) = \{(4,1), (4,2), (4,3), (5,1), (5,2), (5,3)\}$

$\therefore (A \times B) \neq (B \times A)$

But $n(A \times B) = n(B \times A) = n(A) \cdot n(B)$

$= 3 \times 2$

$= 6$

Here $(A \times B)$ & $(B \times A)$ are Equivalent sets but NOT Equal sets.

54. (A x B) is a set of all ordered pairs (i,j) where

$i \in A$ &

$j \in B$

If $A = \{pune\}$ $B = \{1,2,3\}$ Find $(A \times B)$ & $(B \times A)$

$\Longrightarrow$ $A \times B = \{(pune,1), (pune,2), (pune,3)\}$

$B \times A = \{(1,pune), (2,pune), (3,pune)\}$

$n(A \times B) = n(B \times A)$

but $(A \times B) \neq (B \times A)$

55. A = {Mumbai, Pune} B = {3, 4, 8, 9} C = {11, 3, 18, 9, 25}

Find A x (B∩C)

$\rightarrow$ $A \times (B \cap C)$

$= \{mumbai, pune\} \times \{3, 9\}$

$= \{(mumbai,3), (mumbai,9), (pune,3), (pune,9)\}$

56. A = {5, 6, 8, 9, 10} B = {3, 6, 13, 14, 15} C = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}

Find C x (A∩B)

$\rightarrow$ $C \times A \cap B$

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

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

57.

$y = 3x^2 + 8x + 9$

$y = e^{\log x} + 3^x + 9x$

$y = 5^{2x+3}$

$y = 9x + \frac{13}{\log x}$

$y = 8x$

$y = \frac{100}{x} + x^2$

$y = \text{Log}\left(\frac{5x+3}{2x+9}\right) + 8^x + 19$

$y = 18x^2 + 13x + \text{Log}\, x$

y is expressed in terms of x

∴ y = Dependent variable

x = Independent variable

y is a function of x

which can be written as,

$y = f(x)$, $y = g(x)$,

$y = h(x)$ --------

58. Demand (y) is dependent on price (x) then we can say that

$y = f(x)$

$y = f(x) = 200 - 5x$

x	y = f (x) = 200 - 5x
20	$f(20) = 200 - 5(20) = 100$
22	$f(22) = 200 - 5(22) = 90$
23	$f(23) = 200 - 5(23) = 85$
18	$f(18) = 200 - 5(18) = 110$
17	$f(17) = 200 - 5(17) = 115$
15	$f(15) = 200 - 5(15) = 125$
30	$f(30) = 200 - 5(30) = 50$

If $f(x) = 3x^2 + 2x + 21$ Find $f(2)$, $f(3)$, $f(-5)$, $f(P)$, $f(0)$

$\Longrightarrow$ $f(2) = 3(2)^2 + 2(2) + 21 = 37$

$f(3) = 3(3)^2 + 2(3) + 21 = 54$

$f(-5) = 3(-5)^2 + 2(-5) + 21 = 86$

$f(P) = 3P^2 + 2P + 21$

$f(0) = 3(0)^2 + 2(0) + 21$
$= 21$

math $a^2+b^2=c^2$

59. $f(x) = 8x^2 + 2x + 1, g(x) = 20x - 2$

Find $f(3), f(-10), g(8), g(13), g(-3), f(-12), f(0), g(0)$

① $f(3) = 8(3)^2 + 2(3) + 1 = 79$

② $f(-10) = 8(-10)^2 + 2(-10) + 1 = 781$

③ $g(8) = 20(8) - 2 = 158$

④ $g(13) = 20(13) - 2 = 258$

⑤ $g(-3) = 20(-3) - 2 = -62$

⑥ $f(-12) = 8(-12)^2 + 2(-12) + 1 = 1129$

⑦ $f(0)$

$= 8(0)^2 + 2(0) + 1 = 1$

⑧ $g(0)$

$= 20(0) - 2$

$= -2$

60. If $f(p) = 8p^2 + 3p + 25$. Find $f(x), f(m), f(10), f(-3), f(0)$

$f(x) = 8x^2 + 3x + 25$

$f(m) = 8m^2 + 3m + 25$

$f(10) = 8(10)^2 + 3(10) + 25 = 855$

$f(-3) = 8(-3)^2 + 3(-3) + 25 = 88$

$f(0) = 8(0)^2 + 3(0) + 25 = 25$

$f(x+1) = 8(x+1)^2 + 3(x+1) + 25 = 8(x^2+2x+1) + 3x+3+25$

$= 8x^2 + 16x + 8 + 3x + 28 = 8x^2 + 19x + 36$

$f(p-4) = 8(p-4)^2 + 3(p-4) + 25 = 8(p^2-8p+16) + 3p - 12 + 25$

$= 8p^2 - 64p + 128 + 3p + 13 = (8p^2 - 61p + 141)$

61. If $f(x) = 39x - 7, g(x) = 3x + 5$

Find $f[g(2)],\ g[f(8)]$

① $f[g(2)] = f\cdot g(2) = f[3(2)+5] = f(11)$

$= 39(11) - 7 = 422$

② $g[f(8)] = g\cdot f(8) = g[39(8)-7] = g(305)$

$= 3(305) + 5 = 920$

Function of Function is known as composite function

y = VR's income

x = No of student in his Batches

m = No of students doing CA in india

$y = f(x)$

$y = f[g(m)]$

62. y = Vinod Reddy's Income
x = No. of students in his batches
k = No. of students pursuing CA course in India
m = India's industrial/service sector Growth rate

→ $y = f(x)$, $x = g(k)$, $k = h(m)$

$y = f(x)$
$y = f[g(k)]$
$y = f\{g[h(m)]\} = f \cdot g \cdot h(m)$

$f(x) = 8x + 11$, $g(x) = 3x - 1$, $h(x) = 2x + 33$ Find $f \cdot g \cdot h(2)$

$\Longrightarrow$ $f \cdot g \cdot h(2) = f \cdot g[2(2)+33] = f \cdot g(37) = f[3(37)-1]$
$= f(110) = 8(110) + 11 = 891$

Function of function is known as Composite function

63. f (x) = 2x + 7 , g (x) = 4x -9. Find f.g (10), g.f (11), f.g (-m)

→ ① $f \cdot g(10) = f[4(10)-9] = f(31) = 2(31) + 7 = 69$

② $g \cdot f(11) = g[2(11)+7] = g(29) = 4(29) - 9$
$= 107$

③ $f \cdot g(-m) = f[4(-m)-9] = f(-4m-9)$
$= 2(-4m-9) + 7$
$= -8m - 18 + 7 = -8m - 11 = -(8m+11)$

64. $f(x) = 7x + 3$
$g(x) = 2x + 11$
$h(x) = 10x - 3$
Find f.g.h(10), g.f.f.h.g.h(-1)

$f.g.g.h.f.h.g.h(10)$
$\Rightarrow f.g.g.h.f.h.g(97)$
$= f.g.g.h.f.h(205)$
$= f.g.g.h.f(2047) = f.g.g.h(14332)$
$= f.g.g(143317) = f.g(286645)$
$= f(573301)$
$= 40,13,110$

1. f.g.h(10) =
$f.g\,[10(10)-3] = f.g\,(97)$
$= f.[2(97)+11] = f(205)$
$= 7(205)+3 = 1438$

$f.g.h(-1)$
$\Rightarrow f.g(-13)$
$= f(-15) = -102$

2. g.f.f.h.g.h(-1) = $g.f.f.h.g\,(10(-1)-3) = g.f.f.h.g(-13)$
$= g.f.f.h(-15)$
$= g.f.f\,(-153)$
$= g.f(-1068)$
$= g(-7473) = -14,935$

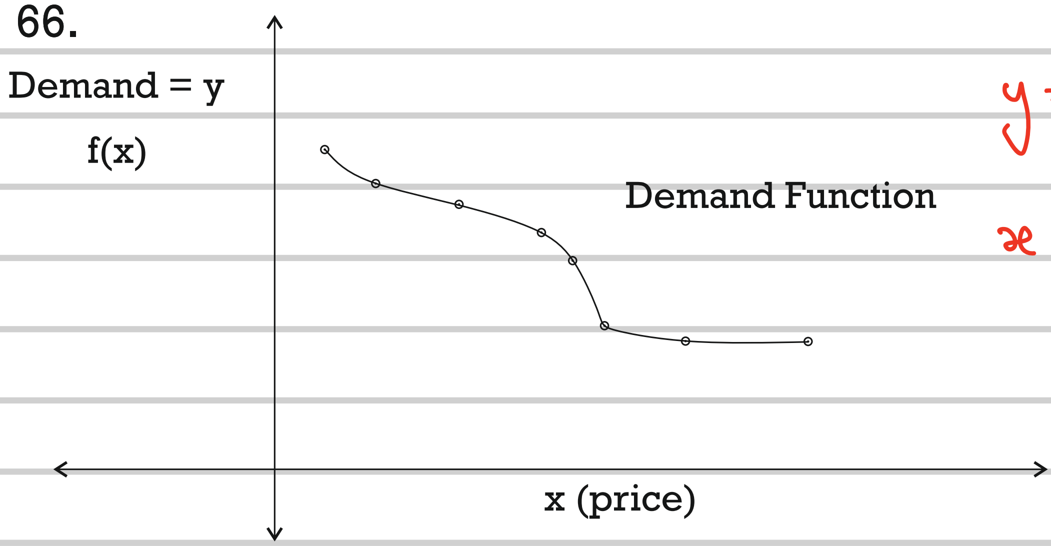
65. $f(x) = 3x^2 + 2x - 1$
Find f(x+2), f(x-3), f(p+2)

① $f(x) = 3x^2+2x-1$
$f(x+2) = 3(x+2)^2 + 2(x+2) - 1$
$= 3(x^2+4x+4) + 2x + 4 - 1$
$= 3x^2 + 12x + 12 + 2x + 3 = 3x^2 + 14x + 15$

② $f(x-3) = 3(x-3)^2 + 2(x-3) - 1$
$= 3(x^2-6x+9) + 2x - 6 - 1$
$= 3x^2 - 18x + 27 + 2x - 7 = 3x^2 - 16x + 20$

③ $f(p+2) = 3p^2 + 14p + 15$

66.



$y =$ Dependent variable

$= $ Demand

$x =$ Independent variable

$=$ price

67. $f(x) = 8x^2 - x - 1$, $g(x) = 11x + 3$. Find f.g(2), g.f(-1)

① $f.g(2) = f\left[11(2)+3\right] = f(25)$

$= 8(25)^2 - 25 - 1 = 4974$

② $g.f(-1) = g\left[8(-1)^2 - (-1) - 1\right] = g(8)$

$= 11(8) + 3 = 91$

③ $f.g(p+2) = f\left[11(p+2)+3\right] = f(11p+25)$

$= 8(11p+25)^2 - (11p+25) - 1$

$= 8(121p^2 + 550p + 625) - 11p - 25 - 1$

$= 968p^2 + 4389p + 4974$

68. $f(x) = 3x^2 - x - 1$, $g(x) = x^2 + 2x + 3$. Find f.g(-3), g.f(13)

① $f.g(-3) = f\left[(-3)^2 + 2(-3) + 3\right] = f(6)$

$= 3(6)^2 - 6 - 1 = 101$

② $g.f(13) = g\left[3(13)^2 - 13 - 1\right] = g(493)$

$= 493^2 + 2(493) + 3 = 2,44,038$

math

69. $f(x) = 13x^2 - 7x - 8$

Find f(2x-1), f(x+3), f(p-10)

➡

1. $f(2x-1) = 13(2x-1)^2 - 7(2x-1) - 8$

$= 13(4x^2 - 4x + 1) - 14x + 7 - 8$

$= 52x^2 - 52x + 13 - 14x - 1$

$= 52x^2 - 66x + 12$

2. $f(x+3) = 13(x+3)^2 - 7(x+3) - 8$

$= 13(x^2 + 6x + 9) - 7x - 21 - 8$

$= 13x^2 + 78x + 117 - 7x - 29$

$= 13x^2 + 71x + 88$

3. $f(p-10) = 13(p-10)^2 - 7(p-10) - 8$

$= 13(p^2 - 20p + 100) - 7p + 70 - 8$

$= 13p^2 - 260p + 1300 - 7p + 62$

$= 13p^2 - 267p + 1362$

70. If f(2x-7) = 10x + 23. Find f(x), f(p)

➡

$f(2x-7) = 10x + 23$

$f(2x-7) = 5(2x-7) + 35 + 23$

$f(2x-7) = 5(2x-7) + 58$

$f(p) = 5p + 58$

$f(x) = 5x + 58$

cross-check

$f(x) = 5x + 58$

Find $f(2x-7)$

$\Rightarrow$

$f(2x-7) = 5(2x-7) + 58$

$= 10x - 35 + 58$

$= 10x + 23$

math

71. If f(x+1) = 10x - 28. Find f(x), f(p), f(13)

OR

$f(x+1) = 10x - 28$

$f(x+1) = 10(x+1) - 10 - 28$

① $f(x) = 10x - 38$

② $f(p) = 10p - 38$

③ $f(13) = 10(13) - 38$

$= 92$

$f(x+1) = 10x - 28$

$f(p-1+1) = 10(p-1) - 28$

$f(p) = 10p - 10 - 28$

① $f(p) = 10p - 38$

② $f(x) = 10x - 38$

③ $f(13) = 10(13) - 38 = 92$

72. f(3x-1) = 11x - 35. Find f(p), f(m), f(y)

$f(3x-1) = 11x - 35$

$f(3x-1) = \frac{11}{3}(3x-1) + \frac{11}{3} - 35$

$f(p) = \frac{11p}{3} + \frac{11}{3} - \frac{105}{3} = \frac{11p + 11 - 105}{3} = \left(\frac{11p - 94}{3}\right)$

$f(m) = \left(\frac{11m - 94}{3}\right)$, $f(y) = \left(\frac{11y - 94}{3}\right)$

cross-check : If $f(p) = \left(\frac{11p - 94}{3}\right)$, Find $f(3x-1)$

$\Rightarrow f(3x-1) = \frac{11(3x-1) - 94}{3} = \frac{33x - 11 - 94}{3}$

$= \frac{33x - 105}{3} = \frac{3(11x - 35)}{3} = 11x - 35$

73. $f(x) = \text{Log}\left(\dfrac{5x+3}{7x-8}\right)$ Find f(x-1)

$$f(x-1) = \text{Log}\left(\frac{5(x-1)+3}{7(x-1)-8}\right)$$

$$= \text{Log}\left(\frac{5x-5+3}{7x-7-8}\right) = \text{Log}\left(\frac{5x-2}{7x-15}\right)$$

$$f(p+8) = \text{Log}\left(\frac{5(p+8)+3}{7(p+8)-8}\right) = \text{Log}\left(\frac{5p+43}{7p+48}\right)$$

74. $f(x-1) = x^2$. Find f(x), f(p), f(p+1)

$$f(x-1) = x^2$$

$$f(x-1) = (x-1)^2 + 2x - 1$$

$$f(x-1) = (x-1)^2 + 2(x-1) + 2 - 1$$

$$f(x-1) = (x-1)^2 + 2(x-1) + 1$$

① $f(p) = p^2 + 2p + 1 = (p+1)^2$

② $f(x) = (x+1)^2$

③ $f(p+1) = (p+1+1)^2 = (p+2)^2$

$$f(x-1) = x^2$$

$$f(p+1-1) = (p+1)^2$$

① $f(p) = (p+1)^2$

② $f(x) = (x+1)^2$

③ $f(p+1) = (p+1+1)^2$
$= (p+2)^2$

cross-check

$f(x) = (x+1)^2$, Find $f(x-1)$

$\Longrightarrow f(x-1) = (x-1+1)^2 = x^2$

75. $f(x+1) = x^3$. Find f(p)

$$f(x+1) = x^3$$

$$f(p-1+1) = (p-1)^3$$

$$\boxed{f(p) = (p-1)^3}$$

76. If $f(x) = 1 - x - x^2$ & $f(x-1) = f(x+2)$.

Find value of x.

$$f(x-1) = f(x+2)$$

$$1-(x-1)-(x-1)^2 = 1-(x+2)-(x+2)^2$$

$$1-x+1-(x^2-2x+1) = 1-x-2-(x^2+4x+4)$$

$$\cancel{1}-\cancel{x}+\cancel{1}-\cancel{x^2}+2x-\cancel{1} = \cancel{1}-\cancel{x}-2-\cancel{x^2}-4x-4$$

$$2x = -4x-6$$

$$6x = -6 \quad \therefore x = -1$$

77. If $g(x) = 13 - 2x - 3x^2$ & $g(p+1) = g(p-3)$.

Find the value of p.

$$g(p+1) = g(p-3)$$

$$\cancel{13}-2(p+1)-3(p+1)^2 = \cancel{13}-2(p-3)-3(p-3)^2$$

$$-2\cancel{p}-2-3(p^2+2p+1) = -2\cancel{p}+6-3(p^2-6p+9)$$

$$-2-3\cancel{p^2}-6p-3 = 6-3\cancel{p^2}+18p-27$$

$$-6p-5 = 18p-21$$

$$16 = 24p$$

$$\therefore p = 16/24 = 2/3$$

78. If $f(x) = 18 - 10x - 8x^2$ & $f(p+4) = f(p-5)$.

Find p.

$$f(p+4) = f(p-5)$$

$$\cancel{18}-10(p+4)-8(p+4)^2 = \cancel{18}-10(p-5)-8(p-5)^2$$

$$-10\cancel{p}-40-8(p^2+8p+16) = -10\cancel{p}+50-8(p^2-10p+25)$$

$$-40-8\cancel{p^2}-64p-128 = 50-8\cancel{p^2}+80p-200$$

$$-64p-168 = 80p-150$$

$$-18 = 144p$$

$$p = \left(-18/144\right) = -1/8$$

79. If $g(x) = 3x^2 - 17x + 25$ & $g(x+1) = g(x-1)$.
Find x.

$$g(x+1) = g(x-1)$$

$$3(x+1)^2 - 17(x+1) + 2\cancel{5} = 3(x-1)^2 - 17(x-1) + 2\cancel{5}$$

$$3(x^2+2x+1) - 1\cancel{7x} - 17 = 3(x^2-2x+1) - 1\cancel{7x} + 17$$

$$\cancel{3x^2} + 6x + 3 - 17 = \cancel{3x^2} - 6x + 3 + 17$$

$$6x - 14 = -6x + 20$$

$$12x = 34$$

$$x = \left(\frac{34}{12}\right) = \left(\frac{17}{6}\right)$$

80. $\boxed{y = f(x) = 8x + 3}$

$y = 8x + 3$

$8x = y - 3$

$x = \left(\frac{y-3}{8}\right)$

$x = f^{-1}(y) = \frac{y-3}{8}$

Here y is expressed in terms of x

Dependent Variable = y

Independent Variable = x

y is a function of x
Now x is the inverse function of y

If y is the function of x then x is the inverse function of y

If $y = f(x)$ then $x = f^{-1}(y)$

If Demand is the function of Price then Price is the inverse function of demand

$\boxed{\text{If } y = g(x) \text{ then } x = g^{-1}(y)}$

81. $y = f(x) = 13x - 17$

Find $f^{-1}(y), f^{-1}(p), f^{-1}(35), f^{-1}(40), f^{-1}(x), f^{-1}(0)$

→

$$\boxed{\begin{array}{l} \text{As } y = f(x) \\ \therefore x = f^{-1}(y) \end{array}}$$

$y = f(x) = 13x - 17$

$13x = y + 17$

$x = \left(\frac{y+17}{13}\right)$

① $f^{-1}(y) = \left(\frac{y+17}{13}\right)$

② $f^{-1}(p) = \left(\frac{p+17}{13}\right)$

③ $f^{-1}(35) = \left(\frac{35+17}{13}\right)$

$= 4$

④ $f^{-1}(40) = \left(\frac{40+17}{13}\right) = \left(\frac{57}{13}\right)$

⑤ $f^{-1}(x) = \left(\frac{x+17}{13}\right)$

⑥ $f^{-1}(0) = \left(\frac{0+17}{13}\right) = \left(\frac{17}{13}\right)$

82. If $y = f(x) = 10x + 23$.

Find $f^{-1}(y), f^{-1}(m+1), f^{-1}(-80), f^{-1}(x), f^{-1}(-2/3)$

→ $y = f(x) = 10x + 23$

$\therefore x = \left(\frac{y-23}{10}\right)$

① $f^{-1}(y) = \left(\frac{y-23}{10}\right)$

② $f^{-1}(m+1) = \left(\frac{m+1-23}{10}\right) = \left(\frac{m-22}{10}\right)$

③ $f^{-1}(-80) = \frac{-80-23}{10}$

$= -103/10$

④ $f^{-1}(x) = \left(\frac{x-23}{10}\right)$

⑤ $f^{-1}(-2/3)$

$= \left(\frac{-\frac{2}{3} - 23}{10}\right) = \frac{-2-69}{30}$

$= -71/30$

83. If $y = f(x) = \left(\dfrac{8x - 10}{3x + 13}\right)$ Find $f^{-1}(y), f^{-1}(x), f^{-1}(12)$

$$y = f(x) = \left(\frac{8x-10}{3x+13}\right)$$

$$y(3x+13) = 8x-10$$

$$3xy + 13y = 8x - 10$$

$$13y + 10 = 8x - 3xy$$

$$13y + 10 = x(8-3y)$$

$$\therefore\ x = \left(\frac{13y+10}{8-3y}\right)$$

$$\boxed{f^{-1}(y) = \frac{13y+10}{8-3y}}$$

$$\therefore\ f^{-1}(x) = \left(\frac{13x+10}{8-3x}\right)$$

$$f^{-1}(12) = \left[\frac{13(12)+10}{8-3(12)}\right]$$

$$= \left(\frac{166}{-28}\right) = \left(-83/14\right)$$

84. If $f(x) = \left(\dfrac{8 - 2x}{3x - 21}\right)$ Find $f^{-1}(p), f^{-1}(38), f^{-1}(5/7)$

$$y = f(x) = \frac{8-2x}{3x-21}$$

$$3xy - 21y = 8 - 2x$$

$$3xy + 2x = 8 + 21y$$

$$x(3y+2) = 8 + 21y$$

$$\therefore\ x = \left(\frac{8+21y}{3y+2}\right)$$

$$\boxed{f^{-1}(y) = \left(\frac{8+21y}{3y+2}\right)}$$

$$f^{-1}(p) = \left(\frac{8+21p}{3p+2}\right)$$

$$f^{-1}(38) = \frac{8+(21\times 38)}{(3\times 38)+2} = \left(\frac{806}{116}\right)$$

$$= \left(403/58\right)$$

$$f^{-1}\left(\frac{5}{7}\right) = \left[\frac{8+\left(21\times\frac{5}{7}\right)}{\left(3\times\frac{5}{7}\right)+2}\right]$$

$$= \left(\frac{56+105}{15+14}\right) = \left(\frac{161}{29}\right)$$

$f^{-1}[f(m)] = m = f[f^{-1}(m)]$

math

85. $g(x) = \left(\dfrac{8x+21}{13}\right)$ Find $g^{-1}(y), g^{-1}(30), g^{-1}(x)$, $g^{-1}[g(20)]$

$y = g(x) = \left(\dfrac{8x+21}{13}\right)$

$8x + 21 = 13y$

$x = \left(\dfrac{13y-21}{8}\right)$

① $g^{-1}(y) = \left(\dfrac{13y-21}{8}\right)$

② $g^{-1}(30) = \left(\dfrac{13\times 30 - 21}{8}\right) = \dfrac{369}{8}$

③ $g^{-1}(x) = \left(\dfrac{13x-21}{8}\right)$

we know,

$g^{-1}[g(20)] = 20$

Let's cross-check

$g^{-1}[g(20)]$

$= g^{-1}\left(\dfrac{8(20)+21}{13}\right)$

$= g^{-1}\left(\dfrac{181}{13}\right)$

$= \dfrac{13 \times \frac{181}{13} - 21}{8}$

$= \dfrac{160}{8} = 20$

86. Speed = f(acceleration), then

Accelation $= f^{-1}$(speed)

87. If $f(x) = \text{Log}\left(\dfrac{8x+3}{9x-17}\right)$ Find f(2/3)

$f\left(\frac{2}{3}\right) = \text{Log}\left(\dfrac{8\times\frac{2}{3}+3}{9\times\frac{2}{3}-17}\right) = \text{Log}\left(\dfrac{16+9}{18-51}\right)$

$= \text{Log}\left(\dfrac{25}{-33}\right)$

88. If $f(x) = \left(\frac{3x+7}{11-2x}\right)$ Find $f^{-1}[f(10)]$

We know $f^{-1}[f(10)]$ must be equal to 10.

Let's cross-check

$y = f(x) = \frac{3x+7}{11-2x}$

$3x + 7 = 11y - 2xy$

$3x + 2xy = 11y - 7$

$x(3+2y) = 11y - 7$

$\therefore \quad x = \left(\frac{11y-7}{3+2y}\right)$

$f^{-1}(y) = \left(\frac{11y-7}{3+2y}\right)$

$f^{-1}[f(10)]$

$= f^{-1}\left[\frac{3(10)+7}{11-2(10)}\right] = f^{-1}\left(\frac{-37}{9}\right)$

$= \left(\frac{11 \times \frac{-37}{9} - 7}{3 + 2 \times \frac{-37}{9}}\right)$

$= \frac{-407-63}{27-74} = \frac{-470}{-47}$

$= 10$

$$\boxed{f[f^{-1}(k)] = k = f^{-1}[f(k)]}$$

89. $f(x) = 9x - 2$. Find $f^{-1}[f(20)]$, $f[f^{-1}(28)]$

We know $f^{-1}[f(20)] = 20$ & $f[f^{-1}(28)] = 28$

Let's cross check

$y = f(x) = 9x - 2$

$x = \left(\frac{y+2}{9}\right)$

$f^{-1}(y) = \left(\frac{y+2}{9}\right)$

① $f^{-1}[f(20)] = f^{-1}(178)$

$= \left(\frac{178+2}{9}\right) = 20$

② $f[f^{-1}(28)] = f\left(\frac{28+2}{9}\right)$

$= f\left(\frac{30}{9}\right) = \left(9 \times \frac{30}{9}\right) - 2 = 28$

math

90. If $f(x) = x^2$. Find f(8), f(-8)

$f(x) = x^2$

$f(8) = (8)^2 = 64$

$f(-8) = (-8)^2 = 64$

Here $f(8) = f(-8) = 64$

$f(x) = f(-x)$

then $f(x)$ is an even function

when $f(x)$ is said to be an even function?

Answer : when $f(x) = f(-x)$ then $f(x)$ is an even function

91. $f(x) = x^2 + x^4$. Find f(2), f(-2)

$f(x) = x^2 + x^4$

$f(2) = 2^2 + 2^4 = 4 + 16 = 20$

$f(-2) = (-2)^2 + (-2)^4 = 4 + 16 = 20$

As $f(2) = f(-2)$ i.e. $f(x) = f(-x)$, It is an even function.

92. If $f(x) = x^3$. Find f(8), f(-8)

$f(x) = x^3$

$f(8) = (8)^3 = 512$

$f(-8) = (-8)^3 = -512$

$f(8) = 512$

$f(8) = -(-512)$

$\boxed{f(8) = -f(-8)}$

OR $\boxed{f(-8) = -f(8)}$

Here $f(x)$ is an odd function

If f(x) = -f(-x) or f(-x) = -f(x) then f(x) is said to be an odd function.

93. f(x) is said to be

an even function	an odd function
When	When
$f(x) = f(-x)$	$f(x) = -f(-x)$
	OR
	$-f(x) = f(-x)$

94. If f(x) = $x^2 + x^3$ then f(x) is ____________

a. An odd function
b. An even function
c. Neither odd nor even function
d. Both odd as well as even function

$f(x) = (x^2 + x^3)$

$f(-x) = (-x)^2 + (-x)^3$

$= (x^2 - x^3)$

$f(2) = 2^2 + 2^3 = 12$

$f(-2) = (-2)^2 + (-2)^3$

$= 4 - 8 = -4$

95. If f(x) = $x^3 - x^5$ then f(x) is ____________

a. An odd function
b. An even function
c. Neither odd nor even function
d. Both odd as well as even function

$f(x) = x^3 - x^5$

$f(-x) = (-x)^3 - (-x)^5$

$= -x^3 - (-x^5)$

$= -x^3 + x^5$

$= -(x^3 - x^5)$

$f(-x) = -f(x)$

$f(2) = 2^3 - 2^5 = 8 - 32 = -24$

$f(-2) = (-2)^3 - (-2)^5$

$= -8 - (-32) = 24$

Here $f(2) = -f(-2)$

$\therefore f(x)$ is an odd function

math

96. $f(x) = \text{Log}\left(\frac{1+x}{1-x}\right)$ then f(x) is ______________

~~a. An odd function~~ b. An even function

c. Neither odd nor even function d. Both odd as well as even function

$f(x) = \text{Log}\left(\frac{1+x}{1-x}\right) = \text{Log}(1+x) - \text{Log}(1-x)$ ---------------- ①

$f(-x) = \text{Log}\left(\frac{1+(-x)}{1-(-x)}\right) = \text{Log}\left(\frac{1-x}{1+x}\right)$

$f(-x) = \text{Log}(1-x) - \text{Log}(1+x)$

$f(-x) = -\left[\text{Log}(1+x) - \text{Log}(1-x)\right]$

$f(-x) = -f(x)$

$\therefore$ f(x) is an odd function.

97. If $f(x) = (x^3+x^{11})$ then f(x) is ______________

a. An odd function b. An even function

c. Neither odd nor even function d. Both odd as well as even function

$f(x) = x^3 + x^{11}$

$f(-x) = (-x)^3 + (-x)^{11}$

$f(-x) = -x^3 - x^{11}$

$f(-x) = -(x^3 + x^{11})$

$f(-x) = -f(x)$ $\therefore$ f(x) is an odd function.

98. If $f(x) = 3x^2 + 2x + 1$ and $f(x+1) = f(x-2)$. Find value of x.

$$f(x+1) = f(x-2)$$

$$3(x+1)^2 + 2(x+1) + \cancel{1} = 3(x-2)^2 + 2(x-2) + \cancel{1}$$

$$3(x^2+2x+1) + 2x + 2 = 3(x^2-4x+4) + 2x - 4$$

$$\cancel{3x^2} + 6x + 3 + \cancel{2x} + 2 = \cancel{3x^2} - 12x + 12 + \cancel{2x} - 4$$

$$6x + 5 = -12x + 8$$

$$18x = 3 \quad \therefore x = 1/6$$

99. If $g(x) = 2x^2 - 10x + 3$ and $g(x-2) = g(x+2)$. Find value of x.

$$g(x-2) = g(x+2)$$

$$2(x-2)^2 - 10(x-2) + \cancel{3} = 2(x+2)^2 - 10(x+2) + \cancel{3}$$

$$2(x^2-4x+4) - 10\cancel{x} + 20 = 2(x^2+4x+4) - 10\cancel{x} - 20$$

$$\cancel{2x^2} - 8x + \cancel{8} + 20 = \cancel{2x^2} + 8x + \cancel{8} - 20$$

$$40 = 16x$$

$$\therefore x = \frac{40}{16} = 5/2 = 2.50$$

100. If $f(x) = \frac{3x - 11}{x}$. Find $f^{-1}(y)$, $f^{-1}(p)$, $f^{-1}(30)$

$$y = f(x) = \left(\frac{3x-11}{x}\right)$$

$$xy = 3x - 11$$

$$11 = 3x - xy$$

$$11 = x(3-y)$$

$$\therefore x = \left(\frac{11}{3-y}\right)$$

$$f^{-1}(y) = \left(\frac{11}{3-y}\right)$$

$$f^{-1}(p) = \left(\frac{11}{3-p}\right)$$

$$f^{-1}(30) = \left(\frac{11}{3-30}\right) = \left(\frac{11}{-27}\right)$$

$$= -11/27$$

101. If f(x) = 5x + 11 and g(x) = 3x - 1. Find f.g(p) & g.f(p)

① $f \cdot g(p) = f[3p-1] = 5(3p-1)+11$

$= 15p - 5 + 11 = 15p + 6$

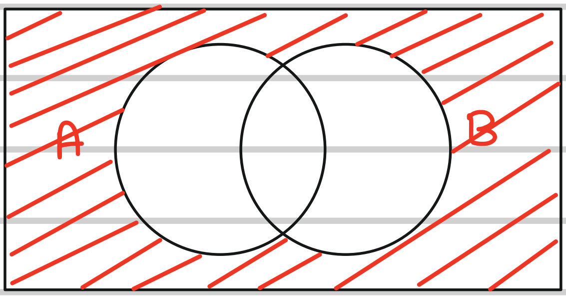
② $g \cdot f(p) = g[5p+11] = 3(5p+11) - 1$

$= 15p + 33 - 1$

$= 15p + 32$

102. De-morgan's rule of sets

1. U = universal set

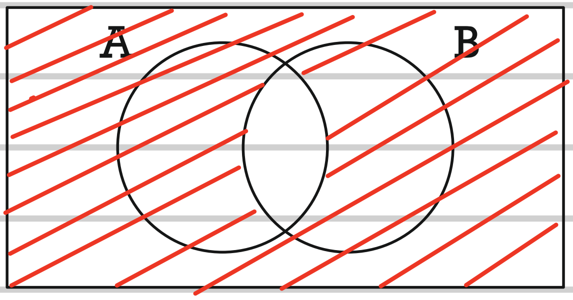


$(A' \cap B') = (A \cup B)'$

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

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

2. U = universal set



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

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

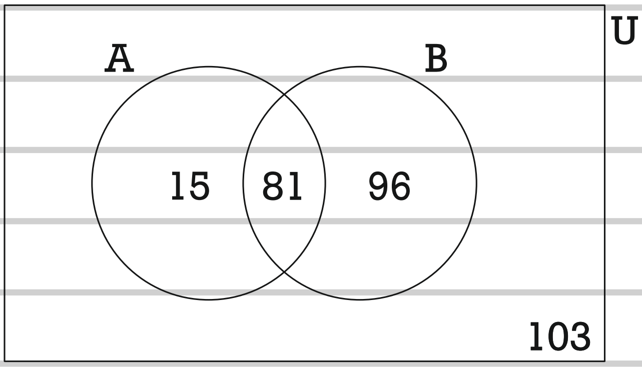
$= n(U) - n(A \cap B)$

103. 1. n(A ∪ B ∪ C)

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

2. $n(A' \cap B' \cap C') = n(A \cup B \cup C)' = n(U) - n(A \cup B \cup C)$

104.



$n(A) = 96$

$n(B) = 177$

$n(A') = 199$

$n(B') = 118$

$n(U) = 295$

$n(A \cap B) = 81$

$n(A \cup B) = 192$

$n(A \triangle B) = 111$

$n(A - B) = 15$

$n(B - A) = n(B \cap A') = 96$

$n(A \cup B') = 199$

$n(B \cup A') = 280$

$n(A' \cap B') = 103$

$n(A' \cup B') = 214$

105. If $f(x) = \left(\frac{1}{1+x}\right)$, $g(x) = \left(\frac{x-1}{x}\right)$

Find f.g (1/2), g.f (3/2), g.f (p-3)

① $f \cdot g\left(\frac{1}{2}\right) = f\left(\frac{\frac{1}{2}-1}{\frac{1}{2}}\right) = f\left(\frac{1-2}{1}\right) = f(-1) = \frac{1}{1+-1} = \frac{1}{0}$

= Not defined

② $g \cdot f\left(\frac{3}{2}\right) = g\left[\frac{1}{1+\frac{3}{2}}\right] = g\left(\frac{2}{2+3}\right) = g\left(\frac{2}{5}\right) = \left(\frac{\frac{2}{5}-1}{\frac{2}{5}}\right)$

math

$= \left(\frac{2-5}{2}\right) = -3/2$

③ $g.f(p-3) = g\left[\frac{1}{1+p-3}\right] = g\left(\frac{1}{p-2}\right) = \frac{\frac{1}{p-2} - 1}{\frac{1}{p-2}} = \frac{1-1(p-2)}{1}$

$= 1 - p + 2 = (3-p)$

106. A = {3, 5, 8} B = {8, 3, 5, 8, 3, 3, 8} $\Rightarrow B = \{8, 3, 5\}$

A, B are

a. Equal sets

b. Equivalent sets

~~c.~~ Both of these

d. None of these

107. P = {m, n, x, d} Q = {p, m, j, q, j, q, m}, here P, Q are

a. Equal sets

~~b.~~ Equivalent sets

c. Both of these

d. None of these

$Q = \{p, m, j, q\}$

Here $n(P) = n(Q) = 4$

$\therefore$ P, Q are Equivalent sets

108. (A △ B) ∪ (A ∩ B) =

~~a.~~ (A ∪ B)

b. (A - B)

c. (A' ∩ B')

d. U

109. A = {2, 3, 5, 8, 9} B = {5, 5, 6, 6, 7}

Here, A, B are

a. Equal sets

b. Equivalent sets

c. Both of these

~~d.~~ None of these

110. $A = \{ y : y = 1 - (-1)^x \ \& \ x \in N\}$ then $y = ?$

a. { }   b. {1}   c. {1, 2}   ~~d.~~ {0, 2}

$x = 1$	$x = 2$	$x = 3$	$x = 4$	$x = 5$	$x = 6$ ------
$y = 1 - (-1)^x$	$1-(-1)^2$	$1-(-1)^3$	$1-(-1)^4$	$1-(-1)^5$	$1-(-1)^6$
$= 1-(-1)^1$	$= 1-1$	$= 1-(-1)$	$= 1-1$	$= 1-(-1)$	$= 1-1$
$= 1-(-1)$	$= 0$	$= 2$	$= 0$	$= 2$	$= 0$
$= 1+1$					
$= 2$					

111. If E is a set of all Even natural numbers & O is a set of all odd natural numbers then Find :

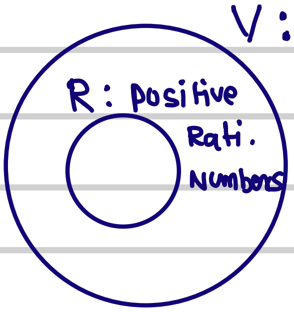
(E U O) = $\{1,2,3,4,5,6,7,8,9,10 \text{ ---------}\} = N$

(E ∩ O) = $\phi = \{ \ \}$ = Null set = Empty set = Void set

112. If R is a set of all positive rational numbers & V is a set of all real numbers then

a. $R \subseteq V$ ~~b.~~ $R \subset V$ c. $V \subseteq R$ d. $V \subset R$

V : Real Numbers



Every obs^n of set - R belongs to set - V also, but every obs^n of set - V does not belong to set - R.

∴ R is a proper subset of V.

113. If R is a set of all quadrilaterals & M is a set of all rectangles then

a. $M \subseteq R$ ~~b.~~ $M \subset R$ c. $R \subseteq M$ d. $R \subset M$

• Every Rectangle is a quadrilateral, but every quadrilateral is not a Rectangle

114. If S is a set of all squares & R is a set of all rectangles then

$S \subseteq R$: S is a subset of R

infact

S is a proper subset of R , $S \subset R$

Every square is a rectangle but every rectangle is not necessarily a square

115. If D = { x^2 : where $x \in N$} then D is ______________

a. Null set b. Singleton set c. Finite set ~~d.~~ Infinite set

$D = \{1^2, 2^2, 3^2, 4^2, \text{..............} \text{ unlimited observations}\}$

116. If M = { x : where $x \geq 10$ & $x \leq 10$} then M is ______________

a. Null set ~~b.~~ Singleton set c. Finite set d. Infinite set

$M = \{10\}$

• Set of handsome boys in india is a ______________

ⓐ Finite set ⓑ infinite set ⓒ Null set

~~ⓓ~~ Not a well defined collection

• $A = \{x : \text{where } x \leq 10, x \geq 5 \text{ \& } x \in N\}$ Find A.

$\Longrightarrow A = \{5, 6, 7, 8, 9, 10\}$

117. If N = { x : where x > 50 & x < 50} then N is ________________

~~a.~~ Null set   b. Singleton set   c. Finite set   d. Infinite set

118. K = {0} Here set K is

a. Null set   ~~b.~~ Singleton set   c. Void set   d. Infinite set

As $n(K) = 1$, K is a singleton set

119. B = {0} Here set B is

a. Null set   b. Empty set   c. Void set   ~~d.~~ None of these

120. Null set is represented by

a. { }   b. ϕ ~~c.~~ a or b   d. None of these

121. If $h(x) = \left(\frac{px - q}{qx - p}\right)$ then x = ?

~~a.~~ h(y)   b. h(1/y)   c. h(-y)   d. None of these

$$y = h(x) = \frac{px-q}{qx-p}$$

$$y(qx-p) = px - q$$

$$qxy - py = px - q$$

$$qxy - px = py - q$$

$$x(qy-p) = (py-q)$$

$$x = \left(\frac{py-q}{qy-p}\right) \text{ -------- } 1$$

$$h(x) = \left(\frac{px-q}{qx-p}\right)$$

$$h(y) = \left(\frac{py-q}{qy-p}\right) \text{ -------- } 2$$

From Eqⁿs 1 & 2

$$x = h(y)$$

122. If n(A) = 3, n(B) = 8 then n (A x B) = ?

a. 8 b. 11 c. 24 d. 48

$n(A \times B) = n(A) \times n(B) = 3 \times 8 = 24$

123. A = {3, 5} B = {8, 9} then

→

A x B = $\{(3,8), (3,9), (5,8), (5,9)\}$

B x A = $\{(8,3), (8,5), (9,3), (9,5)\}$

Here (A x B) ≠ (B x A)

but n(A x B) = n(B x A) = $n(A) \times n(B) = 2 \times 2 = 4$

∵ (A x B), (B x A) are Equivalent sets but not Equal sets.

124. A = {2, 10} B = {10, 2} Find

→

A x B = $\{(2,10), (2,2), (10,2), (10,10)\}$

B x A = $\{(10,2)\ (10,10), (2,2), (2,10),\}$

(A x B) U (B x A) = $\{(10,2)\ (10,10), (2,2), (2,10)\}$

(A x B) ∩ (B x A) = $\{(10,2)\ (10,10), (2,2), (2,10)\}$

If A, B are equal sets then

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

math

125. If $f(x) = e^x$ then $f(p+q) = ?$

a. $f(p) + f(q)$ ~~b.~~ b. $f(p) \times f(q)$

c. $f(p) / f(q)$ d. None of these

$f(x) = e^x$

$f(p) = e^p$

$f(q) = e^q$

$f(p+q) = e^{p+q}$

$f(p+q) = e^p \times e^q$

$f(p+q) = f(p) \times f(q)$

126. $f(x) = \frac{1}{1-x}$, $g(x) = \frac{x-1}{x}$. Find $f.g\left(\frac{1}{x}\right)$

$f.g\left(\frac{1}{x}\right) = f\left[\frac{\frac{1}{x}-1}{\frac{1}{x}}\right] = f\left(\frac{1-x}{1}\right) = f(1-x)$

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

127. If $f(x) = \frac{x}{1-x}$ Find $[f.f(\frac{-1}{2})]$

$f.f\left(-\frac{1}{2}\right) = f\left[\frac{-\frac{1}{2}}{1-\left(-\frac{1}{2}\right)}\right] = f\left[\frac{-\frac{1}{2}}{\frac{3}{2}}\right] = f(-1/3)$

$= \left[\frac{-\frac{1}{3}}{1-\left(-\frac{1}{3}\right)}\right] = \left[\frac{-\frac{1}{3}}{\frac{4}{3}}\right] = (-1/4)$

128. $f(x-1) = x^3 - 1$ Find $f(p)$

Let's say $x-1 = p$

$\therefore x = p+1$

$f(x-1) = x^3 - 1$

$f(p) = (p+1)^3 - 1$

$= p^3 + \cancel{1} + 3p \times 1(p+1) - \cancel{1}$

$= p^3 + 3p^2 + 3p$

129. The set $A = \{x : 0 < x < 5 \;\&\; x \in N\}$ represents

~~a.~~ $\{1, 2, 3, 4\}$ b. $\{0, 1, 2, 3, 4\}$

c. $\{1, 2, 3, 4, 5\}$ d. $\{0, 1, 2, 3, 4, 5\}$

130. The set $A = \{x : 0 < x \leq 5 \;\&\; x \in N\}$ represents

a. $\{1, 2, 3, 4\}$ b. $\{0, 1, 2, 3, 4\}$

~~c.~~ $\{1, 2, 3, 4, 5\}$ d. $\{0, 1, 2, 3, 4, 5\}$

131. Any subset of product set X.Y is said to define a relation from X to Y and any relation from X to Y in which No 2 diff ordered pairs have the same first element is called as Function.

X = { MH, Karnataka, Bihar} Y = {Mumbai, Pune, Bangalore, Patna, Jaipur}

then → Any subset of this is a $R : X \to Y$

X.Y = {(MH, Mumbai), (MH, Pune), (MH, Bang), (MH, Patna), (MH, Jaipur),
(Karna, Mumbai), (Karna, Pune), (Karna, Bang), (Karna, Patna), (Karna, Jaipur),
(Bihar, Mumbai), (Bihar, Pune), (Bihar, Bang), (Bihar, Patna), (Bihar, Jaipur)}

$y = f(x) = x^2 + 3$ $f : A \to B$ $A = \{1, 2, 3, 8\}$, $B = \{4, 7, 12, 67\}$

in $(A \times B)$ we will have 16 observations

x : pre-image $y = f(x)$ = image

$f : X \longrightarrow Y$ X = State Y = Capital City

one of subset of $X \cdot Y$ = { (MH,Mumbai), (Karnataka, Bang), (Bihar, Patna)}

Relations : 1. one to one
2. one to many
3. many to one
4. many to many

Out of these 4 relations one to one & Many to one relations are Functions

$R : x < y$

$A = \{1,2,3\}$ $B = \{2,6,7\}$

$R = \{(1,6), (2,6), (3,6) (1,2) (1,7), (2,7) (3,7)\}$

$R : A \to B$ is not a function

Functions : 1. One to one
2. Many to one

When $y = f(x)$ then x : pre-image
y : Image

132. One to many & Many to many : are relations but not functions.

➡ only one to one & many to one relations are functions.

Every function is a relation but every relation is not necessarily a function.

133. A = {1, 2, 3, 4, 5} B = {1, 4, 9, 16, 25, 36, 49}

➡ Here $n(A) = 5$, $n(B) = 7$, $n(A \times B) = 35$

There will be 35 ordered pairs in set (A x B)

Any subset of (A x B) will form a relation between A & B

$f : A \longrightarrow B$ where $f(x) = x^2$

$f : A \longrightarrow B$ = { (1,1), (2,4), (3,9), (4,16), (5,25)}

It is to one to one function

Pre-image (x)	Image [f(x)]
1	1
2	4
3	9
4	16
5	25

Domain = {1, 2, 3, 4, 5} = set of all first elements in a Relation

Co-domain = {1, 4, 9, 16, 25, 36, 49} = is a super set of Range

Range = {1, 4, 9, 16, 25} = Range is subset of co-domain
⇓ set of all second elements in a Relation

Here Range is the proper subset of co-domain,

When,

Range is the proper subset of co-domain : INTO function

Range is the improper subset of co-domain : ONTO function

134. R = {(10,30), (20,60), (15,45), (25,75), (30,90)}

Here

➡

Domain = {10, 20, 15, 25, 30} = set of all first elements of a relation

Range = {30, 60, 45, 75, 90} = set of all Second elements of a relation

This is one to one relation.

135. $R = \{(10,1), (20,1), (30,1), (40,1), (50,1), (60,1)\}$

➡ Here

Domain = $\{10, 20, 30, 40, 50, 60\}$

Range = $\{ 1 \}$

This is example of many to one correspondence.

136. When a Relation is said to be

Let $S = \{a, b, c, d, \ldots\ldots\ldots\}$ then the Relation is any subset of $(S \times S)$

➡

1. Reflexive : if for every $a \in S$ (a,a) is present in the relation.

2. Symmetric : if $(a,b) \in R$ then $(b,a) \in R$ then only relation is said to be symmetric.
For every (a,b) present in Relation, if (b,a) is also present then Relation is said to be symmetric

3. Transitive : If $(a,b), (b,c) \in R$ then (a,c) should also belong to R if order call relation as Transitive
For every (a,b) & (b,c) present in relation, if (a,c) is also present then Relation is said to be transitive.

4. If a Relation is Reflexive, Symmetric, Transitive then that relation is said to be Equivalence

137. 'Is Equal to' Relation is

a. Reflexive b. Symmetric c. Transitive ~~d.~~ Equivalence

138. 'Is less than' Relation is

a. Reflexive b. Symmetric ~~c.~~ Transitive d. Equivalence

139. 'Is Reciprocal of' Relation is

a. Reflexive ~~b.~~ Symmetric c. Transitive d. Equivalence

140. 'Is Parallel to' Relation is

a. Reflexive b. Symmetric c. Transitive ~~d.~~ Equivalence

141. 'Is Greater than' Relation is

a. Reflexive b. Symmetric ~~c.~~ Transitive d. Equivalence

142. 'Is $\perp$ to' Relation is

a. Reflexive ~~b.~~ Symmetric c. Transitive d. Equivalence

143. Everything in this world, Living or non-living is called as

object.

- Set is a collection of well-defined, Distinct objects

144. Set is a collection of well defined and distinct objects.

145. Find power sets of B If B = {8}

Power sets of B = $\{\phi, \{8\}\}$

146. A set of all possible subsets is known as power set

147. If n(A) = 3379, n(U) = 10,879. Find n(A')

→ $n(A') = n(U) - n(A)$

$= 10{,}879 - 3379 = 7{,}500$

(Cardinal value of any set + Cardinal Value of its complementary set)

= cardinal value of universal set = n(U)

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

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

$n(A \cap B) + n(A \cap B)' = n(U)$

148. Set of cubes of all natural numbers is :

a. Finite set — b. Null set

c. Singleton set — ~~d.~~ Infinite set

$= \{1^3, 2^3, 3^3, 4^3, \text{------------------}\}$

149. Inverse Function is possible only when function is one to one

Only one to one functions are invertible.

150. y = f(x) = $\left(\frac{8x+3}{7x}\right)$ Find $f^{-1}(y), f^{-1}(p), f^{-1}(10)$

→

$y = \frac{8x+3}{7x}$

$7xy = 8x + 3$

$7xy - 8x = 3$

$\therefore f^{-1}(y) = \left(\frac{3}{7y-8}\right)$

$f^{-1}(p) = \left(\frac{3}{7p-8}\right)$

$\therefore x(7y-8) = 3$

$\therefore x = \dfrac{3}{(7y-8)}$

$f^{-1}(10) = \left(\dfrac{3}{7(10)-8}\right) = \left(\dfrac{3}{62}\right)$

151. If $h(x) = 10^{1+x}$ where $3 \leq x \leq 10$

then Range of h(x) is :

If $h(x) = 10^{1+x}$

$3 \leq x \leq 10$

$10^{1+3} \leq h(x) \leq 10^{1+10}$

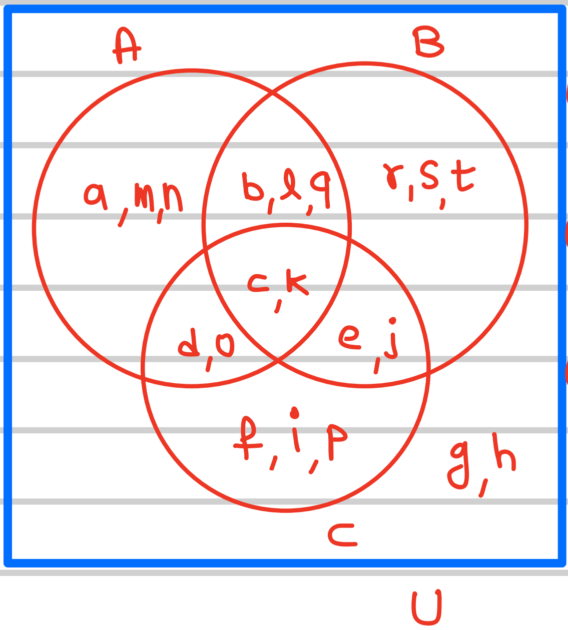
$\therefore 10^4 \leq h(x) \leq 10^{11}$

when $x = 3$, $h(3) = 10^{1+3} = 10^4$

when $x = 10$, $h(10) = 10^{1+10} = 10^{11}$

PATIENCE, PERSISTENCE AND PERSPIRATION MAKE AN UNBEATABLE COMBINATION FOR SUCCESS !

152



(1) $A = \{a, m, n, b, l, q, c, k, d, o\}$

(2) $B = \{b, l, q, r, s, t, c, k, e, j\}$

(3) $C = \{c, k, d, o, e, j, f, i, p\}$

(4) $U = \{a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t\}$

(5) $(A \cup B) = \{a, m, n, b, l, q, c, k, d, o, e, j, r, s, t\}$

(6) $(B \cup C) = \{b, l, q, r, s, t, c, k, e, j, d, o, f, i, p\}$

(7) $(A \cup C) = \{a, m, n, b, l, q, c, k, d, o, e, j, f, i, p\}$

(8) $(A \cap B) = \{b, l, q, c, k\}$ (9) $(A \cap C) = \{c, k, d, o\}$

(10) $(B \cap C) = \{c, k, e, j\}$

(11) $(A - B) = (A \cap B') = \{a, m, n, d, o\}$

(12) $(B - A) = (B \cap A') = \{r, s, t, e, j\}$

(13) $(B - C) = (B \cap C') = \{b, l, q, r, s, t\}$

(14) $(C - B) = (C \cap B') = \{d, o, f, i, p\}$

(15) $(A - C) = (A \cap C') = \{a, m, n, b, l, q\}$

(16) $(C - A) = (C \cap A') = \{f, i, p, e, j\}$

(17) $(A \Delta B) = \{a, m, n, d, o, r, s, t, e, j\}$

(18) $(B \Delta C) = \{b, l, q, r, s, t, d, o, f, i, p\}$

(19) $(A \Delta C) = \{a, m, n, b, l, q, f, i, p, e, j\}$

(20) $A' = \{r, s, t, e, j, f, i, p, g, h\}$

(21) $B' = \{a, m, n, d, o, f, i, p, g, h\}$

(22) $C' = \{a, m, n, b, l, q, r, s, t, g, h\}$

(23) $(A' \cap B') = \{f, i, p, g, h\}$

(24) $(B' \cap C') = \{a, m, n, g, h\}$

(25) $(A' \cap C') = \{r, s, t, g, h\}$

(26) $(A' \cup B') = \{a, m, n, d, o, r, s, t, e, j, f, i, p, g, h\}$

(27) $(B' \cup C') = \{a, m, n, b, l, q, r, s, t, d, o, f, i, p, g, h\}$

(28) $(A' \cup C') = \{a, m, n, b, l, q, r, s, t, e, j, f, i, p, g, h\}$

(29) $(A \cup B \cup C) = \{a, m, n, b, l, q, c, k, d, o, r, s, t, e, j, f, i, p\}$

(30) $(A' \cap B' \cap C') = \{g, h\}$

(31) $(A \cap B' \cap C') = \{a, m, n\}$

(32) $(B \cap A' \cap C') = \{r, s, t\}$

(33) $(C \cap A' \cap B') = \{f, i, p\}$

(34) $(A \cap B \cap C') = \{b, l, q\}$

(35) $(B \cap C \cap A') = \{e, j\}$

math

$a^2+b^2=c^2$

(36) $(A \cap C \cap B') = \{d, o\}$

(37) $(A \cap B \cap C) = \{c, k\}$

(38) $(A \cup B') = \{a, m, n, b, l, q, c, k, d, o, f, i, p, g, h\}$

(39) $(A \cup C') = \{a, m, n, b, l, q, c, k, d, o, r, s, t, g, h\}$

(40) $(B \cup C') = \{b, l, q, r, s, t, c, k, e, j, a, m, n, g, h\}$

(41) $(C \cup B') = \{c, k, e, j, d, o, f, i, p, a, m, n, g, h\}$

(42) $(A' \cup B' \cup C') = \{a, b, d, e, f, g, h, i, j, l, m, n, o, p, q, r, s, t\}$