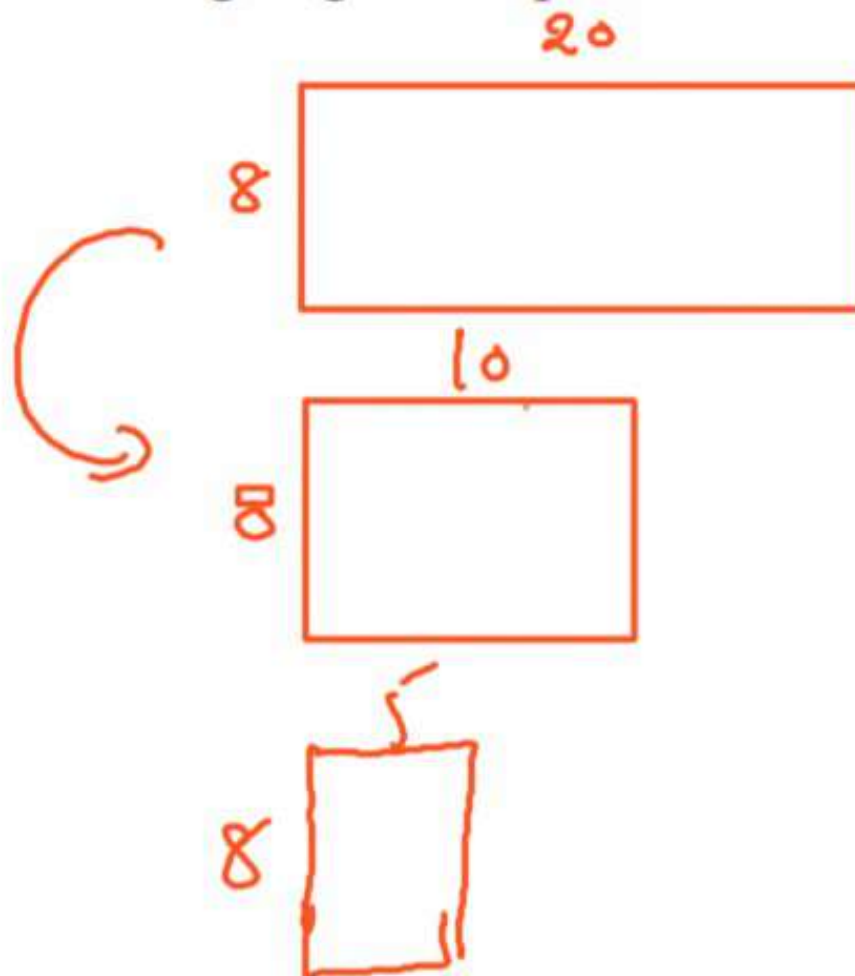


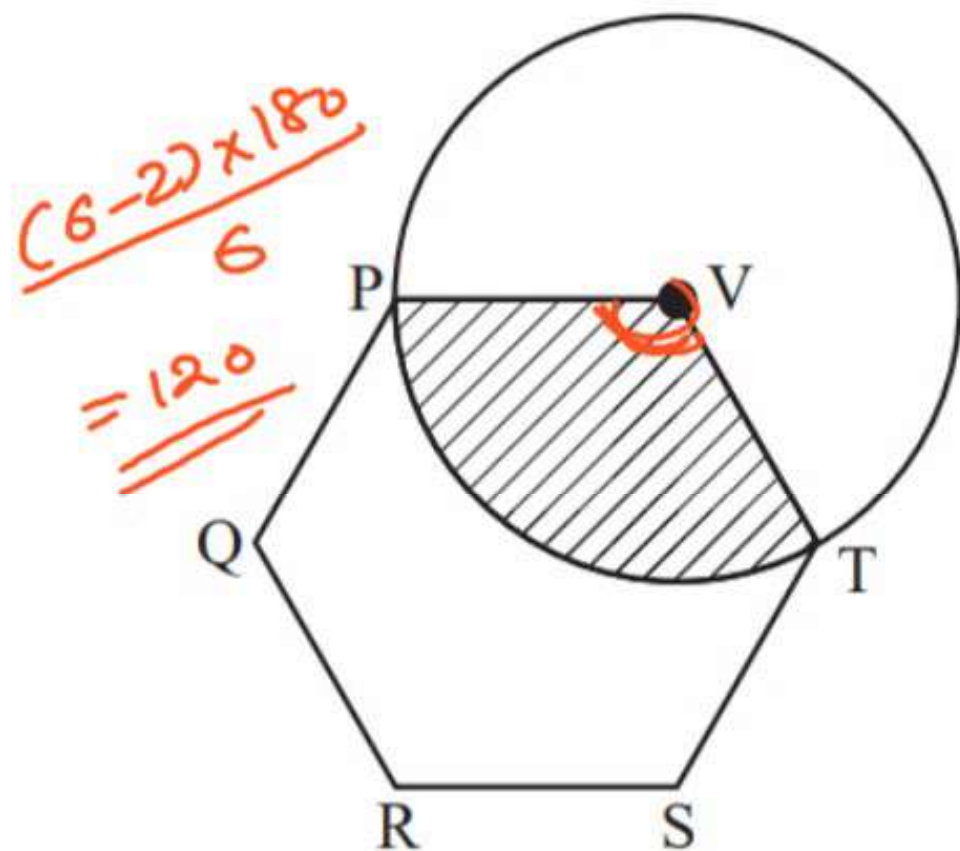
A rectangular paper of  $20 \text{ cm} \times 8 \text{ cm}$  is folded 3 times. Each fold is made along the line of symmetry, which is perpendicular to its long edge. The perimeter of the final folded sheet (in cm) is

18



$$4 \times 5 = 2(5 + 4) = \underline{\underline{18}}$$

In the given figure, PQRSTV is a regular hexagon with each side of length 5 cm. A circle is drawn with its centre at V such that it passes through P. What is the area (in  $\text{cm}^2$ ) of the shaded region? (The diagram is representative) **(GATE\_2023)**



$$\text{Sector Area} = \frac{\theta}{360} \pi r^2$$

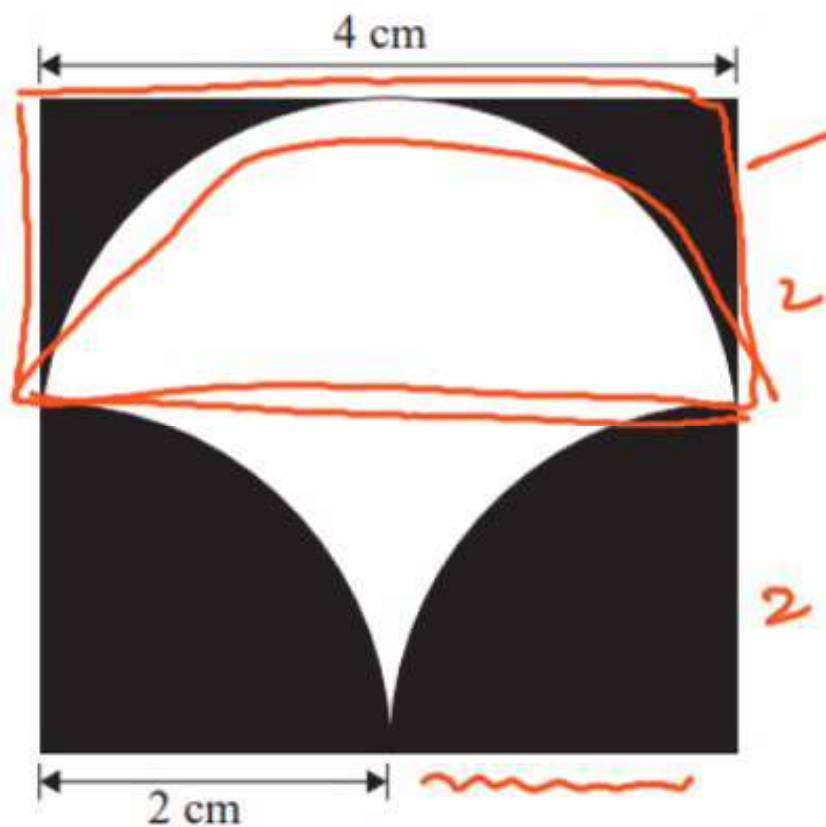
$$= \frac{120}{360} \cdot \pi r^2$$

$$= \frac{120}{360} \cdot \pi (5^2)$$

$$= \frac{25\pi}{3} \checkmark$$

A square of side length 4 cm is given. The boundary of the shaded region is defined by one semi-circle on the top and two circular arcs at the bottom, each of radius 2 cm, as shown.

The area of the shaded region is 8 cm<sup>2</sup>.  
(GATE\_2023)



□le Area — Semi Circle Area

$$\left( 2b - \frac{\pi r^2}{2} \right) + 2 \left( \frac{\theta}{360} \pi r^2 \right)$$

$$2b - \frac{\pi r^2}{2} + 2 \left( \frac{90}{360} \pi r^2 \right)$$

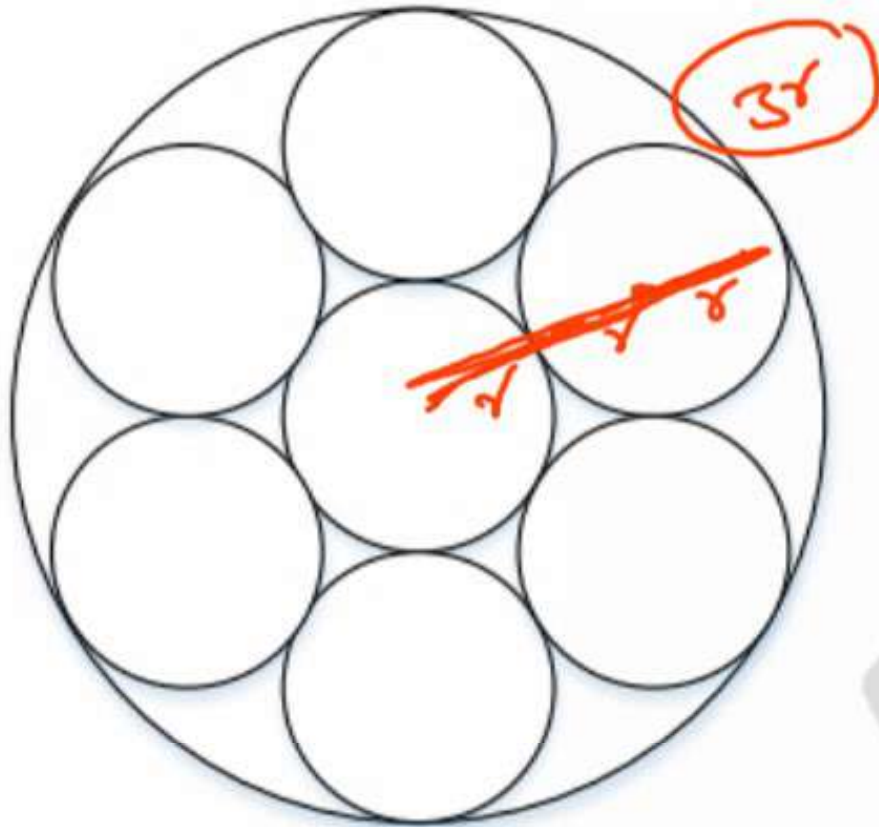
$$2b - \frac{\pi r^2}{2} + \frac{\pi r^2}{2}$$

$$= 4(2) = 8 \checkmark$$





Seven identical cylindrical chalk-sticks are fitted tightly in a cylindrical container. The figure below shows the arrangement of the chalk-sticks inside the cylinder.



$$\frac{\text{7 sticks Volume}}{\text{cylinder} - 7 \text{ sticks}} = ?$$

$$\frac{7(\pi r^2 h)}{\pi (3r)^2 h - 7\pi r^2 h} = \frac{7\pi r^2 h}{9\pi r^2 h - 7\pi r^2 h}$$

$$= \frac{7\cancel{\pi r^2}h}{2\cancel{\pi r^2}h}$$

$$= \underline{\underline{7/2}}$$

The length of the container is equal to the length of the chalk-sticks. The ratio of the occupied space to the empty space of the container is

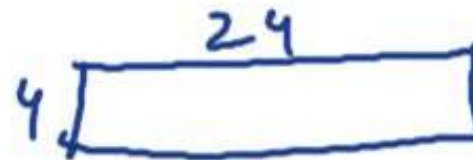
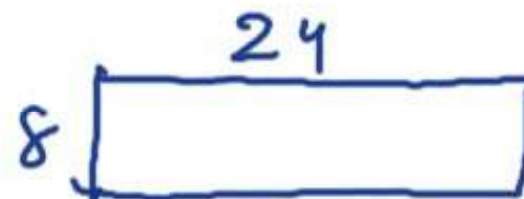
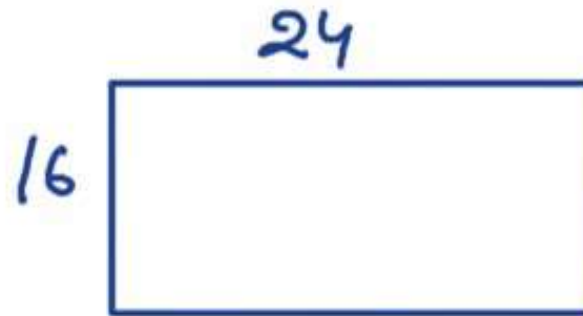
Two identical sheets A and B, of dimensions 24 cm  $\times$  16 cm, can be folded into half using two distinct operations, FO1 or FO2.

In FO1, the axis of folding remains parallel to the initial long edge, and in FO2, the axis of folding remains parallel to the initial short edge.

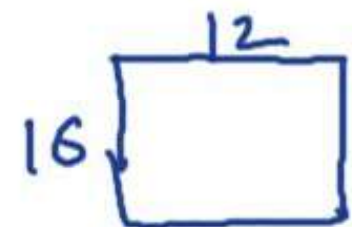
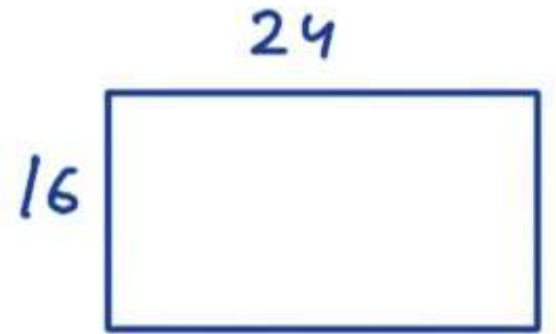
If sheet A is folded twice using FO1, and sheet B is folded twice using FO2, the ratio of the perimeters of the final shapes of A and B is

$$14:11$$

$$\frac{28}{14} = \frac{22}{11}$$



$$2(4+24)$$



$$2(6+16)$$

I) ACC →

~~~~~

└→

3!

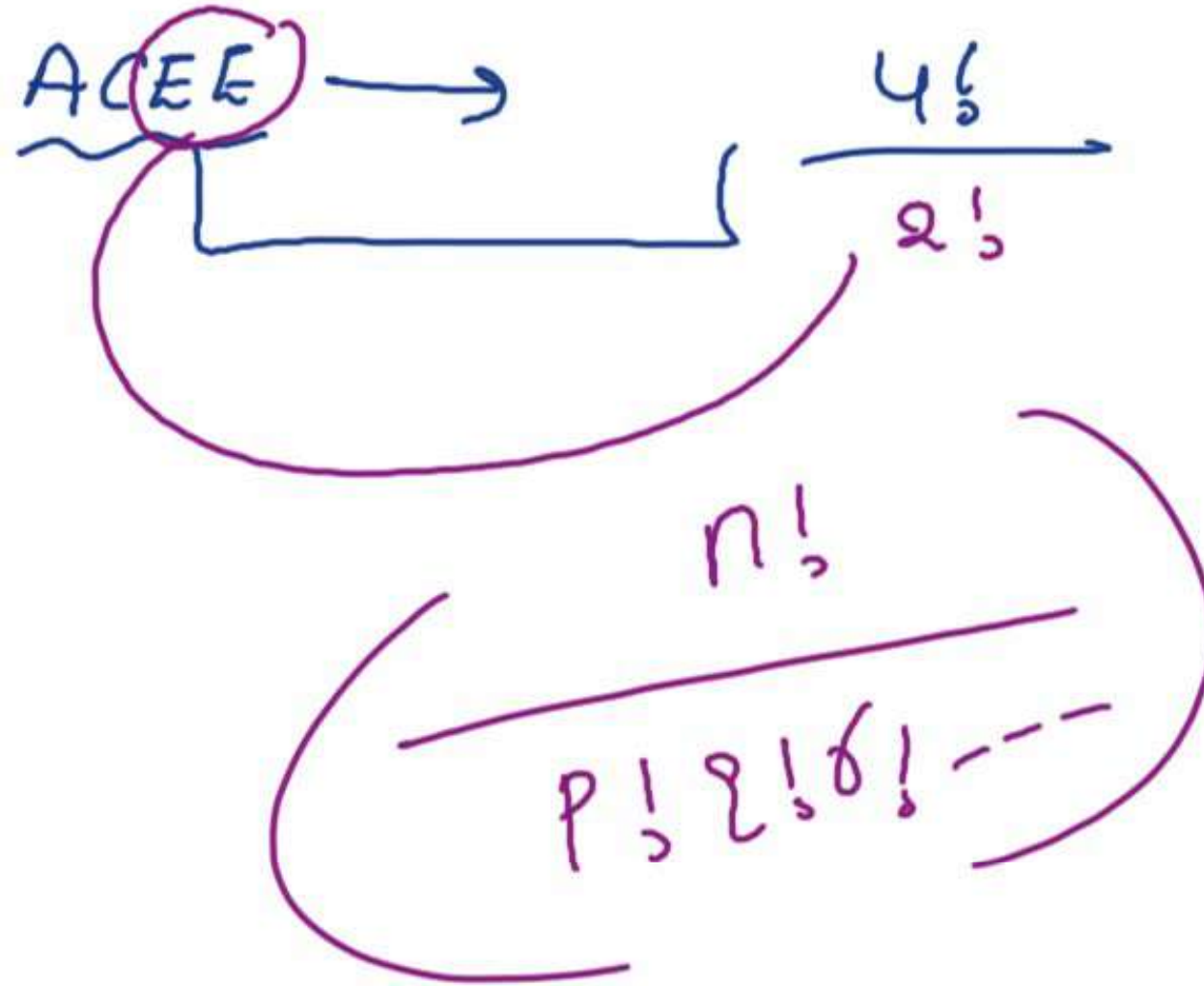
~~~~~

ACC | CEA | EAC  
AEC | CAE | ECA  
~~~~~

n!



II



III

vowels come together

GATEPSU  $\Rightarrow$  (AEU) GTPS

5!(3!)



How many words can be made using all the letters of the word 'HELICOPTER' so that the vowels come together?



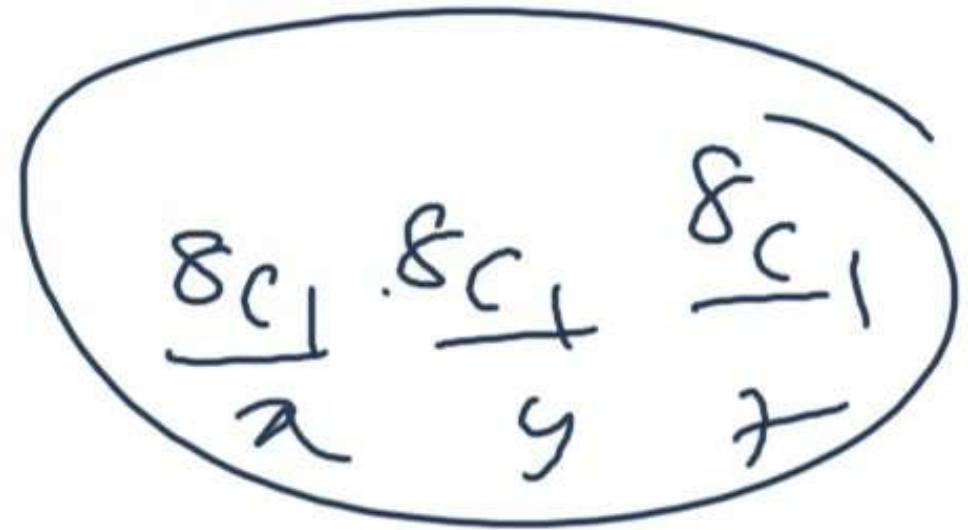
How many 3-letter words can be formed by the letters of the word 'LAUNCHER' if repetition of letters is allowed?

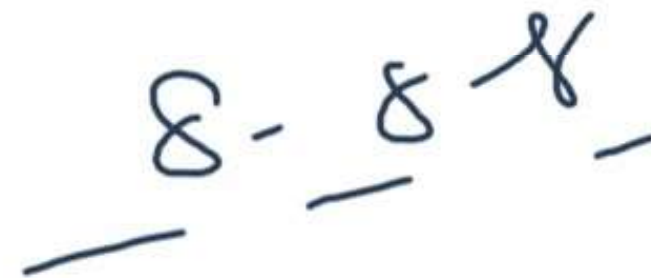
(a)  $8P_3$

(c)  $8^3$

(b)  $8C_3$

(d)  $3^8$







Everybody in a room shakes hands with each other. The total number of handshakes is 66. The total number of persons in the room is:

- (a) 10 (b) 11  
(c) 12 (d) 13 (e) 17

$nC_2$

$$nC_2 = \frac{n(n-1)}{2} = 66$$

$$n(n-1) = 132$$

$$\underline{\underline{n=12}}$$

$$\underline{\underline{12 \times 11 = 132}}$$

Five teams have to compete in a league, with every team playing every other team exactly once, before going to the next round. How many matches will have to be held to complete the league round of matches?

- (a) 20 (b) 10 (c) 8 (d) 5

(GATE\_15)

$nC_2$

$$\frac{n(n-1)}{2}$$

$5C_2$

$$= \frac{5 \times 4}{2 \times 1}$$

$$= 10$$



In a party, 60% of the invited guests are male and 40% are female. If 80% of the invited guests attended the party and if all the invited female guests attended, what would be the ratio of males to females among the attendees in the party?

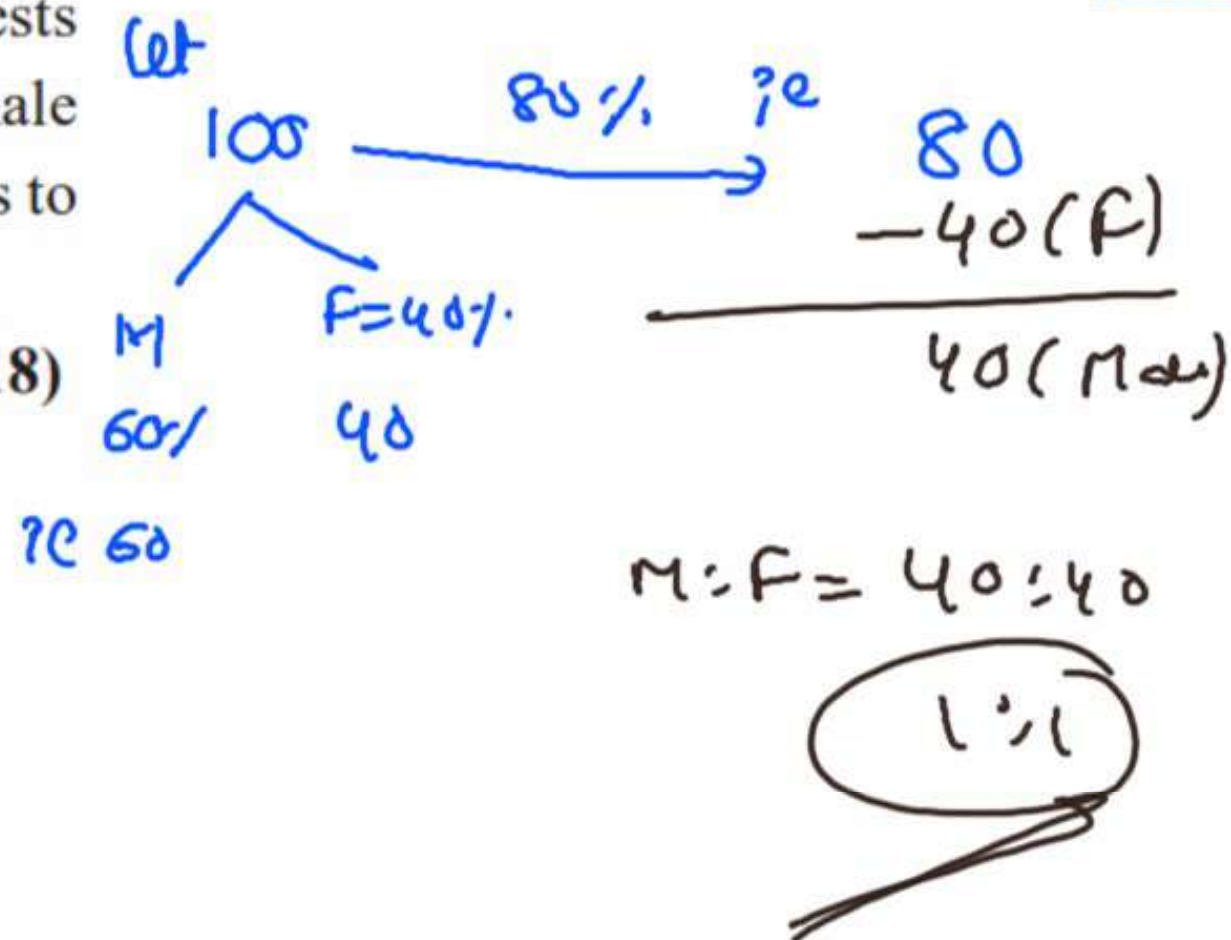
(GATE - 18)

(a) 2 : 3

(b) 1 : 1

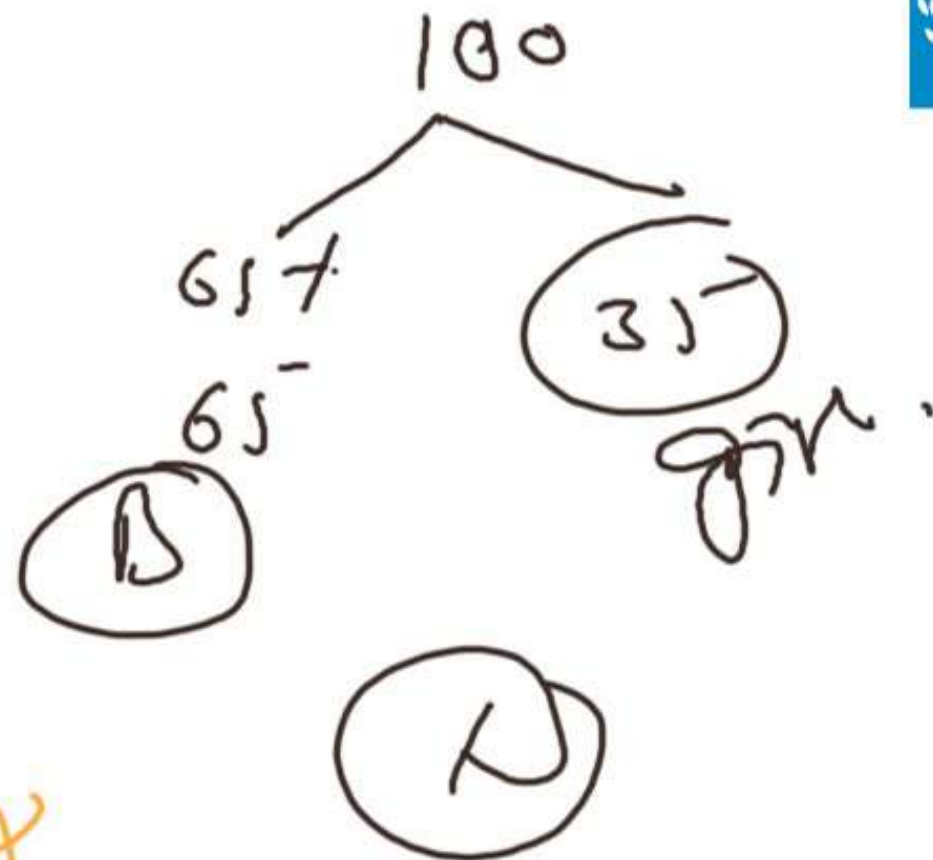
(c) 3 : 2

(d) 2 : 1



In a recently conducted national entrance test, boys constituted 65% of those who appeared for the test. Girls constituted the remaining candidates and they accounted for 60% of the qualified candidates. Which one of the following is the correct logical inference based on the information provided in the above passage? (GATE\_2022)

- (a) Equal number of boys and girls qualified ~~✗~~
- (b) Equal number of boys and girls appeared for the test ~~✗~~
- (c) The number of boys who appeared for the test is less than the number of girls who appeared ~~✗~~
- (d) The number of boys who qualified the test is less than the number of girls who qualified ✓





The radius as well as the height of a circular cone increases by 10%. The percentage increase in its volume is \_\_\_\_\_. (GATE\_2019)

- (a) 17.1 (b) 21.0  
(c) 33.1 (d) 72.8

$$r = 10$$

$$h = 10$$

$$V = \frac{1}{3} \pi r^2 h$$

Let

$$r = 10 \xrightarrow{10\% \uparrow} 11$$

$$h = 10 \xrightarrow{10\% \uparrow} 11$$

$$\tilde{r}^2 \tilde{h} \Rightarrow 11^2 \cdot 11$$

$$11^2 \cdot 11$$

$$1331$$

$$\frac{1331}{1000} \times 100 = 133.1\%$$



Anitha sold a painting at a profit of 11%. Had she sold it for ₹175 more, she would have gained 18%.

The C.P of the painting is

(a) ₹ 2250

(b) ₹ 2350

(c) ₹ 2500

(d) ₹ 2550

| <u>%</u> | <u>S.P</u> |
|----------|------------|
| 11%      | → 2/-      |
| 18%      | → 2+175/-  |

---

2/- → 175/-

100% = ?  $\frac{175 \times 100}{7}$   
 = 2500

II

Remaining on (Rest on) (Successive) :-

$$S.P = C.P \times \frac{100 \pm x}{100} \times \frac{100 \pm y}{100} \times \dots$$

If after successive discounts of 30%, 20% and 10%, a customer has to pay ₹ 252, what is the list price of the article?

(a) ₹ 400

(c) ₹ 600

☒ (b) ₹ 500

(d) ₹ 360

Chain Rule:-

$$g_1 \Rightarrow M_1 D_1 H_1 \cancel{r} \cdot \longrightarrow \omega_1$$

$$g_2 \Rightarrow M_2 D_2 H_2 y \cdot \longrightarrow \omega_2$$

$$\frac{M_1 D_1 H_1 \cancel{r} \cdot}{\omega_1} = \frac{M_2 D_2 H_2 y \cdot}{\omega_2}$$





Work done by group:

5 skilled workers can build a wall in 20 days; 8 semi-skilled workers can build a wall in 25 days; 10 unskilled workers can build a wall in 30 days. If a team has 2 skilled, 6 semi-skilled and 5 unskilled workers, how long will it take to build the wall?

(GATE)

(a) 20 days

(b) 10 days

(c) 16 days

(d) 15 days

$$\begin{array}{l|l} 5 \text{ sk} \rightarrow 20 & 8 \text{ Sem} \rightarrow 25 \\ 1 \text{ sk} \rightarrow 100 & 1 \text{ Sem} \rightarrow 200 \\ \frac{1}{100} & \frac{1}{200} \end{array}$$

$$10 \text{ un} \rightarrow 30$$

$$1 \text{ un} \rightarrow 300$$

$$\frac{1}{300}$$

$$\begin{aligned} 2 \text{ sk} + 6 \text{ Sem} + 5 \text{ un} &\rightarrow 2 \left( \frac{1}{100} \right) + 6 \left( \frac{1}{200} \right) + 5 \left( \frac{1}{300} \right) \\ &\Rightarrow \frac{2(6) + 6(3) + 5(2)}{600} = \frac{1}{15} \\ &\quad \text{re } 15 \text{ days} \end{aligned}$$

A, B and C alone can-do work in 12, 15 and 30 days respectively. A start the work and B join him after 3 days. A leaves and C joins 3 days before the work is completed. In total how many days the work was completed?

- (a) 7 days  
(c) 10 days

- (b) 9 days  
(d) 12 days

$$\left(\frac{1}{12}\right)^3 + \left(\frac{1}{12} + \frac{1}{15}\right)^x + 3\left(\frac{1}{15} + \frac{1}{30}\right) = 1$$

$$x = 3$$

$$T = 3 + 3 + 3 = \underline{\underline{9 \text{ days}}}$$



A man takes 5 hours in walking to a certain place and riding back. He would have gained 2 hours by riding both ways. The time he would take to walk both ways is

(a) 11 hrs

(b) 8 hrs

(c) 7 hrs

(d) 9 hrs

$$W + R = 5$$

$$R + R = 3 \quad (\because 5 - 2 = 3)$$

$$2R = 3$$

$$R = 1.5$$

Both  
sides walking =  $2(3.5)$   
 $= 7 \text{ hrs}$

$$W + 1.5 = 5$$

$$W = 3.5$$





**NUMERICAL ABILITY**

***10***

***MARKS***

## **REASONING**

LETTERS

NUMBERS

CODING AND DECODING

DIRECTIONS

BLOOD RELATIONS

SEATING ARRANGEMENT

SYLLOGISMS

ANALYTICAL FIGURES

VENN DIAGRAMS

CUBE AND DICE

CLOCKS

RANKING

## **QUANTITATIVE**

TIME AND WORK

TIME AND DISTANCE

AREAS AND VOLUMES

PROBABILITY

PERMUTATION

PERCENTAGES

PROFIT AND LOSS

AGES

AVG

RATIO AND PROPRTION

ALLIGATION

SIMPLE AND COMPOUND

INTEREST

## **SIMPLIFATION**

INDICES

SURDS

PROGRESSIONS

NUMBER SYSTEM

LOG

QUADRATIC EQUATIONS

## **DATA INTERPRETATION**

PIE CHART

BAR CHART

TABLE CHART

LINE CHART



[illegible]

## DIAGRAMMATIC LOGICAL THINKING



Q1] Consider the following sentences.

All benches are beds.

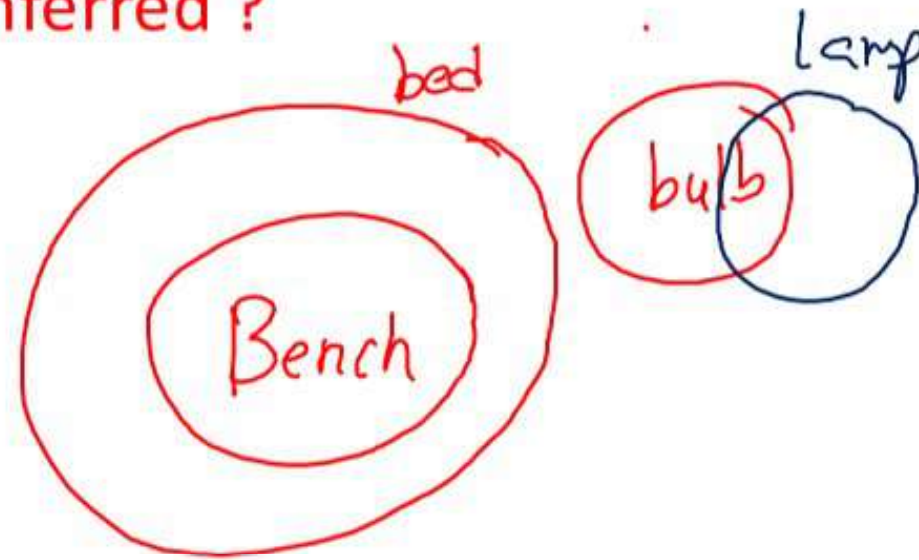
No bed is a bulb.

Some bulbs are lamps.

Which of the following can be inferred ?

i. some beds are lamps  $\alpha$

ii. some lamps are beds  $\alpha$



(a) Only i

(b) Only ii

(c) Both i and ii

(d) Neither i nor ii ✓

Given below are three conclusions drawn based on the following three statements

**Statement 1: All teachers are professors.**

**Statement 2: No professor is a male.**

**Statement 3: Some males are engineers.**

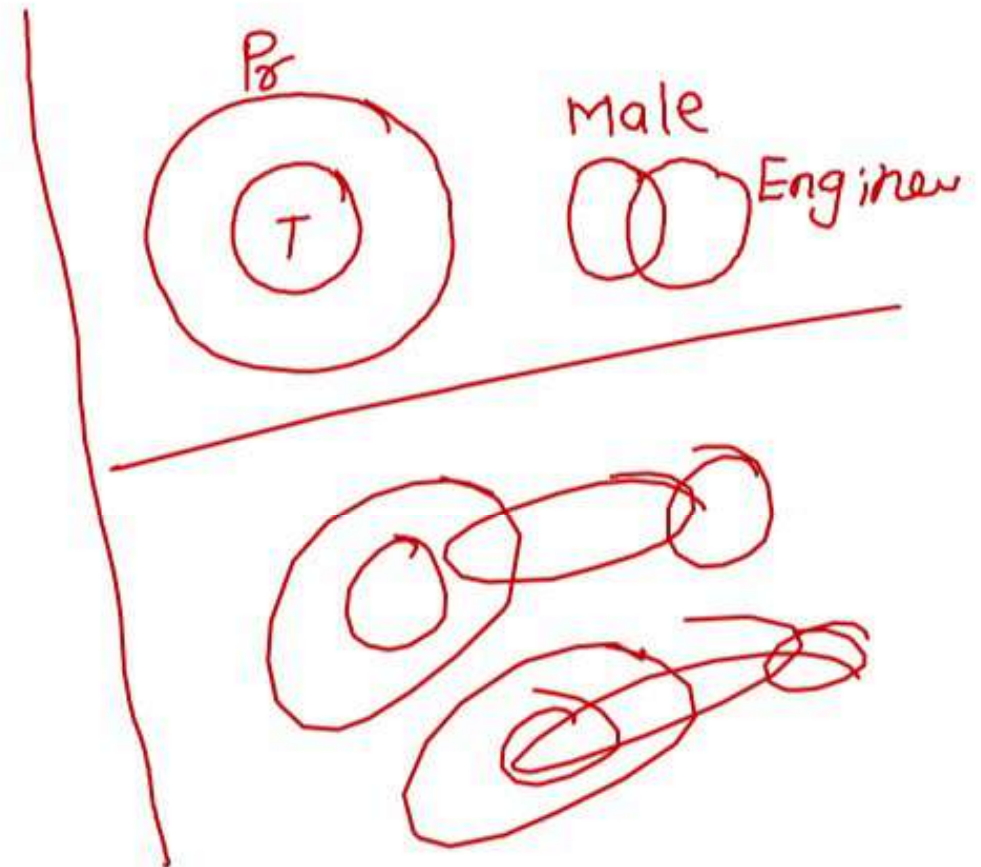
Conclusion I: No engineer is a professor. ✗

Conclusion II: Some engineers are professors. ✗

Conclusion III: No male is a teacher.

Which one of the following options can be logically inferred?

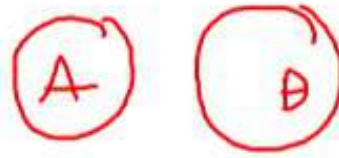
- (a) Only conclusion III is correct
- (b) Only conclusion I and conclusion II are correct
- (c) Only conclusion II and conclusion III are correct
- (d) Only conclusion I and conclusion III are correct



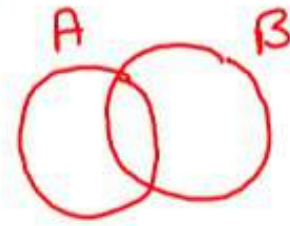
All A's are B



No A is B



Some A's are B



Some A's are not B





Q3] no of squares in chess board?



~~A] 204~~

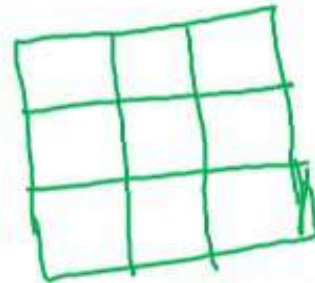
B] 214

C] 64

D] 216

$$\sum 8^2 = \frac{8(8+1)(2 \times 8 + 1)}{6}$$

$$= 204$$

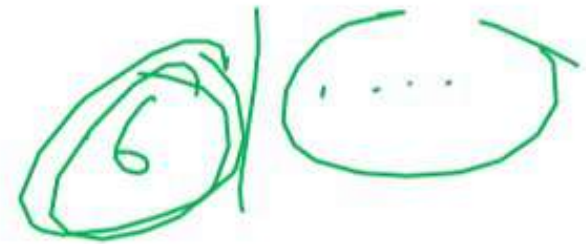


$$3^2 + 2^2 + 1^2$$

$$14$$



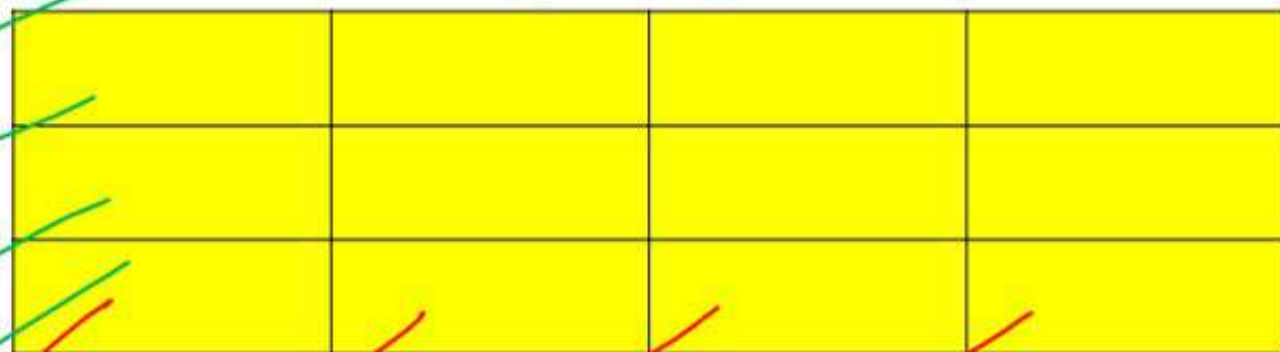
$$(4 \times 3) + (3 \times 2) + (2 \times 1) \\ 12 + 6 + 2 = 20$$



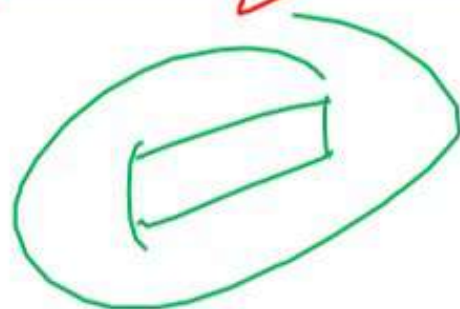
$$\sum n^2$$

$$\sum m+n$$

In given each and every grid also rectangle.  
Find no of rectangles in given?



- A] ~~60~~
- B] 90
- C] 45
- D] 40



$$mC_2 \times nC_2$$

$$m=4$$

$$n=3$$

$$4C_2 \times 3C_2$$

$$= \frac{4 \times 3}{2 \times 1} \times \frac{3 \times 2}{2 \times 1}$$

$$= \underline{\underline{60}}$$





5] which of the following is odd

~~23, 35, 37, 41, 43, 11, 53~~

6] what is next term in given series?

5, 7, 10, 15, 22, 33, .....  
2 3 5 7 11 12

- ~~a] 46~~
- b] 43
- c] 45
- d] 50

10, 13, 19, 28, 46  
3 6 9 12

125, 343, 729, 1331, 17<sup>3</sup>

7]. AD, CG, FK, JP, OV  
(a) ~~PV~~ (b) ~~PW~~ (c) ~~OV~~ (d) OW

8] 7G, 11K, 13M, 17Q  
(a) 15Q (b) ~~17Q~~ (c) 15P (d) 17P

9] 13M, 17Q, 19S, \_\_\_\_  
(a) 21W (b) 21V  
(c) ~~23W~~ (d) 23V

10] A, CD, GHI, \_\_\_\_, UVWXY  
(a) LMN (b) MNO  
(c) ~~MNOP~~ (d) NOPQ

Seven cars P, Q, R, S, T, U and V are parked in a row not necessarily in that order. The cars T and U should be parked next to each other.

The cars S and V also should be parked next to each other, where as

P and Q cannot be parked next to each other.

Q and S must be parked next to each other.

R is parked to the immediate right of V.

T is parked to the left of U.

Based on the above statements, the only INCORRECT option given below is:

- ☒ (a) There are two cars parked in between Q and V.
- (b) Q and R are not parked together.
- (c) V is the only car parked in between S and R.
- (d) Car P is parked at the extreme end.

3

{ TU  
UT

{ SV  
VS

QS  
SQ

P TU Q S V R P  
\_ \_ \_



Consider five people- Mitra, Ganga, Rekha, Lakshmi and Sana, Ganga is taller than both Rekha and Lakshmi. Lakshmi is taller than Sana. Mitra is taller than Ganga. Which of the following conclusions are true?

1. Lakshmi is taller than Rekha
2. Rekha is shorter than Mitra
3. Rekha is taller than Sana
4. Sana is shorter than Ganga

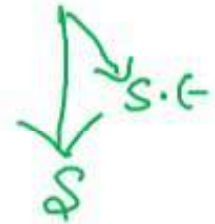
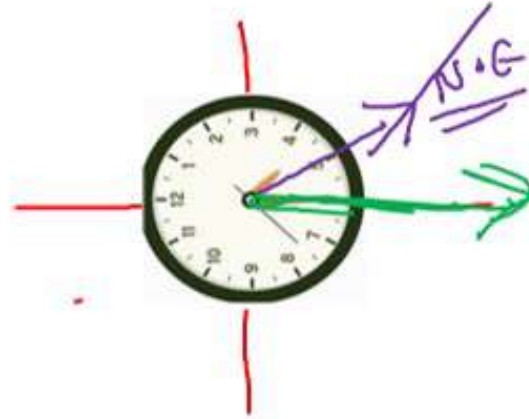
- (a) 1 only (b) 1 and 3  
(c) 3 only (d) 2 and 4

$M > G > R$

$M > G > L > Sana$

A watch reads 4:30. If the minute hand points East, in what direction will the hour hand point?

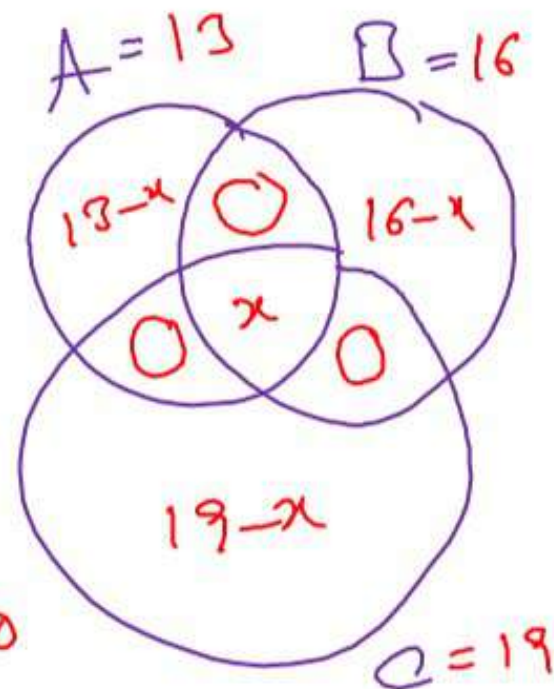
- (a) North - East
- (b) South - West
- (c) North
- (d) South



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?

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



$$13 - x + 0 + 16 - x + 0 + x + 0 + 19 - x = 40$$

$$48 - 2x = 40$$

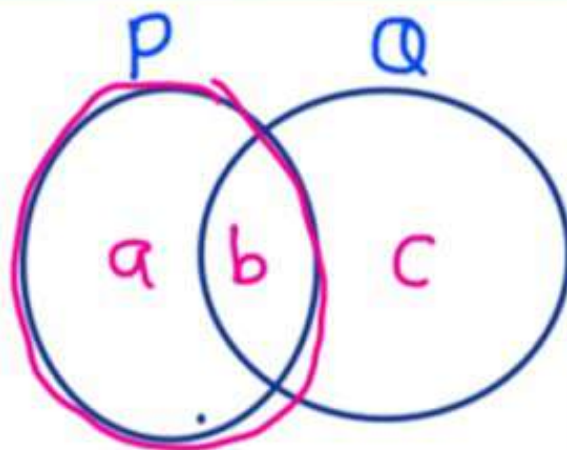
$$2x = 8$$

$$x = 4$$

$$\left. \begin{array}{l} \text{only } n(A \cap B) = 0 \\ n(A \cap B) = x \end{array} \right\}$$

$$n(A \cap B) = \text{only } n(A \cap B) + n(A \cap B \cap C)$$





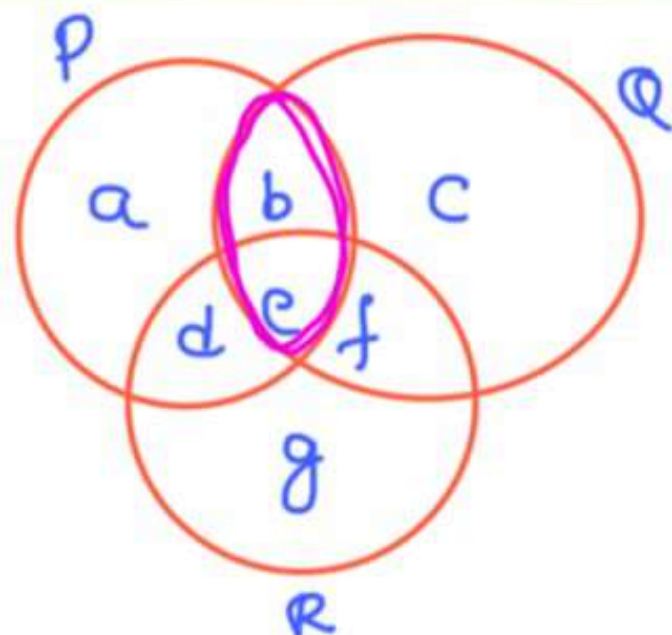
$$P = a, b$$

$$Q = b, c$$

$$P \cap Q = b$$

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

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



$$P = a, b, d, e$$

$$Q = b, c, e, f$$

$$R = d, e, f, g$$

$$P \cap Q = b, e$$

$$Q \cap R = e, f$$

$$P \cap R = d, e$$

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

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

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

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

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

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

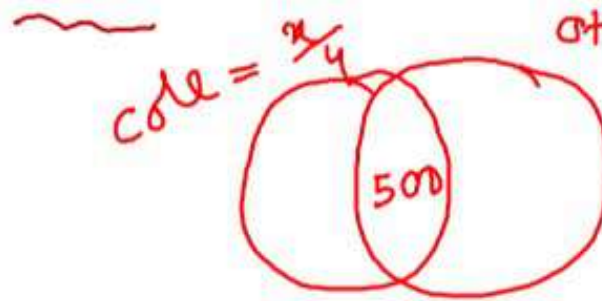
$$P \cap Q \cap R = e$$

$\mathcal{M} = ?$

In an engineering college of 10,000 students, 1,500 like neither their core branches nor other branches. The number of students who like their core branches is  $\frac{1}{4}$ th of the number of students who like other branches. The number of students who like both their core and other branches is 500. The number of students who like their core branches is

- ☒ A] 1,800
- (B) 3,500
- (C) 1,600
- (D) 1,500

$$\begin{array}{r} 10,000 \\ 1,500 \\ \hline 8,500 \end{array}$$



$$\begin{aligned} n(c \cup other) &= n(c) + n(other) \\ &\quad - n(c \cap o) \end{aligned}$$

$$8500 = \frac{x}{4} + x - 500$$

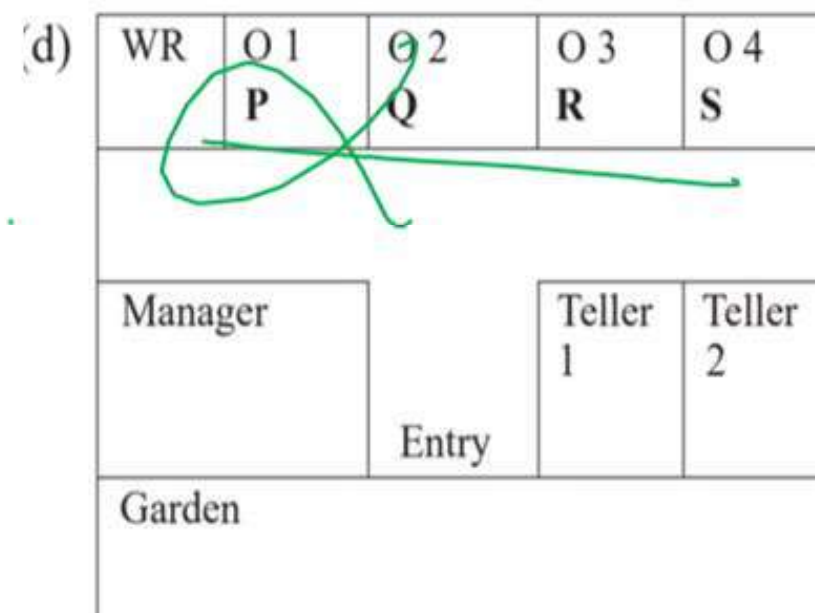
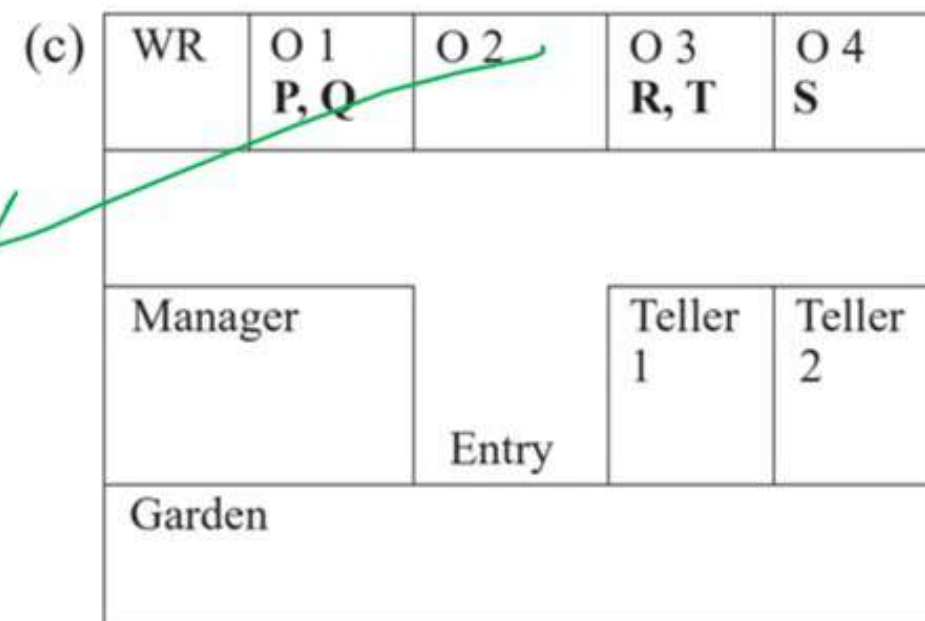
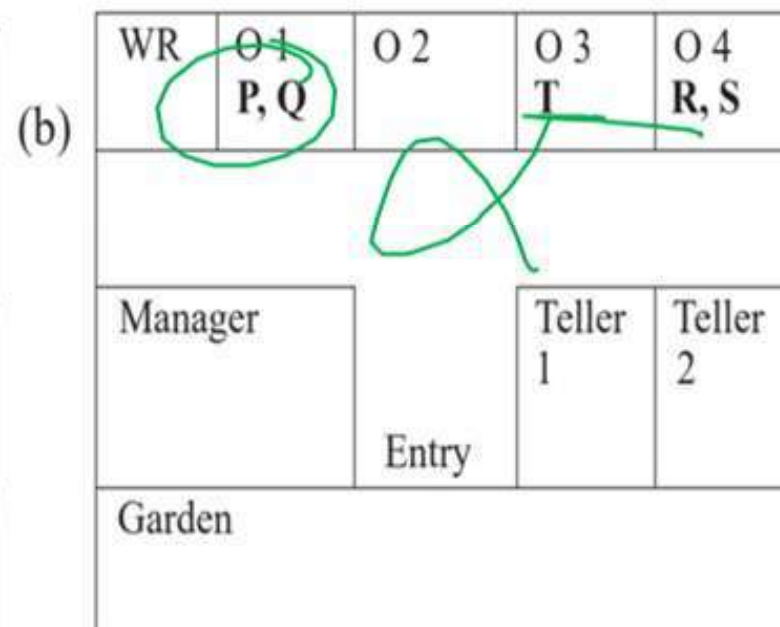
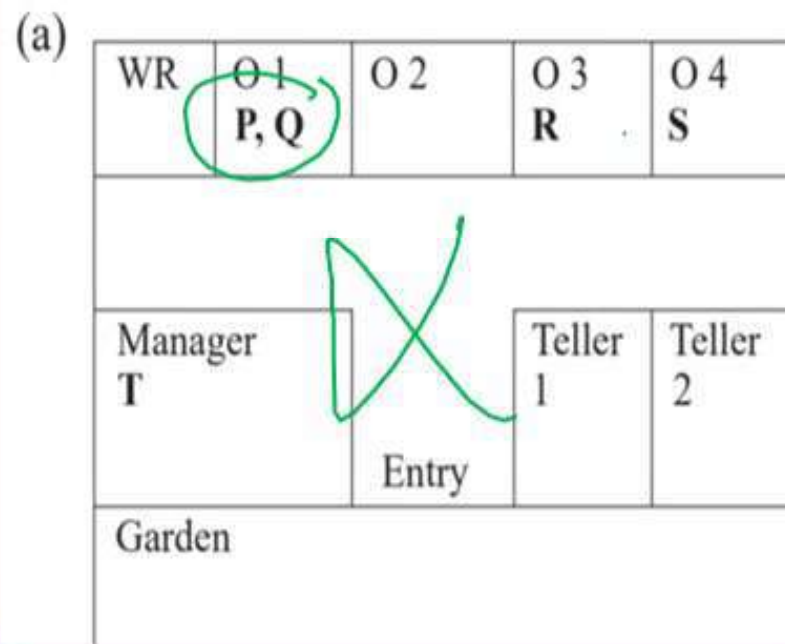
$$\frac{18}{9} \frac{10000}{1000} = \frac{5x}{4}$$

$$\frac{x}{4} = 1800$$

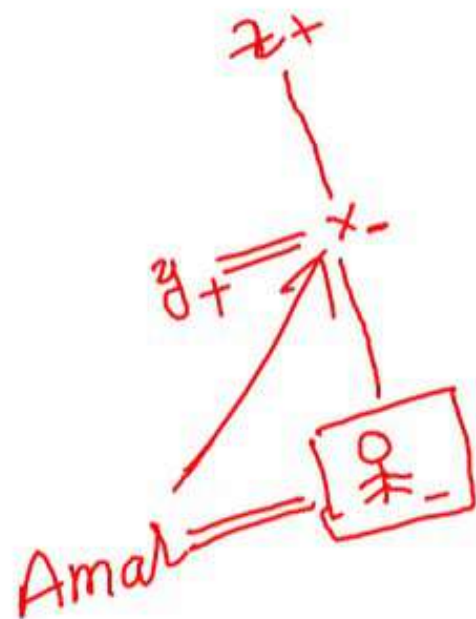


Five people P, Q, R, S and T work in a bank. P and Q don't like each other but have to share an office till T gets a promotion and moves to the big office next to the garden. R, who is currently sharing an office with T wants to move to the adjacent office with S, the handsome new intern. Given the floor plan, what is the current location of Q, R and T? (O = Office, WR = Washroom)

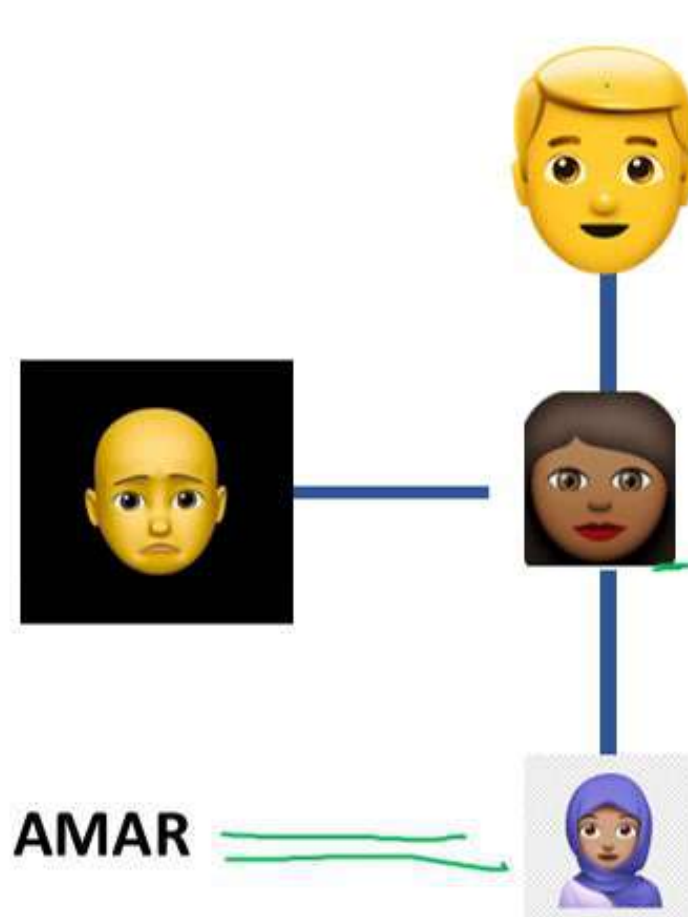
*PQ, RS*







Q. Pointing to Girl in the photograph, Amar said  
“ Her mother’s brother is the only son of my  
mother’s father” How is the Girl’s mother  
related to Amar?

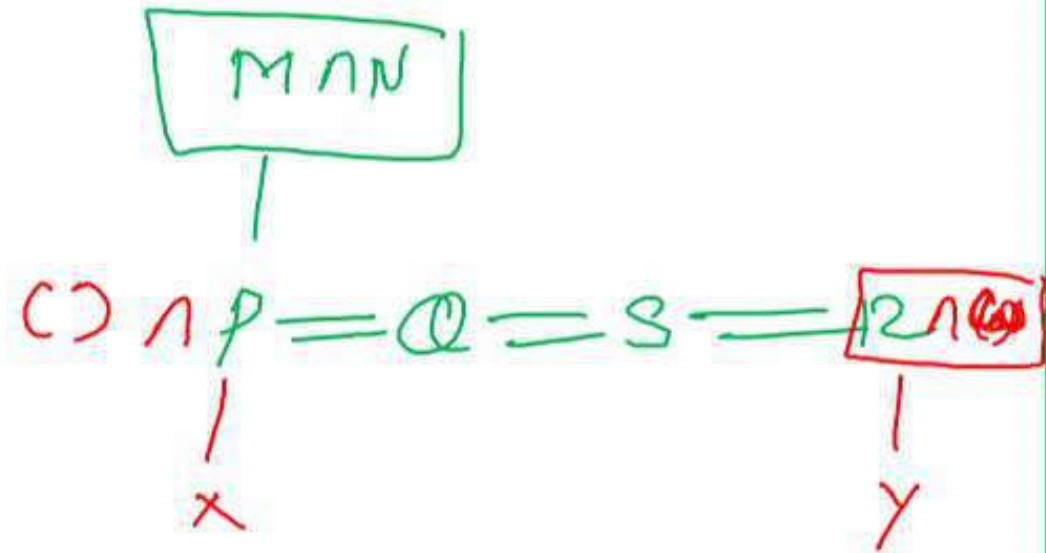


- ~~a) Mother~~
- b) Sister
- c) cousin
- d) Grand mother

M and N had four children P, Q, R and S. Of them, only P and R were married. They had children X and Y respectively. If Y is a legitimate child of W, which one of the following statements is necessarily FALSE?

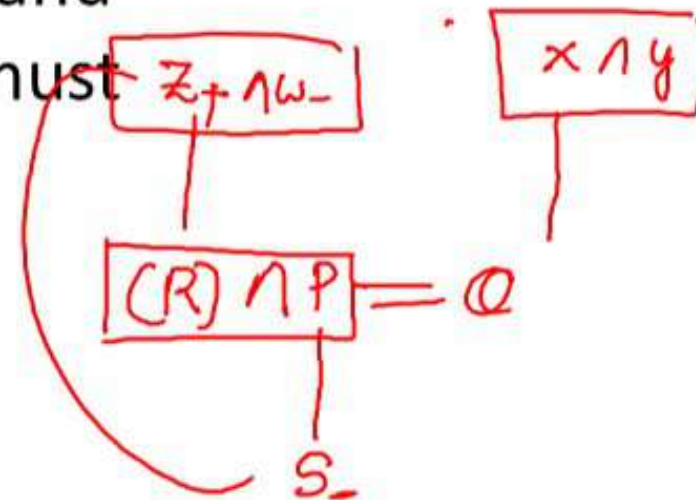
- ~~(a) W is the wife of P~~
- (b) W is the wife of R
- (c) M is the grandmother of Y
- (d) R is the father of Y

legal



Each of P, Q, R, S, W, X, Y and Z has been married at most once. X and Y are married and have two children P and Q. Z is the grandfather of the daughter S of P. Further, Z and W are married and are parents of R. Which one of the following must necessarily be FALSE?

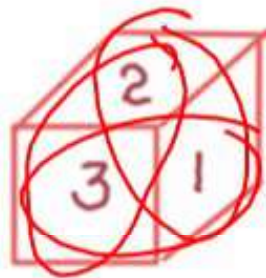
- (a) X is the mother-in-law of R. ●
- ~~(b) P and R are not married to each other.~~
- (c) P is the son of X and Y. ●
- (d) Q can not be married to R. ●





## STANDARD DICE

- > ADJACENT SURFACES SUM DOES NOT EQUAL TO 7 THEN OPPOSITE SURFACES SUM SHOULD BE 7
- > SUCH TYPE OF DICE IS CALLED STANDARD DICE

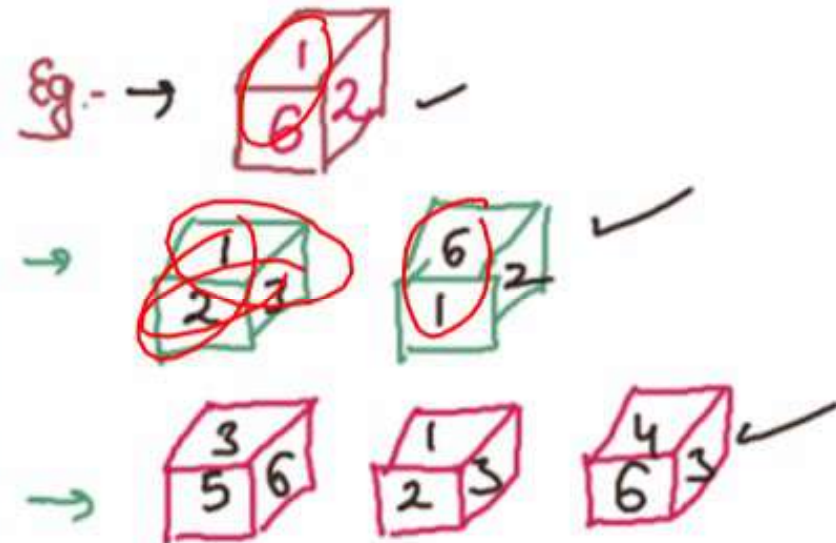


2-5  
3-4  
1-6



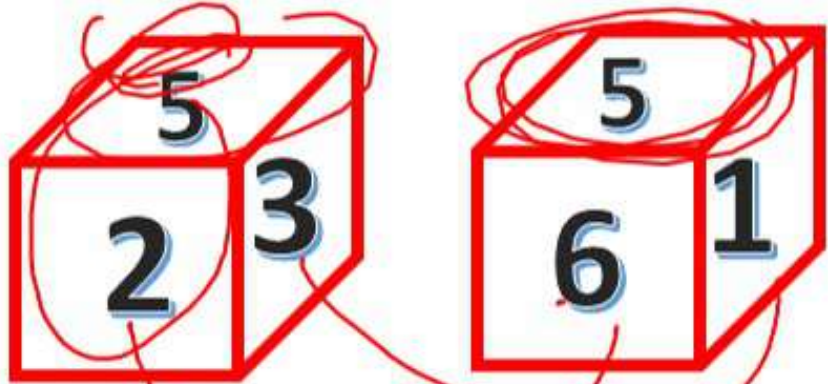
## GENERAL DICE

- > ONE OF THE ADJACENT SURFACES SUM VIEW IS 7
- > SUCH TYPE OF DICE IS CALLED GENERAL DICE





Q. Which number is in opposite plane of 3?



~~(a) 1~~

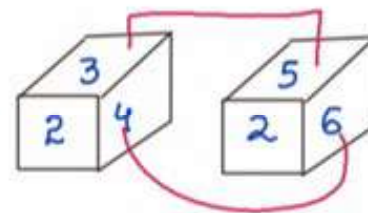
(b) 4

(c) 6

(d) 5

For identify the opposite surface of General dice:-

APTI RAJESH



3-5

4-6

2-1

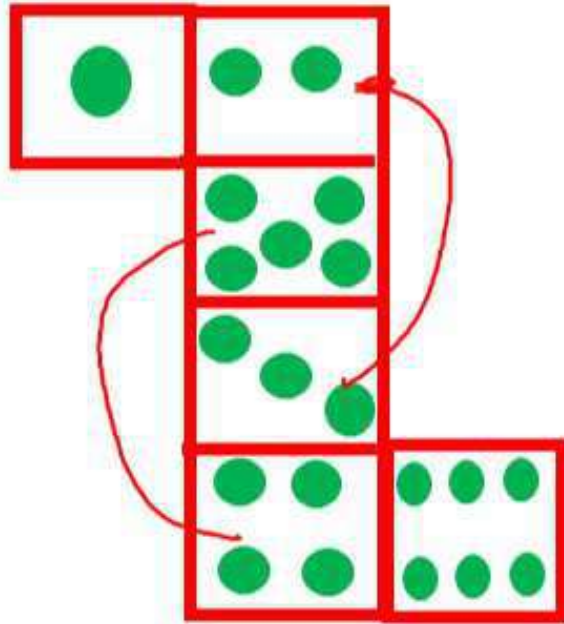
we have 1-common number and also same surface. then

corresponding numbers are called opposite surface.

and also remaining no is called opposite of common number.



Q. When the following figure is folded to form a cube, how many dots would lie opposite the face bearing five dots?



(a) 1

(b) 2

~~(c) 4~~

(d) 6

Q. In a certain code language 'JOURNAL' is written as 'MRXUQDO', how will 'TRAINING' be written in the same code language?

- Handwritten calculations for the code language:
- $$\begin{array}{r} 10 \\ 20 \ 14 \ 9 \\ +3 \\ \hline 12 \\ \textcircled{2} \end{array}$$
- Options:
- (a) WVDHRLQJ
  - (b) ~~WUDLQLQJ~~
  - (c) WUDKQLQJ
  - (d) ~~WUCLQLQJ~~

Q] in code language

BOOK = 172

PEN = 105

what is code for "NIB"?

- ~~A] 75~~
- B] 50
- C] 60
- D] 70

Sum x no of  
letter

$$\rightarrow (2 + 15 + 15 + 11)$$

$$43 \times 4 = 172$$

$$35 + 7 = 105$$

N I B

14

9

2

$$\xrightarrow{\quad} \textcircled{25} \times 3 = 75$$



clocks

2  
180  
90

$$\theta = \left| \frac{11}{2} m - 30h \right|$$

$m = \text{min}$   
 $h = \text{hours}$

$$\theta = \left| \frac{11}{2} m - 30h \right|$$

2  
2

# DATA INTERPRETATION

$$\text{PERCENTAGE INCREASE/DECREASE} = \frac{\text{DIFFERENCE}}{\text{ORIGINAL}} \times 100$$

$$\text{AVG} = \frac{\text{SUM OF OBS}}{\text{NUM OF OBS}}$$

$$\text{RATIO} = A : B$$

$$\% \text{ OF } X, \text{ IN } Y = \frac{X}{Y} \times 100$$

MAXIMUM, AND MINIMUM

CONVERSION

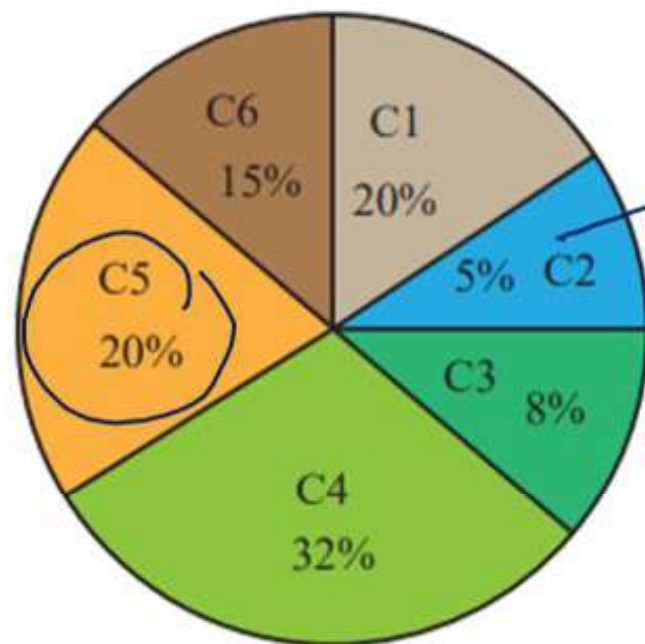
$$\frac{1500 - 1000}{100}$$

depends up on  
given  
Information



The distribution of employees at the rank of executives, across different companies C1, C2, ....., C6 is presented in the chart given above. The ratio of executives with a management degree to those without a management Degree in each of these companies is provided in the table above. The total number of executives across all companies is 10,000. The total number of management degree holders among the executive in companies C2 and C5 together is

| Company | Ratio |
|---------|-------|
| C1      | 3:2   |
| C2      | 1:4   |
| C3      | 5:3   |
| C4      | 2:3   |
| C5      | 9:1   |
| C6      | 3:4   |



$$C_2 = 10,000 \times \frac{5}{100} \rightarrow 500$$

$$C_5 = \frac{20}{100} \times 10,000 \Rightarrow 2000$$

with degree

$$\frac{1}{5} \times 500 = 100$$

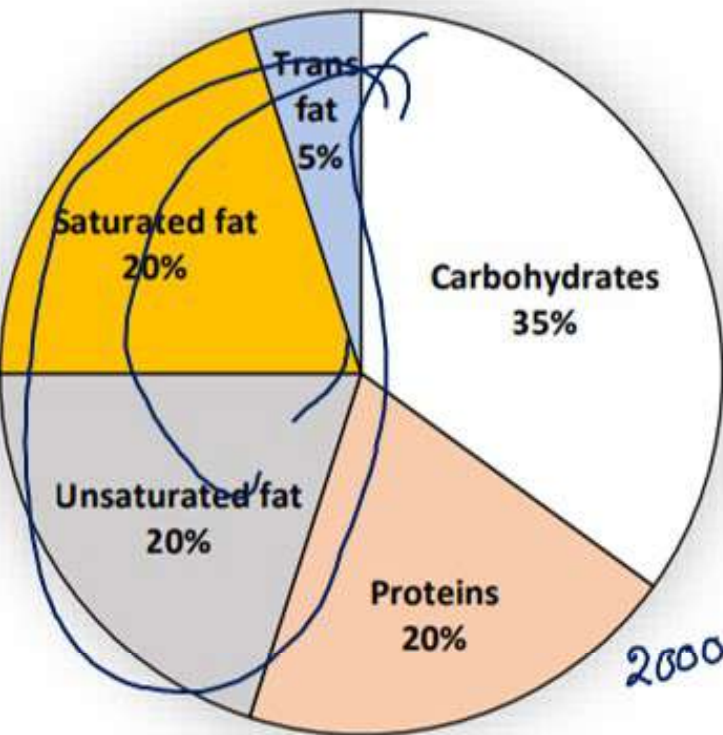
$$\frac{9}{10} \times 2000 = 1800$$

$$C_2 + C_5 \rightarrow \underline{\underline{1900}}$$

- (a) 225   (b) 600   ~~(c) 1900~~   (d) 2500

The pie chart presents the percentage contribution of different macronutrients to a typical 2,000 kcal diet of a person.

Macronutrient energy contribution



The total fat (all three types), in grams, this person consumes is?

- (A) 44.4 (B) 77.8 (C) 100 (D) 3,600

The typical energy density (kcal/g) of these macronutrients is given in the table

| Macronutrient   | Energy density (kcal/g) |
|-----------------|-------------------------|
| Carbohydrates   | 4 kcal/g                |
| Proteins        | 4 g                     |
| Unsaturated fat | 9                       |
| Saturated fat   | 9                       |
| Trans fat       | 9                       |

27 kcal → 3gm  
900 → ? (100g)

900

9 k.cal → 1 gram  
900 kcal → ?

$$\frac{900}{9} = 100 \text{ g}$$



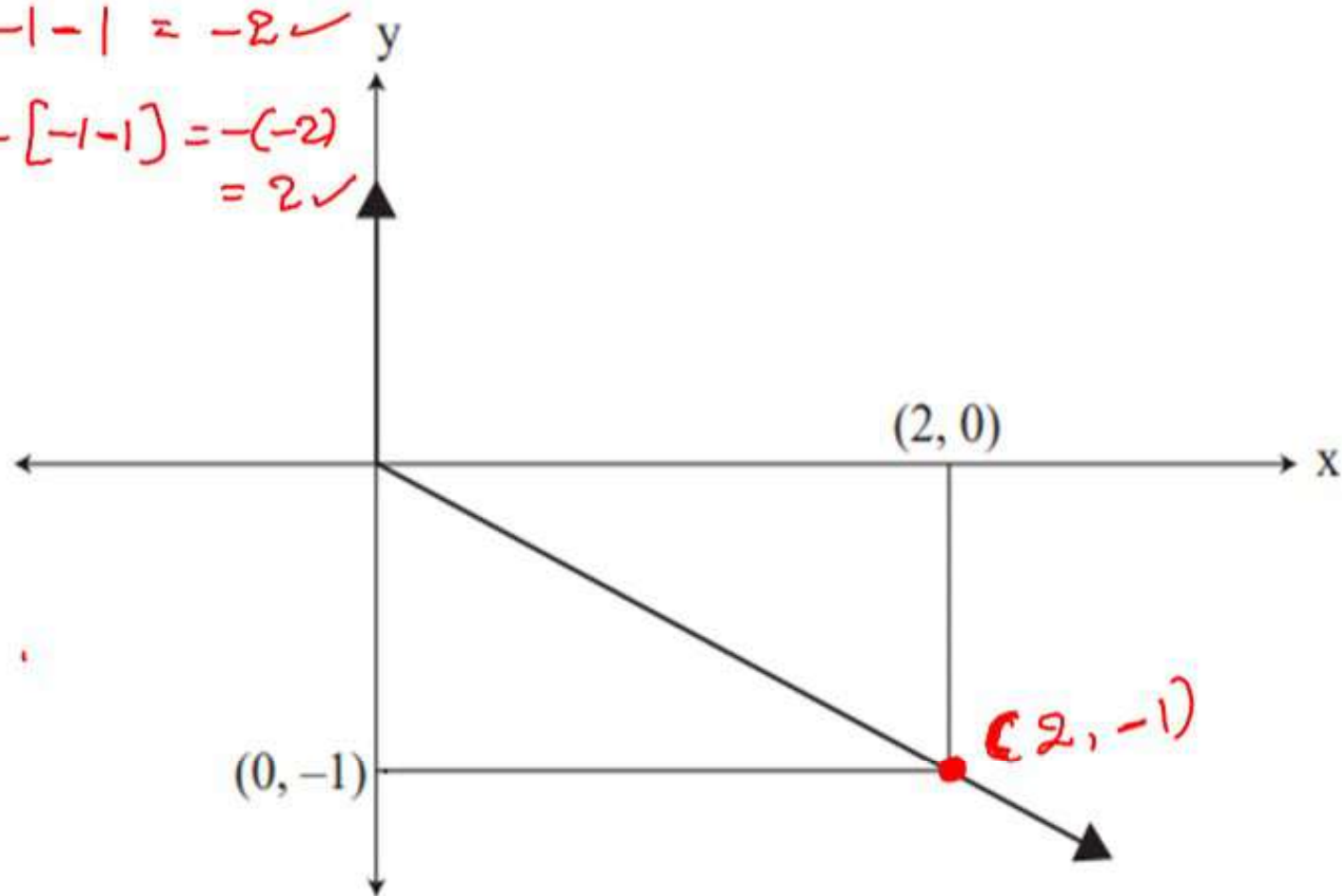
Choose the most appropriate equation for the function drawn as thick line, in the plot below.

~~(a)~~  $x = y - |y| \Rightarrow -1 - (1-1) = -1 - 1 = -2 \checkmark$

~~(b)~~  $x = -(y - |y|) \Rightarrow -[-1 - (1-1)] = -[-1 - 1] = -(-2) = 2 \checkmark$

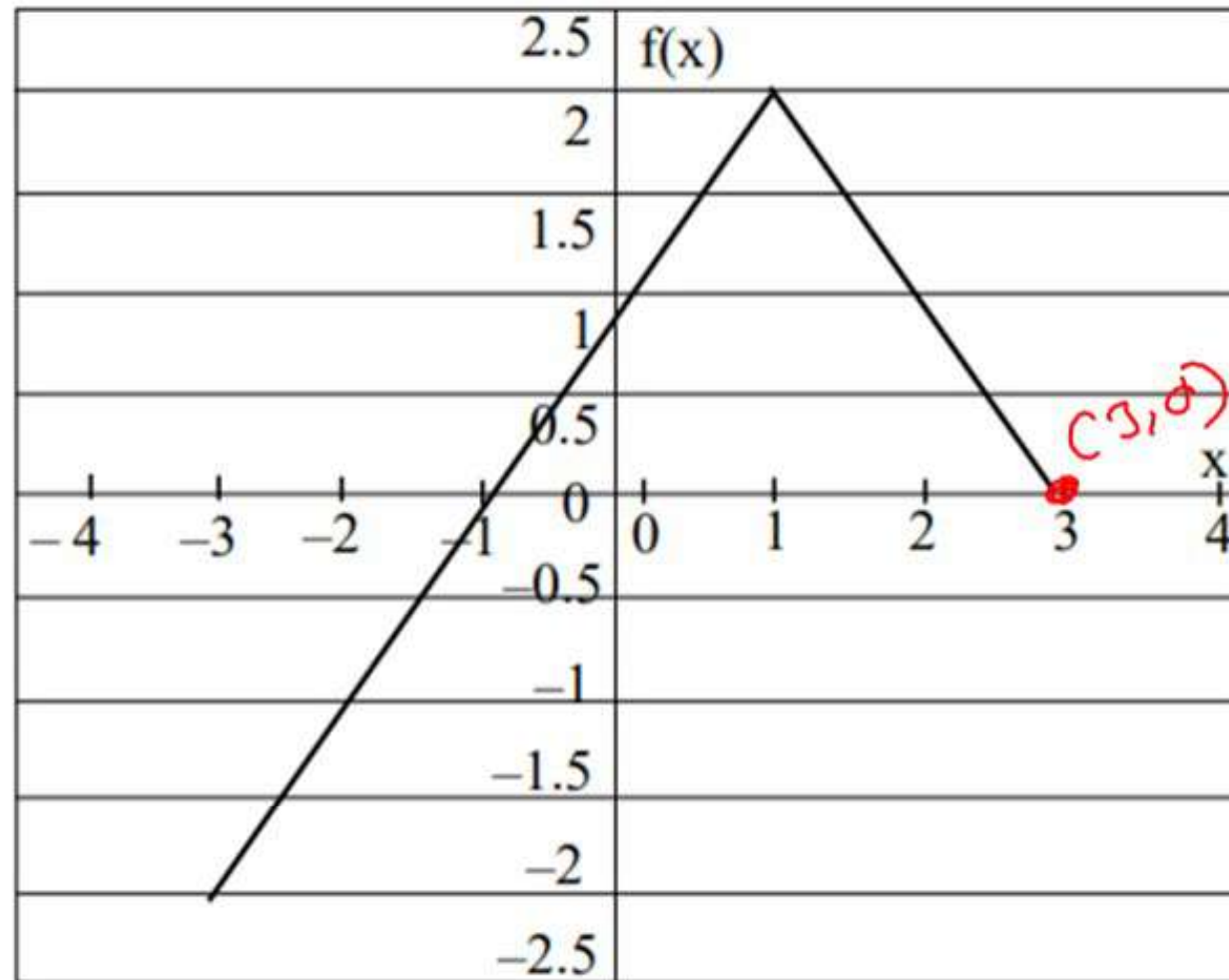
(c) ~~x~~  $y + |y|$

(d) ~~x~~  $= -(y + |y|)$





Choose the correct expression for  $f(x)$  given in the graph.



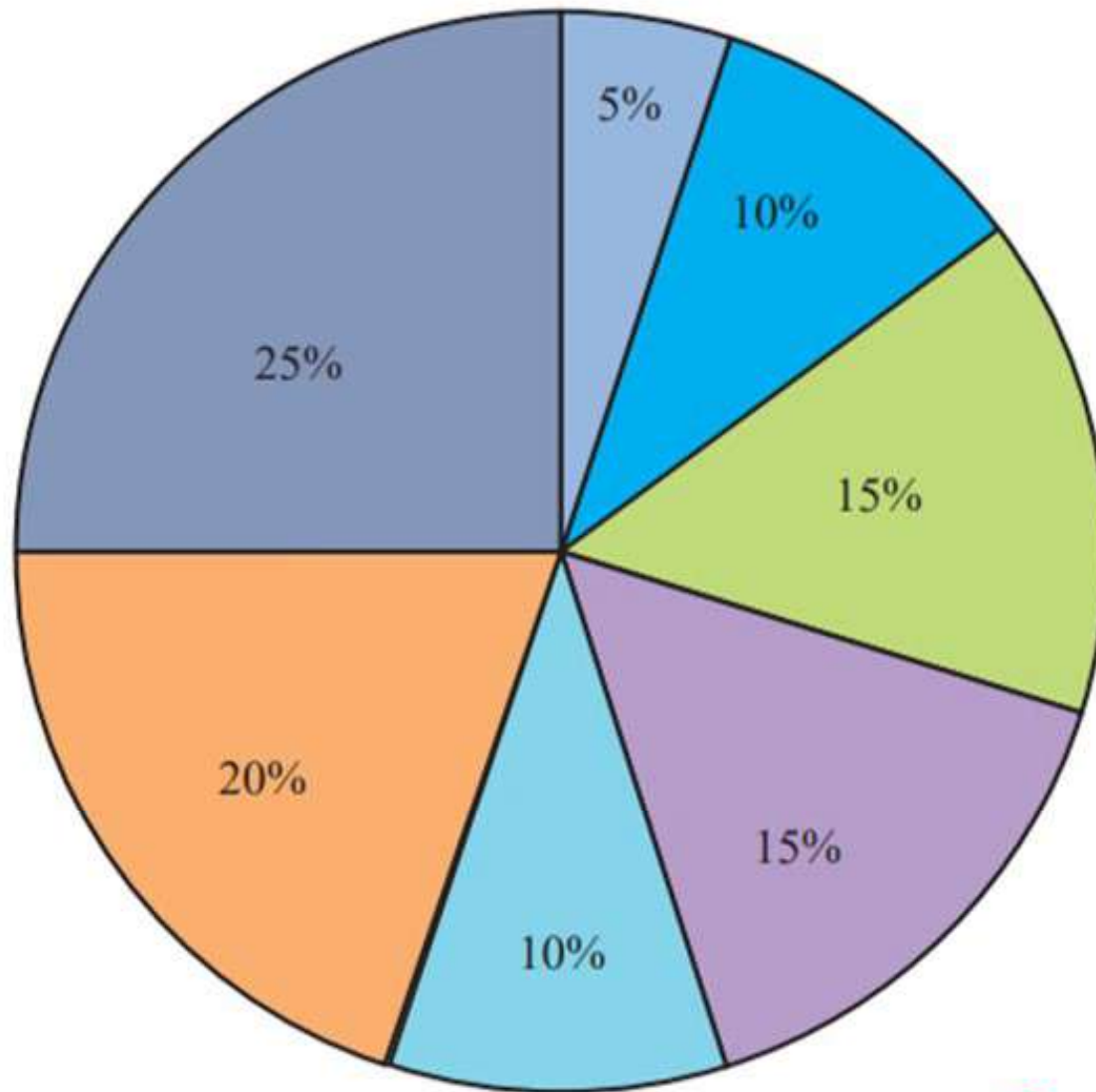
(a)  $f(x) = 1 - |x-1|$

(b)  $f(x) = 1 + |x-1|$

(c)  $f(x) = 2 - |x-1|$

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

The total expenditure of a family, on different activities in a month, is shown in the pie-chart. The extra money spent on education as compared to transport (in percent) is \_\_\_\_\_. (GATE\_20-CE)



Health (5%)

Transport (10%)

Household Items (15%)

Education (15%)

Leisure (10%)

House rent (20%)

Other (25%)

$$\begin{aligned} & \frac{5\%}{10\%} \times 100 \\ &= 50\% \end{aligned}$$

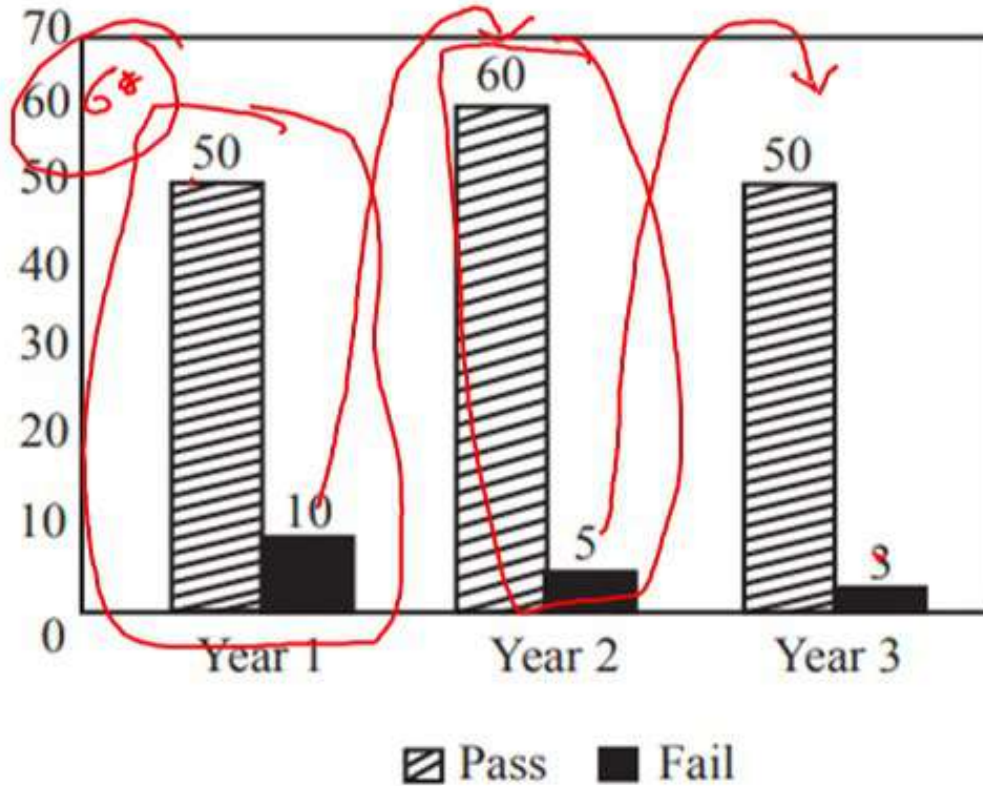
(a) 5

(b) 33.3

~~(c) 50~~

(d) 100

$$\text{2nd yr} \rightarrow (60 + 5) - 10 = 55$$



$$\begin{aligned} &3^{\text{rd}} \text{ yr} \\ &= 50 + 3 - 5 \\ &= 48 \end{aligned}$$

The number of students passing or failing in an exam for a particular subject is presented in the bar chart above. Students who pass the exam cannot appear for the exam again. Students who fail the exam in the first attempt must appear for the exam in the following year. Students always pass the exam in their second attempt.

The number of students who took the exam for the first time in the year 2 and the year 3 respectively, are \_\_\_\_\_.

(a) 65 and 53

(b) 60 and 50

(c) 55 and 53

(d) 55 and 48



# **SPATIAL APTITUDE**

***MIRROR IMAGE & WATER IMAGES***

***PAPER FOLDING***

***PAPER FOLDING & PUNCHED***

***FIGURE SERIES***

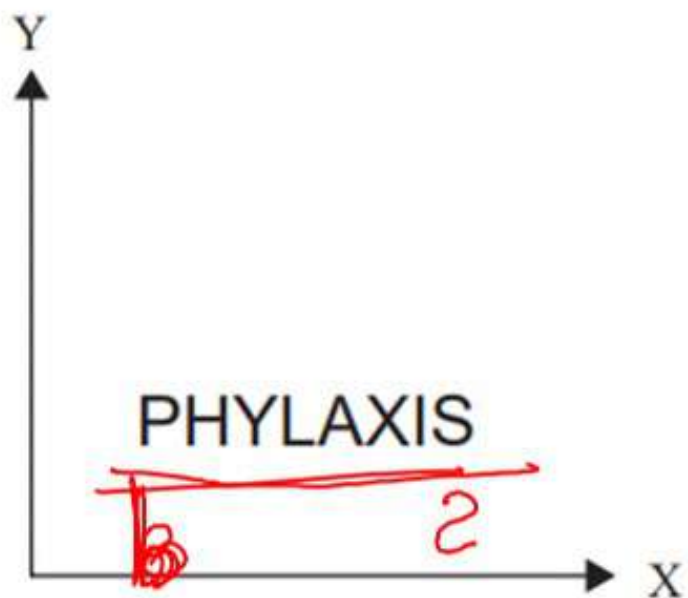
***ANALOGY***

***CLASSIFICATION***

***MATRIX***

***ROTATION***

***DIAGRAMATIC LOGICAL THINKING***



The mirror image of the above text about the X-axis is

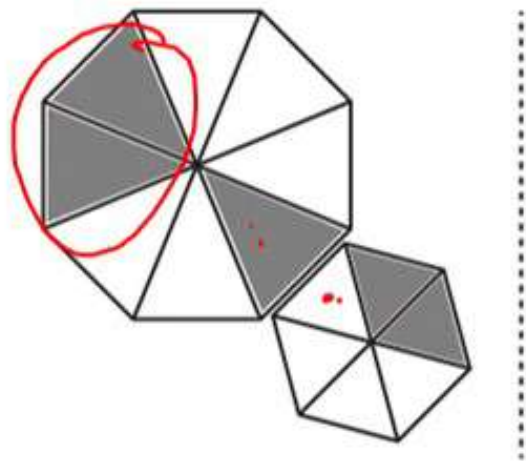
(a) ~~PHYLAXIS~~

(b) ~~PHYLAXIS~~

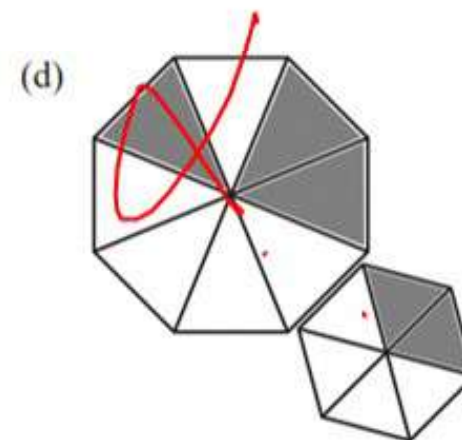
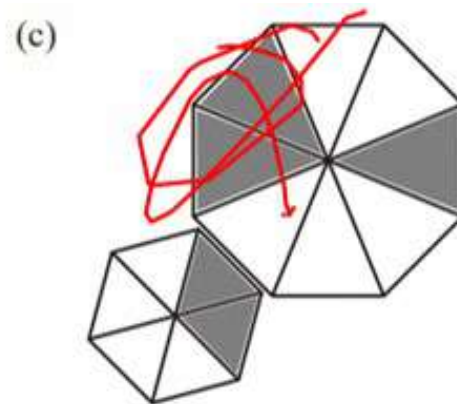
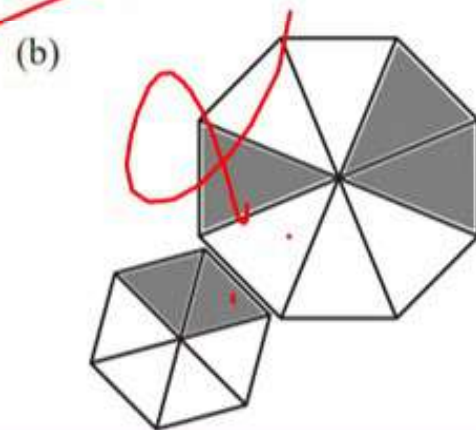
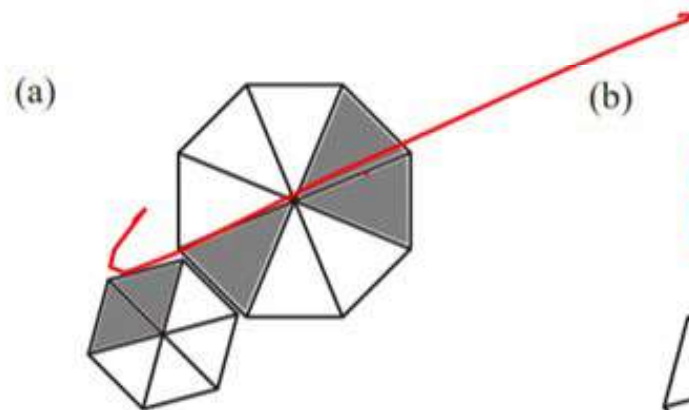
(c) ~~PHYLAXIS~~

(d) ~~PHYLAXIS~~

For the picture shown above, which one of the following is the correct picture representing reflection with respect to the mirror shown as the dotted line?

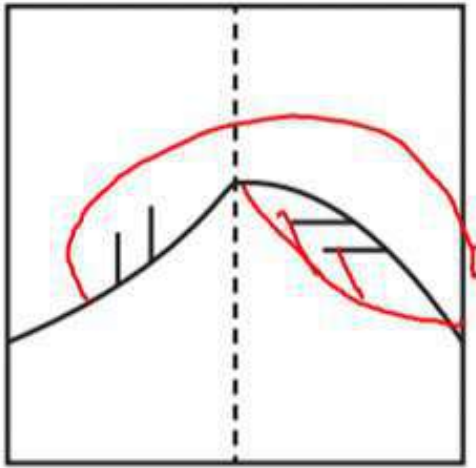


QUESTION

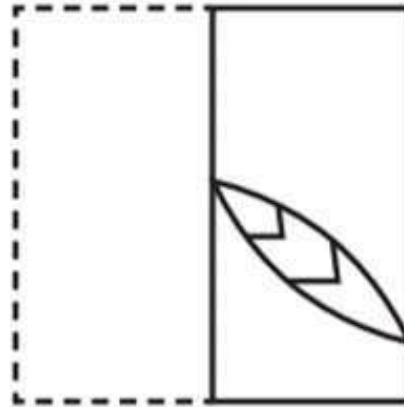




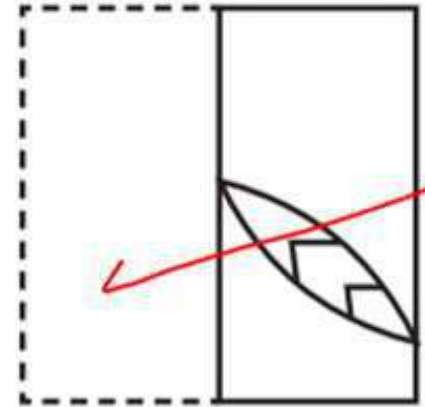
A transparent square sheet shown above is folded along the dotted line. The folded sheet will look like \_\_\_\_\_.



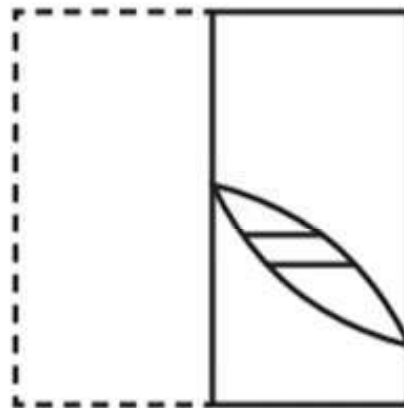
(a)



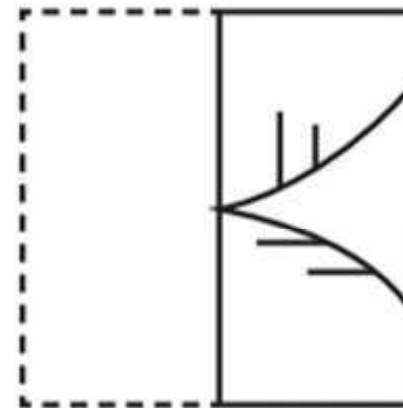
(b)



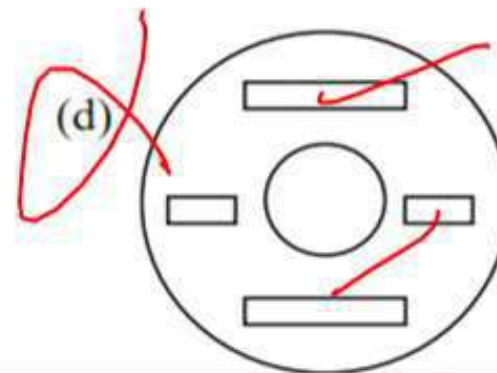
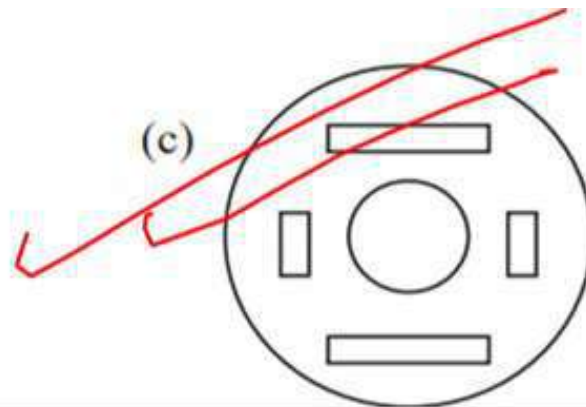
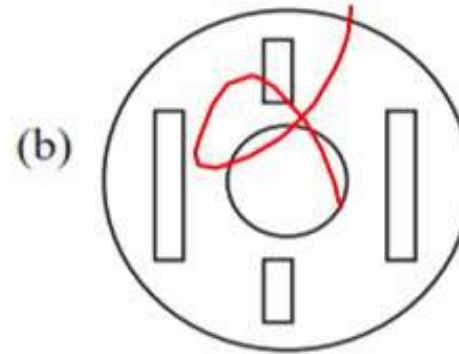
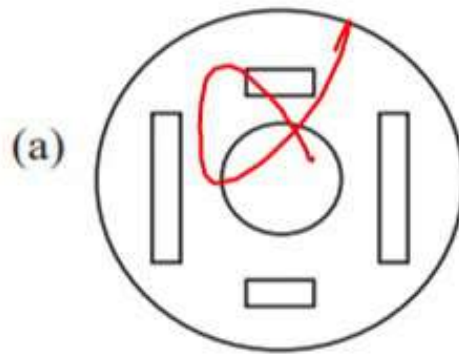
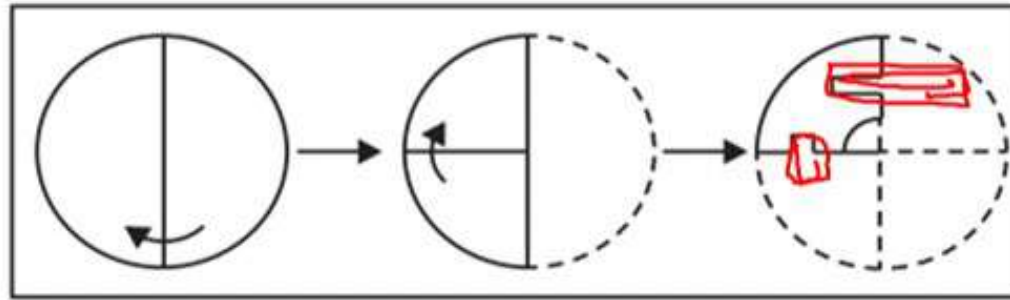
(c)



(d)

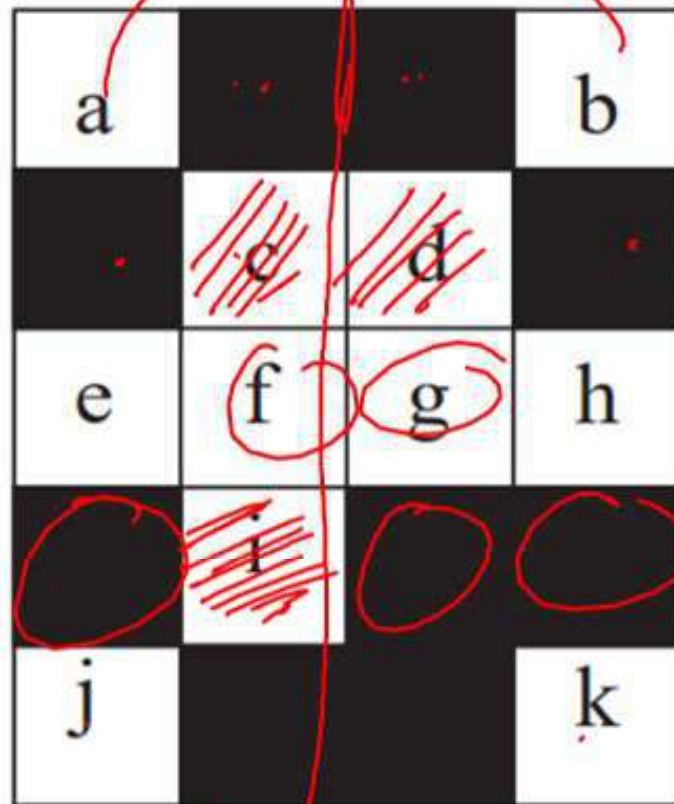


A circular sheet of paper is folded along the lines in the directions shown. The paper, after being punched in the final folded state as shown and unfolded in the reverse order of folding, will look like \_\_\_\_\_. (GATE\_2021)



A line of symmetry is defined as a line that divides a figure into two parts in a way such that each part is a mirror image of the other part about that line.

The figure below consists of 20 unit squares arranged as shown. In addition to the given black squares, upto 5 more may be coloured black. Which one among the following options depicts the minimum number of boxes that must be coloured black to achieve two lines of symmetry? (The figure is representative) (GATE\_2023)



(a) ~~d~~

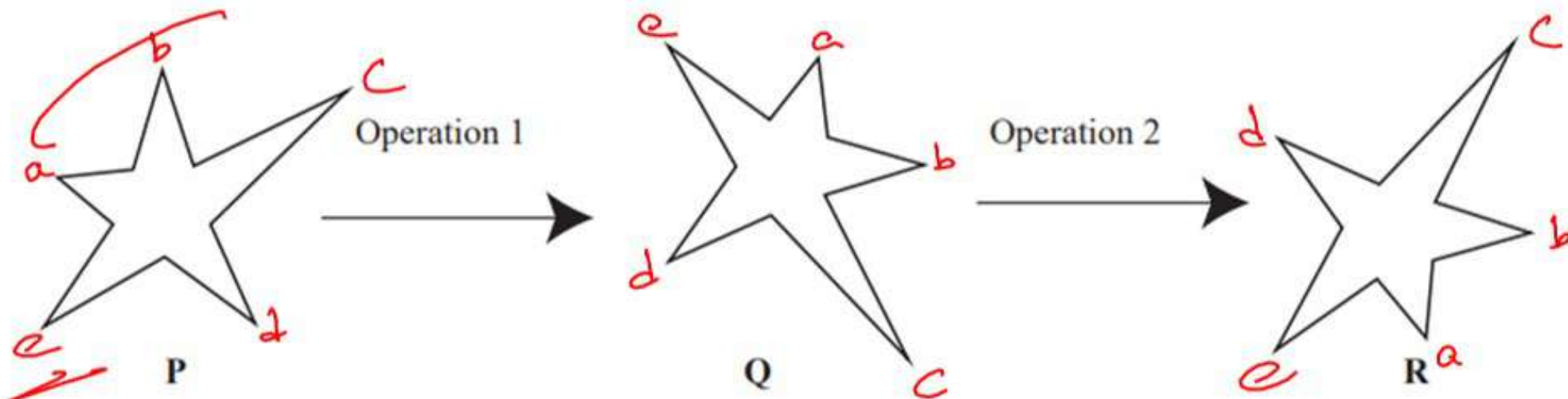
~~(b) c, d, i~~

~~(c) c, i~~

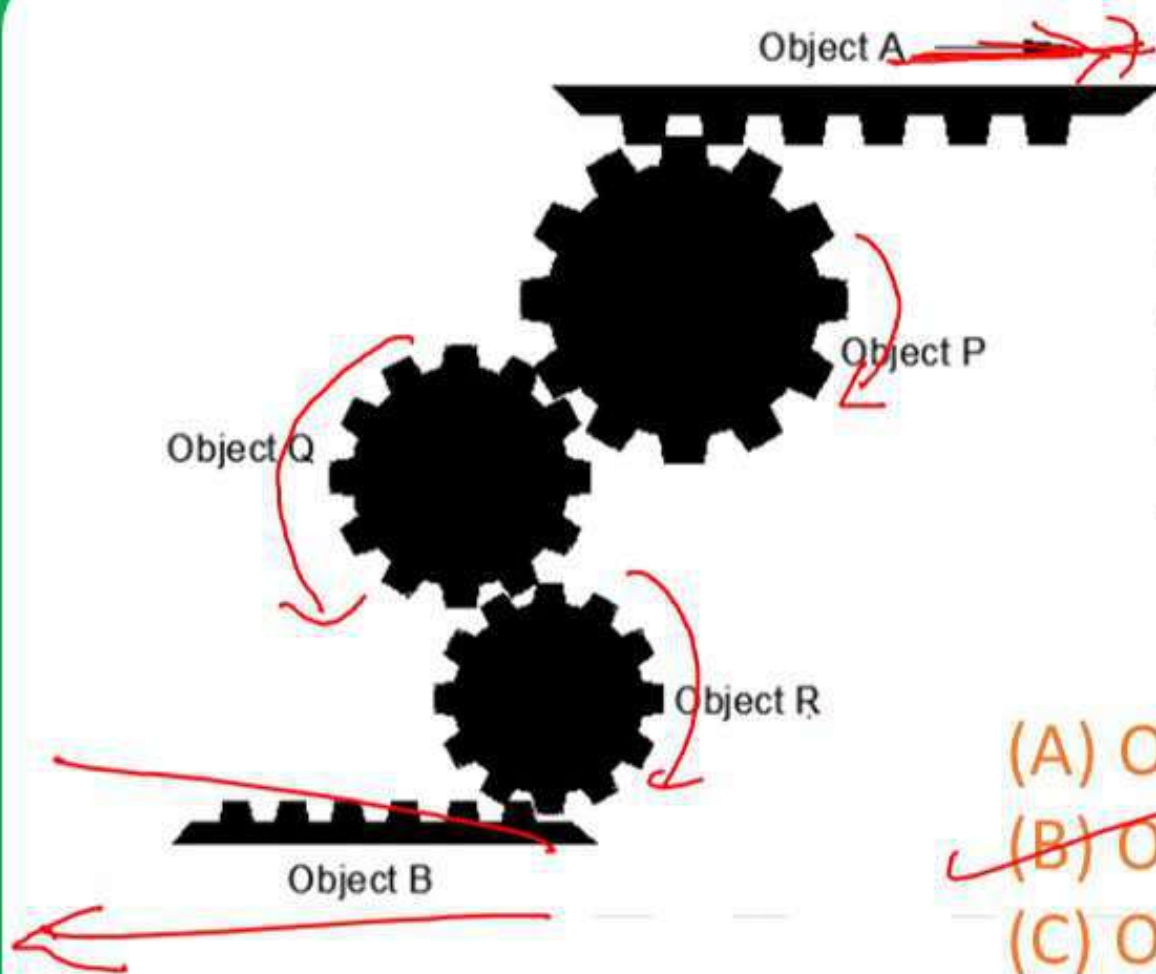
(d) c, d, i, f, g



Which one of the options best describes the transformation of the 2-dimensional figure P to Q, and then to R, as shown? (GATE\_2023)



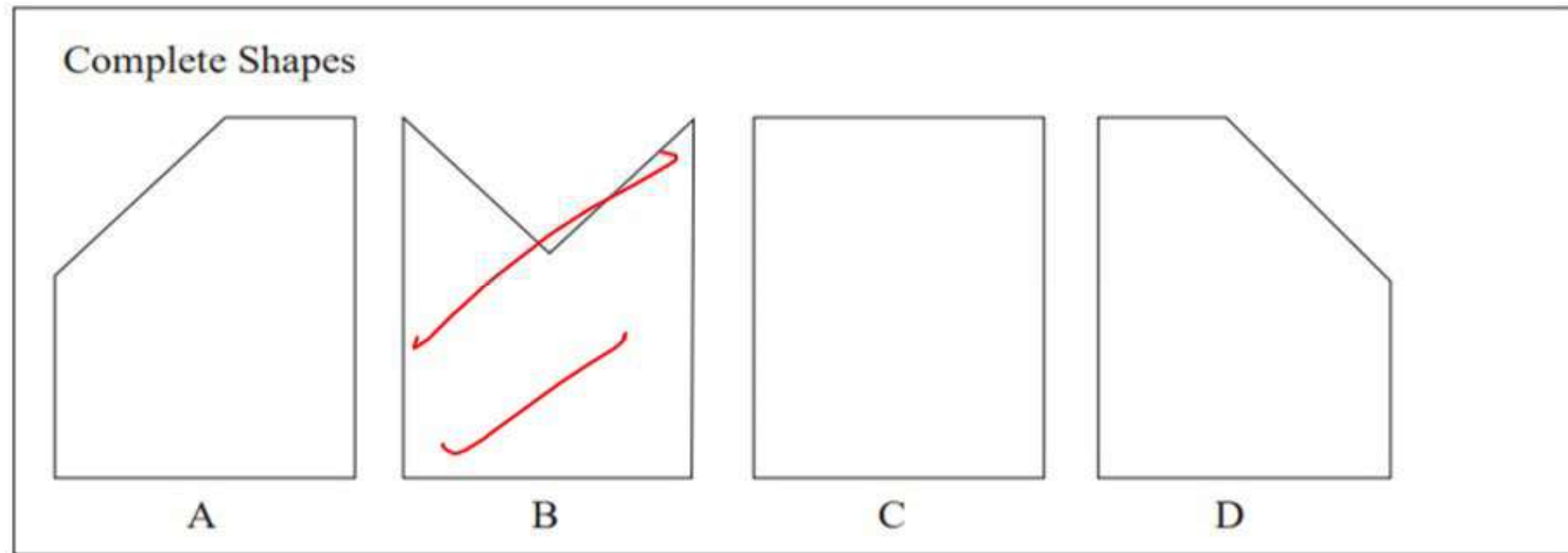
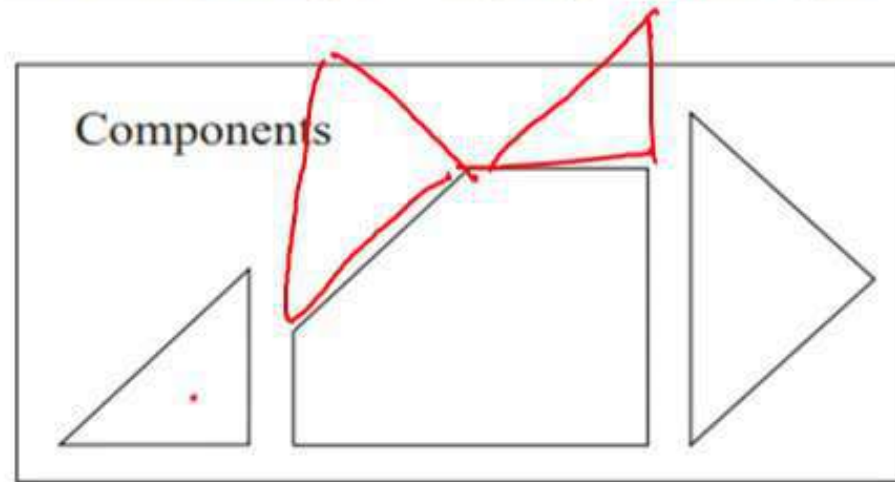
- (a) Operation 1: A clockwise rotation by  $90^\circ$  about an axis perpendicular to the plane of the figure. Operation 2: A reflection along a horizontal line.
- (b) Operation 1: A counter clockwise rotation by  $90^\circ$  about an axis perpendicular to the plane of the figure. Operation 2: A reflection along a horizontal line.
- (c) Operation 1: A clockwise rotation by  $90^\circ$  about an axis perpendicular to the plane of the figure. Operation 2: A reflection along a vertical line.
- (d) Operation 1: A counter clockwise rotation by  $180^\circ$  about an axis perpendicular to the plane of the figure. Operation 2: A reflection along a vertical line.



The assembly shown below has three teathed circular objects (Pinions) and two teathed flat objects (Racks), which are perfectly mating with each other. Pinions can only rotate clockwise or anti-clockwise staying at its own center. Racks can translate towards the left ( $\leftarrow$ ) or the right ( $\rightarrow$ ) direction. If the object A (Rack) is translating towards the right ( $\rightarrow$ ) direction, the correct statement among the following is

- (A) Object B translates towards the right direction.
- ~~(B) Object B translates towards the left direction.~~
- (C) Object R rotates in the anticlockwise direction.
- (D) Object Q rotates in the clockwise direction.

Find out which of the figures A), B), C) and D) can be formed from the pieces given in figure (X).

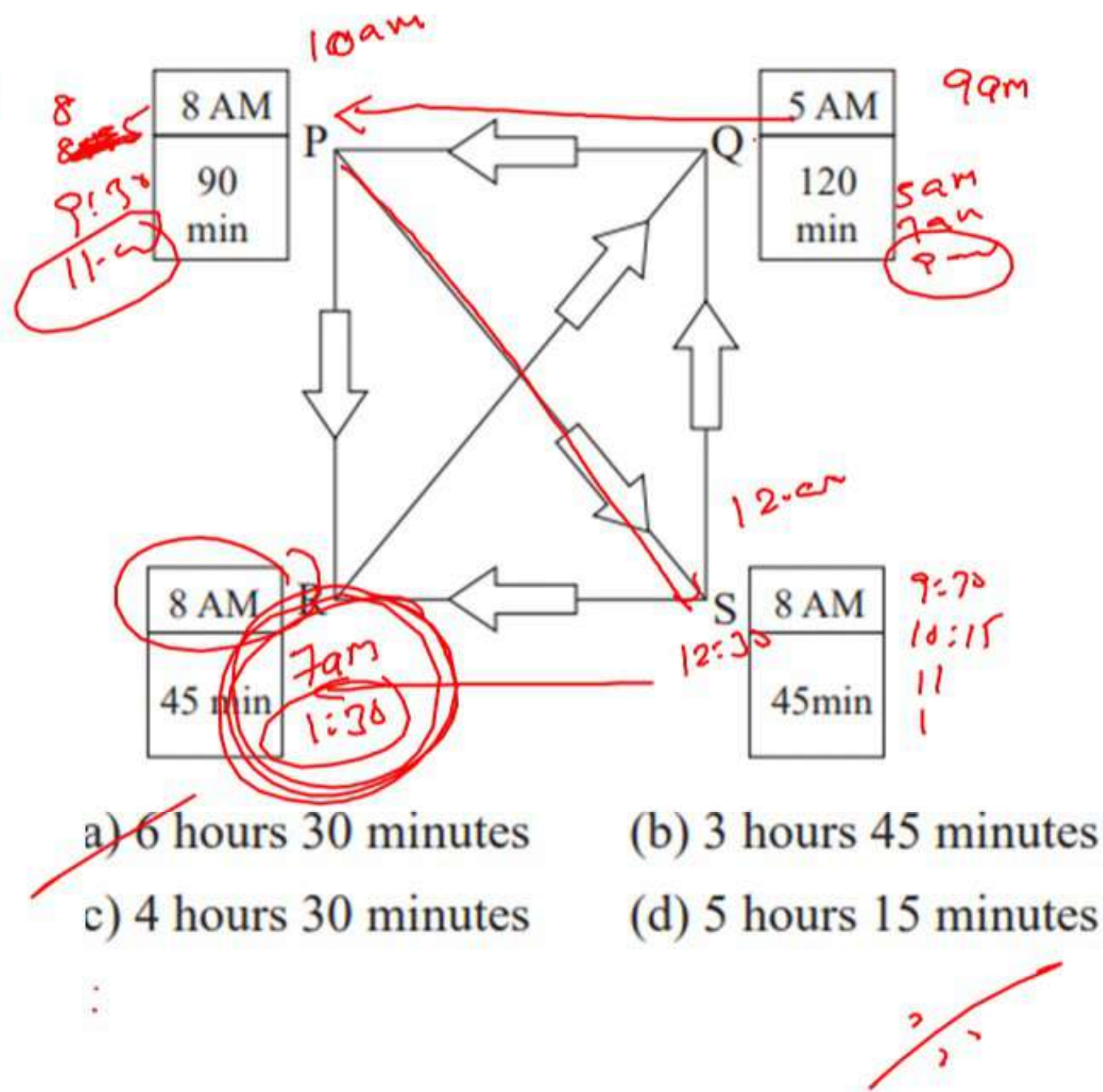






An ant is at the bottom-left corner of a grid (point P) as shown above. It aims to move to the top-right corner of the grid. The ant moves only along the lines marked in the grid such that the current distance to the top-right corner strictly decreases. Which one of the following is a part of a possible trajectory of the ant during the movement?

Four cities P, Q, R and S are connected through one way routes as shown in the figure. The travel time between any two connected cities is one hour. The boxes beside each city name describe the starting time of first train of the day and their frequency of operation. For example, from city P, the first trains of the day start at 8 AM with a frequency of 90 minutes to each of R and S. A person does not spend additional time at any city other than the waiting time for the next connecting train. If the person starts from R at 7 AM and is required to visit S and return to R, what is the minimum time required?



# SIMPLIFICATIONS

*INDICES*

*SURDS*

*PROGRESSIONS*

*NUMBER SYSTEM*

*LOG*

*QUADRATIC EQUATIONS*



For non-negative integers,  $a, b, c$ , what would be the value of  $a + b + c$ , if  $\log a + \log b + \log c = 0$ ?

(GATE\_18)

(a) 3

(c) 0

(b) 1

(d) -1

$$1 + 1 + 1$$

3

1

For integers,  $a, b$  and  $c$ , what would be the minimum and maximum values respectively of  $a+b+c$  if  $\log |a| + \log |b| + \log |c| = 0$ ?

(GATE\_18)

~~(a) -3 and 3~~

(c) -1 and 3

(b) -1 and 1

(d) 1 and 3

$$a = \pm 1$$

$$b = \pm 1$$

$$c = \pm 1$$

$$-3, +3$$

Given that  $\frac{\log P}{(y-z)} = \frac{\log Q}{(z-x)} = \frac{\log R}{(x-y)} = 10$  for  $x \neq y \neq z$ , what is the value of the product  $PQR$ ?

LSAT

$$\log P = 10(y-z)$$

$$\log Q = 10(z-x)$$

$$\log R = 10(x-y)$$

$$\log P + \log Q + \log R = 10(y-z + z-x + x-y)$$

$$\log PQR = 0$$

$$10 \Rightarrow PQR = 10^0$$

$$PQR = 1$$

What will be the sum to  $n$  terms of the series

$8 + 88 + 888 + \dots?$   $\Rightarrow 8(1 + 11 + 111 + \dots + n)$  **(GATE)**

(a)  $8/81 [10^n - 9n]$   $\frac{8}{9}(8 + 88 + \dots)$

~~(b)  $8/81 [10^{n+1} - 10 - 9n]$~~   $\frac{8}{9} \left( \frac{10(10^n - 1)}{9} - n \right)$

(c)  $8 [10^n - 1 - 10]$

(d)  $8 [10^{n+1} - 10]$



Find the sum to  $n$  terms of the series:  $11 + 103 + 1005 + \dots$  **(GATE)**

(a)  $\frac{(10)}{9}(10^n - 1) + 1$

(b)  $\frac{(10)}{9}(10^n - 1) + n$

~~(c)  $\frac{(10)}{9}(10^n - 1) + n^2$~~

(d)  $\frac{(10)}{11}(10^n + 1) + n^2$

$(10+1) + (10^2+3) + \dots \Rightarrow (10+10^2+\dots) + (1+3+\dots)$   
 $\frac{10(10^n-1)}{9} + n^2$

A number consists of two digits. The sum of the digits is 9. If 45 is subtracted from the number, its digits are interchanged. What is the number?

(GATE - 2018)

~~(a) 63~~      ~~(b) 72~~  
 $\begin{array}{r} 63 \\ -45 \\ \hline 18 \end{array}$        $\begin{array}{r} 72 \\ -45 \\ \hline 27 \end{array}$

(c) 81

(d) 90

The sum and product of two integers are 26 and 165 respectively. The difference between these two integers is \_\_\_\_\_.

(GATE - 2019)

(a) 3

(b) 6

(c) 2

~~(d) 4~~

The sum of the series  $2^2 + 4^2 + 6^2 + \dots + 20^2$  is \_\_\_\_\_  $\Rightarrow$

(ESE\_2021)

(a) 1040

~~(b) 1540~~

(c) 2540

(d) 3080

$$x + y = 26$$

$$xy = 165$$

$$(x - y) = ?$$

$$\begin{aligned}
 (x - y)^2 &= (x + y)^2 - 4xy \\
 &= 26^2 - 4(165) \\
 &= 676 - 660 \\
 &= 16
 \end{aligned}$$

$$x - y = 4$$

$$\begin{aligned}
 &2^2(1^2 + 2^2 + 3^2 + \dots + 10^2) \\
 &= \frac{4 \cdot 10(10+1)(2(10)+1)}{6}
 \end{aligned}$$

The digit in the unit's place of the product  $3^{\frac{999}{4}} \times 7^{\frac{1000}{4}}$  is  $7 \times 1 = 7$  (GATE\_2023)

- (a) 7 (b) 1 (c) 3 (d) 9

Unit place in  $(26591749)^{\frac{110016}{16}}$  is

(GATE\_20)

- (a) 6 (b) 1 (c) 3 (d) 9

The last digit of  $(2171)^7 + (2172)^9 + (2173)^{11} + (2174)^{13}$  is (CE - 2017)

- (a) 2 (b) 4 (c) 6 (d) 8

The numeral in the units position of  $211^{870} + 146^{127} \times 3^{424}$  is \_\_\_\_\_. (EE\_2016)

The units digit of  $(35)^{87} + (93)^{46}$  is: (GATE\_18)

- (a) 4 (b) 2 (c) 6 (d) None of these



$(27)^4 \Rightarrow 7$  ✓  
 $(36)^6 \Rightarrow 6$  ✓  
 $(8^4)^2 \Rightarrow 6$  ✓

| NUMBER | UNIT DIGITS                     |
|--------|---------------------------------|
| 1      | 1                               |
| 2      | 2, 4, 8, 6                      |
| 3      | 3, 9, 7, 1                      |
| 4      | if power is odd = 4<br>Even = 6 |
| 5      | 5                               |
| 6      | 6                               |
| 7      | 7, 9, 3, 1                      |
| 8      | 8, 4, 2, 6                      |
| 9      | if power is odd = 9<br>Even = 1 |

$$10^1 - 1 + 10^2 - 1 + 10^3 - 1 + \dots \Rightarrow (10^1 - 1) + (10^2 - 1) + \dots + (10^n - 1)$$

$$S_n = \frac{a(r^n - 1)}{r - 1}$$

$$a = f_1$$

$$r = c \cdot r$$

$$\frac{t_2}{t_1} = \frac{t_3}{t_2}$$

$$= (10 + 10^2 + \dots + 10^n) - n$$

$$S_n = \frac{a(r^n - 1)}{r - 1}$$

$$\frac{10(10^n - 1)}{10 - 1} - n$$

$$\frac{t_4}{t_3} \dots$$