

↑ ↓ { → Directions  $\xrightarrow{1:15}$  314  
→ Numbers  $\xrightarrow{1}$  11 Time  
→ Venn-diagrams  $\xrightarrow{8}$  Times  
            ↓  
            45

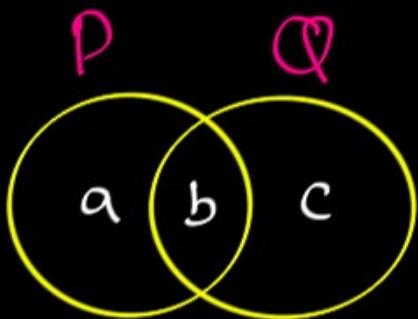
## Venn-diagrams

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

$$\begin{aligned}n(A \cup B \cup C) &= n(A) + n(B) + n(C) \\&\quad - n(A \cap B) - n(B \cap C) - n(A \cap C) \\&\quad + n(A \cap B \cap C)\end{aligned}$$

|  $\square$

18



$$P \Rightarrow a, b$$

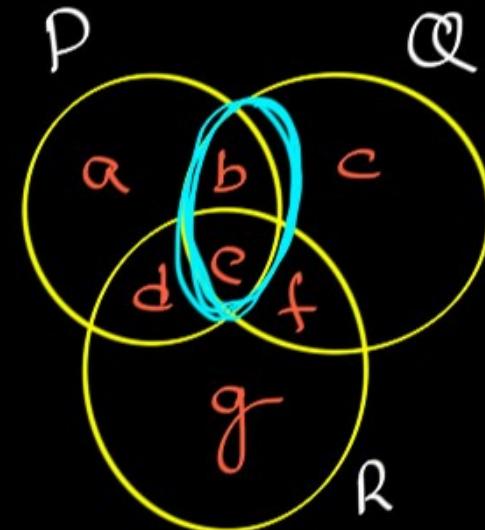
$$Q \Rightarrow b, c$$

$$P \cap Q = b$$

$$\text{only } P = a$$

$$\text{only } Q = c$$

$P = a, b, d, e$
$Q = b, c, e, f$
$R = d, e, f, g$
$P \cap Q = b, e$
$Q \cap R = e, f$
$P \cap R = e, d$
$P \cap Q \cap R = e$



$$\text{only } P \cap Q \Rightarrow b$$

$$\text{only } Q \cap R \Rightarrow f$$

$$\text{only } P \cap R \Rightarrow d$$

$$\text{only } P \Rightarrow a$$

$$\text{only } Q \Rightarrow c$$

$$\text{only } R \Rightarrow g$$

01. In a college, 200 students are randomly selected. 140 like tea, 120 like coffee and 80 like both tea and coffee.

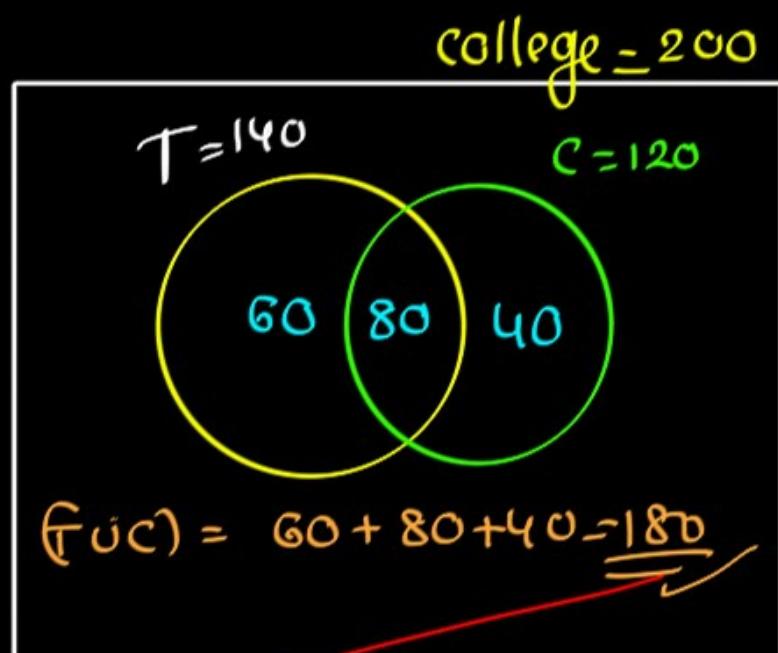
(i) How many students like only tea? 60

(ii) How many students like only coffee? 40

(iii) How many students like neither tea nor coffee? 20

(iv) How many students like only one of tea or coffee?  
60 + 40 = 100

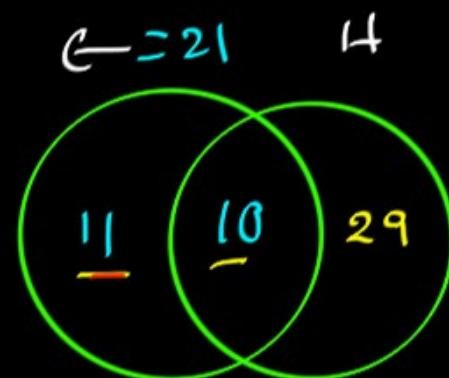
(v) How many students like at least one of the beverages?



$$200 - 180 = 20$$

02. There are 50 students admitted to a nursery class, they speak at least one language. Some students can speak only English and some can speak only Hindi. Ten students can speak both English and Hindi. If the number of students who can speak English is 21, then how many students can speak Hindi, how many can speak only Hindi and how many can speak only English ?

- (a) 39, 29 and 11 respectively
- (b) 37, 27 and 13 respectively
- (c) 28, 18 and 22 respectively
- (d) 21, 11 and 10 respectively



$$H = 10 + 19 = 39$$

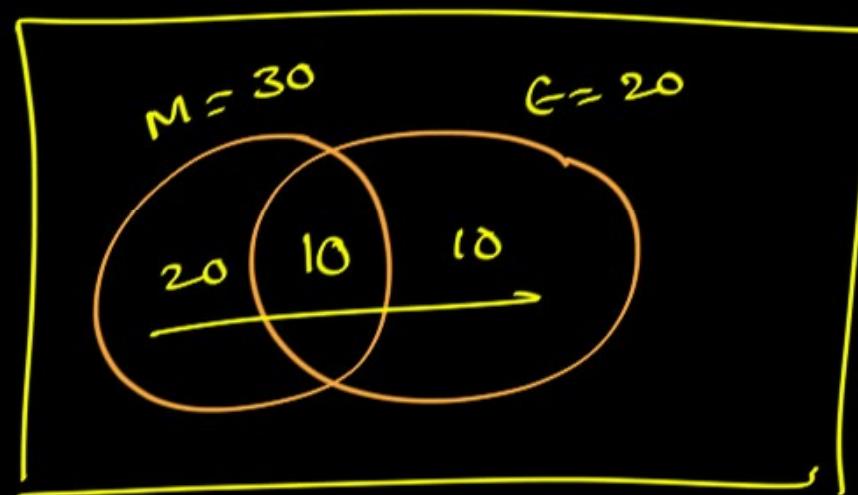
$$E = 21$$

$$\text{only } E = 21 - 10 = 11$$

03. In an examination 80% students passed in English and 70% students passed in Maths. 10% students failed in both the subjects. If 144 students passed in both the subjects, Find the total number of students.

8.8  
Comn

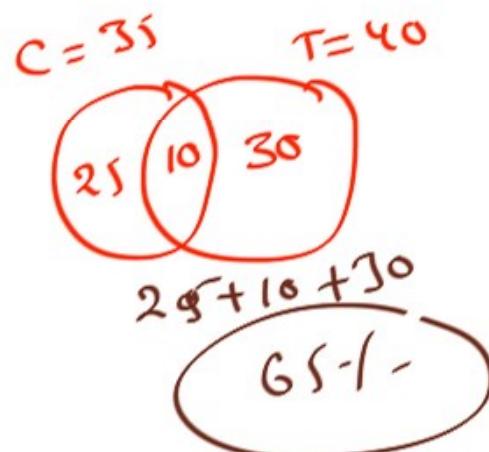
$$E = 80\% \text{ Passed} = 20\% \text{ Failed}$$
$$M = 100\% - 20\% \Rightarrow 70\% \text{ Passed}$$



$$\text{Failed} = 40\%$$
$$\text{Passed} = 60\%$$

$$60\% = 144$$
$$100\% = ?$$
$$\frac{24 + 144 \times 100}{60} = 240$$

07. In a company, 35% of the employees drink coffee, 40% of the employees drink tea and 10% of the employees drink both tea and coffee. What % of employees drink neither tea nor coffee?  $(100 - 65\%) = 35\%$



**(GATE-21-CE/IN SET1)**

- (a) 35
- (c) 40

- (b) 15
- ~~(d) 25~~

04. A Class of 40 students completed a survey on what pets they like.

The choices were: Cats, Dogs, and Birds. Everyone liked at least one pet.

10 students liked Cats and Birds but not dogs

6 students liked Cats and Dogs but not birds

2 students liked Dogs and Birds but not Cats

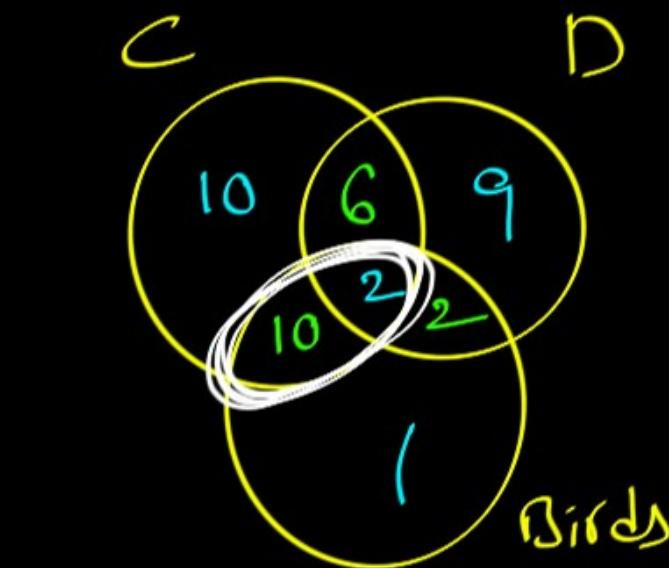
2 students liked all three pets

10 students liked Cats only

9 students liked Dogs only

1 student liked Birds only

How many students like Cats and Birds?



$$10 + 2 = 12$$

06. Among 150 faculty members in an institute, 55 are connected with each other through Facebook and 85 are connected through Whatsapp. 30 faculty members do not have Facebook or Whatsapp accounts. The numbers of faculty members connected only through Facebook accounts is \_\_\_\_\_.

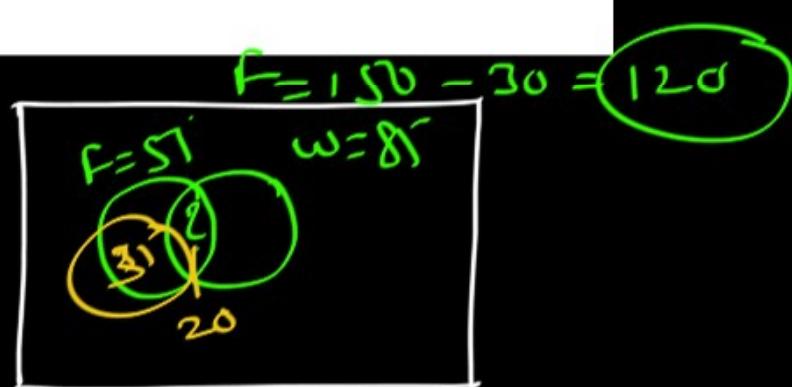
- (a) 35  
(c) 65

- (b) 45  
(d) 90

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

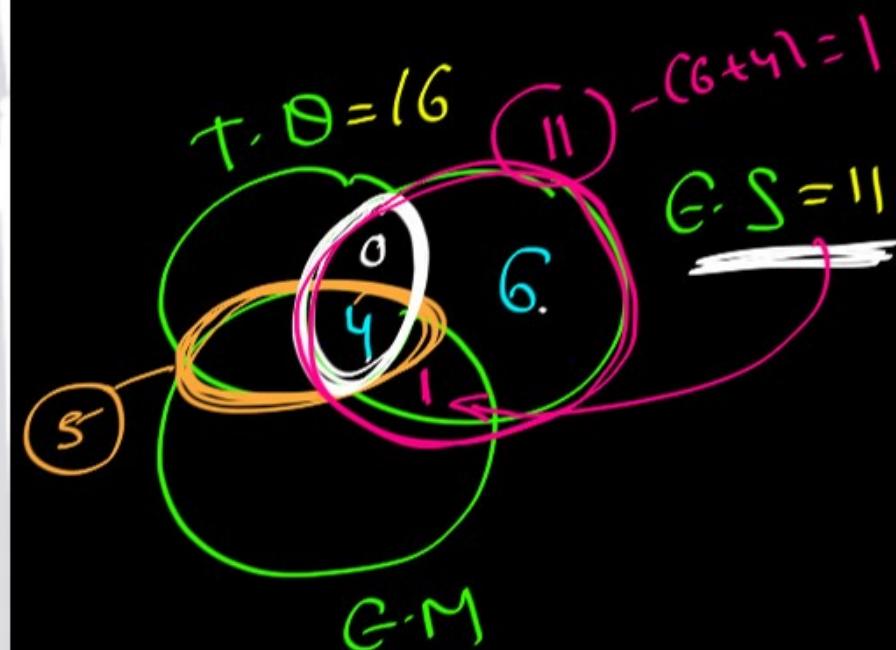
$$120 = 55 + 85 - n(A \cap B)$$

$$n(A \cap B) = 20$$



10. There are 16 teachers who can teach Thermodynamics (TD), 11 who can teach Electrical Sciences (ES), and 5 who can teach both TD and Engineering Mechanics (EM). There are a total of 40 teachers. 6 cannot teach any of the three subjects, i.e. EM, ES or TD. 6 can teach only ES. 4 can teach all three subjects, i.e. EM, ES and TD. 4 can teach ES and TD. How many can teach both ES and EM but not TD?

- (a) 1
- (b) 2
- (c) 3
- (d) 4



09. Forty students watched films A, B and C over a week. Each student watched either only one film or all three. Thirteen students watched film A, sixteen students watched film B and nineteen students watched film C. How many students watched all three films?

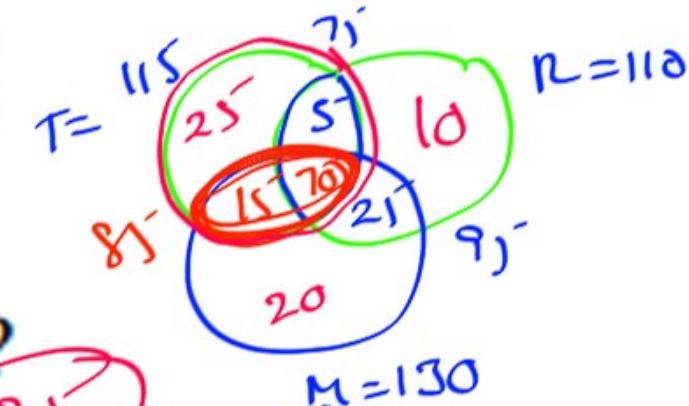
(GATE - 2018)

- (a) 0
- (b) 2
- (c) 4
- (d) 8

$$A = 13, B = 16, C = 19$$
$$13 - x + 16 - x + 19 - x + x = 40$$
$$48 - 2x = 40$$
$$2x = 8$$
$$x = 4$$

An advertising agency finds that, of its 170 clients, 115 use Television, 110 use Radio and 130 use Magazines. Also 85 use Television and Magazines, 75 use Television and Radio, 95 use Radio and Magazines, 70 use all the three. Draw Venn diagram to represent these data. Find

- How many use only Radio? 10
- How many use only Television? 25
- How many use Television and Magazine but not radio? 15



Numbers  
(11-Times)

Series

$$6, 10, 14, 18, 22, \xrightarrow{+6}$$

$$6, 27, 128, 629, \xrightarrow{+5^k}$$

$$5^1 + 1 \quad 5^2 + 2 \quad 5^3 + 3 \quad 5^4 + 4 \quad 5^5 + 5$$

$k^n + n$

Analogy

$$5 : 125 :: 10 : \frac{10^3}{5-1}$$

- Odd man out
- Q) 1000, 729, 64, 8, 125, 68, 343
- Q) 11, 13, 23, 33, 43, 53

→ common difference

$$10, 12, 14, 16, 18, \underline{20}$$

$$100, 110, 120, 130, 140, \underline{150}$$

→ Difference increased by fixed Number.

$$10, \underbrace{12}_2, \underbrace{15}_3, \underbrace{19}_4, \underbrace{24}_5, \underbrace{30}_6, \underbrace{\underline{37}}_7$$

→ Difference is double

$$5, \underbrace{6}_1, \underbrace{10}_2, \underbrace{19}_3, \underbrace{35}_4, \underbrace{60}_5, \underbrace{\underline{96}}_{36} (\because n^2)$$

→ Difference decreased by fixed Number.

→ Sum of preceding two numbers.

(Fibonacci Series)

$$3, \cancel{5}, 8, 13, 21, \cancel{34}, \cancel{55}, \cancel{89} \rightarrow$$

→ product of preceding two numbers,

$$2, 1, 2, 2, 4, 8, 32, \frac{8(32)}{256}$$

→  $n^2$  (100, 121, 144, 169,  $14^2$ )

→  $n^2+1$  (26, 37, 50, 65,  $9^2+1$ )

→  $n^2-1$  (99, 120, 143, 168,  $14^2-1$ )

→  $n^3$  (8, 27, 64,  $5^3$ )

→  $n^3+1$  (1001, 1332,  $12^3+1$ )

→  $n^3-1$

→ multiplication by fixed number.

→ multiplication & addition

→ multiplication & subtraction.

→ multiplication by prime

→ Prime numbers

→ Alternative primes

→ difference belongs to primes

→  $(P \cdot N)^2$

→  $(P \cdot N)^2 + 1$

→  $(P \cdot N)^2 - 1$

→  $(P \cdot N)^3$

→  $(P \cdot N)^3 + 1$

→  $(P \cdot N)^3 - 1$

⇒ Number = sum of digits

$$120, 117, 108, 99, 81 \xrightarrow[\text{P}]{\frac{72}{81-9}}$$

→  $(\text{sum of digits})^2$

→  $k^n + n$ ,  $\rightarrow k^n + 1$

→  $k^n - n$ ,  $\rightarrow k^n - 1$

$$\begin{aligned} 120 - (1+2+0) \\ 120 - 3 = 117 \end{aligned}$$

$$5, 11, 23, 47, 95 \quad \cancel{x_{2+1}} \quad \cancel{191} \quad \checkmark$$

$$5, 7, 10, 15, 22, 33, \cancel{46} \quad (\text{diff belongs to primes})$$

$\cancel{2}$     $\cancel{3}$     $\cancel{5}$     $\cancel{7}$     $\cancel{11}$     $\cancel{13}$

$$100, 99, 97, 94, 90, 85, \cancel{79}$$

$\cancel{-1}$     $\cancel{-2}$     $\cancel{-3}$     $\cancel{-4}$     $\cancel{-5}$     $\cancel{-6}$

$$2, 12, 60, 240, 720, 1440, \overline{1440}$$

$$2, \frac{3}{1.5}, \frac{6}{2.5}, 15, \overline{45}, 157.5, 630$$

$$8, 27, 125, 343, 1331, \frac{2197}{2^3} \quad (P.N)^3$$

$$0, 7, 26, 63, 124, \frac{6^3 - 1}{6 - 1}$$

$$\left[ \begin{array}{l} \text{(sum of digits)}^2 \\ 14, 25, 49, 169, \frac{(1+6+9)^2 = 256}{6-1} \end{array} \right]$$

12. The missing number in the given sequence 343, 1331, \_\_\_\_\_ 4913 is (GATE - 19)
- (a) 2744  
(c) 3375
- (b) 2197  
(d) 4096

13. What is the missing number in the following sequence? (GATE - 18)

2, 12, 60, 240, 720, 1440, \_\_\_\_\_, 0

- (a) 2880  
(c) 720
- (b) 1440  
(d) 0

14. The next term in the series 81, 54, 36, ~~24~~<sup>x2</sup>, ... is (GATE - 14)

15. What is the next number in the following series (GATE - 14)

12 , 35 , 81 , 173 , 357 , ?

16. Fill in the missing number in the series (GATE - 14)
- 2      3      6      15      45      157.5      630

15. What is the next number in the following series  
**(GATE – 14)**

12      35

23

81

92

173

184

357

368

?

725

01. Pick the odd one out in the following:

13, 23, 33, 43, 53

(EE - 16) (1M)

Primos

- (a) 23  
(c) 43

- (b) 33  
(d) 53

02. The number that least fits this set: (324, 441, 97 and 64) is \_\_\_\_\_. (EC/IN - 16) (1M)

18 ~ 21 ~  
~~8~~ ✓ 64

(c) 97

(a) 324  
(b) 441

(d) 64

03.  $125,216,525,729$

- (a) 125
- (c) 729

$n \geq$

- (b) 216
- (d) 525

$$13 \times 3 = 39$$

04.  $\cancel{13339}, \cancel{13452}, \boxed{13564}^\alpha, \cancel{13678}, \cancel{13791}$

- (a) 13791
- (c) 13339

- (b) 13678
- (d) 13564

05. (a)  $14 - 49$   $(\frac{1}{2})^2$   
(c)  $20 - 100$

- (b)  $16 - 64$
- (d)  $24 - 121$

$$\left| 
 \begin{array}{l}
 10 : 101 :: 15 : \frac{15^2 - 1}{(6 \times 7)} \\
 3 \times 4 \quad 4 \times 5 \quad 5 \times 6 \quad 6 \times 7 \\
 12 : 20 :: 30 : 42 \\
 \\ 
 7 : 342 :: 10 : \frac{10^3 - 1}{7 \times 11} \\
 2 \times 3 \quad 3 \times 5 \quad 5 \times 7 \quad 7 \times 11 \\
 1234564 : 25 :: 12 : \frac{1}{3}
 \end{array} \right|$$

(sum of digits)

01.  $27:125 :: 64: ?$

$3^3 : 5^3 :: 4^3 : ?$

(a) 162

(c) 517

(b) 216

(d) 273

02.  $144:10 :: 169: ?$

(a) 14

(c) 13

(b) 11

(d) 12

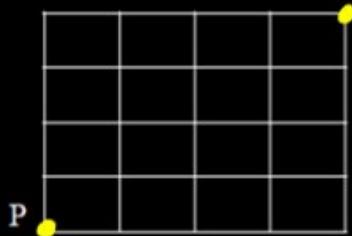
03.  $68:130 :: ?: 350$

$4^3 + 4 \quad 5^3 + 5 \quad 6^3 + 6 \quad 7^3 + 7$

$6^3 + 6$

## Directions (5-times)

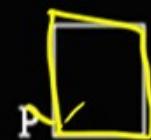
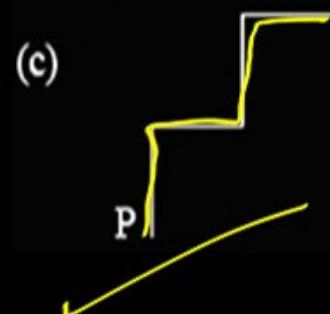
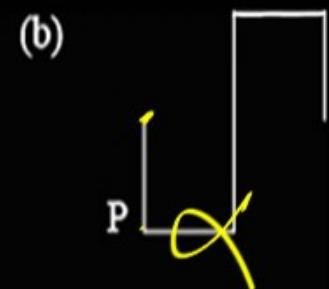
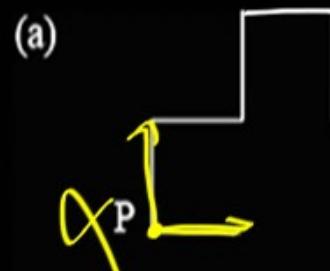
Q.



An ant is at the bottom-left corner of a grid (point P) as shown above. It aims to move to the top-right corner of the grid. The ant moves only along the line marked in the grid such that the current distance to the top-right corner strictly decreases.

Which one of the following is a part of a possible trajectory of the ant during the movement?

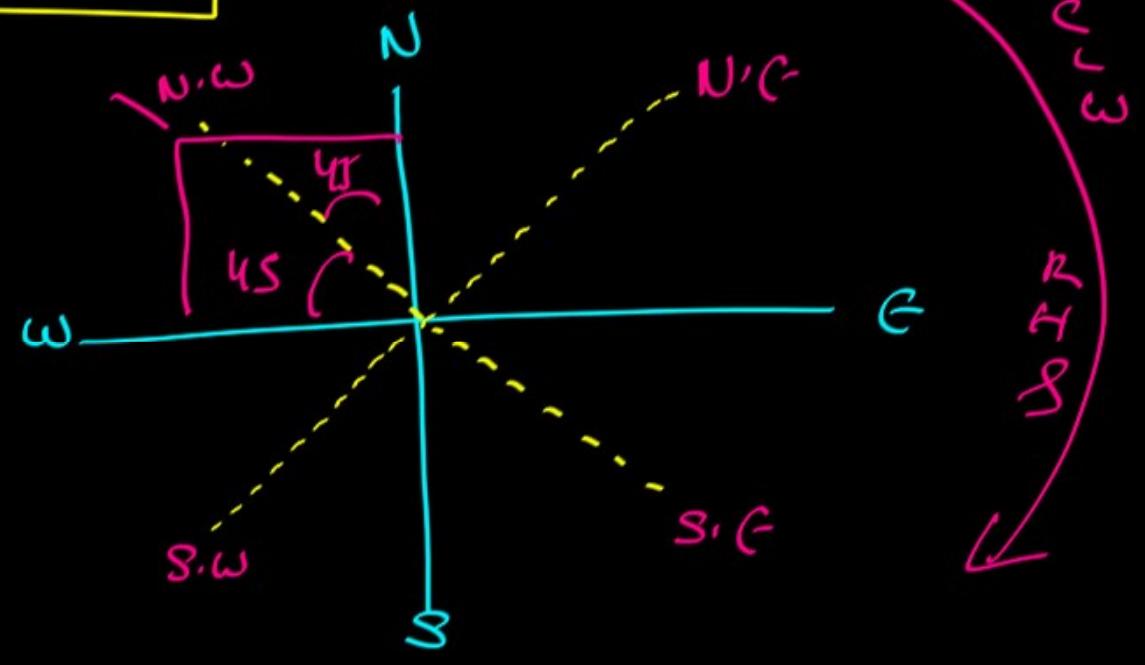
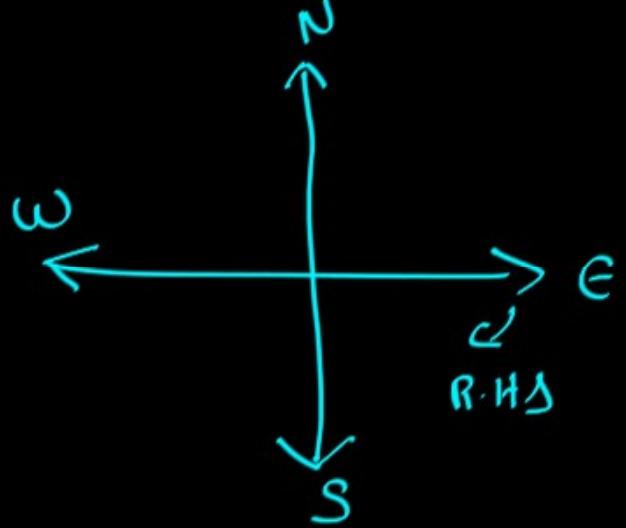
(GATE-22-EE)



Direction

$$R \cdot H \cdot S = C I \omega = \curvearrowright$$

$$L \cdot H \cdot S = A C I \omega = \curvearrowup$$



A man going to Market Towards East, After some Time he takes  $135^\circ$  R.H.S, again he takes  $90^\circ$  L.H.S. After some Time he takes  $45^\circ$  clw, again he turns  $45^\circ$  R.H.S finally he takes  $90^\circ$  Ackw.  
In which direction facing the man now?

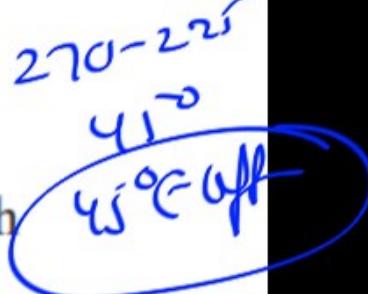


$$\text{East} + 45^\circ \text{ (R.H.S)} \\ = \underline{\text{S.E}}$$

$$225 - 180^\circ = 45^\circ \in \underline{\text{R.H.S}}$$

A man is facing west. He turns 45 degree in the clockwise direction and then another 180 degree in the same direction and then 270 degree in the anticlockwise direction. Find which direction he is facing now?

- (a) South-West
- (b) West
- (c) South
- (d) East-South

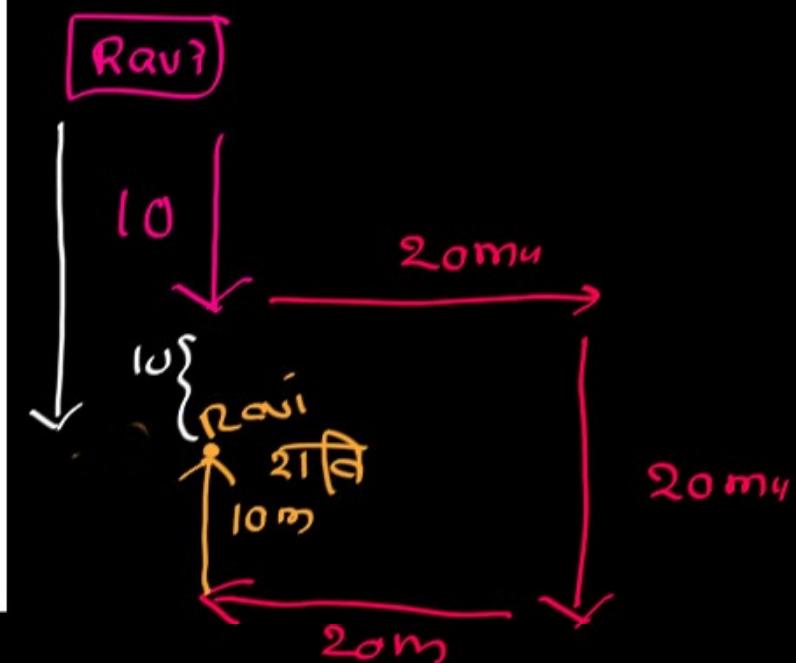
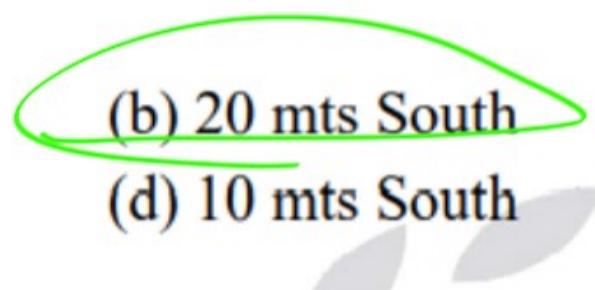


went  $45^\circ$  (left)

$\Rightarrow \overbrace{S \cdot W}$

Ravi walks 10 mts towards the South turning to the left he walks 20 mts and then moves to his right. After moving distance of 20 mts he turns to the right and walks 20 mts. Finally he turns to right and moves an distance of 10 mts. How far and in which direction is he from the starting point?

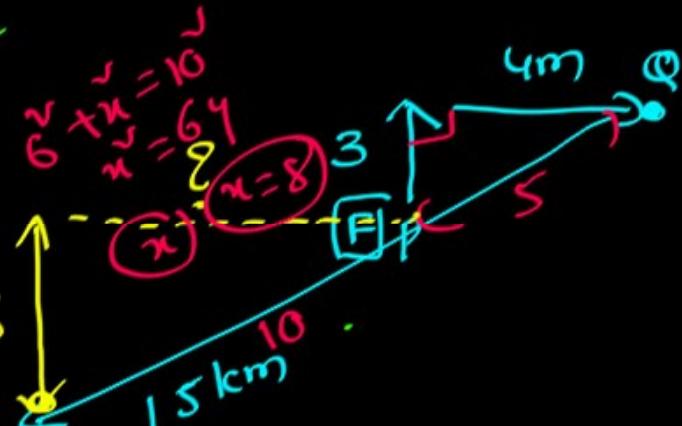
- (a) 10 mts North
- (b) 20 mts South
- (c) 20 mts North
- (d) 10 mts South



Q. Fatima starts from point P, goes North for 3km, and then East for 4km to reach point Q. She then turns to face point P and goes 15km in that direction. She then goes North for 6km. How far is she from point P, and in which direction should she go to reach point P?

(GATE – 17) (1M)

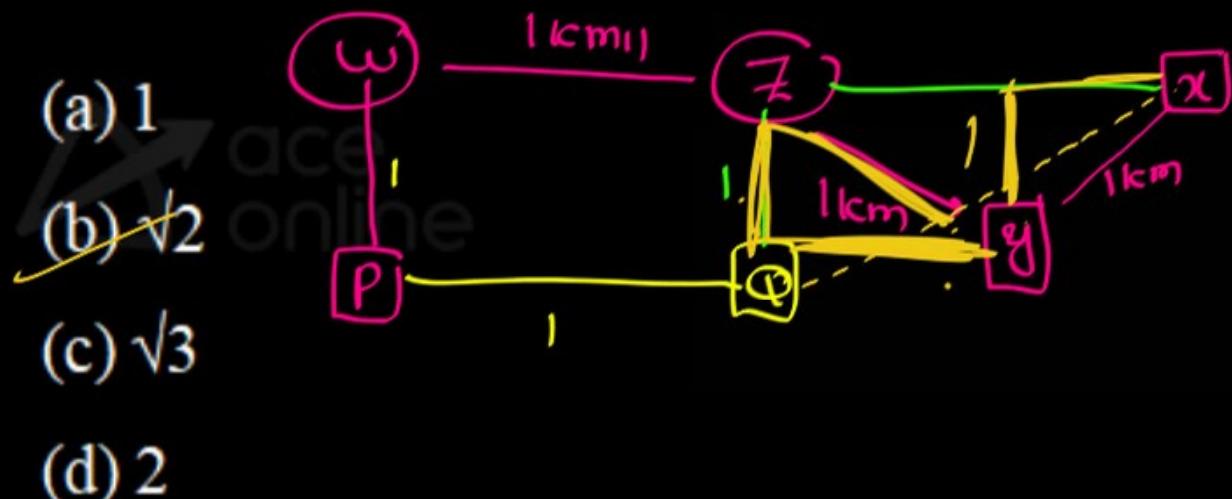
- (a) 8km, East
- (b) 12km, North
- (c) 6km, East
- (d) 10km, North



*y  $\nearrow$  Y  $\nwarrow$  y'  $\nearrow$*

Q. X is 1km north-east of Y. Y is 1km southeast of Z. W is 1km west of Z. P is 1km south of W. Q is 1km east of P. What is the distance between X and Q in km?

(GATE – 14) (2M)



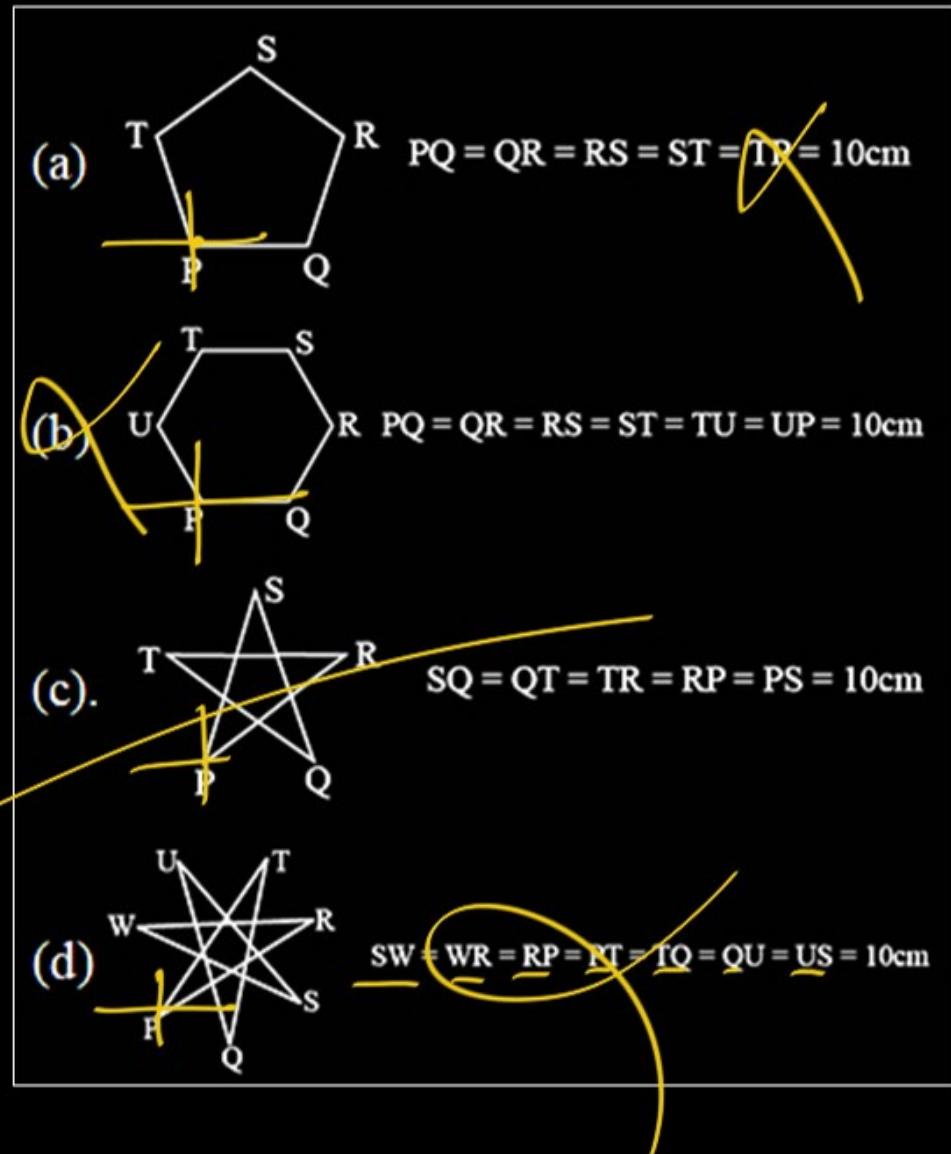
Q. An ant walks in a straight line on a plane leaving behind a trace of its movement. The initial position of the ant is at point P facing east.

The ant first turns  $72^\circ$  anticlockwise at P, and then does the following two steps in sequence exactly FIVE times before halting.

1. Moves forward for 10 cm.
2. Turns  $144^\circ$  clockwise

The pattern made by the trace left behind by the ant is

(GATE-22-CE S2)



NOTE :-

East is called S.C.  
North is called N.C.

$$C: E + 45^\circ (R.H) = S.E)$$

$$C: N + 45^\circ (R) = N.E)$$

S.W is called West.

$$C: S.W + 45^\circ (R) = W)$$

What is code for N.W = ?

$$N.W + 45^\circ (R.H) = \underline{\underline{N.W}}$$

$S-C + 135^\circ$  (Qf)

$N-C + 135^\circ$

10. If South-East becomes North, North-East becomes West and so on. What will West become?

(a) North-East

(b) North-West

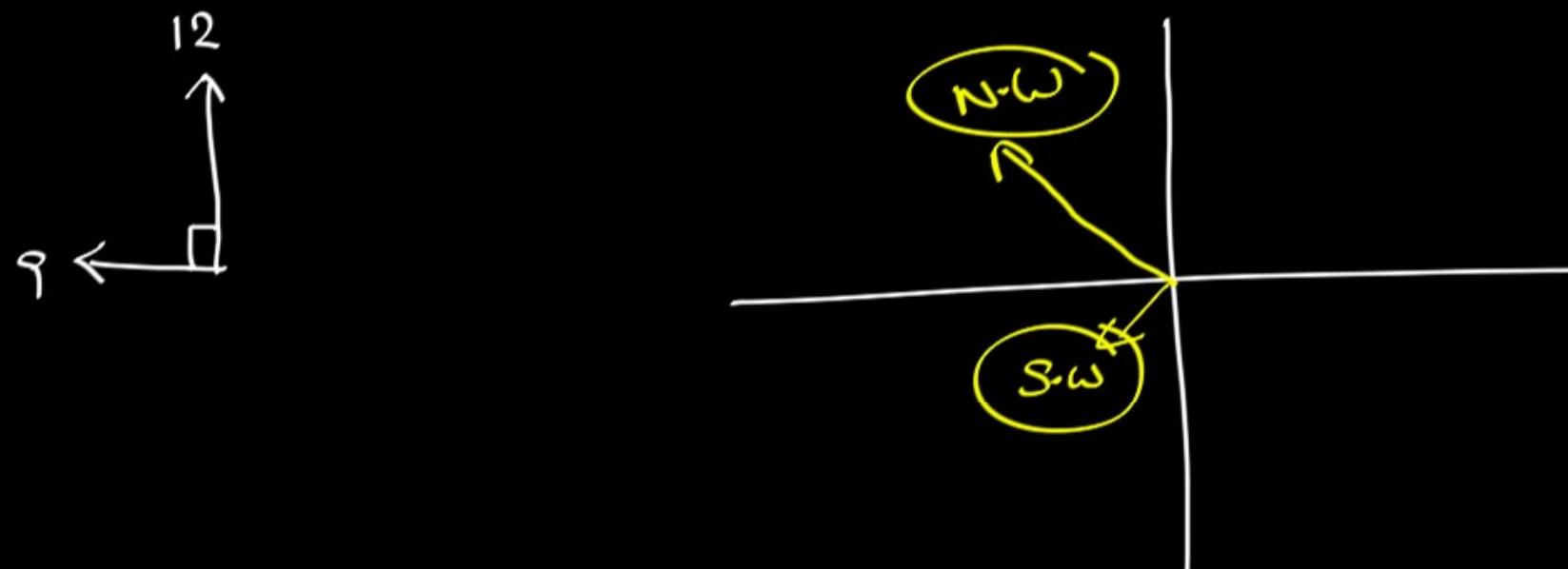
(c) South-East

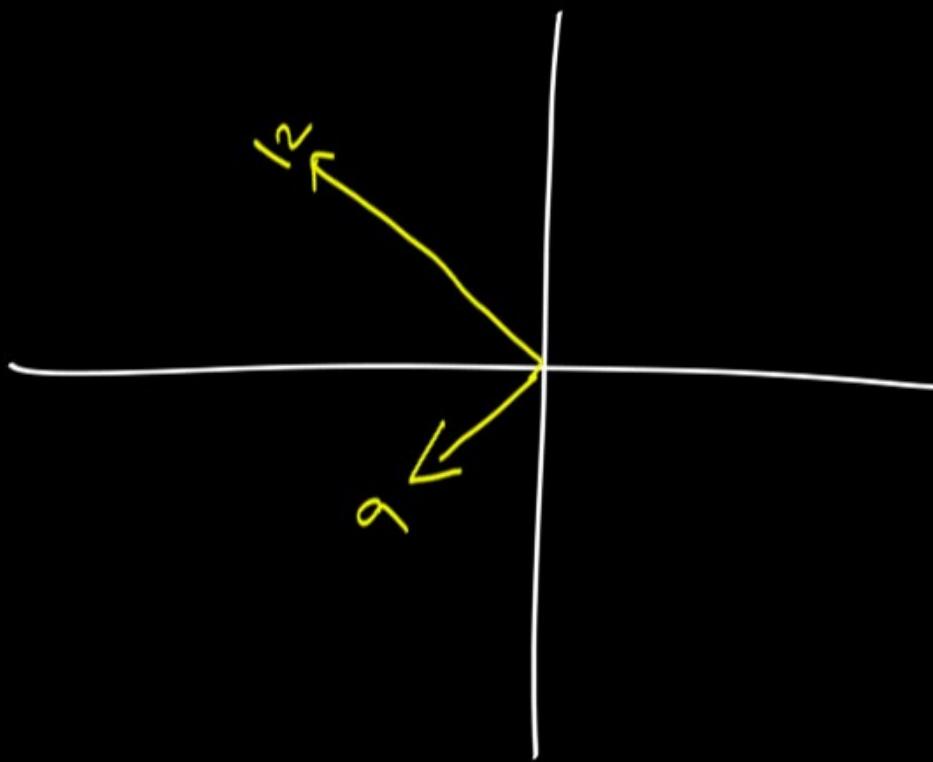
(d) South-West

$\omega + 135^\circ$  (Qff)

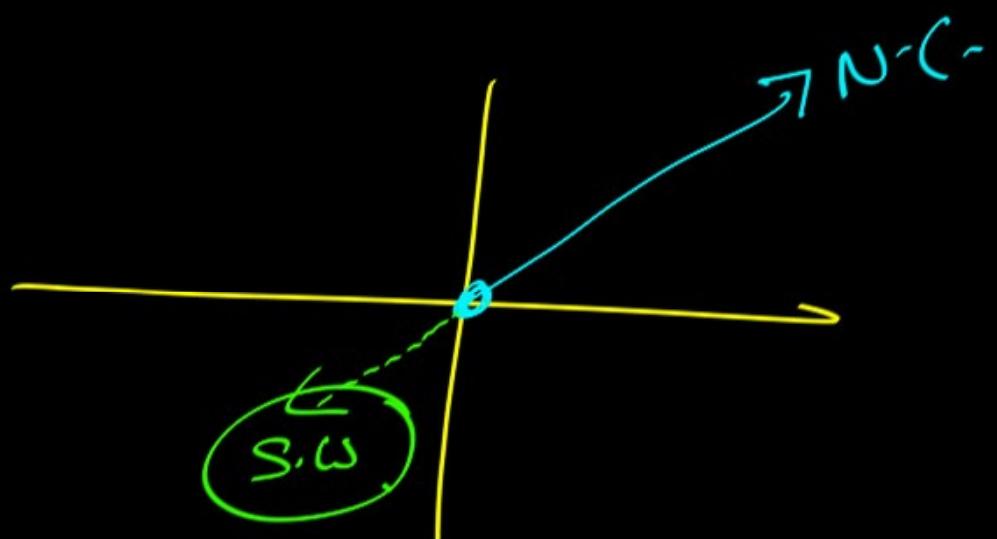
NOTE:-

If Time is 9' o'clk, then minute hand indicates N-west. In which direction indicates the hour hand?





If Time is 6' o'clock, then minute hand indicated N-EAST. In which direction indicates the hour hand?



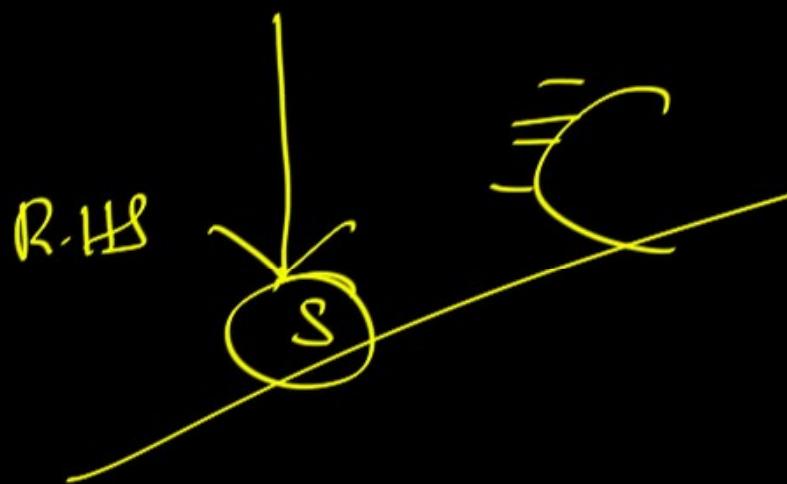
Back side



front side



One day morning A man going to market, suddenly he observed his shadow become R.H.S of him. In which direction facing of man now?



One day morning, A boy going to School.  
Suddenly he observed his shadow become  
his back side. In which direction  
is the boy now?



one day Morning Raju & Rani , Talking Each other  
Suddenly Raju observed, Rani's shadow become Right  
hand side of him. In which directions They are  
Talking Each other and also find , their  
Individual directions ?