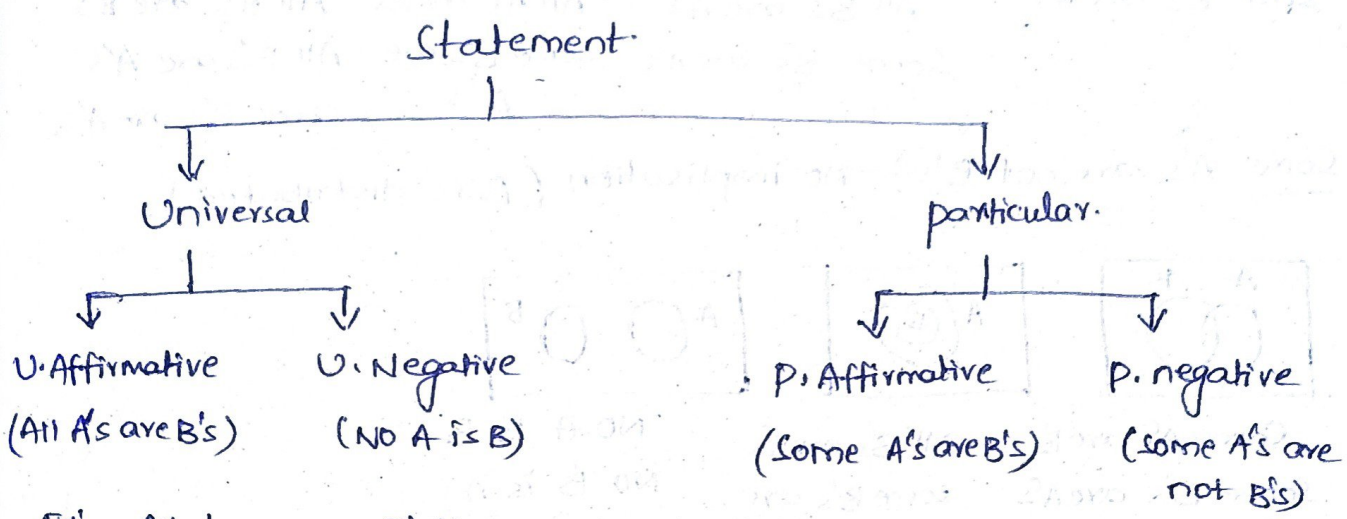
Logical deductions & Syllogism

Statements are divided into 2 types.

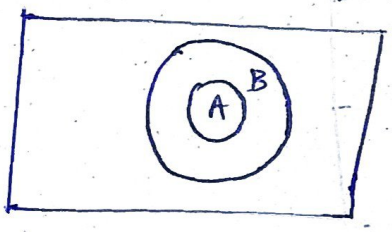
1) Universal Statements
2) particular Statements



Ex: All boys are girls. → predicate.

Indicate mode ✓ | subject ✗ | copula

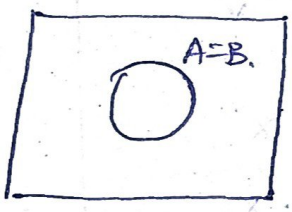
All A's are B's :- → Some A's are B's
→ some B's are A's.



Positive.

Some A's are B's.

Some B's are A's.

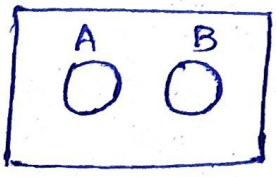


All B's are A's.

some A's are B's.

some B's are A's.

NO A ✓ is B ✓ :- Both are distributed.

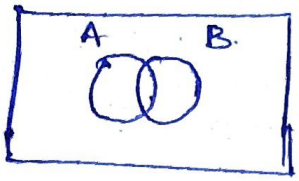


NO B is A.

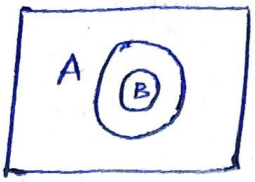
Some A's are not B's = All A's are not B's.

Some B's are not A's = All B's are not A's.

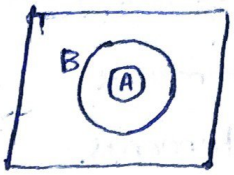
Some A's are B's :- Both are not distributed.



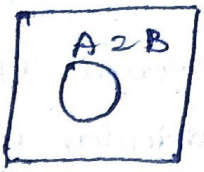
Some B's are A's



All B's are A's
Some B's are A's

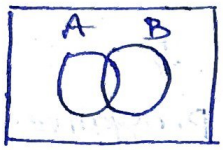


All A's are B's
Some B's are A's

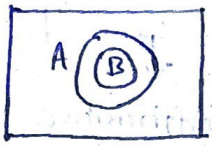


All A's are B's
All B's are A's
Some B's are A's.

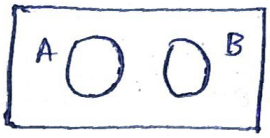
Some A's are not B's :- no implication (B is distributed)



Some A's are B's
Some B's are A's
Some B's are not A's



All B's are A's
Some B's are A's.



NO A is B
NO B is A.
Some B's are not A's.

Distribution Table :-

		Subject	predicate
A	All	✓	X
E	No	✓	✓
I	some	X	X
O	some not	X	✓

Statements & their implications :-

All A's are B's → Some A's are B's.
→ Some B's are A's

NO A is B → No B is A.
→ some A's are not B's
→ Some B's are not A's

Some A's are B's → Some B's are A's

Some A's are not B's → No Implications.

19/4/23.

Rules for logical Deduction:-

- Every deductions must have 3 and only 3 distinct terms.

Eg: All A's are B's. } There are 4 distinct terms so no
All C's are D's } conclusion can be drawn.

All A's are B's. } There are 3 distinct terms so it is
All B's are C's } possible to deduction.

Middle term (or) common term = 'B'.

Possible positions of middle term.

1. All A's are B's.
All B's are C's.

2. All A's are B's.
All C's are A's.

3. All A's are B's.
All A's are C's.

4. All A's are B's.
All C's are B's.

- Middle term (or) common term is atleast one distributio-n in the premises (or) statements.

Eg: All A's ✓ are B's ✗.
All B's ✓ are C's ✗.

C:- All A's are C's.
Because Middle term is atleast one distribution.

All A's ✓ are B's ✗.
Some B's ✗ are C's ✗.

No conclusion since middle term is not atleast one distributed.

All A's are B's.
No B's is C.

Middle term is atleast one distribution
so the conclusion is No A is C (or) No C is A.

- If one statement is negative then conclusion must be negative

Eg: All A's are B's
No B is C

one stmt is -ve.
so conclusion must be -ve.

C: No A is C (or) No C is A.

All A's are B's.
some C's are not B's.

C: Some C's are not A's.

- If one statement is particular then conclusion must be particular.

Eg: All A's are B's.
Some C's are not B's.

C: Some C's are not A's.

All A's are B's
some A's are C's
↳ particular

C: some B's are C's.
Some C's are B's.

- If both statements are particular then no conclusion can be drawn.

Eg: some A's are B's.
some B's are C's.

No conclusion can be drawn.

some A's are B's.
some B's are not C's

No conclusion can be drawn.

- If both statements are negative then no conclusion can be drawn

Eg: NO A is B
NO B is C

No conclusion can be drawn since both stmts are -ve.

Some A's are not B's
NO A is C is C.

No conclusion can be drawn.

- If any term is distributed in the conclusion then that term must be distributed in the statement and vice versa.

Eg: All A's (✓) are B's (x).
All B's (✓) are C's (x).

All A's are C's.

Here A is distributed in stmt and distributed in conclusion. C is not distributed in stmt and it is not distributed in conclusion.

27/4/23

In each of the questions given below are few statements followed by few conclusions. You have to given statements to be true of they seen to be various form.

Read all the conclusions & then decide which of the conclusions logically follows from the given statements

1. All booklets are packets. ✓ ×
   All packets are bottles. ✓ ×
   Some bottles are cans. × ^
   some cans are pitchers. × ×

   → All booklets are bottles.
   ↓
   Some booklets are bottles
   Some bottles are booklets.

Conc:-

I. Some pitchers are bottles

II. Some cans are packets.

III Some bottles are booklets.

(i) None follows (ii) only one follows (iii) only two follows.
(iv) only three follows (v) Only 2 & 3 follows.

A:(iv) Only three follows.

Complementary pairs:-

Given two conclusions have same subject and same predicate but one statement is positive and another statement is negative that pair is called complementary pair.

E } ~~No A's are~~ No A is B.
I } Some A's are B's.

I } Some A's are B's.
O } some A's are not B's.

O } some A's are not B's.
A } All A's are B's.

Stmts.

1. ~~Some~~ Doctors are treatments
   All treatments are Indians
   Some Indians are stars.

   Some Doctors are Indians
   Some treatments are Indians.

Conc:-

~~I~~ Some treatments are Indians

~~II~~ Some Doctors are Indians

III Some Doctors are stars (I)
~~IV~~ Some Doctors are not stars (O) } complementary pair.

(I) 1, 2, & 3 follows. (II) 1, 2, 4 follows (III) 2 & 3 follow.
~~(IV)~~ 1, 2 & either 3 (or) 4 follow (V) None of these.

25/5/23.

1. Each Question consists of 5 stmts followed by options consisting of 3 stmts put together in a specific order. Choose the option which indicates a valid argument i.e. Where the 3rd stmt is a conclusion drawn from the preceding 2 stmts. (logically related)

A. All men are martians.

B. All Women are from venus.

C. Some from venus are non-vegetarians.

D. All martians are vegetarians.

E. All men are vegetarians.

(I) A, B, E. (II) B, C, D (III) A, E, C ~~(IV)~~ A, D, E.

A. All p's are Q's

B. All p's are R's

C. Some Q's are R's.

D. Some p's are R's.

E Some p's are not R's.

(I) A, C, D ~~(II)~~ A, D, C (III) A, E, D (IV) C, D, A.

Logical connectives:-

Statement:- A statement means a formal account of certain facts, views, problems, situations express in words is called a statement.

Eg: It is a sunday = P.

It is not a sunday = ¬P (Negation p).

I will go for a movie = Q.

I will not go for a movie = ¬Q.

Compound statement:- Two or more statements combine together to form a single statement that is called compound statement.

Eg: If it is a sunday then I will go for a movie

1) If p then Q.

2) either p or Q.

3) only if p then Q.

logically consisted stms (or) logically truthful stmts

Table of Logical Connectives

	logically followed stmts	Its negation
If p then Q Q if p Whenever p then Q Q whenever p When p then Q Q when p. Everytime p then Q Q Everytime p	$p \to q$ $\sim q \to \sim p$	$p \to \sim q$ $\sim q \to p$
Either p or Q Unless p, Q	$\sim p \to q$ $\sim q \to p$	$\sim p \to \sim q$ $\sim q \to \sim p$
only if p then Q Q only if p.	$q \to p$ $\sim p \to \sim q$	$q \to \sim p$ $\sim p \to q$

Find the logically consistent stmts of the given compound stmts.

p Q

1. If desert is vast then ocean is hallow.

A. Desert is vast. : p

B. Desert is not vast. : $\sim p$

C. Ocean is Hallow. : Q

D. Ocean is not hallow. : $\sim Q$

(i) C, A (ii). A, B (iii) B, C (iv) D, B.

If p and q then r.

(1) (p and q) $\longrightarrow$ r.

(2) $\sim r \longrightarrow \sim(p \text{ and } q)$.

$\Rightarrow$ (1) (p and q) $\longrightarrow$ r.

(a) p and $\sim r \longrightarrow \sim q$

(b) q and $\sim r \longrightarrow \sim p$.

$\Rightarrow$ (2) $\sim r \longrightarrow \sim(p \text{ and } q)$.

(a) $\sim r \longrightarrow \sim p$ (or) $\sim q$.

(b) $\sim r \longrightarrow \sim p$.

(c) $\sim r \longrightarrow \sim q$.

2. If p then Q and R.

(1) $p \longrightarrow$ (Q and R).

(2) $\sim p \longrightarrow \sim$(Q and R)

$\Rightarrow$ (1) . p $\longrightarrow$ (Q and R)

(a) $\sim R \longrightarrow$ Q and $\sim p$.

(b) $\sim Q \longrightarrow$ R and $\sim p$.

$\Rightarrow$ (2) $\sim p \longrightarrow \sim$(Q and R).

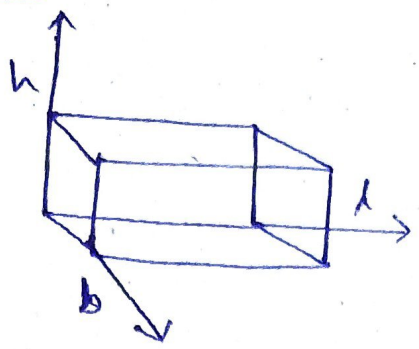
(a) $\sim p \longrightarrow \sim Q$ (or) $\sim R$.

(b) $\sim p \longrightarrow \sim Q$.

(c) $\sim p \longrightarrow \sim R$.

11/6/25.

Cuboid



Surfaces = 6.

Edges = 12.

Corners / vertices = 8.

Volume = Base Area × h.

$= l \times b \times h = lbh.$

Lateral surface (or) Curved surface area.

= Base perimeter × height.

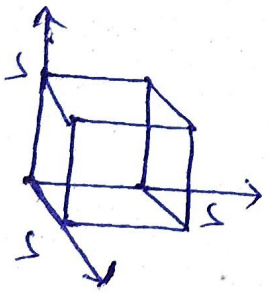
$= 2(l+b) \times h.$

Total surface area = L.S.A + 2. Base area.

$= 2h(l+b) + 2(lb)$

$= 2(lh+hb+lb)$ sq units.

diagonal = $\sqrt{l^2+b^2+h^2}$.



Surfaces = 6.

Edges = 12.

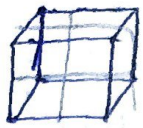
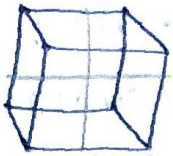
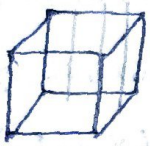
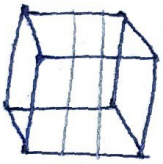
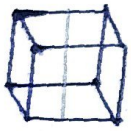
Corners / vertices = 8.

Volume = $s \times s \times s = s^3$

Lateral surface area = $4s^2$ sq. units.

Total surface area = $6s^2$ sq. units.

diagonal = $\sqrt{3}\, s$ sq units.

Picture	No. of cuts	Directions	No. of identical pieces.
	3	3 (3d) directions	(1+1)(1+1)(1+1) = 8.
	2	2 (2 direction)	(1+1)(1+1) = 4
	3	3 (same direction)	3+1 = 4
	2	2 (same direction)	2+1 = 3
	1	1 (same direction)	1+1 = 2

Note:-

- If we want max no. of identical pieces then we should the cube in all directions (3 directions).
- If want min no. of identical pieces we should the cube in same direction (1 direction)

15 cuts.

Same direction (1 direction).

15 + 1 = 16.

2 different directions

1, 14 => 2 × 15 = 30

2, 13 => 3 × 14 = 42

3, 12 => 4 × 13 = 52

4, 11 => 5 × 12 = 60

5, 10 => 6 × 11 = 66

6, 9 => 7 × 10 = 70.

7, 8 => 8 × 9 = 72

3 different directions

1 2 12 => 2 × 3 × 12 = 72

2 3 10 => 3 × 4 × 11 = 132

3 4 8 => 4 × 5 × 9 = 180

4 5 6 => 5 × 6 × 7 = 210

5 5 5 => 6 × 6 × 6 = 216

5 6 4 => 6 × 7 × 5 = 210

6 7 2 => 7 × 8 × 3 = 168

6, 6 3 => 7 × 7 × 4 = 196

08/06/23.

No. of cuts	Distribution	Max no. of identical pieces.
7	2 2 3	(2+1)(2+1)(3+1) 3 × 3 × 4 = 36
9	3 3 3	4 × 4 × 4 = 64
10	3 3 4	4 × 4 × 5 = 80
15	5 5 5	6 × 6 × 6 = 216.
16	5 5 6	6 × 6 × 7 = 252
19	6 6 7	7 × 7 × 8 = 392
21	7 7 7	8 × 8 × 8 = 512.

Note:-

N no. of pieces along the edge equal to total no. of cuts by 3 + 1

1. 30 cuts are given N = $\frac{30}{3} + 1 = 11$

No. of identical pieces along edge = 11.

Total no. of identical pieces in the cube = $N^3 = 11^3 = 1331$

1. No. of pieces identical pieces with 3 face visible (or) painted = 8.

2. No. of identical pieces with 2-face-visible (painted)
$= (N-2)12$

3. No. of identical pieces with 1-face visible (Painted)
$= 6(N-2)^2$

4. No. of identical pieces with no-face visible (painted).
$= (N-2)^3$.

1. $12(N-2) = 12(11-2) = 12 \times 9 = 108$.

2. $6(N-2)^2 = 6(11-2)^2 = 6 \times 81 = 486$.

3. $(N-2)^3 = (11-8)^3 = (9)^3 = 729$

$+8$

1331

81
x 9
729
486
+ 108.
1323.
+ 8
1331

1. 343 pieces ar given. How many no. of pieces 3 face visible, 2 face, 1 face and no face visible.

a) No. of faces $= (343)^{1/3} = 7$.

$12(N-2) = 12(7-2) = 12 \times 5 = 60$.

$6(N-2)^2 = 6(7-2)^2 = 6 \times 25 = 150$

$(N-2)^3 = (7-2)^3 = 5^3 = 125$

8

343

25
x 5
125
150
60.
+ 8
343

2. Max no. of identical pieces are 210. To make it as minimum no. of cuts in all directions.

1. How many no. of pieces with 3-face visible?
2. " " " " " 2-face visible?
3. " " " " " 1-face visible?
4. " " " " " no-face visible?

Total no. of identical pieces = 210 ⇒ 7×30.
⇒ 7×6×5.

1. A:- 8.

2. A:- 4(l+b+h−6) = 4(7+6+5−6) = 4(12) = 48

3. A:- 2[(l−2)(b−2) + (b−2)(h−2) + (h−2)(l−2)]
= 2[20+12+15] = 2(47) = 94

4. A:- (l−2)(b−2)(h−2).
= (7−2)(6−2)(5−2)
= (5)(4)(3)
= 60