

8/8/16

# Reasoning & Aptitude

Gate

$$\begin{aligned} 4Q \times 2\text{marks} &= 8m \\ 1Q \times 1m &= 1m \end{aligned}$$

E.S.E.

R/A

20 marks

(2010-2013) → 9 marks

2014 (M.E.) → 12 marks

2015 ] → 10 marks  
2016 ]

P.S.V. → (20-25) %  
(PSC + state engg. services)

C.S.A.T. → paper II

✓ 100 balls → 99 balls (10gms) each.  
→ 1 ball (9gms) faulty.

What is minimum no. of weighings required on a beam balance so as to find the faulty ball?

locate the faulty ball  
our objective

Sol

$$B.B \rightarrow 3^n$$

$$1 \rightarrow 3^1 \rightarrow 1$$

$$4 \rightarrow 3^2 \rightarrow 2$$

$$10 \rightarrow 3^3 \rightarrow 3$$

$$28 \rightarrow 3^4 \rightarrow 4$$

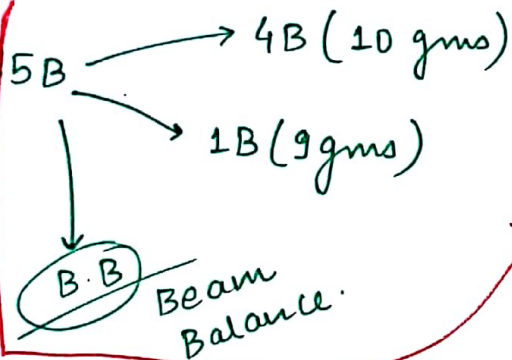
$$82 \rightarrow 3^5 \rightarrow 5 \text{ ✓ Ans.}$$

✓ 100 Balls → 99 balls (10gms) each  
 ↳ 1 ball (9gms) faulty

Minm. no. of weightage req. on a spring Balance.

Sol

always to ensure  
 an answer keeping  
 in mind the  
worst case.



previous  
 qn. (B.B.)

| Spring Balance $2^n$ ✓ |                     |
|------------------------|---------------------|
| answer from 1 ball     | Balls               |
| 2                      | $2^1 \rightarrow 1$ |
| 3                      | $4 \rightarrow 2$   |
| 5                      | $8 \rightarrow 3$   |
| 9                      | $16 \rightarrow 4$  |
| 17                     | $32 \rightarrow 5$  |
| 33                     | $64 \rightarrow 6$  |
| 65                     | $128 \rightarrow 7$ |

✓ 10 Blue / 12 Grey  
 ↳ Dark Room

Min(pair) → 3.

Min(Blue pair) → 14.

✓ Digital Balance → spring Balance.

# CHAPTER 1

## Number System

① Factors :- factors are the set of no.'s which will divide a given no. completely.

$$\begin{array}{r|l} 2 & 72 \\ \hline 2 & 36 \\ \hline 2 & 18 \\ \hline 3 & 9 \\ \hline 3 & 3 \\ \hline \end{array}$$

Factors  $\longleftrightarrow$  Divisors.

examiner denotation.

$$1.72 = 2^3 \times 3^2 = 4 \times 3 = 12 \text{ factors}$$

1, 2, 3, 4, 6, 8, 9, 12, 18, 24, 36, 72

$$120 = 2^3 \times 3^1 \times 5^1 = 4 \times 2 \times 2 = 16 \text{ factors}$$

1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 20, 24, 30, 40, 60, 120

Note :-

$$N = a^p \times b^q \times c^r$$

$$\text{Total factor} = (p+1)(q+1)(r+1)$$

where a, b, c are distinct prime no.'s and p, q and r are natural no.'s.

Q. 10800 =

10800

108

$$(12 \times 9) \rightarrow (3^2)$$

$$(2^2 \times 3)$$

100

$$(5^2 \times 2^2)$$

$$2^4 \times 3^3 \times 5^2$$

$$5 \times 4 \times 3 = 60$$

$$\begin{array}{l} 2^0 \rightarrow 3^0 (1) \\ \rightarrow 3^1 (3) \\ \rightarrow 3^2 (9) \end{array}$$

$$\begin{array}{l} 2^1 \rightarrow 3^0 (2) \\ \rightarrow 3^1 (6) \\ \rightarrow 3^2 (18) \end{array}$$

$$\begin{array}{l} 2^2 \rightarrow 3^0 (4) \\ \rightarrow 3^1 (12) \\ \rightarrow 3^2 (36) \end{array}$$

$$\begin{array}{l} 2^3 \rightarrow 3^0 (8) \\ \rightarrow 3^1 (24) \\ \rightarrow 3^2 (72) \end{array}$$

$$\begin{array}{r|l} 2 & 10800 \\ \hline 2 & 5400 \end{array}$$

$$\begin{array}{r|l} 2 & 2700 \end{array}$$

$$\begin{array}{r|l} 3 & 900 \end{array}$$

$$\begin{array}{r|l} 3 & 300 \end{array}$$

$$\begin{array}{r|l} 2 & 100 \end{array}$$

$$\begin{array}{r|l} 2 & 50 \end{array}$$

$$\begin{array}{r|l} 5 & 25 \end{array}$$

$$\begin{array}{r|l} 5 & 5 \end{array}$$

$$(3) \times (5) \times (4) = 60$$

$$N = 2^3 \times 3^2 \times 5^3$$

① Total factor (Tf) (48)

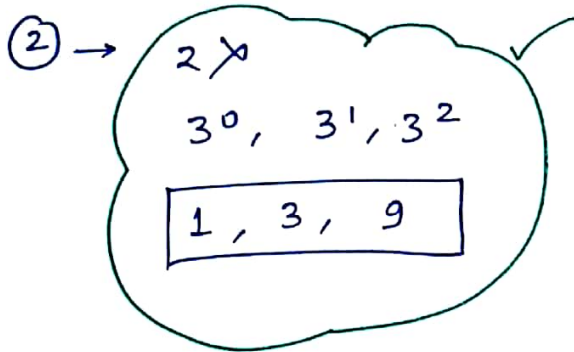
② odd f (12)  $(3 \times 4) \checkmark$   $(2 \rightarrow \times)$

③ even f  $(48 - 12 = 36) \checkmark$

④ perfect square (8)  $= 2 \times 2 \times 2 = 8$

⑤ perfect cubes (4)  $= 2 \times 1 \times 2 = 4$

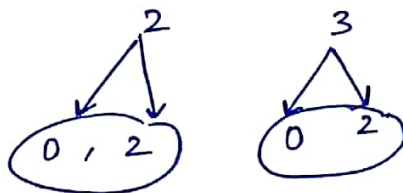
Sol ①  $4 \times 3 \times 4 = 48$



④ for perfect square, power should be multiply of  $\underbrace{2}_{\text{even}}$  and 0.

$2^4 \times 3^2$   
 $2^2 \times 3^2$

$$72 = 2^3 \times 3^2$$



$$2 \times 2 = 4$$

$$2^0 - 3^0 (1)$$

$$3^2 (9)$$

$$2^2 - 3^0 (4)$$

$$3^2 (36)$$

⑤ for no. to be perfect cube, power have to multiply of 3 and 0.

$2^6 \times 3^3$   
 $2^3 \times 3^3$



Q How many factors of no. 72 are multiply of 6.

Sol

$$72 = 2^3 \times 3^2$$

$$(2 \times 3) (2^2 \times 3^1) \quad \text{Ans}$$

$$3 \times 2 = 6 \checkmark$$

$$6 (1, 2, 3, 4, 6, 12)$$

$$\begin{array}{r|l} 6 & 72 \\ \hline \end{array}$$

Q  $120 = 2^3 \times 3^1 \times 5^1$

$$= 2^2 \times 3^1 (2^1 \times 5^1)$$

$$2 \times 2 = 4 \checkmark \text{Ans}$$

$$= 12 (1, 2, 5, 10)$$

Q  $30 (3 \times 2 \times 3) \quad \text{Ans}$

$$\uparrow$$

$$(2 \times 3 \times 5) (2^2 \times 3^1 \times 5^2)$$

\* Prime factor :-

To  
hell of  
higher powers.

$$(60)^{72} \times (98)^{60} \times (44)^{50} \times (45)^{96}$$

$$\downarrow \quad \downarrow \quad \downarrow \quad \downarrow$$

$$(2^2 \times 3 \times 5) \quad (2 \times 7) \quad (2 \times 11) \quad (3 \times 5)$$

$$(2, 3, 5) \quad \text{Pf} \quad (2, 11) \quad (3, 5)$$

$$\uparrow$$

$$\text{Pf}$$

$$(2, 3, 5, 7, 11) \rightarrow \text{Prime factors}$$

② Factorial :- is a product of 2 no.'s  
 ↳ Multiplication of Natural NO. from 1 to N.

Q:  $1! + 2! + 3! + 4! + 5! + 6! + 7! + \dots + 99!$   $\Rightarrow$  unit digit

$\downarrow$     $\downarrow$     $\downarrow$     $\downarrow$     $\downarrow$     $\downarrow$     $\downarrow$     $\downarrow$   
 1   2   6   24   0   0   0   0

Sol:  $5! = 1 \times 2 \times 3 \times 4 \times 5 = 120$

$6! = 6 \times 5! = 720$

$7! = 7 \times 6 \times 5! = 5040$

first 4 no.'s

$$\begin{array}{r}
 33 \\
 +120 \\
 +720 \\
 \hline
 0 \\
 0 \\
 0 \\
 3
 \end{array}$$

Ans  $\rightarrow 3$  ✓

Note :-  $5!$  onwards, every ! ends with atleast a single 0.

Q:  $100!$  ends with how many 0?

Sol:  $100! = 1 \times 2 \times 3 \times 4 \times 5 \times 6 \times \dots \times 99 \times 100$

$5 \rightarrow$  ~~on~~  $\frac{y}{e}$

$$\begin{array}{l}
 \frac{100}{5} = 20 \quad [5, 10, 15, 20, \dots, 100] \approx 5^1 \\
 + \\
 \frac{20}{5} = 4 \quad [25, 50, 75, 100] \approx 5^2 \\
 \hline
 24
 \end{array}$$

Q  $\frac{100}{3^n}$  (maximum power of 3 contained in  $100!$ )

Sol  $100! = 1 \times 2 \times 3 \times 4 \times 5 \times 6 \times \dots \times 100$

$$\begin{aligned} \frac{100}{3} &= 33 \quad [3, 6, 9, 12, 15, \dots, 99] \approx 3^1 \\ &+ \\ \frac{33}{3} &= 11 \quad [9, 27, 36, \dots, 99] \approx 3^2 \\ &+ \\ \frac{11}{3} &= 3 \quad [27, 54, 81] \approx 3^3 \\ &+ \\ \frac{3}{3} &= 1 \quad [81] \approx 3^4 \\ &+ \\ &= 48 \checkmark \end{aligned}$$

Q  $\frac{100}{7^n}$

Sol  $\frac{100}{7} = 14 \quad [7, 14, 21, \dots, 98] \approx 7^1$

$$\begin{aligned} \frac{14}{7} &= 2 \quad [49, 98] \approx 7^2 \\ &= 2 \checkmark \end{aligned}$$

Q  $\frac{100}{15^n}$

Sol  $\frac{100}{15} = 6 \quad [\underline{15}, \underline{30}, \dots, \underline{90}]$

$$100! = 1 \times 2 \times 3 \times 4 \times 5 \times \dots \times 99 \times 100$$

$$\frac{100!}{(3 \times 5)^n}$$

$\swarrow$  roti       $\downarrow$  sabji      since limitation  $\rightarrow 100! / 15^n \Rightarrow 24 \text{ times}$

$$100! = 3^48 \times 5^{24}$$

$$= (3 \times 5)^{24} \times (3)^{24}$$

$$= (15)^{24} \checkmark$$

(15  $\rightarrow$  not prime no.  
hence, बार बार अनेक बार)

Q A no. (of exact) has exactly 3 prime factors ( $a^b \times b^c \times c^r$ )  
125 factors of the number are perfect squares.

Ans 27 factors of the number are  $\rightarrow$  cube.

then overall Total factors of the No. are ?

Q Find the No. of trailing 0's.

(a)  $1! \times 2^2 \times 3^3 \times \dots \times 100^{100}$ .

(b)  $1! \times 2! \times 3! \times \dots \times 100!$ .

\* BASE SYSTEM :-

$$(25)_{10} = ((2^4 2^3 2^2 2^1 2^0)_{(2)})_{(2)}$$

for Reaching to the Base (2).

| 2 | 25 | Remainder    |
|---|----|--------------|
| 2 | 12 | 1 $\uparrow$ |
| 2 | 6  | 0            |
| 2 | 3  | 0            |
|   | 1  | 1            |

$$\rightarrow (16 \times 8 + 0 + 0 + 1)$$

$$(25)_{10}$$

**MOHIT CHOUKSEY**



$$\checkmark \begin{pmatrix} \text{hr} & \text{Min.} & \text{Sec} \\ 3 & : & 24 & : & 36 \\ + 2 & : & 35 & : & 24 \\ \hline 6 & : & 0 & : & 0 \end{pmatrix} b=60$$

if hr Min. Sec  $\rightarrow$  not given,  
then also Base 60  $\checkmark$ .

$\downarrow$  every time we are making Base 60 to zero.

$$\checkmark \begin{pmatrix} \text{hr} & \text{Min.} & \text{Sec} \\ 8 & 7 & 3 \\ + 1 & 2 & 7 \\ \hline 10 & 0 & 0 \end{pmatrix} \begin{pmatrix} \text{Base} \\ 10 \rightarrow 0 \end{pmatrix}$$

$$\checkmark \begin{pmatrix} \text{hr} & : & \text{Min.} & : & \text{Sec} \\ 3 & : & 24 & : & 36 \\ + 2 & : & 45 & : & 32 \\ \hline 6 & : & 10 & : & 8 \end{pmatrix} b=60$$

$\downarrow$   
(60  $\rightarrow$  1  $\rightarrow$  ①)

$$\checkmark \begin{array}{rclcl} 3 & : & 24 & : & 36 \\ 2 & : & 45 & : & 32 \\ \hline 6 & : & 10 & : & 8 \end{array}$$

$$36 + 32 = \overset{?}{\text{base}} + 8$$

$$\boxed{b=60} \checkmark$$

Q. (Gate)  
2010  
(2 marks)

$$+ \begin{array}{r} \textcircled{1} \quad 7+b = b+5 \rightarrow \textcircled{b=8} \\ \textcircled{1} \quad 3 \quad 7 \\ 1 \quad 2 \quad 7 \quad 6 \\ \hline 4 \quad 3 \quad 5 \end{array} \quad \textcircled{b=8}$$

$$\begin{array}{r} \textcircled{1} \quad 7 \quad 3 \quad 1 \\ + 6 \quad 7 \quad 2 \\ \hline \textcircled{1} \quad 6 \quad 2 \quad 3 \end{array} \quad \textcircled{b=8} \quad 1+2 =$$

$$7 + b = 8 + 5$$

$\textcircled{13}$   
 $\downarrow$   
 Base

carry forward  $\pi$   $\text{करेंगे}$   
when  $=$  or  $>$  base

Q.

$$\begin{array}{r} \textcircled{8} \quad \textcircled{8} \quad \textcircled{8} \quad \text{borrow} \\ 7 \quad 6 \quad 3 \quad 2 \quad 1 \\ (-) \quad 6 \quad 7 \quad 2 \\ \hline 0 \quad 3 \quad 7 \end{array} \quad \textcircled{b=8}$$

(1-2)  $\not\rightarrow$  Not possible  
hence Borrow  $\text{करेंगे}$

Q.

$$\begin{array}{r} \textcircled{1} \quad \textcircled{1} \quad \textcircled{1} \quad \textcircled{1} \\ + \quad 2 \quad 2 \quad 2 \quad 6 \\ \hline 1 \quad 0 \quad 0 \quad 0 \quad 1 \end{array} \quad \text{alter}$$

$$2 + 6 = b + 1$$

$\textcircled{8} \quad \textcircled{b \rightarrow 7}$

$2+b=8$  but  $\underline{1}$   
 $\underline{7}$  more  
 $\downarrow$   
 hence  
 7 is base

$$\begin{array}{r} \textcircled{7} \quad \textcircled{7} \quad \textcircled{7} \quad \textcircled{7} \\ 2 \quad 1 \quad 3 \quad 2 \quad 4 \quad 3 \quad 2 \\ - \quad 1 \quad 6 \quad 5 \quad 6 \\ \hline 0 \quad 3 \quad 5 \quad 3 \end{array} \quad \textcircled{b=7}$$

MOHIT CHOUKSEY

Q95  
(Gate 2014)

$$(7 \ 5 \ 2 \ 6)_8 - (Y)_8 = (4364)_8$$

$$\begin{array}{r} (7 \ 5 \ 2 \ 6) \\ (-) \phantom{0000} 6 \\ \hline 4 \ 3 \ 6 \ 4 \end{array} \quad 8$$

$$\begin{array}{r} \cancel{7} \ \cancel{5} \ 2 \ 6 \\ - \ 4 \ 3 \ 6 \ 4 \\ \hline 3 \ 1 \ 4 \ 2 \end{array} \quad 8$$

$$6 + y_1 = 6 + 4$$

$$6 + y_1 = 8 + 4$$

$$6 + y_{i=6} = 12$$

\*  $3 \longrightarrow 3, 6, 9, 12, \dots$   
 $4 \longrightarrow 4, 8, 12, \dots$

$$k \times \text{LCM}(3 \times 4)$$

$$(12K)$$

\* no. divisible by (2, 3, 5)

$$\hookrightarrow \text{LCM}(2, 3, 5) k$$

$$(30K)$$

MOHIT CHOUKSEY

Q Red light flashes  $\rightarrow$   $\left[ \begin{array}{l} R(3 \text{ times} \rightarrow \text{every } 2 \text{ min}) \\ G(5 \text{ times} \rightarrow 3 \text{ min}) \end{array} \right] \rightarrow 120 \text{ sec.}$   
 $\rightarrow 180 \text{ sec}$

$$\left( \begin{array}{c} R_1 \\ 40 \text{ sec} \end{array}, \begin{array}{c} G_1 \\ 36 \text{ sec} \end{array} \right)$$

$$\left( \begin{array}{c} R_1 \\ 40 \end{array}, \begin{array}{c} G_1 \\ 36 \end{array} \right) \text{ secs}$$

$$= 360 \text{ secs} \checkmark$$

$$\downarrow$$

$$\approx 6 \text{ mins}$$

$$\begin{array}{r|l} 2 & 40, 36 \\ \hline 2 & 20, 18 \\ \hline 2 & 10, 9 \\ \hline 5 & 5, 9 \\ \hline 3 & 1, 9 \\ \hline & 1, 3 \end{array}$$

$$\checkmark 1 \text{ hr} = \frac{60 \times 60}{360}$$

10 times

$$\text{LCM} \left( \frac{a}{b}, \frac{c}{d}, \frac{e}{f} \right) = \frac{\text{LCM}(a, c, e)}{\text{HCF}(b, d, f)}$$

Method  
alter

$$\rightarrow \text{LCM} \left( \frac{2}{3}, \frac{3}{5} \right) \text{ min} = \left( \frac{6}{1} \right) \text{ mins} \checkmark$$

$$\text{So within } 1 \text{ hr} \rightarrow \frac{60 \text{ min}}{6} = 6 \text{ times} \checkmark$$

$\rightarrow$  if question says, they flash together at the beginning  
add '1' to the answer.

$\downarrow$   
means  $t = 0$   
0  
0

MOHIT CHOUKSEY





Q.  $(237)^{254} \times (738)^{227} \times (76)^{2401} \times (79)^{5407}$

$\frac{54}{7} \times \frac{27}{8} \times 2 \times 6 \times 9$

$(237)^{\frac{254}{4}} \times (738)^{\frac{227}{4}} \times (76)^{\frac{2401}{4}} \times (79)^{\frac{5407}{4}}$

$(237)^{4n+2} \times (738)^{4n+3} \times (76)^{600+1} \times (79)^{1351+3}$

$(237)^9 \times (738)^3 \times (76)^6 \times (79)^9$

$18 \times 48 \times 7 \times 9 = 7 \times 2 \times 9 \times 9 = 7 \times 2 \times 81 = 7 \times 162 = 1134$

Pg 90 Gate 2016

Q 178

$21^{870} \times 14^{127} \times 3^{124}$

$1 \times 6 \times 1 = 6$

$7 \text{ ans.}$

$1 + 6 \times 1 = 7 \text{ ans.}$

MOHIT CHOUKSEY

\* REMAINDERS any no. can be written in the form

$N = \text{Remainder} \pmod{\text{Divisor}}$

$80 = 8 \pmod{9}$

$26 = 5 \pmod{7}$

$$x = y \text{ Mod } m$$

$$x - y = 0 \text{ Mod } m$$

Take  $80 \leftarrow 8m(9)$

$$(72) = 0 \text{ mod } 9$$

80 chocolates  $\rightarrow$  9 students

$$80 = (-1)m(9)$$

$$80 + 1 = 0 \text{ mod } (9)$$

$$81 = 0 \text{ mod } (9)$$

$$26 \leftarrow -2m(7)$$

Rule-1  $\rightarrow$   $\boxed{+, -, \times}$

$$a = b \text{ mod } c$$

$$d = e \text{ mod } c$$

$$f = g \text{ mod } c$$

$$a \times d \times f = b \times e \times g \text{ mod } c$$

$$b \times e \times g < c$$

$$\begin{array}{l} a \\ + d \\ - f \end{array} \quad \begin{array}{l} b \\ + e \\ - g \end{array}$$

$$b + e - g < c$$

Q. Eg:-

$$1421 \times 1423 \times 1425$$

$$5 \times (-5) \times 12 \times (-3) = 75$$

Ans

$$1421 \times 1423 \times 1425 = 315$$

$$12$$

$$1421 = 5m(12)$$

$$1423 = (-5)m(12)$$

$$1425 = 9m(12)$$

$$1421 \times 1423 \times 1425 = 315m(12) = 3m(12)$$

Rule-2

$$a = b \text{ mod } c$$

$$a^n = b^n \text{ mod } c$$

$$b^n < c$$

Q.  $2^{600} \div 15$

$$2^4 = 1 \text{ mod } (15)$$

$$(2^4)^{150} = (1)^{150} \text{ mod } (15)$$

$$2^{600} = 1 \text{ mod } (15)$$

MOHIT CHOUKSEY

Pg 40  
Q6 and Q7

Sol

$$\begin{array}{r} 6 \\ 49 \\ \times 7 \\ \hline 343 \end{array}$$

~~78~~  $784 \div 342$

$$\begin{array}{ccc} 7^3 & = & (1) \text{ m } (342) \\ \text{a} & & \text{b} \quad \text{c} \end{array}$$

$$(7^3)^8 = (1)^{28} \text{ m } (342)$$

1✓

Q7  $(15^{23} + 23^{23}) \div (19)$

$$\begin{array}{l} (15)^{23} = (-4)^{23} \text{ m } (19) \\ + (23)^{23} = (+4)^{23} \text{ m } (19) \\ \hline 15^{23} + 23^{23} = 0 \text{ m } (19) \end{array}$$

Q (a)  $\frac{10^{10} + 10^{100} + 10^{1000} - 10^{1000}}{3}$

Sol

$$\begin{aligned} (10)^{10} &= (1)^{10} \text{ mod } (3) \\ + (10)^{100} &= (1)^{100} \text{ mod } (3) \\ + (10)^{1000} &= (1)^{1000} \text{ mod } 3 \\ + (10)^{1000} &= (1)^{1000} \text{ mod } 3 \\ \hline &= 2 + 1 - 1 \\ &= 2 \checkmark \end{aligned}$$

(b)  $5^{625} \div 7$

$$\begin{aligned} 5^5 &= 3 \text{ mod } 7 \\ (5)^{125} &= (3)^{125} \text{ mod } 7 \\ 3^{125} \div 7 & \\ (3^5)^{25} \div (5) \text{ mod } 7 & \end{aligned}$$

$$\begin{array}{r} 25 \\ \times 5 \\ \hline 125 \\ \times 5 \\ \hline 625 \\ \times 5 \\ \hline 3125 \\ \times 5 \\ \hline 15625 \\ \times 5 \\ \hline 78125 \\ \times 5 \\ \hline 390625 \\ \times 5 \\ \hline 1953125 \\ \times 5 \\ \hline 9765625 \\ \times 5 \\ \hline 48828125 \\ \times 5 \\ \hline 244140625 \\ \times 5 \\ \hline 1220703125 \\ \times 5 \\ \hline 6103515625 \\ \times 5 \\ \hline 30517578125 \\ \times 5 \\ \hline 152587890625 \\ \times 5 \\ \hline 762939453125 \\ \times 5 \\ \hline 3814697265625 \\ \times 5 \\ \hline 19073486328125 \\ \times 5 \\ \hline 95367431640625 \\ \times 5 \\ \hline 476837158203125 \\ \times 5 \\ \hline 2384185791015625 \\ \times 5 \\ \hline 11920928955078125 \\ \times 5 \\ \hline 59604644775390625 \\ \times 5 \\ \hline 298023223876953125 \\ \times 5 \\ \hline 1490116119384765625 \\ \times 5 \\ \hline 7450580596923828125 \\ \times 5 \\ \hline 37252902984619140625 \\ \times 5 \\ \hline 186264514923095703125 \\ \times 5 \\ \hline 931322574615478515625 \\ \times 5 \\ \hline 4656612873077392578125 \\ \times 5 \\ \hline 23283064365386962890625 \\ \times 5 \\ \hline 116415321826934814453125 \\ \times 5 \\ \hline 582076609134674072265625 \\ \times 5 \\ \hline 2910383045673370361328125 \\ \times 5 \\ \hline 14551915228366851806640625 \\ \times 5 \\ \hline 72759576141834259033203125 \\ \times 5 \\ \hline 363797880709171295166015625 \\ \times 5 \\ \hline 1818989403545856475830078125 \\ \times 5 \\ \hline 9094947017729282379150390625 \\ \times 5 \\ \hline 45474735088646411895751953125 \\ \times 5 \\ \hline 227373675443232059478759765625 \\ \times 5 \\ \hline 1136868377216160297393798828125 \\ \times 5 \\ \hline 5684341886080801486968994140625 \\ \times 5 \\ \hline 28421709430404007434844970703125 \\ \times 5 \\ \hline 142108547152020037174224853515625 \\ \times 5 \\ \hline 710542735760100185871124267578125 \\ \times 5 \\ \hline 3552713678800500929355621337890625 \\ \times 5 \\ \hline 17763568394002504646778106689453125 \\ \times 5 \\ \hline 88817841970012523233890533447265625 \\ \times 5 \\ \hline 444089209850062616169452667236328125 \\ \times 5 \\ \hline 2220446049250313080847263336181640625 \\ \times 5 \\ \hline 11102230246251565404236316680908203125 \\ \times 5 \\ \hline 55511151231257827021181583404541015625 \\ \times 5 \\ \hline 277555756156289135105907917022705078125 \\ \times 5 \\ \hline 1387778780781445675529539585113525390625 \\ \times 5 \\ \hline 6938893903907228377647697925567626953125 \\ \times 5 \\ \hline 34694469519536141888238489627838134765625 \\ \times 5 \\ \hline 173472347597680709441192448139190673828125 \\ \times 5 \\ \hline 867361737988403547205962240695953369140625 \\ \times 5 \\ \hline 4336808689942017736029811203479766845703125 \\ \times 5 \\ \hline 21684043449710088680149056017398834228515625 \\ \times 5 \\ \hline 108420217248550443400745280086994171142578125 \\ \times 5 \\ \hline 542101086242752217003726400434970855712890625 \\ \times 5 \\ \hline 2710505431213761085018632002174854278564453125 \\ \times 5 \\ \hline 13552527156068805425093160010874271392822265625 \\ \times 5 \\ \hline 67762635780344027125465800054371356964111328125 \\ \times 5 \\ \hline 338813178901720135627329000271856784820556640625 \\ \times 5 \\ \hline 1694065894508600678136645001359283924102783203125 \\ \times 5 \\ \hline 8470329472543003390683225006796419620513916015625 \\ \times 5 \\ \hline 42351647362715016953416125033982098102569580078125 \\ \times 5 \\ \hline 211758236813575084767080625169910490512847900390625 \\ \times 5 \\ \hline 1058791184067875423835403125849552452564239501953125 \\ \times 5 \\ \hline 5293955920339377119177015629247762262821197509765625 \\ \times 5 \\ \hline 26469779601696885595885078146238811314105987548828125 \\ \times 5 \\ \hline 132348898008484427979425390731194056570529937744140625 \\ \times 5 \\ \hline 661744490042422139897126953655970282852649688720703125 \\ \times 5 \\ \hline 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$$* (5)^{625} = (-2)^{625} \text{ m } 7$$

$\downarrow$   
 No need  
 any no.

hence, Taken smaller power.

$$5^3 = (-2)^3 \text{ m } 7$$

$$5^3 = -8 \text{ m } 7$$

$$5^3 = -\frac{8}{1} \text{ m } 7$$

aqaya  
 $\downarrow$

$$\checkmark (5^2)^3 = (4)^3 \text{ m } 7$$

$$(5^6)^{104} = (1)^{104} \text{ m } 7$$

$\frac{64}{7} =$   
 $Re \rightarrow 1$

$$5^{624} = 1 \text{ m } 7$$

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## CHAPTER 2

### Time and Work Calendar

36 365 d, 5 hrs, 48 mins, 11 secs - - - - -

$$365d \approx 6 \text{ hrs}$$

- ① Every multiple of 4 is a Leap year (4, 8, 12, 16 - - - LY)
- ② Century year is Non Leap year (100, 200, 300, - - NLY)
- ③ Every 4th century year is LY (400, 800, 1200, - - - LY)

ordinary year

$$1(O.Y.) = 365d = \frac{52 \times 7}{1} + 1 \text{ odd day}$$

$$1(O.Y.) = \left( \frac{365}{7} \right) d \quad \text{Remainder (Re) } 1 \text{ odd day}$$

$$1(L.Y.) = \left( \frac{366}{7} \right) d \quad \text{Re } 2 \text{ odd day}$$

within 1st 100 Y  $\longrightarrow$   $24(L.Y.) + 76(O.Y.)$   
 $\times 2(Re) + \times 1(Re)$

$$48 + 76 = \frac{124}{7} \text{ Re } 5 \text{ odd day}$$

since never  
Re can't be  
more than divisor  
or no of odd days  
can't be more  
than 7  
hence  $\div$  by 7 to  
get (5)  
odd day.

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4)  $\times 100 Y \rightarrow 5$  odd days

$\times 200 Y \rightarrow 3$  odd days

$\times 300 Y \rightarrow 1$  —

$\checkmark 400 Y \rightarrow 6 \text{ — } + 1 = \frac{7}{7} = 0^{\text{Re}} = 0$  odd days

$\frac{400}{4} \rightarrow$   
hence

extra  
1 day

5) 1<sup>st</sup> odd day is Monday

(Gregorian calendar  $\rightarrow$  01 01 AD)

Q 28<sup>th</sup> Aug 1994  
1900  $\rightarrow$  1

?

6) (a)  $400 \rightarrow 0$

$1600 \rightarrow 0$

$300 \rightarrow 1$

$1900 \rightarrow 1$

Sol  $0 - 1900 \rightarrow 1$

$1900 - 93 \rightarrow 4$

$94 \rightarrow 2$

7

$93 = \begin{matrix} L.Y. & O.Y. \\ 23 & + & 70 \\ \times 2 & + & \times 1 \end{matrix}$

$46 + 70 = \frac{116}{7} \text{ Re } (4) \checkmark \text{ odd day}$

1994

J ~~31~~  $\leftarrow$  do well  
31  
7  
Re (3) odd

F 29 1  
94 is not a leap year

F 0 M 3 A 2 3 M 2 3 J 2 3 Aug 0

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Scanned by CamScanner

Q. 9th Aug 2016

<6>(b)  $\begin{matrix} 0 - 400 \rightarrow 0 \\ 0 - 2000 \rightarrow 0 \end{matrix}$

Sol

2000  $\rightarrow$  0

15  $\rightarrow$  4

16  $\rightarrow$  5

9

2016

leap year

$\frac{9}{7}$  Re (2)  $\rightarrow$  Tuesday

Y = L.Y. + O.Y.  
15 = 3 + 12

$\begin{matrix} \times 2 & \times 1 \\ \hline 6 + 12 = \frac{18}{7} \end{matrix}$  (Re 4)

| J | F | M | A | M | J | J | A |
|---|---|---|---|---|---|---|---|
| 3 | 1 | 3 | 2 | 3 | 2 | 3 | 2 |

$\frac{9}{7}$  (Re 2)

Q If 15th Aug 1947 was Friday, then 26th January 1950 was \_\_\_\_\_.

Sol

26th Jan. 1950

0 - 1900  $\rightarrow$  1

$\begin{matrix} LY & NLY \\ 49 \rightarrow 12 & 37 \\ \times 2 & \times 1 \\ \hline 48 + 37 = 85 \end{matrix}$

24 + 37 = 61

$\frac{61}{7} =$

$\begin{matrix} 12 \\ -50 \\ \hline 4 \end{matrix}$  (48)

$\begin{matrix} 1 \\ 7 \overline{) 75} \\ - 7 \downarrow \\ \hline 65 \end{matrix}$

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812

26th Jan 1950

Paper print → Sunday  
 1st odd day → Monday

1900 → 1

49 → 5

50 → 5

 $\frac{11}{7}$  Re 4

1950

Thursday

49

LY

OY

12

37

x 2

x 1

$$\frac{24 + 37}{7} = \frac{61}{7} \text{ Re 5}$$

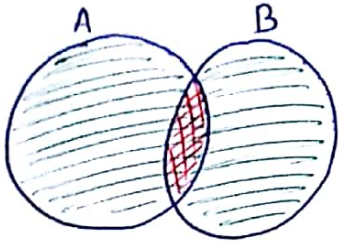
 $\frac{26}{7}$  Jan Re 5

### # Alternate Method

Let 15th August 1947 = Fri<sup>o</sup> = 0th odd day

|              | Aug $\frac{16}{7}$ | Sep                          | Oct          | Nov.         | Dec          |   |
|--------------|--------------------|------------------------------|--------------|--------------|--------------|---|
| 1948         | <del>2</del>       | <del>2</del>                 | <del>3</del> | <del>2</del> | <del>3</del> |   |
| 1948         | <del>2</del>       | ← $\frac{366}{7}$ (L.Y.)     |              |              |              | $\frac{2}{+2}$<br>$\frac{2}{+3}$<br>$\frac{7}{7}$ |
| 1949         | <del>1</del>       | ← $\frac{365}{7}$ (O.Y.)     |              |              |              | $\frac{2}{+3}$<br>$\frac{2}{7}$                   |
| 1950         | <del>5</del>       | ← 26th Jan.<br>$\frac{7}{7}$ |              |              |              |   |
| 6 → Thursday |                    |                              |              |              |              |   |

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

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

$$n(A \cup B \cup C \cup D) = + \sum n(A) \xrightarrow{4 \text{ values}} 4C_2 = 6 \text{ values} \begin{array}{l} AB \\ AC \\ AD \end{array} \begin{array}{l} ABC \\ ACD \\ ABD \\ BCD \end{array}$$

$$- \sum n(A \cap B) \xrightarrow{= 6 \text{ values}} \begin{array}{l} BC \\ BD \\ CD \end{array}$$

$$+ \sum n(A \cap B \cap C) \xrightarrow{4C_3 = 4 \text{ values}}$$

$$- n(A \cap B \cap C \cap D) \xrightarrow{1 \text{ value}}$$

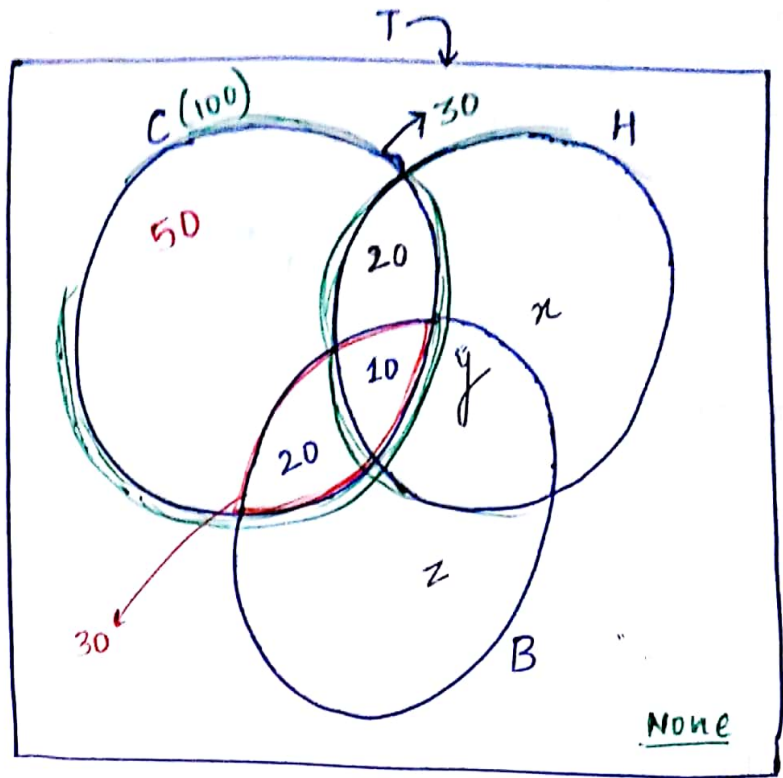
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Discussion → Important

h → hockey

Ck H only  $\rightarrow$  inside  $\rightarrow 20$

$C \models H$  but not  $B \rightarrow C \models H$   
only  
 $\downarrow$   
20



Q How many students are playing any of these 3 games  
(or) at least one of 3 games

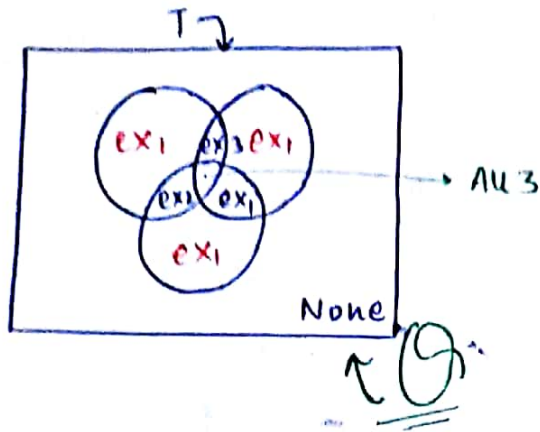
$$n(A \cup B \cup C) = [100 + (x + y + z)]$$

let  $\rightarrow x, y, z \leftarrow \text{naming}$

Q none of these 3 games

$\swarrow T - n(A \cup B \cup C)$   
 Total

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(a) atleast 2 of games = (B) + (B)

(a) atleast 1 of games = (R) + (B) + (B)

= sum of all the values.

cricket only  $\rightarrow$  (inside)

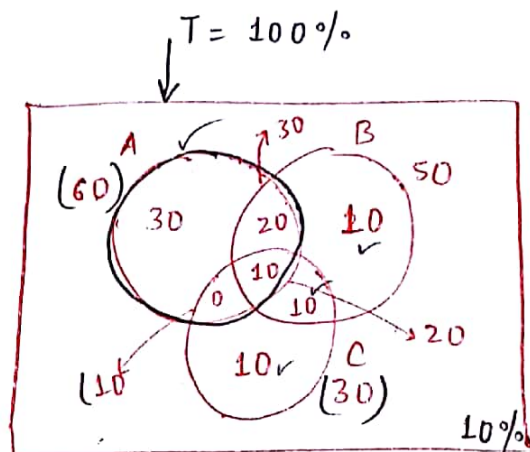
cricket  $\rightarrow$  (बाह्य)

1,2,3 Pg 48

a (20%) ✓

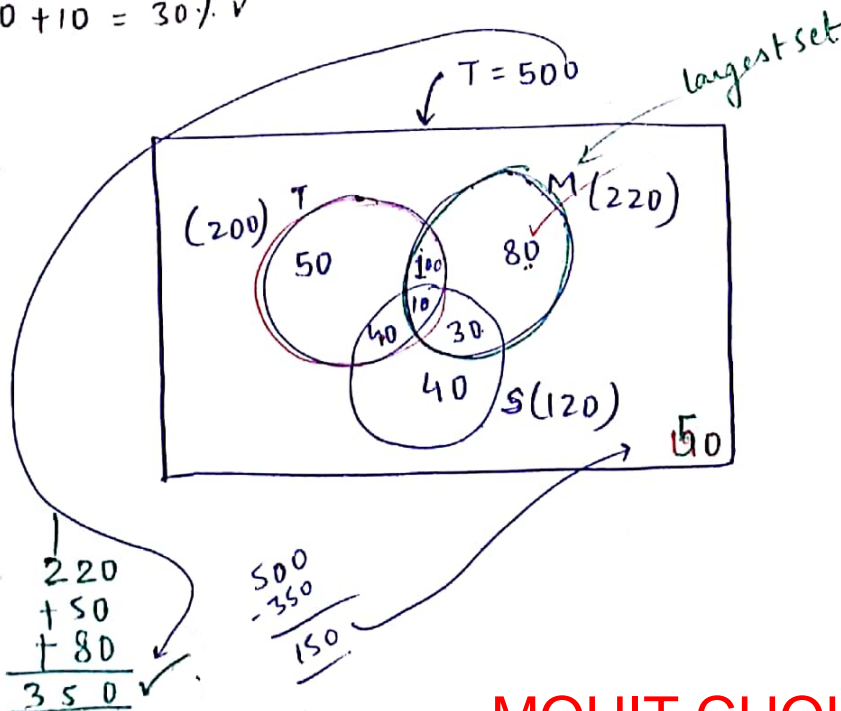
b (10%) ✓

c  $20 + 0 + 10 = 30\%$  ✓



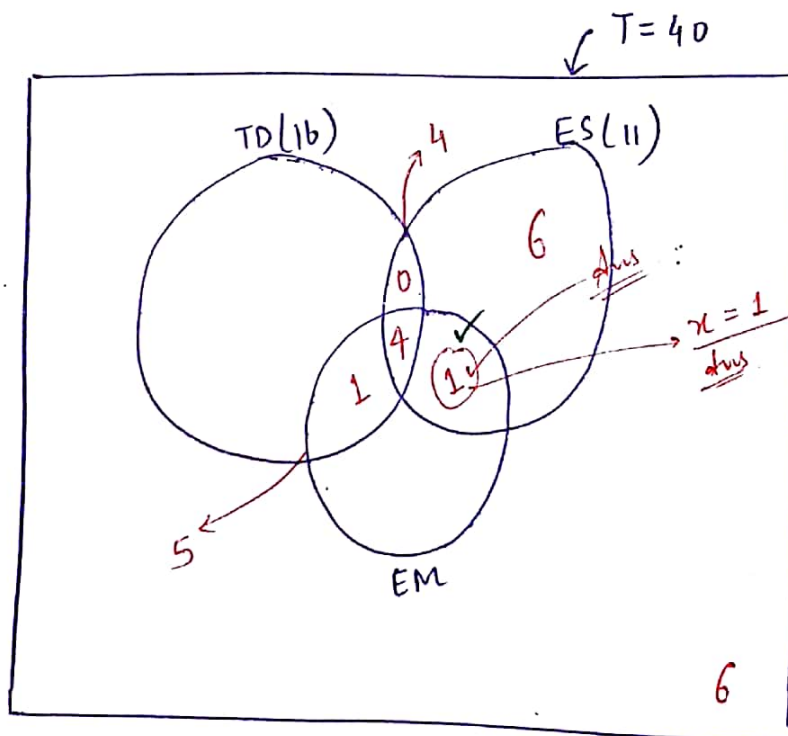
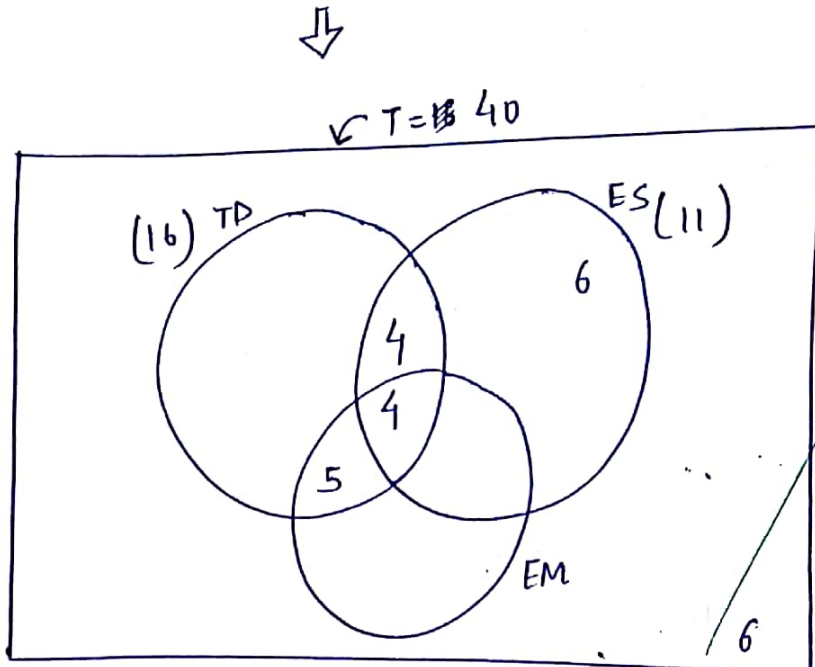
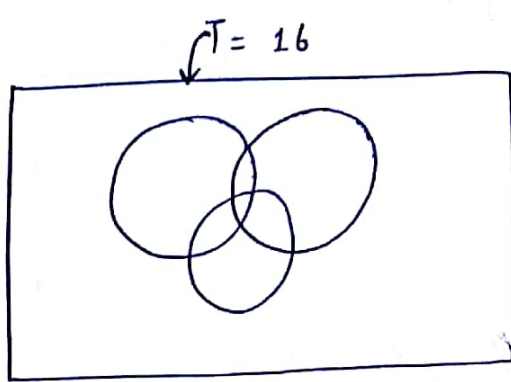
Pg 48 8 to 11

80 ✓  
170 ✓  
150 ✓  
30 ✓



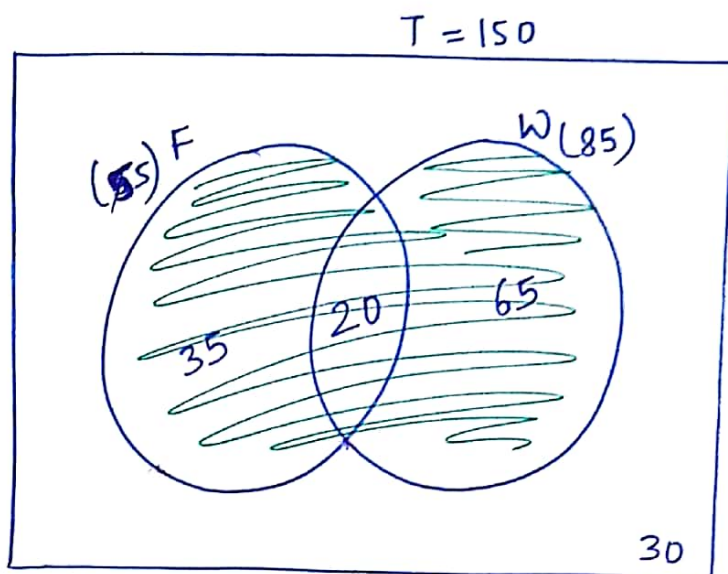
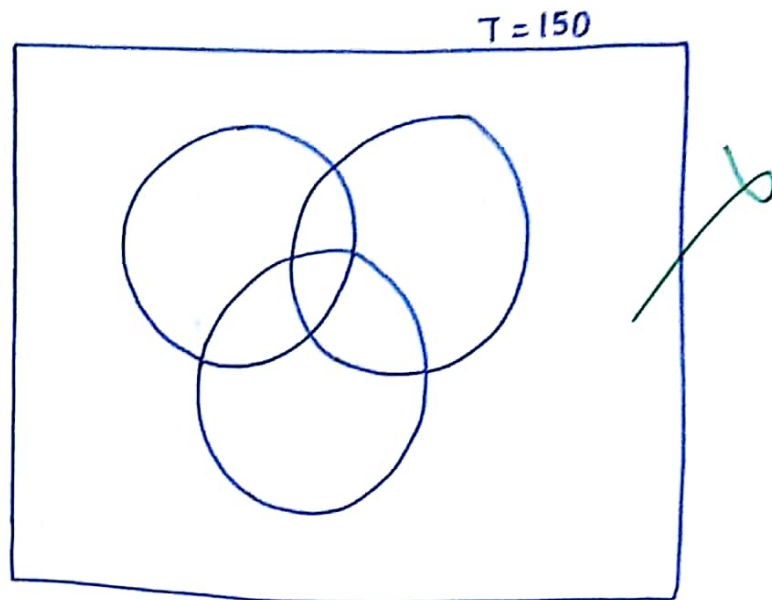
200 ✓  
80 ✓  
30 ✓  
40 ✓  
350  
200  
220  
120  
540





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Q 166



$$T - 30 = n(A \cup B) = 120$$

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

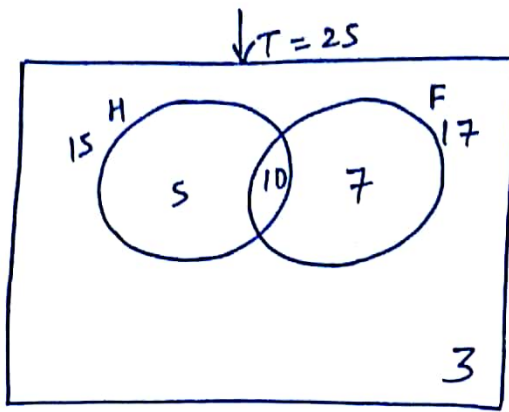
$$55 + 85 - \text{---} = 120$$

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

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Pg 68

Q1



Pg 79  
Q 13 to 16

→ logical Venn Diagram → eyesight Test.

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10/8/16

Q9

$$S_2 = 1 \times 2 + 2 \times 3$$

$$S_2 = 8$$

$$\text{put } u = 2 \text{ op}^n s$$

$$S_2 = 8 (c)$$

$$\sum T_n = \sum n(n+1)$$

$$S_n = (\sum n^2 + \sum n)$$

$$Q T_1 \Rightarrow A = 2^{172} - 2^{171}$$

$$A = 2^{171} (2 - 1)$$

$$A = 2^{171} =$$

Q Ans.  $N$  lies b/w  $9 < N < 1000$

$$\boxed{S_N + P_N = N}$$

$$Q \left( \begin{array}{cccccccccccccccccccc} 1 & 2 & 1 & 2 & 1 & 2 & 1 & 2 & 1 & 2 & 1 & 2 & \dots & \dots & \dots & \dots & 1 & 2 \end{array} \right) \begin{array}{l} \left. \begin{array}{l} (12 \text{ written}) \\ (150 \text{ times}) \end{array} \right\} \text{calc. Remainder} \\ (300 \text{ digit no.}) \end{array}$$

99

Q  $n$  is a 3<sup>digit</sup> natural no. on the base of 10 and converted into base of 7 and base 9, how many such no's are there.

$$\underbrace{(a \ b \ c)_7}_{\text{digit reverse ho jati hai}} \underbrace{(c \ b \ a)_9}$$



# TIME & WORK

A  $\rightarrow$  16 d

1 day work of A  $\rightarrow \frac{1}{16}$

13 day work of A  $\rightarrow \frac{13}{16}$

$$\text{Left over work} = 1 - \frac{13}{16} = \frac{3}{16}$$

$$\frac{1}{2} \times 10 \text{ (A)} = 2 \text{ B} \rightarrow 10 \text{ days}$$

5 days

$$A = \frac{1}{2} B \rightarrow 10 \text{ days}$$

$2 \times 10 = 20 \text{ days}$

Q. A is 4 times as eff. as B and takes 15 days less than B to finish a work. in how many days will the work get finished / done if A and B are working together

Sol

$$\frac{1}{4}(4x) \text{ (A)} = 4 \text{ B} \rightarrow 4x \text{ days}$$

x days

$$3x = 15$$

$$x = 5$$

A  $\rightarrow$  5 days  $\rightarrow$  one day work  $\rightarrow \frac{1}{5}$   
 B  $\rightarrow$  20 days  $\rightarrow$  " " " "  $\rightarrow \frac{1}{20}$

$$\left[ \frac{1}{5} + \frac{1}{20} \right] = \left[ \frac{1}{4} \right]$$

in one day  $\leftarrow$ ,  $\frac{1}{4}$ th of work is completed

so 4 days

Ans

MOHIT CHOUKSEY

## Alternate work concept

alone  $\rightarrow$  A = 12 days  
 $\rightarrow$  B = 16 days

Q In how many days will the work be done if A and B are working alternatively, beginning with A.

Sol

$$\begin{array}{l} \text{1st day of A} \quad \quad \quad \text{2nd day of B} \\ \text{2 day work} = \left[ \left( \frac{1}{12} + \frac{1}{16} \right) \right] = \frac{7}{48} \times 6 = \frac{42}{48} = \frac{7}{8} \\ \times 6 \text{ cycles} \end{array}$$
$$\begin{array}{l} \text{12 days work} = \frac{7}{8} \quad \parallel \text{ (LOW) } = \frac{1}{8} \end{array}$$

$$\begin{array}{l} \text{on 13th day} \\ \text{(A)} \end{array} \quad \frac{1}{8} - \frac{1}{12} = \frac{1}{24} \text{ (LOW)}$$

$$\begin{array}{l} \text{on 14th day} \\ \text{(B)} \end{array} \quad \frac{\frac{1}{24}}{\frac{1}{16}} = \frac{2}{3} \quad \left| \begin{array}{l} 13\frac{2}{3} \\ \text{A starts} \end{array} \right.$$

Q if B starts the work.

Sol 12 days work =  $\frac{7}{8}$  , LOW =  $\frac{1}{8}$

on 13th day (B)

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Sin

$$\frac{2dw}{\times 6} = \left[ \frac{1}{16} + \frac{1}{12} \right] = \frac{7}{48} \times 6 = \frac{42}{48} = \frac{7}{8}$$

$$\frac{12dw}{12dw} = \frac{7}{8} \quad | \quad LOW = \frac{1}{8}$$

on 13th day (B)

$$\frac{1}{8} - \frac{1}{16} = \frac{1}{16} \text{ [LOW]}$$

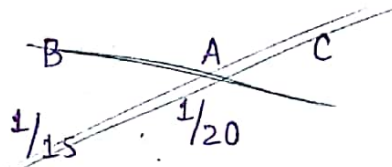
on 14th day (A)

$$\frac{\frac{1}{16}}{\frac{1}{12}} = \frac{3}{4} \rightarrow 13\frac{3}{4} \text{ days } \underline{\text{Ans}}$$

if B starts

Pg 47  
Q6

A → 20  
B → 15  
C → 12



SIR

1st day work of (A & B)  $\left[ \frac{1}{20} + \frac{1}{15} \right] = \frac{7}{60}$

2dw  $\left[ \frac{3}{60} + \frac{4}{60} \right]$

2nd day work of (A & C)  $\left[ \frac{1}{20} + \frac{1}{12} \right] = \frac{8}{60}$

2dw  $\left[ \frac{3}{60} + \frac{5}{60} \right]$

2dw  $\rightarrow \frac{1}{4} \text{th work}$

2dw  $\rightarrow \frac{15}{60}$

2dw  $\times 4 = \frac{1}{4} \text{th}$

8 dw = 1

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Q A = 10 days  
 B = 12 days  
 C = 15 days

max. 2 people are allowed to work in any single day  
 with no two consecutive day having same pair of people repeating

Then the minimum no. of days in which work can be done?

Sol

1<sup>st</sup> dw of (A and B)  $\left( \frac{1}{10} + \frac{1}{12} \right) = \frac{11}{60}$  (most efficient + lesser efficient)

2<sup>nd</sup> dw of (A & C)  $\left( \frac{1}{10} + \frac{1}{15} \right) = \frac{10}{60}$

2<sup>nd</sup> dw =  $\frac{21}{60}$   
 $\times 2 = \frac{42}{60}$

4<sup>th</sup> dw =  $\frac{42}{60}$  | Low =  $\frac{18}{60}$

on 5<sup>th</sup> day  
 A & B  $\frac{18}{60} - \frac{11}{60} = \frac{7}{60}$  (Low)

on 6<sup>th</sup> day  
 A & C  $\frac{7/60}{10/60} = 7/10$

5  $\frac{7}{10}$  days  
 Ans

### \* Men-days Concept

Inversely proportional

$\uparrow a \propto \frac{1}{b} \downarrow$

$a = \frac{k}{b}$

$a \times b = k$

$a_1 \times b_1 = a_2 \times b_2$

$\uparrow m \propto \frac{1}{d} \downarrow$

$m \times d = k$

$m_1 \times d_1 = m_2 \times d_2$

if  $(200 m \times 10 \text{ days}) = 2000 m d$

$$\begin{array}{ccc} 90m & \longrightarrow & 270d \\ 30m & \longrightarrow & x \end{array} \quad \begin{array}{c} \downarrow \\ 1/3^{rd} \end{array} \quad \begin{array}{c} \downarrow \\ 3 \text{ times} \end{array}$$

$$90 \times 270 = 30 \times x$$

$$\underline{x = 810}$$

Q5

$$(4m + 3w)^2 = (6m + 9w) \times 4$$

$$(8m + 6w) = (6m + 9w)$$

$$\boxed{2m = 3w}, \quad \boxed{1m = 1.5w}$$

$$(20m + 6w)x = (6m + 9w) \times 4$$

$$(30w + 6w)x = (9w + 9w) \times 4$$

$$(36w)x = (18w \times 4)$$

$$\boxed{x = 2 \text{ days}}$$

Q11

$$\cancel{(5M + 7B) \times 24} =$$

$$(9m + 18b) \times 15 \times 8 = \cancel{(3m + 6b)} \times x \times 8$$

$$3(3m + 6b) \times 15 = \cancel{(3m + 6b)} x$$

$$\boxed{x = 45 \text{ days}}$$

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Q8

$$\begin{aligned} A &= 15 \times 8 = 120 \text{ hrs} \\ B &= 6\frac{2}{3} \times 9 = 60 \text{ hrs} \end{aligned}$$

$$10 \left[ \frac{1}{120} + \frac{1}{60} \right] x = 1$$

$$10 \left[ \frac{\cancel{2}}{\cancel{120}_4} \right] x = 1$$

$$x = 4$$

Q9

$$A = 24 \text{ days}$$

$$B = 36 \text{ days}$$

$$\left( \frac{1}{24} \right) x + \left( \frac{1}{36} \right) x = 6$$

$$\left( \frac{1}{24} \right) x + 6 \left[ \frac{1}{24} + \frac{1}{36} \right] = 1$$

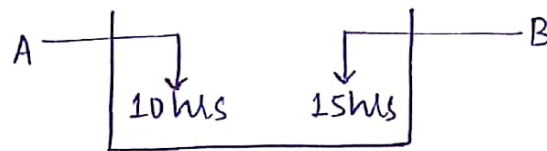
$$\frac{x}{24} = \frac{7}{12}$$

$$x = 14 \text{ days}$$

Q

$$\left[ \frac{1}{10} + \frac{1}{15} \right] = \frac{1}{6}$$

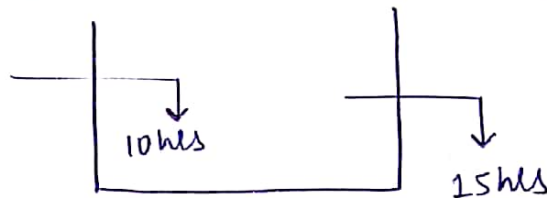
6 hrs



$$\left[ \frac{1}{10} - \frac{1}{15} \right] = \frac{1}{30}$$

drainage pipe

30 hrs

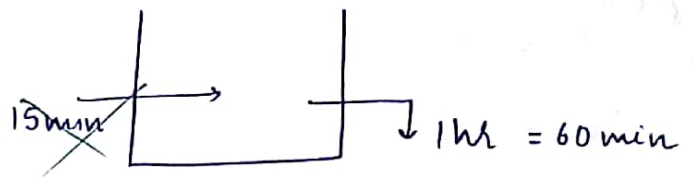


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Q

$$\left[ \frac{1}{15} - \frac{1}{60} \right] = \frac{3}{60}$$

$$= \frac{1}{20}$$



SIR

$x \rightarrow \text{mins}$

$$15 \left[ \frac{1}{x} - \frac{1}{60} \right] = 1$$

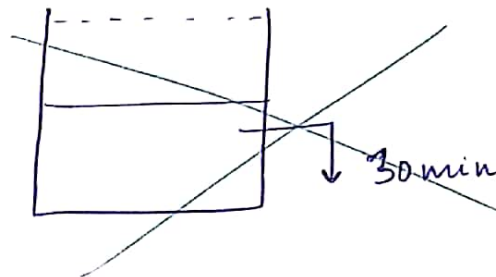
↓  
1 min work

Pg 77  
Q 71

$$10 \left[ \frac{1}{x} - \frac{1}{30} \right] = 1$$

$$\frac{1}{x} = \frac{1}{10} + \frac{1}{30}$$

$$\frac{1}{x} = \frac{3+1}{30}$$



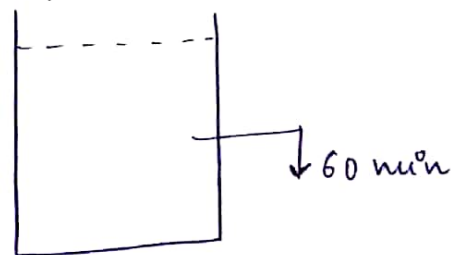
SIR

$x \rightarrow \text{mins}$

$$10 \left[ \frac{1}{x} - \frac{1}{60} \right] = \frac{1}{2}$$

$$\frac{1}{x} - \frac{1}{60} = \frac{1}{20}$$

$$\frac{1}{x} = \frac{1}{20} + \frac{1}{60} =$$



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Q144

|   |   |       |   |    |
|---|---|-------|---|----|
|   | P | Q     | R | S  |
| Q | → | 25    | x | 12 |
| R | → | 50    | x | 12 |
| Q | → | (x-2) | x | 12 |
| R | → |       | x | 18 |

Previous Qn  
 $y \rightarrow \text{min}$   
 $10 \left[ \frac{1}{y} - \frac{1}{30} \right] = 1$   
 half the tank  
 $y = 7.5 \text{ min}$

$$\begin{array}{r} 25 \\ 12 \\ \hline 50 \\ 25 \times \\ \hline 300 \end{array}$$

SIR Q = 25 x 12 = 300 hrs.

$\frac{1}{300} \rightarrow 1 \text{ hr work of Q}$

$\left( \frac{5 \times 12}{300} \right) \rightarrow \frac{1}{5} \text{th of work}$

$$\frac{60}{300}$$

R  
 50 x 12 = 600 hrs

$\frac{1}{600} \leftarrow 1 \text{ hr work of R}$

$\left( \frac{18 \times 7}{600} \right) \rightarrow \text{own fraction of work}$

$$\frac{126}{600}$$

$\frac{60}{300} : \frac{126}{600}$

$20 : 21 \checkmark$

Q173  
 Q2016

A → 6 hr  
 B → 4 hr

A  
 $\frac{1}{6}$

B  
 $\frac{1}{4}$

$\frac{1}{6}$

SIR

A  $3 \left( \frac{1}{6} \right) = \frac{1}{2} \text{ Re A} = \frac{1}{2}$

B  $3 \left( \frac{1}{4} \right) = \frac{3}{4} \text{ Re B} = \frac{1}{4}$

Pg 24

A = 3 x 4 = 12 Re A = 12

B = 3 x 6 = 18 Re B = 6

$\left[ 1 - x \left( \frac{1}{6} \right) \right] = 2 \left[ 1 - x \left( \frac{1}{4} \right) \right] \quad (x=3)$

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 CHOUKSEY

Pg 47  
Q12

~~m~~

$$m + B = 160 \text{ Rs}$$

$$m = 3B$$

$$3B + B = 160 \text{ Rs}$$

$$B = 40 \text{ Rs}$$

$$m = 3 \times 40 = 120 \text{ Rs}$$

Q2

$$4m \times 40 = 7W \times 40$$

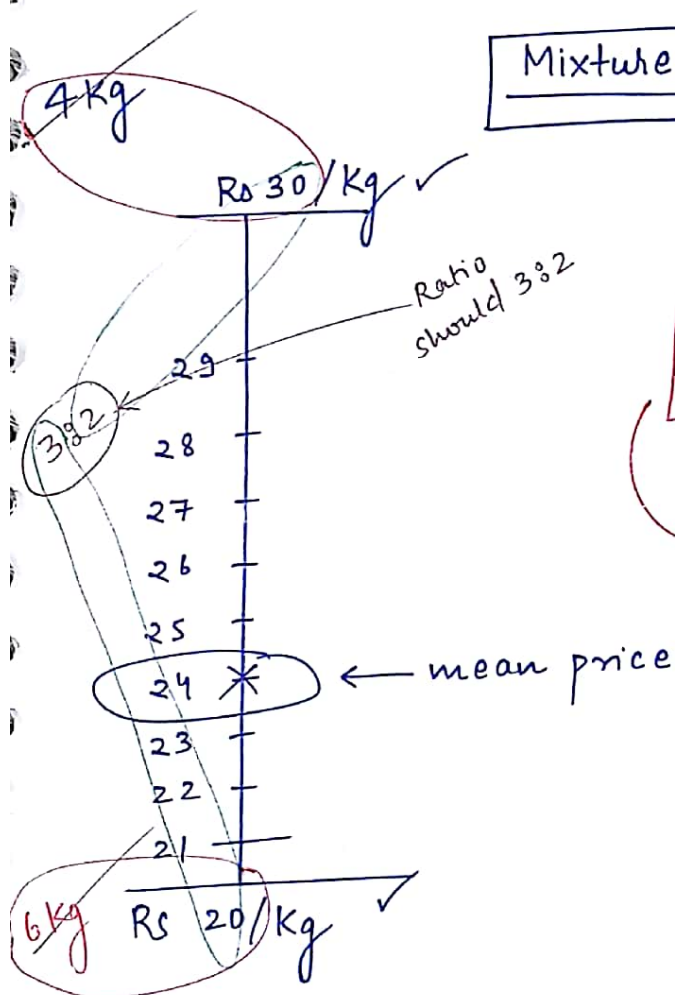
$$4m = 7W$$

Mixture

$$\frac{60 + 60}{5}$$

$$\left[ \frac{120 + 120}{6 + 4} \right]$$

₹ 24/Kg



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Q

$$\begin{array}{c} 48.32 \\ \hline 38.17 \\ \hline 16.96 \end{array}$$

①

$$\frac{Q_c}{Q_D} = \frac{P_D - MP}{MP - P_c}$$

quantity cheaper, deeper price, away formula, mean price, cheaper price

$$\frac{Q_{20}}{Q_{30}} = \frac{30 - 24}{24 - 20} = \frac{6}{4} = \frac{3}{2}$$

$$\frac{15}{10} = \frac{15}{1} = \frac{12}{8} = \dots$$

Q

wine

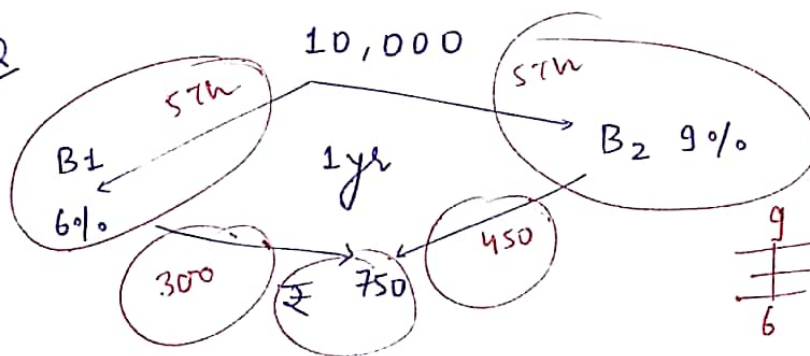
6L B<sub>1</sub> (P<sub>c</sub>) 62%  
5L B<sub>2</sub> (P<sub>D</sub>) 84%

B<sub>3</sub> (M<sub>ox</sub>) (MP) 72%

$$\frac{Q_I}{Q_{II}} = \frac{84 - 72}{72 - 62}$$

$$= \frac{6}{5} \rightarrow 6L \checkmark, 5L \checkmark$$

Q



$$\frac{9}{6} \rightarrow 7.5$$

$$10,000 \rightarrow 750$$

$$100 \rightarrow 7.5\%$$

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### (3) Replacement's formulae / Replacements.

Volm = k  
conserve

|     | M (milk) | W (water) |
|-----|----------|-----------|
|     | 100 lit  | 0 lit     |
|     | (10)     | +10       |
| 100 | 90       | 10        |
|     | -9       | -1        |
|     | 81       | 9         |
| 100 | 81       | 19        |
|     | -8.1     | -1.9      |
|     | 72.9     | 17.1      |
| 100 | 72.9     | 27.1      |
|     |          | +10       |
| 100 |          |           |

(Step 1)  
(9 : 1) ← inside a container

(Step 2)  
(81 : 19)

(Step 3)

dilution ([M] ↓ [W] ↑)  
concn.

Quantity of milk left after  $n^{\text{th}}$  operation

$$\text{Initial ~~limited~~ quantity of milk} = \left[ \frac{a-b}{a} \right]^n = \left[ 1 - \frac{b}{a} \right]^n$$

[I.Q.]

$$\text{Qu. of Milk left after } n^{\text{th}} \text{ opr} = IQ \times \left[ 1 - \frac{b}{a} \right]^n$$

where  $a$  is initial quantity,  $b$  is quantity taken out everytime & replaced by water,  $n$  = no. of replacements/operations.

$$\left[ x - \frac{10}{100}x \right] \quad x[1 - 0.1]$$

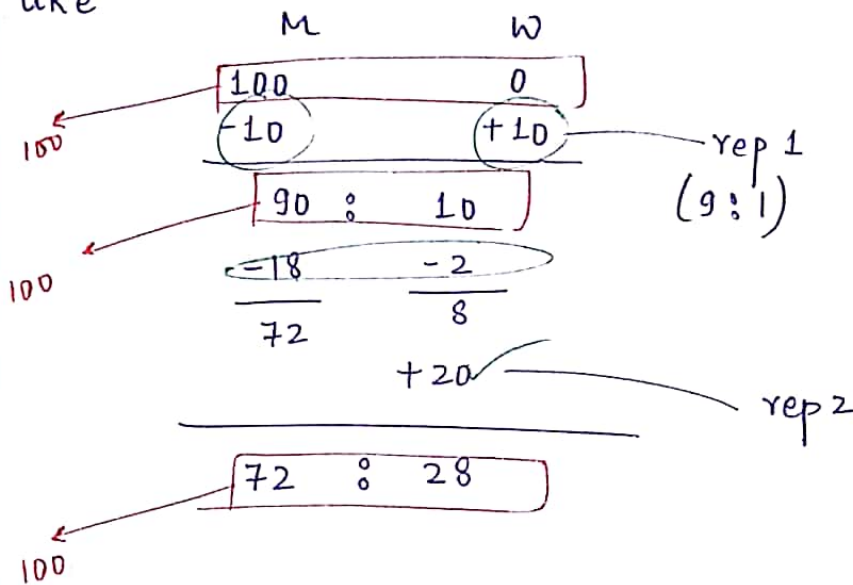
$$\begin{array}{l} \uparrow 10x \\ 1.20x \\ 1.30x \\ 1.23x \end{array} \quad \begin{array}{l} \downarrow \\ 0.90x \\ 0.80x \\ 0.77x \end{array}$$

Quantity - - - of milk after 1st opr =  $100 \left[ 1 - \frac{10}{100} \right]^1 = 100 \times 0.9$

2nd " =  $100 \times 0.9 \times 0.9 = 81 \checkmark$

3rd and so on  $\frac{3}{3} = 72.9$

like



Now

$$\text{2nd opr} = 100 \left[ 1 - \frac{10}{100} \right] \left[ 1 - \frac{20}{100} \right]$$

$$= 100 \times 0.9 \times 0.8$$

$$= 72\%$$

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$$Q \text{ Milk left} = 40 \left[ 1 - \frac{4}{40} \right] \left[ 1 - \frac{5}{40} \right] \left[ 1 - \frac{6}{40} \right]$$

$$= (A)$$

$$\text{water left} = 40 - (A)$$

Pg 69  
Q 7

$$10 \left[ 1 - \left( \frac{1}{10} \right) \right]^3 = 7.29$$

1 is 10% of 10.

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11/8/16  
T4  
Pg 48

$$\left( \frac{1}{A} + \frac{1}{B} = \frac{1}{12} \right) \left( \frac{1}{B} + \frac{1}{C} = \frac{1}{16} \right) \rightarrow B = 48$$

$$\frac{5}{A} + \frac{7}{B} + \frac{13}{C} = 1$$

$$5 \left[ \frac{1}{A} + \frac{1}{B} \right] + 2 \left[ \frac{1}{B} + \frac{1}{C} \right] + \frac{11}{C} = 1$$

$$5 \left( \frac{1}{12} \right) + 2 \left( \frac{1}{16} \right) + \frac{11}{C} = 1$$

$$C = 24$$

$$T_5 \rightarrow 48$$

### PERCENTAGE

Q → A's salary is 20% more than that of B. By how much % is B's salary less than that of A.

Sol

$$\begin{aligned} & \text{20\% } \uparrow \\ & B = 100, A = 120 \\ & \frac{-20}{120} = -\frac{1}{6} \approx \underline{16.6\%} \downarrow \end{aligned}$$

$$\begin{aligned} & \text{let } 100 \xrightarrow{10\% \uparrow} 110 \\ & \frac{-10}{110} = -\frac{1}{11} \approx 9.09 \downarrow \end{aligned}$$

Q → A's salary is 20% less than that of B. By how much % is B's salary more than that of A.

$$\begin{aligned} & \text{20\% } \downarrow \\ & B = 100, A = 80 \end{aligned}$$

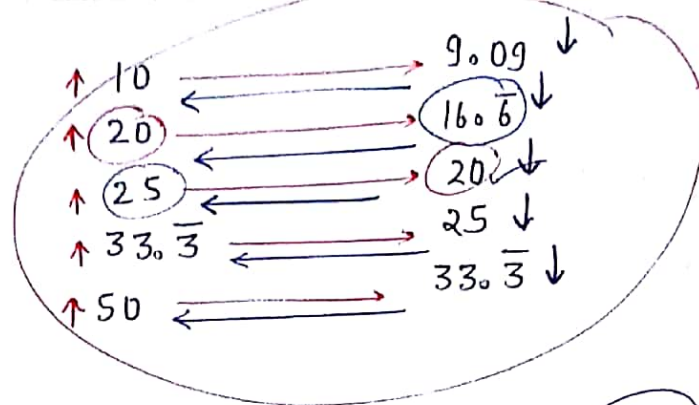
$$\frac{+20}{80} = \frac{1}{4} \approx \underline{25\%} \uparrow$$

$$\text{let } B = 100 \xrightarrow{25\% \downarrow} 75$$

$$\frac{+25}{75} = \frac{1}{3} \approx \underline{33.3\%} \uparrow$$

$$\frac{20}{80} = \frac{1}{4}$$

$$25\%$$



\*  $R = a \times b$

$a$  changes by  $x\%$

$b$  changes by  $y\%$

$$\Delta R = x + y + \frac{xy}{100}$$

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Ex:-  $A = l \times b$

$D = n \times t$

Revenue (R) = Price of car (P)  $\times$  (N) No. of car

\*  $l = 20 \uparrow$   $b = 10 \uparrow$   $32\%$

$A = l \times b$

$A' = 1.2l \times 1.1b$

$A' = 1.32 lb$

or

$$20 + 10 + \frac{20 \times 10}{100} = 32\%$$

$l = 20 \uparrow$   $b = 10 \downarrow$

$A = l \times b$

$A' = 1.2l \times 0.9b$

$A' = 1.08 lb$   $8\%$

or

for every  $\uparrow$   $\downarrow$

$$20 - 10 + \frac{20(-10)}{100} = 8\%$$



\*\*\* \*\* PROFIT (%) LOSS

$$P = (SP - CP)$$

✓ selling price (SP)

✓ cost price (CP)

$$P\% = \left[ \frac{(SP - CP)}{CP} \right] \times 100$$

$$L\% = \left[ \frac{(CP - SP)}{CP} \right] \times 100$$

20% Profit  $\rightarrow$   $SP = CP \times 1.2$

$\hookrightarrow$  SP is 20% above the cost price.

20% Loss  $\rightarrow$   $SP = CP \times 0.8$

$\hookrightarrow$  SP is 20% below the cost price.

Q eggs are bought at the rate of 7 eggs for Rs. 1. If the shopkeeper wants to make a profit of 40%, how many eggs should he sell for 1 Rs.

Sol

$$CP (1 \text{ egg}) = \left( \frac{1}{7} \right)$$

$$SP \text{ of } 1 \text{ egg} = \left( \frac{1}{7} \right) \times 1.4$$

=

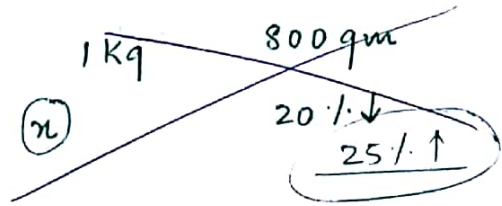
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Q ① A dishonest shopkeeper uses a false weight of 800 gm instead of 1 kg weight. If he promises to sell the goods at the cost price, then his profit %.

Q ② On selling 36 mangoes, a shopkeeper recovers a CP of 33 mangoes only. Find loss %.

Sol 1

$$P = \frac{SP - CP}{CP}$$



SIR →

$$\frac{\text{Profit}}{CP} = \frac{(\text{CP of } 200 \text{ gms})}{(\text{CP of } 800 \text{ gms})} = \frac{1}{4} \approx 25\%$$

Sol 2

$$\frac{L}{CP} = \frac{(\text{CP of } 3 \text{ Mangoes})}{(\text{CP of } 36 \text{ mangoes})} = \frac{1}{12} \approx 8.3\%$$

Q 1> A dishonest milkman uses a false measuring vessel of 800 ml instead of 1000 ml and further adulterates milk with 20% water (free of cost). If he promises to sell the milk at the CP then his Profit %.

Sol

~~$$P\% = \frac{CP \text{ of } 200 \text{ ml}}{CP \text{ of } 1000 \text{ ml}}$$~~
~~$$P\% = \frac{CP \text{ of } 200}{CP \text{ of } 1000}$$~~

1st cheating →  $\frac{CP \text{ of } 200 \text{ ml}}{CP \text{ of } 800 \text{ ml}} = \frac{1}{4} \approx 25\%$

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1st cheating (without mixing water)  $\rightarrow$  25%

$$(1.25) \times (1.2) = 1.50$$

or

$$25 \times 20 + \frac{25 \times 20}{100} = 50\%$$

ex

$$1 \text{ ml} = 1 \text{ Rs}$$

$$1000 \text{ ml}^m = 1000 \text{ Rs}$$

$$(+)\ 200 \text{ ml}^w = 0 \text{ Rs}$$

$$1200 \text{ ml} = 1000 \text{ Rs} = \text{Total cost Price (TCP)}$$

$$\frac{1}{6} = 16.\bar{6}\% \text{ w}$$

$$800 \text{ ml} \rightarrow \text{Rs. } 1000$$

$$400 \text{ ml} \rightarrow \text{Rs. } 500$$

$$1200 \text{ ml} \rightarrow \text{TCP} = \text{Rs } 1500$$

$$\frac{P}{CP} = \frac{500}{1000} \times 100 = 50\%$$

other ex

$$1 \text{ ml} = \frac{1}{6} \text{ Rs}$$

$$800 \text{ ml}^m \rightarrow \text{Rs } 800$$

$$160 \text{ ml}^w \rightarrow \text{Rs } 0$$

$$960 \text{ ml} \rightarrow \text{Rs. } 800 = \text{TCP}$$

adulterate  $\rightarrow$  add.  
puts  
mixture does not  
contain 20%  
water

$$800 \text{ ml} \rightarrow \text{Rs } 1000$$

$$160 \text{ ml} \rightarrow \text{Rs. } 200$$

$$960 \text{ ml} \rightarrow 1200 \text{ Rs}$$

$$P/CP = \frac{400}{800} \times 100 = 50\%$$

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Q 29 (Pg 72)

SP  $\rightarrow$  Rs 60/unit

TC<sub>Pris</sub> = Rs 100

TP<sub>Pr</sub> = Rs 500  
%ft

$\uparrow$  30%

130

TC' = 130

SP = 600

₹ 60 ——— 1 unit

100 ₹  
Sir

SP/unit = 60 Rs

Total CP = 100 Rs

Profit = 500 Rs

Profit % =  $\frac{P}{CP} \times 100 = \frac{500}{100} \times 100 = 500\%$

~~SP = CP + Profit~~      ~~SP = 600~~      CP' = 130 Rs

P.% = 500% same

laymen  
dont  
follow  
this

Profit' = 650 Rs (+130)

SP' = 780

SP'/unit =  $\frac{780}{10} = 78/-$

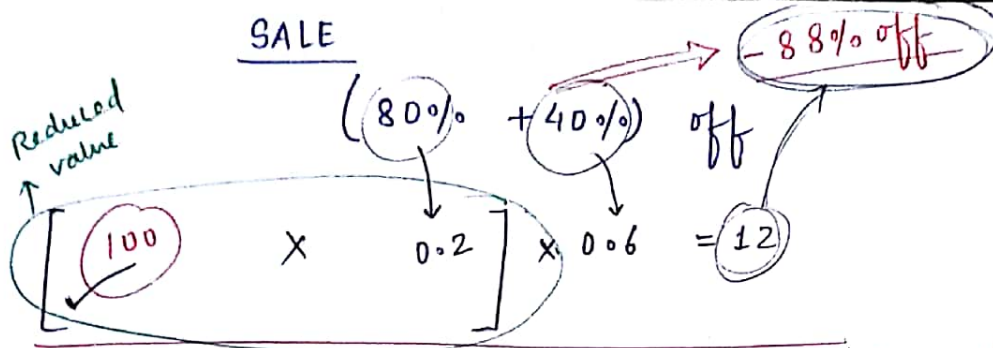
$60 \times 1.3$       30%

NOW  
SIR

SP = CP  $\times$  1.0 P ✓  
 $\swarrow$   
SP  $\times$  1.3 =  $\frac{CP \times 1.3}{1.3} \times 1.0 P$  ✓  
SP' = CP'

Profit doesn't depend  
on no. of  
units.

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milkman

$$1.25 \times 1.20$$

$$25 + 20 \times \frac{25 \times 20}{100}$$

$$= 50\%$$

successive profit cond<sup>n</sup> → dhamaake pay dhamaaka.

$$\frac{-80 - 40 + \frac{(-80)(-40)}{100}}{-120 + 32} = -88 \text{ off}$$

$$\begin{array}{l} 100 \\ \downarrow \times 0.9 \\ 90 \\ \downarrow \times 0.9 \\ 81 \\ \downarrow \times 0.9 \\ 72.9 \end{array}$$

Q

$(70\% + 30\%) \text{ off}$

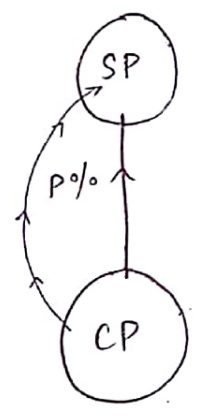
$100 \times 0.3 \times 0.7 = 21$

$-79\%$

$\text{if } \neq 10\%$

$\times 0.9 =$

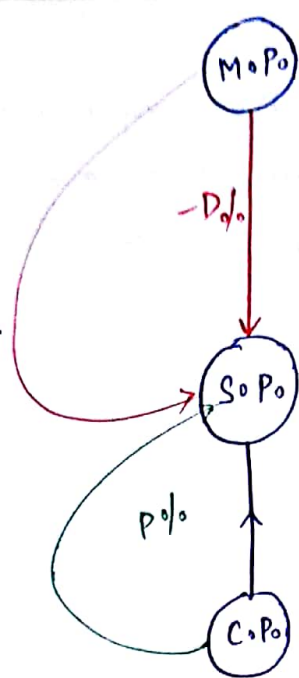
**MARKED PRICE** → list price, labelled price, print price, MRP



[ N.P ]

MOHIT CHOUKSEY



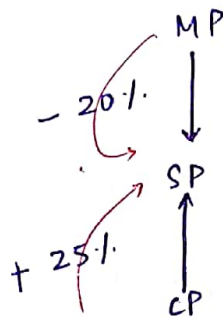
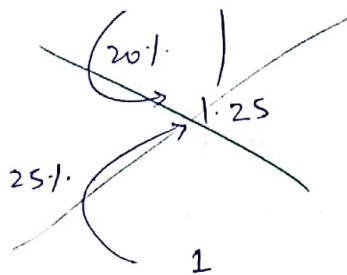


marked price  $\rightarrow$  discount selling price  
and CP  $\rightarrow$  profit.

Q. After offering a discount of 20%, a shopkeeper still manages to make a profit of 25%. By how much % is the mark price above the cost price.

Sol

$$MP \times \cancel{0.8} 0.8 = SP \quad SP = CP \times 1.25$$



$$MP = CP \times \frac{1.25}{.8}$$

$$MP = CP \times 1.5625$$

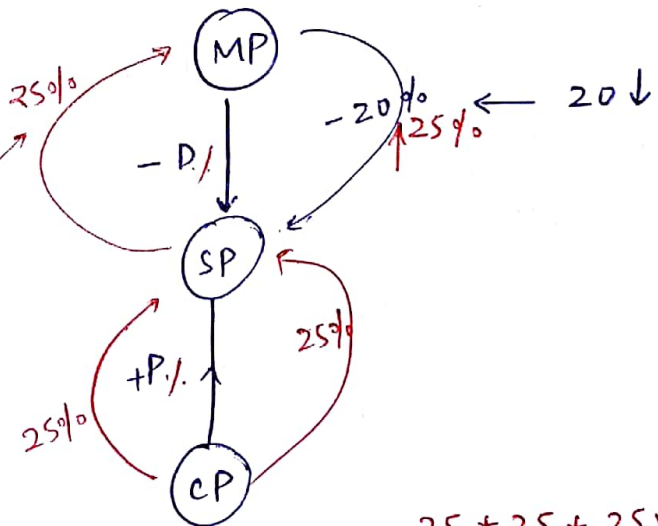
$$56.25\%$$

✓  $MP \times 0.8 = SP$

$$MP \times \frac{4}{5} = SP$$

$$MP = SP \times \frac{5}{4}$$

$$MP = \frac{SP \times 1.25}{1}$$



$$25 + 25 + \frac{25 \times 25}{100}$$

$$56.25\%$$

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## Two Rules

↳ Rule (1) Two articles are sold at a common SP (selling price) of Rs. S each. one is sold at a profit of P% and another at a loss of P%, then effectively there is always a loss during the entire transaction

$$\text{(value)} \quad \boxed{\text{loss} = \frac{2P^2 S}{(100^2 - P^2)}} \quad (\text{Rs})$$

$$\boxed{\text{loss}\% = \frac{P^2}{100} \%}$$

↳ Rule (2) Two articles are bought at a common CP, one is sold at a profit of P% and another at a loss of P%, then effectively there is no profit no loss.

Q Two shirts are sold at a common SP of Rs 480 each, 1 is sold at a profit of 20% and ~~20~~ another at a loss of 20%. then find loss and loss %.

Sol

$$SP_1 = SP_2 = ₹ (480) \text{ each}$$

$$SP_1 = CP_1 \times 1.2$$

$$480 = CP_1 \times 1.2$$

$$SP_2 = CP_2 \times 0.8$$

$$480 = CP_2 \times 0.8$$

$$\text{TSP} = 960$$

$$\Rightarrow CP_1 = 400$$

+

$$\Rightarrow CP_2 = 600$$

$$\text{TCP} = 1000$$

$$\text{loss} = 40 \text{ Rs}$$

$$\text{loss}\% = \frac{40}{1000} \times 100 = 4\%$$

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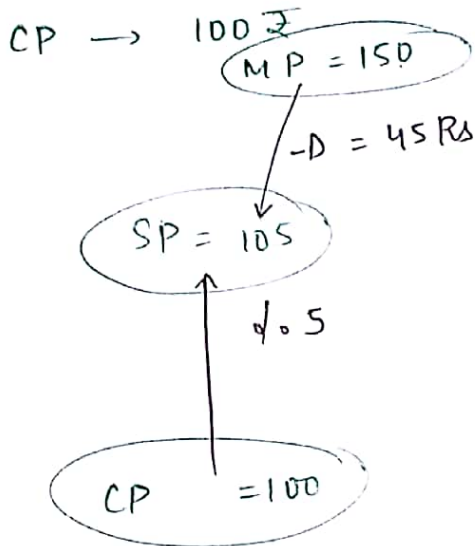
0h

$$\text{Loss} = \frac{2 \times 20 \times 20 \times 480}{80 \times 120} = 40 \text{ ₹}$$

$$\text{Loss \%} = \frac{20 \times 20}{16} = 4\%$$

Pg 52  
Q10

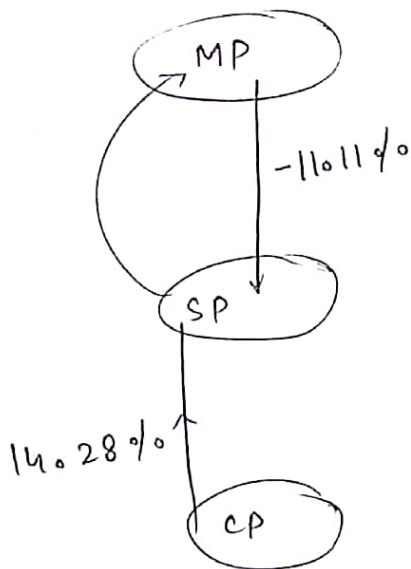
~~50%~~ ~~CP~~



hence

$$\frac{45}{150} \times 100 = 30\%$$

T9



SIR

$$11.11 \rightarrow \frac{1}{9}$$

$$\begin{aligned} & \text{MP} \left( 1 - \frac{10}{100} \right) \\ & \text{MP} \left( 1 - \left( \frac{1}{9} \right) \right) \\ & = \text{SP} = \text{CP} \times \left( 1 + \frac{1}{7} \right) \end{aligned}$$

$$\text{MP} \times \frac{8}{9} = \text{CP} \times \frac{8}{7}$$

$$\text{MP} = \frac{9}{7} \text{ CP}$$

$$\boxed{\text{MP} = 1.2856 \text{ CP}}$$

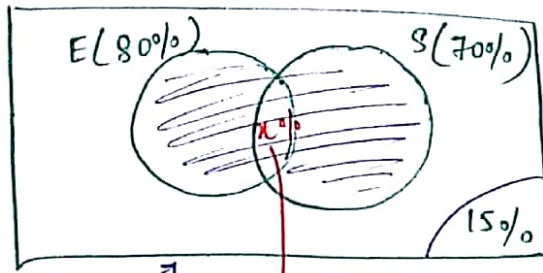
MOHIT CHOUKSEY

51  
P9 Q7

$$\begin{aligned} 80\% & \xrightarrow{P} E \\ 70\% & \xrightarrow{P} S \\ 15\% & \xrightarrow{F} E \& S \end{aligned}$$

$$195 \xrightarrow{P} E \& S$$

SIR



100%

$$65\% \text{ of } T = 195$$

$$T = 300$$

**RATIO**

comparison b/w 2 quantities

Q.7 A student scored marks in 5 subjects in the ratio of 5:6:7:8:9. If the maxm. marks for all subjects is same and on aggregate, he scored 60% marks. in how many subjects did he pass the exam if passing marks is 50%.

Sol

let the maxm. marks in each subject = 100

Total semester = 500

$$\text{He scored} = \frac{5}{100} \times \frac{6}{100} \times \frac{7}{100} \times \frac{8}{100} \times \frac{9}{100} = 300$$

$$\begin{aligned} 5x + 6x + 7x + 8x + 9x &= 300 \\ 35x &= 300 \\ x &= 60/7 \end{aligned}$$

$5 \times \frac{60}{7}$   
 $6 \times \frac{60}{7}$

**MOHIT CHOUKSEY**



# PROPORTION

$$\begin{array}{cccc} \text{I} & \text{II} & \text{III} & \text{IV} \\ a & : & b & : : c & : & d \end{array}$$

$$\frac{a}{b} = \frac{c}{d}$$

$$a \times d = b \times c$$

if  $a, b, c, d$  are in continuous proportion.

$$\frac{a}{b} = \frac{b}{c} \Rightarrow b^2 = ac \Rightarrow b = \sqrt{a \times c}$$

$b$  is GM (geometric mean)  
or MP (mean proportion) b/w ( $a$  &  $c$ )

## DIRECT PROPORTION

$$\uparrow a \propto b \uparrow$$

$$a = kb'$$

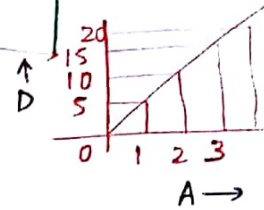
$$a/b = k$$

$$\rightarrow a_1/b_1 = a_2/b_2$$

→ unitary method

$$\rightarrow y = \text{mix}$$

$$\begin{array}{ccc} \uparrow A & \propto & D \uparrow \\ M & [1 \times 5] & \\ 3 & \propto & 15 \text{ Rs} \\ 6 & \propto & 30 \\ 10 & \propto & 50 \end{array}$$



ONGC 2012

Q Reduction in speed of a Railway engine is directly  $\propto$  to the sq. root of no. of compartments attached. If the maximum speed of the engine was 42 kmph when no compartment was attached and speed was 24 kmph when 9 compartments were attached. then the maxm. no. of compartments that can be carried forward by the Engine.

$$42 - k(3) = 24$$

Sol

$$\cancel{(x)} \propto \cancel{y}^{1/2}$$

$$\text{Redn} \propto \sqrt{n}$$

$$\text{Redn} = k\sqrt{n}$$

$$sp = sp_{\max} - k\sqrt{n}$$

$$sp = 42 - k\sqrt{n}$$

$$24 = 42 - k\sqrt{n}$$

$$k=6$$

$$sp = 42 - 6\sqrt{n}$$

$$6\sqrt{n} = 42$$

$$\sqrt{n} = 7$$

$$n = 49$$

engine stops  
so at  $n = 48$   
engine unsafe.

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$$\text{Red}^n \propto \sqrt{n}$$

$$(v_2 - v_1) = k\sqrt{n}$$

$$42 - 24 = k\sqrt{9}$$

$$k = 6$$

$$42 - \cancel{24}^0 = 6\sqrt{n}$$

$$n = 49$$

## INVERSE PROPORTION

$$\uparrow a \propto \frac{1}{b} \downarrow \rightarrow a_1 \times b_1 = a_2 \times b_2$$

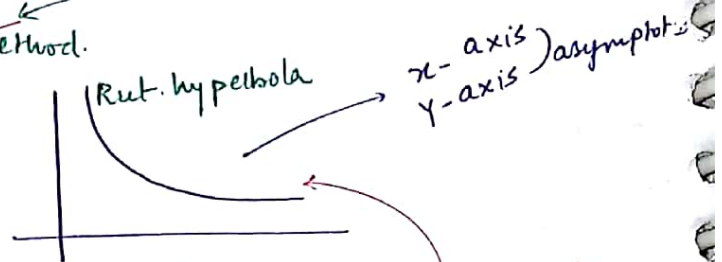
$$a = \frac{k}{b}$$

$$a \times b = k$$

~~unitary method.~~

$$x \times y = c$$

never applicable



if 40 m  $\rightarrow$  100 day  
20 m  $\rightarrow$   $x = 200$  //

## CHAIN RULE

m

30

20

d

15

$x$

l

40

50

b

60

45

h

90

80

$$\frac{DP}{\frac{a}{b}} = k$$

$$\frac{IP}{a \times b} = k$$

m  $\downarrow$

30

20

l  $\uparrow$

40

50

b  $\uparrow$

60

45

h  $\uparrow$

90

80

d  $\uparrow$

15

$x$

$$15 \times 30$$

$$40 \times 60 \times 90$$

$$= \frac{x \times 20}{50 \times 45 \times 80}$$

$$50 \times 45 \times 80$$

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Pg 69  
Q9

$P_{50}$

$\frac{1}{8}$

$Q_{40}$

$R_{30}$

$S_{20}$

$P_{50} \quad Q_{40} \quad R_{30} \quad S_{20}$

SIR

$D \propto P$   
 $\propto t$   
 $\propto g$   
 $D = K p g t$

varies proportionately  $\rightarrow$  graphs

$\uparrow D \propto$   
age

$\rightarrow \uparrow$  Growth  
growth of a single microbe surviving human immunity  
system  
within 24 hrs of entering  
the  
body

$\rightarrow \uparrow$  Potency (probability of microbe overcoming H. immunity  
man)

$\rightarrow \downarrow \frac{1}{E}$  Toxicity (milligram of Mrc seq.)

$D = \frac{P g}{t} K$  - formulae

LR DI  
Logical Reasoning Data interpretation

dangerous  
level

$D_p = \frac{5^2 \times 4}{8 \times 2} = 12.5$

$D_q = \frac{4^2 \times 5}{6} = 13.33$

$D_A = \frac{3^2 \times 4}{3} = 12$

$D_S = \frac{2^2 \times 8}{2} = 16$

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Pg no.  
50  
Q3

$$25p \rightarrow \frac{1}{5m} \text{ rs}$$

$$10p \rightarrow \frac{1}{10} \text{ rs} = 61$$

Q6

$$\frac{a}{b} = \frac{c}{d}$$

Q8

$$\frac{\text{Profit A}}{\text{Profit B}} = \frac{I_A \times T_A}{I_B \times T_B}$$

investment → Time

Q7

$$\frac{a}{b} = \frac{b}{c} \quad \checkmark \quad \frac{36}{48} = \frac{48}{n}$$

Q9

$$0.7, 2.8$$

$$MP = \sqrt{0.7 \times 2.8}$$

$$\frac{I_n A}{5 \times 8 + 4 \times 4}$$

$$\frac{I_n B}{6 \times 4 + 3 \times 8}$$

$$\frac{5x}{8x}$$

$$\frac{8 \text{ months} \times 5x}{T_B \times 8x} = \frac{1}{2}$$

$$T_B = 10 \text{ months}$$

Q

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12/8/16

# SPEED, DISTANCE, TIME

$$S = \frac{D}{t}$$

$$\frac{1 \text{ km}}{\text{hr}} = \frac{1000 \text{ m}}{60 \text{ sec} \times 60 \text{ sec}}$$

$$= \frac{5}{18} \text{ m/sec}$$

$$(\because t = K) \uparrow S \propto D \uparrow$$

$$\frac{S_1}{S_2} = \frac{D_1}{D_2}$$

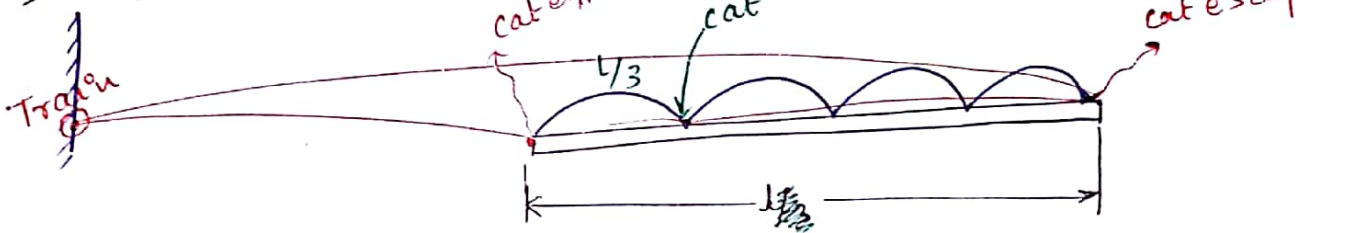
$$(\because D = K)$$

$$\uparrow S \propto \frac{1}{t} \downarrow$$

$$S \times t = K$$

$$S_1 \times t_1 = S_2 \times t_2$$

Q Gate 2017  
(2m)



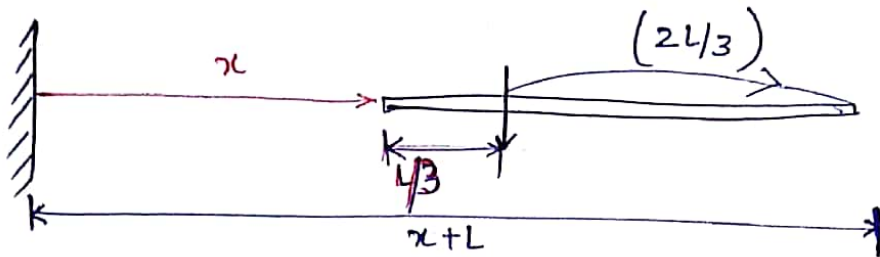
$$\frac{S_{pT}}{S_{pC}} = ?$$

$$S = \frac{D}{T} \quad C \rightarrow S = \frac{D_T}{T_1}$$

$$\frac{D_T}{T_1}$$

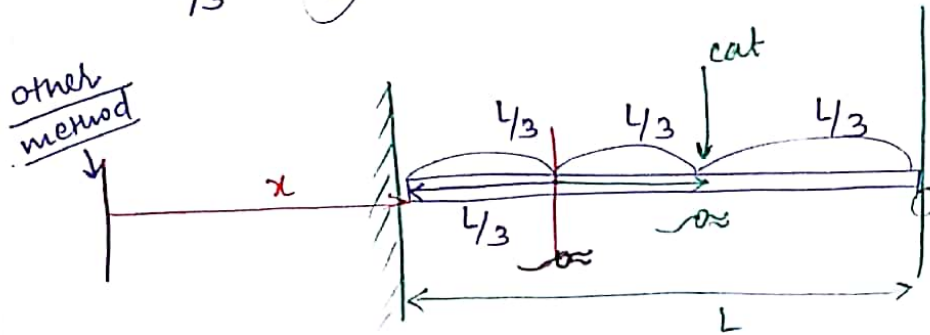
$$\frac{L/3}{T_1}$$

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$$\frac{S_{PT}}{S_{PC}} = \frac{x}{L/3} = \frac{x+L}{2L/3} \Rightarrow 2x = x+L \Rightarrow x=L$$

$$\frac{L}{L/3} = \left(\frac{3}{1}\right)$$



$$\frac{S_{PT}}{S_{PC}} = \frac{L}{L/3} = \frac{3}{1} \quad (\because t = k)$$

**AVERAGE SPEED**

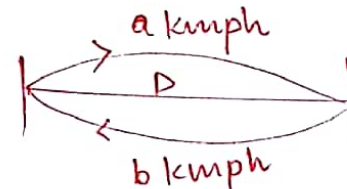
$$= \frac{\text{Total Distance}}{\text{Total time}}$$

AM > GM > HM

$$\text{Avg sp} = \frac{TD}{TT} = \left[ \frac{D_1 + D_2 + D_3}{t_1 + t_2 + t_3} \right]$$

$$\left[ \frac{S_1 \times t_1 + S_2 \times t_2 + S_3 \times t_3}{t_1 + t_2 + t_3} \right] \checkmark$$

$$\frac{D_1 + D_2 + D_3}{\left( \frac{D_1}{S_1} + \frac{D_2}{S_2} + \frac{D_3}{S_3} \right)} \checkmark$$



$$\text{Avg sp} = \frac{TD}{TT}$$

$$= \frac{2D}{D/a + D/b}$$

$$= \frac{2ab}{a+b}$$

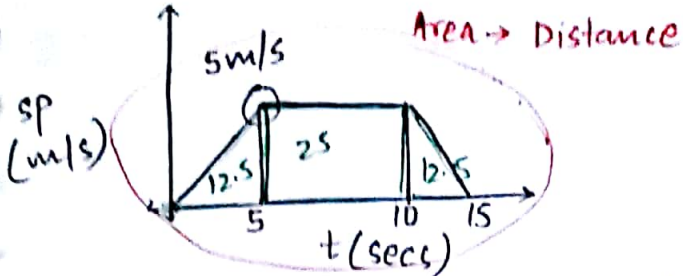
harmonic mean of a & b.

Arg sp.

$$TD = \frac{2ab}{a+b}$$

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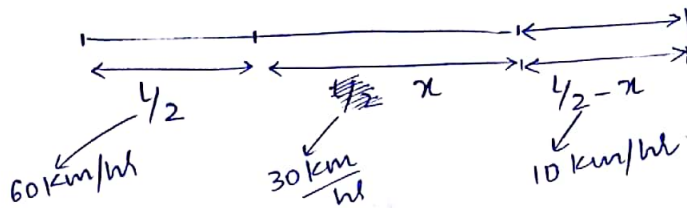




Average speed =  $\frac{TD}{TT} \rightarrow \frac{\text{Area under any (s-t) graph}}{(TT)}$

$$\text{Arsp} = \frac{50}{15} = 3.33 \text{ (m/s) (during entire journey)}$$

Q34  
Pg 72



~~Avg sp =  $\frac{\frac{1}{2} + \frac{1}{2}}{\frac{1}{2} + \frac{1}{2}}$~~

~~$$= \frac{1}{\frac{1}{120} + \frac{x}{30} + \frac{1}{20} - \frac{x}{20}}$$
  

$$= \frac{1 + 4x + 6 - 6x}{120}$$
  

$$= \frac{1 + (-2x) + 6}{120}$$~~

(34)

120 kms

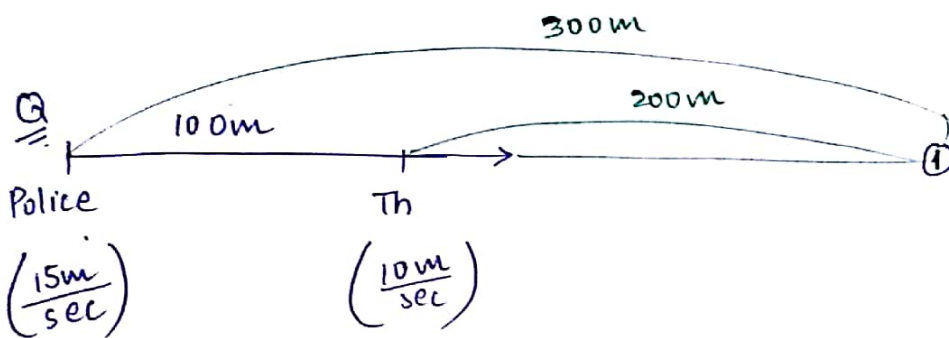
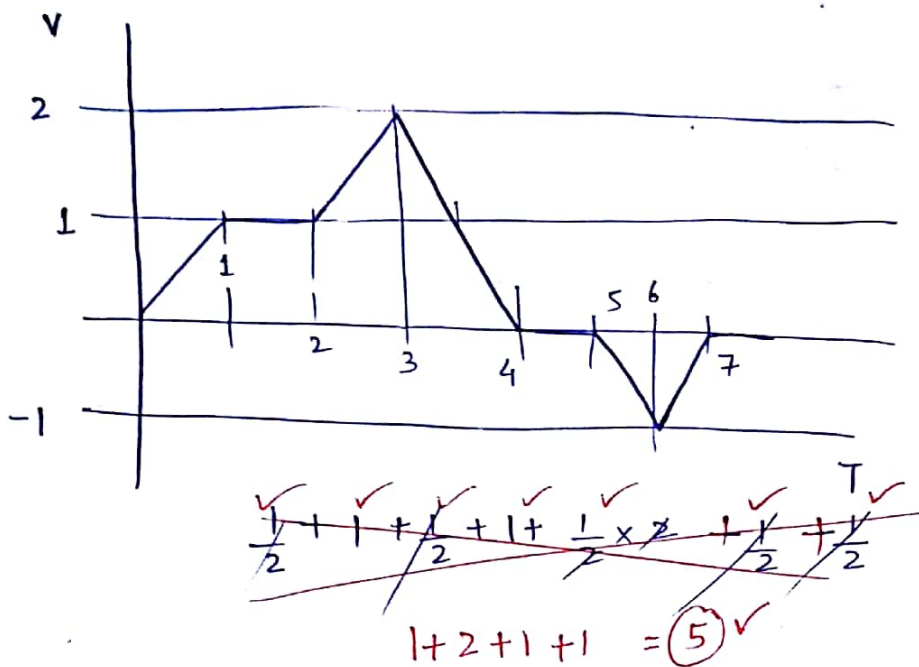
$$\left( \frac{60}{60} + \frac{30}{30} + \frac{30}{10} \right) \text{ hrs} = 24 \text{ kmph}$$

(40)

$$\frac{(8 + 6 + 16) \text{ km}}{(\frac{1}{4} + \frac{1}{4} + \frac{1}{4}) \text{ hrs}} = \frac{30 \text{ km}}{3/4 \text{ hrs}} = 40 \text{ kmph} \checkmark$$

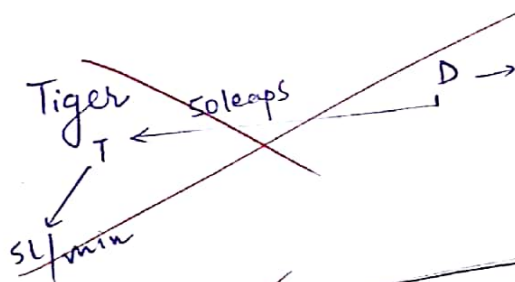
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Q154



$$\frac{100m}{(15-10) \frac{m}{sec}} = 20 \text{ sec} \quad \text{Relative speed}$$

127



$$\frac{D}{S_0} = \frac{S}{T}$$

each leap = 8m (Tiger)

SIR

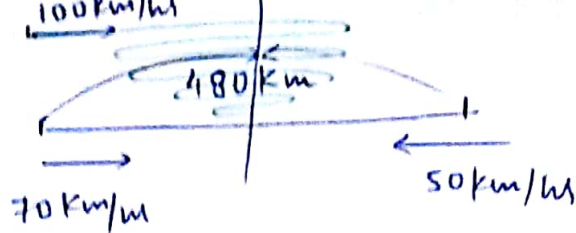
$$5 \times \frac{8 \text{ m}}{\text{min}} = 40 \frac{\text{m}}{\text{min}}$$

$$4 \times \frac{5 \text{ m}}{\text{min}} = 20 \frac{\text{m}}{\text{min}}$$

$$RS = \frac{400}{(40-20) \frac{m}{min}} = 20 \text{ mins}$$

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Q713  
Pg 54



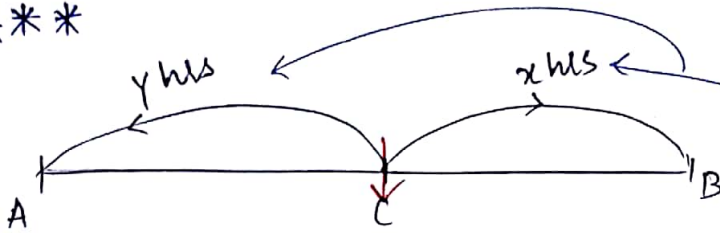
Bird remain in  
here and do  
not k for  
motion in  
4 hrs

$$R_s = \frac{480 \text{ km}}{(70+50) \frac{\text{km}}{\text{hr}}} = \frac{480}{120} = 4 \text{ hrs}$$

$\frac{\text{km}}{\text{hr}} 100 \times 4 \text{ hrs} = \frac{400 \text{ km}}{\text{km}}$

$DB = SP_B \times t$   
 $= 400 \text{ kms}$

\*\*\*



$$\frac{SP_A}{SP_B} = \sqrt{\frac{y}{x}}$$

① & ②

$x$  &  $y$  are not  
general time  
taken.

Before meeting

$x, y$  are time taken after  
meeting.

$$SP_A \times t = AC$$

$$SP_B \times t = BC$$

After meeting

A goes CB in ' $x$ ' hrs,

$$SP_A = \frac{CB}{x} = \frac{SP_B \times t}{x} \quad \text{--- ①}$$

B goes CA in ' $y$ ' hrs,

$$SP_B = \frac{AC}{y} = \frac{SP_A \times t}{y} \quad \text{--- ②}$$

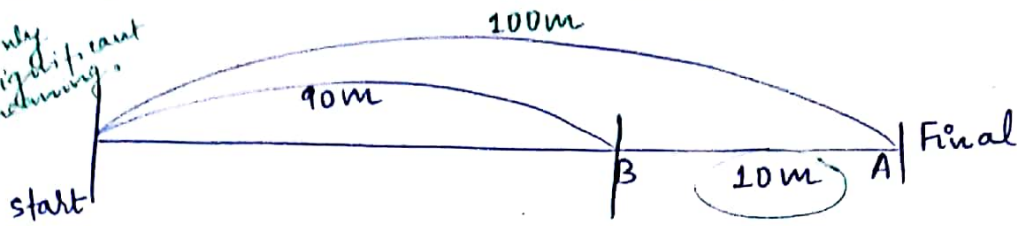
T12 →

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**RACES.** → pure application of Ratio / nothing but Ratio

A beats B by 10m in a 100m race.

B = 90m  
A = 100m  
→ only significant meaning.

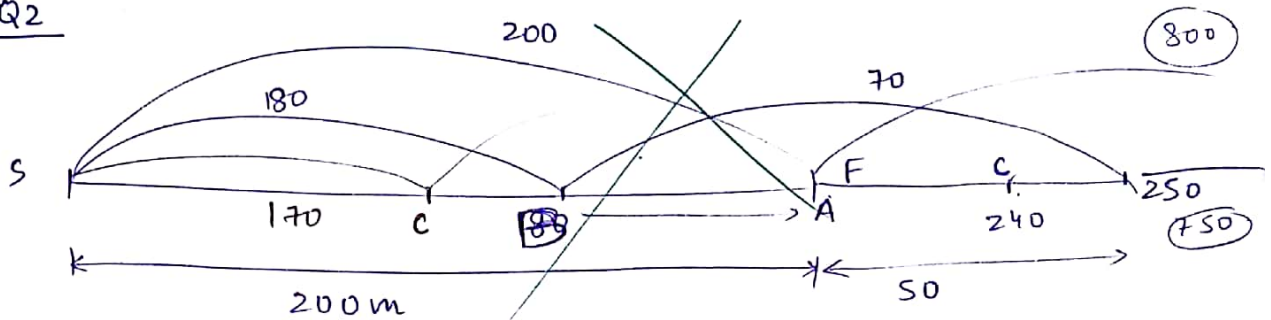


$$\left[ \frac{S_A}{S_B} = \frac{100}{90} \right] (\because t = k)$$

Q A finishes 12m ahead of B and 18m ahead of C. while B finishes 8m ahead of C. then the length of the race.  
a. 36, b. 48, c. 60, d. 72

Sol → Q2

Q1 Pg 53



$$\frac{S_A}{S_B} = \frac{200}{180} = \frac{20}{18}$$

$$\frac{S_B}{S_C} = \frac{250}{240} = \frac{25}{24}$$

$$\frac{S_A}{S_B} \times \frac{S_B}{S_C} = \frac{20}{18} \times \frac{25}{24} = \frac{25}{18}$$

$$\frac{S_A}{S_C} = \frac{25}{18}$$

$$\frac{S_A}{S_C} = \frac{250}{108}$$

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Pg 53

$$\frac{B}{C} = \frac{250}{240}$$

$$\left[ \frac{A}{C} = \frac{A}{\cancel{B}} \times \frac{\cancel{B}}{C} \right]$$

$$\frac{A}{C} = \frac{20}{18} \times \frac{25}{24}$$

$$\frac{A}{C} = \left( \frac{500}{432} \right) \times 2 = \frac{1000}{864} = 1.36 \text{ means}$$

$$\frac{A}{B} = \frac{L}{L-12}$$

$$\frac{A}{C} = \frac{L}{L-18}$$

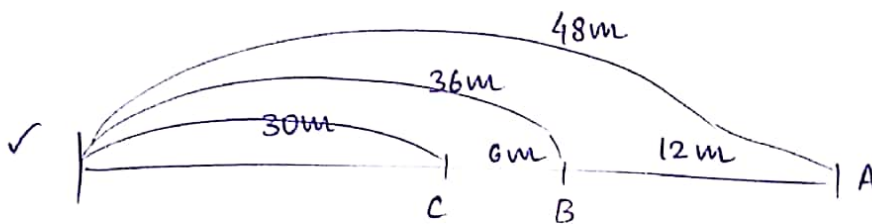
$$\frac{B}{C} = \frac{L}{L-8}$$

$$\frac{L}{L-18} = \frac{L}{L-12} \times \frac{L}{L-8}$$

$$\frac{\cancel{L}}{L-18} = \frac{\cancel{L}}{L-12} \times \frac{\cancel{L}}{\cancel{L-18}}$$

$$\left[ \frac{L-12}{L-18} = \frac{L}{L-8} \right]$$

use options  $\rightarrow (L=48)$



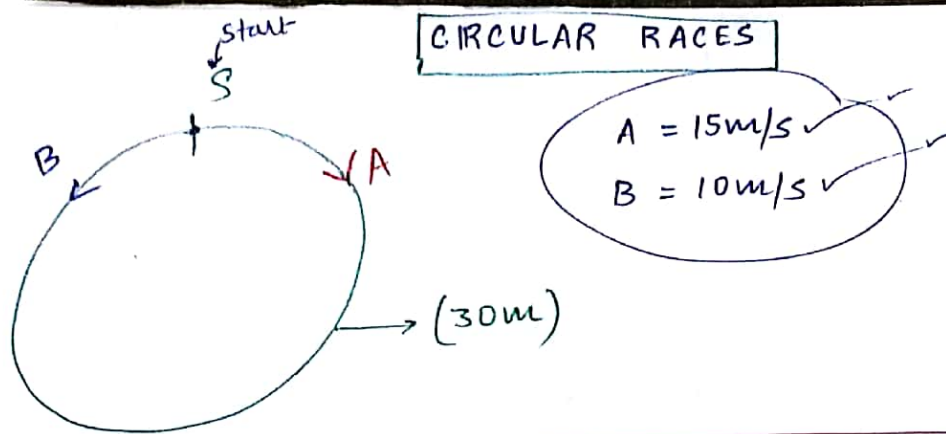
$$\frac{B}{c} = \frac{36}{30} = \left(\frac{6}{5}\right) \times \frac{8}{8} = \frac{48}{-40}$$

---

$$\frac{8}{m}$$

Scanned by CamScanner





① Time taken for meeting @ start point for the first time

LCM ( $t_A, t_B$ )

$$\text{LCM} \left( \frac{\text{circumference}}{s_{pA}}, \frac{\text{circumference}}{s_{pB}} \right)$$

$$\text{LCM} \left( \frac{30}{15} + \frac{30}{10} \right) = \underline{6\text{sec}}$$

@ 6 sec

$$D_A = 15 \times 6 = 90\text{m} = 3\text{h}$$

$$D_B = 10 \times 6 = 60\text{m} = 2\text{h}$$

@ 12 sec

$$D_A = 15 \times 12 = 6\text{h}$$

$$D_B = 4\text{h}$$

② Time taken for meeting for <sup>the</sup> 1st time

$$\frac{\text{circumf.}}{\text{Rel. } (s_{pA} \pm s_{pB})} = \frac{30}{(15+10)} = \underline{1.2\text{secs}}$$

@ 1.2 secs

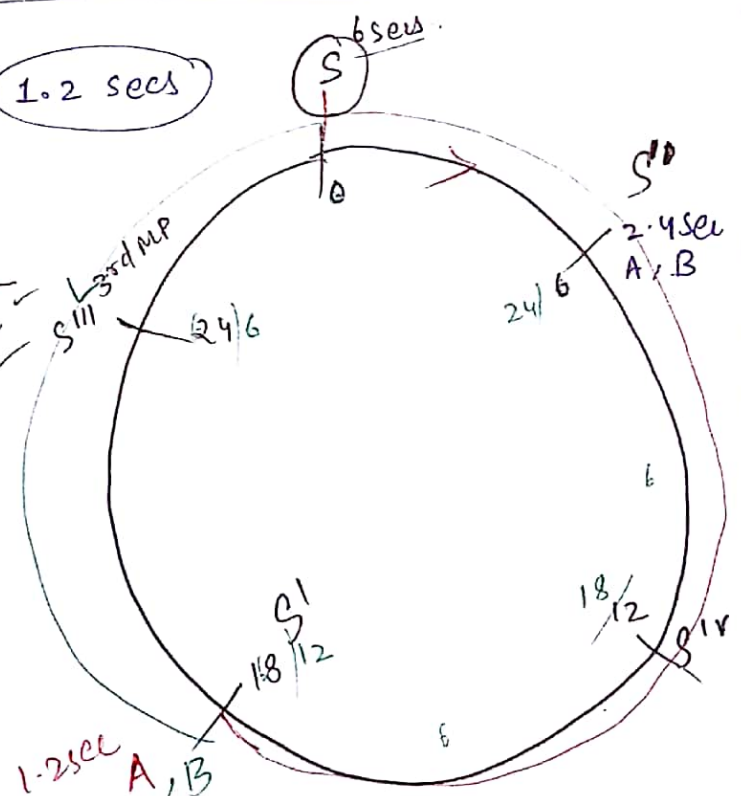
$$D_A = 15 \times 1.2 = 18\text{m}$$

$$D_B = 10 \times 1.2 = 12\text{m}$$

@ 2.4 sec

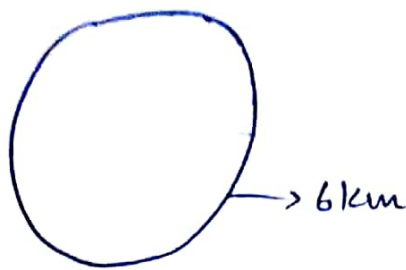
$$D_A = 36\text{m}$$

$$D_B = 24\text{m}$$



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Pg 53  
(7) x



A  $\rightarrow$  6 km/h  
B  $\rightarrow$  12 km/h

$$\frac{6 \text{ km}}{(6+12) \frac{\text{km}}{\text{h}}} = \frac{1}{3} \text{ h} \approx 20 \text{ min} \checkmark$$

$\frac{30}{18} = 6$

⑧ @SP  $\text{LCM}\left(\frac{600}{15}, \frac{600}{20}\right) \frac{\text{m}}{\text{sec}} = \frac{600}{5} = 120 \text{ sec} \approx 2 \text{ min} \checkmark$

3rd formulae

No. of distant int meeting points on the track

$= \frac{P}{Q}$   
 $\rightarrow$  value after ①  
 $\rightarrow$  value after ② formulae  
 (1.2)  $\rightarrow$  6

4th formulae

Time taken for meeting at the start point is independent of the dirn. of the runners.

5th formulae

if 3 Runners.  $\text{LCM} \rightarrow (t_A, t_B, t_C)$

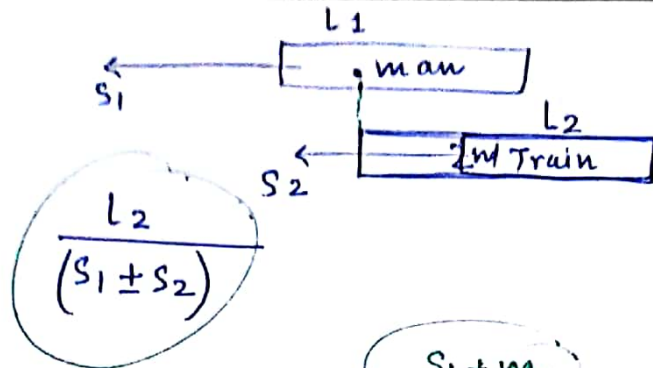
$$\text{LCM} \left[ \frac{\text{circ}}{(A \pm B)}, \frac{\text{circ}}{(B \pm C)} \right]$$

Q

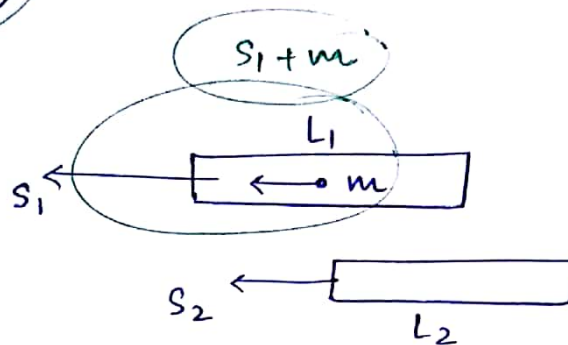
Time taken  $\rightarrow$  train passes poll  $\rightarrow \frac{L_T \leftarrow \text{Train}}{SP_T}$   
 $\rightarrow$  Platform  $\rightarrow \frac{L_T + L_P \leftarrow \text{platform}}{SP_T}$   
 $\rightarrow$  to cross each other  $\rightarrow \frac{L_1 + L_2}{SP_1 \pm SP_2}$

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Q

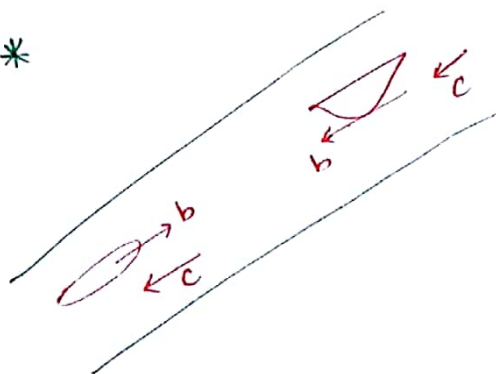


Q



$$\frac{l_2}{s_2 - (s_1 \text{ or } m)}$$

\*



$\downarrow sp = (b + c) \rightarrow \text{time less}$

$\uparrow sp = (b - c) \rightarrow \text{time more}$

Pg 53  
Q2



$$\frac{D}{\downarrow (20 + c)} = \frac{1}{3}$$

$$\frac{D}{\uparrow (20 - c)} = \frac{1}{2}$$

$$\frac{20 - c}{20 + c} = \frac{2}{3}$$

$$c = 4$$

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Q74  
Pg 77

$$x = 8 \text{ km/h}$$

$$x - y = \frac{D}{3t} \quad \left| \quad x + y = \frac{D}{t} \right.$$

$$\frac{\frac{D}{3t}}{\frac{D}{t}} = \frac{1}{3}$$

$$\frac{x - y}{x + y} = \frac{1}{3}$$

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

$$3x - 3y = x + y$$

$$2x - 3y = 8 + y$$

$$16 = 4y$$

$$y = 4$$

$$\frac{D}{8 + c} = t$$

$$\frac{D}{8 - c} = 3t$$

$$\frac{8 - c}{8 + c} = 3$$

Pg 84  
Q9

use options  
put  $v = 60$

through  
options

$$\frac{840}{v} - \frac{840}{v + 10} = 2$$

$$\frac{840}{60} - \frac{840}{70} = 2$$

$$14 - 12 = 2 \quad \checkmark$$

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# CLOCK

Clock is an application of circular Race b/w hour hand and minute hand.

## Min. hand

60 min  $\rightarrow$  1 round  $\rightarrow 360^\circ$

1 min  $\rightarrow \frac{1 \text{ round}}{360} \rightarrow (6^\circ)$

for RG of  $(5\frac{1}{2})$  Min hand goes (6).

for (RG of (1) min hand  $\rightarrow (\frac{12}{11})^\circ$ )

## Hr. hand

12 hrs  $\rightarrow 360^\circ$

(60 min)  $\approx$  1 hr  $\rightarrow 30^\circ$

1 min  $\rightarrow (1/2)^\circ$

$5\frac{1}{2} \rightarrow 6$

$\frac{11}{2} \rightarrow 6$

11  $\rightarrow 12$

1  $\rightarrow \frac{12}{11}$

Relative (RG) =  $(5\frac{1}{2})^\circ$

gain which  
the Min.  
hand over  
Hr. hand

Q 1st variety  $\rightarrow$  12 hrs

|                                  |          |    |       |
|----------------------------------|----------|----|-------|
| (1) coincide $\rightarrow$ 11    | } 24 hrs | 22 | ] day |
| (2) right angle $\rightarrow$ 22 |          | 44 |       |
| (1) opposite $\rightarrow$ 11    |          | 22 |       |

## FORMULAS

(x) & (x+1) 0' clock

$5x \times \frac{12}{11}$   $\leftarrow$  coincidence

$(5x \pm 15) \frac{12}{11}$   $\leftarrow$  opposite  $\leftarrow$  Rt. angle

$(5x \pm 30) \frac{12}{11}$   $\leftarrow$  ~~stand~~ opposite

$x > 6 (-)$   
 $x < 6 (+)$

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$$\left[ 5x \pm \left( \frac{D^\circ}{6} \right) \right] \times \frac{12}{11}$$

Pg 56  
Q6

~~40°~~

~~5x~~

~~$$\left[ 5x - \frac{D^\circ}{6} \right] \times \frac{12}{11}$$~~

~~$$\left[ 5x2 - \frac{40}{6} \right]$$~~

$$\left[ 5x + \frac{D^\circ}{6} \right] \times \frac{12}{11}$$

$$\left[ 5 \times 2 - \frac{40}{6} \right] \times \frac{12}{11} = \frac{40}{11} = 3 \frac{7}{11}$$

$$2 : 3 \frac{7}{11}$$

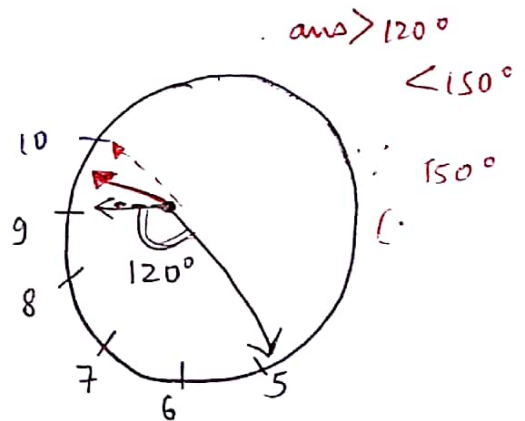
or

$$\left[ 5 \times 2 + \frac{40}{6} \right] \times \frac{12}{11} = \frac{200}{11} = 18 \frac{2}{11} \Rightarrow 2 : 18 \frac{2}{11}$$

Q What is the angle b/w the minute hand and hour hand at 9:25?

Sol

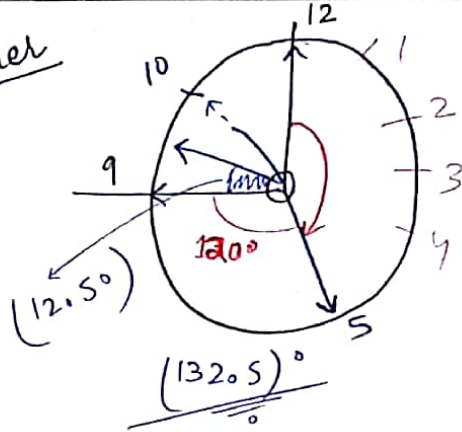
~~$$\left[ 5x + \frac{180}{6} \right] \frac{12}{11}$$~~
~~$$\left[ 5x - \frac{180}{6} \right] \frac{12}{11}$$~~
~~$$(125 - 30) \times \frac{12}{11}$$~~
~~$$95 \times \frac{12}{11}$$~~



$$\left[ 5x + \left( \frac{D^\circ}{6} \right) \right] \times \frac{12}{11} = 25^\circ$$

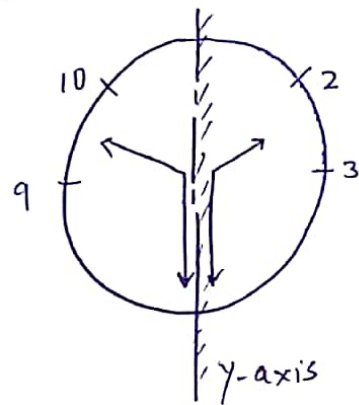
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other



hr hand  
 $1 \text{ min} \rightarrow \frac{1}{2}^\circ$   
 $25 \text{ min} \rightarrow 12.5^\circ$

Mirror image  $\rightarrow$  symm. about y axis



Q: How much time / or min hand hr hand kitni del baad mile?

$$60 \times \frac{12}{11} = \frac{720}{11} = \boxed{65 \frac{5}{11}}^{\text{min}} \text{ lettr (1 time)}$$

$$\sqrt{12 \text{ hr}} = 12 \times 60 = \frac{720 \text{ hr}}{\frac{720}{11}} = 11 \text{ times}$$

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1/11/2016

# Aptitude and Reasoning

CAT - 30 to 35 Qn.

## P and C (Permutation & Combination).

'F.P.C.' → Fundamental principle of counting

↳ 25 Qns out of 30 Qns

F.P.C. → Additive Rule

only one thing at a time

10 Boys 12 Girls

'a' monitor → 22 ways

$$10 + 12 = 22 \text{ ways}$$

'OR' → additive Rule can be applicable! hidden in the meaning of question.

Product Rule

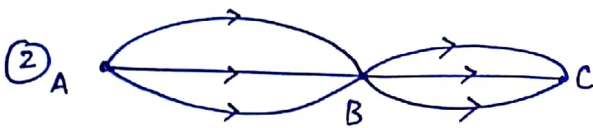
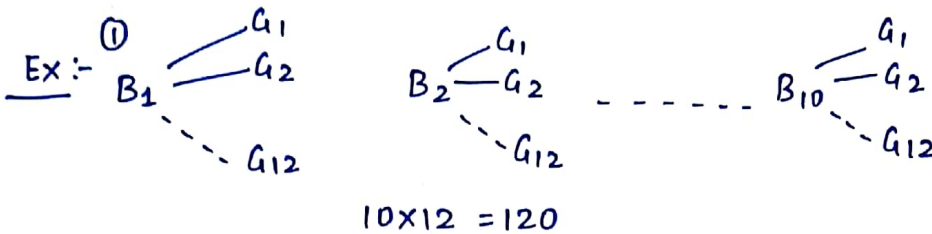
More than one thing

$$10 \times 12 = 120 \text{ ways}$$

1 Bk 14 monitor

and

qn. → hidden or given or available



$$A \rightarrow C$$

$$\frac{6 \text{ ways} + 3}{(3 \times 3)} = 9 \text{ ways}$$

## \* Arrangement

$${}^n P_r = \frac{n!}{(n-r)!}$$

6 chairs, 6 members.

$${}^6 P_6 = \frac{6!}{0!} = 720 \text{ ways}$$

Ex:-  $\frac{6 \times 5 \times 4 \times 3 \times 2 \times 1}{1}$

if 2 chairs broken

$${}^6 P_4 = \frac{6!}{2!} = 360 \text{ ways}$$

$$Q \rightarrow \{a, b, c\} \rightarrow \{ab, bc, ca\}$$

selection

$${}^n C_r = \frac{n!}{(n-r)! \times r!} \Rightarrow {}^3 C_2 = \frac{3!}{1! \times 2!} = 3 \text{ ways.}$$

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Q 12 people (handshake)

$${}^{12}C_2 = \frac{12!}{10! \times 2!} = \frac{12 \times 11}{2} = 66$$

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

Q 12 points (str. line)

$${}^{12}C_2 = 66$$

\*  ${}^nC_r = {}^nC_{n-r} \rightarrow$  Ex:-  ${}^5C_2 = {}^5C_3$   
 ${}^8C_5 = {}^8C_3$

Q1> All 6 digit natural no's are being formed from 1st 6 natural no's without repetition. (w.r.n). How many such no's are divisible by 4?

Q2> How many 4 digit no. can be formed with 10 digits 0, 1, ..., 9. If no number can start with zero and if repetition are not allowed?

Q3> given digits 2, 2, 3, 3, 3, 4, 4, 4, 4. How many distinct 4 digit no's greater than 3000 can be formed?  
 (Gate 2010) (a) 50 (b) 51 (c) 52 (d) 54.

Q4> All 4 digit natural no's are being formed from 1st five natural numbers. How many such no's are divisible by 4.

Me

Sol>

$$\begin{array}{cccccc} 1 & 2 & 3 & 4 & 5 & 2 \\ \times & \times & \times & \times & \times & \times \end{array} \quad (240)$$

$$1, 2, 3, 4, 5, 6$$

②

$$\begin{array}{cccc} 9 & 9 & 8 & 7 \end{array}$$

$$0, 1, 2, 3, 4, 5, 6, 7, 8, 9$$

$$\begin{array}{r} 56 \\ \times \end{array}$$

$$4 \times 3 \quad 12$$

③

$$\begin{array}{cccc} 2 & 7 & 6 & 5 \\ = & (5103) & 420 & \checkmark \end{array}$$

$$1, 2, 3, 4, 5$$

④

$$\begin{array}{cccc} 5 & 5 & 5 & 1 \end{array}$$

$$(125)$$

$$(250)$$

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- Six → ① 192  
 ② 4536  
 ③ 51  
 ④ 125

### explanations

①  $[1 \times 2 \times 3 \times 4] \times \begin{matrix} T & U \\ \hline & \end{matrix}$  8 ways  
 1, 2, 3, 4, 5, 6

| TU | TU | 20 | 28 |
|----|----|----|----|
| 12 | 36 | 40 | 48 |
| 16 | 52 | 60 | 68 |
| 24 | 56 | 80 | 88 |
| 32 | 64 | 08 | 88 |
|    |    | 04 | 8  |
|    |    | 8  |    |

44 ✓

⇒  $4 \times 3 \times 2 \times 1 \times 8 = 192 \text{ ways}$

②  $\frac{9}{(1 \text{ to } 9)} \times \frac{9}{(0 \text{ to } 9)} \times \frac{8}{(0-9)} \times \frac{7}{(0-9)} = 4536$

④  $5 \times 5 \times \begin{matrix} T & U \\ \hline & \end{matrix}$  1, 2, 3, 4, 5  
5 ways

125 Ans

1 2  
 2 4  
 3 2  
 4 4  
 5 2

③ (2, 2) (3, 3, 3) 4, 4, 4, 4

$\frac{1}{Th=3} \times \frac{3}{2 \text{ or } 3 \text{ or } 4} \times \frac{3}{2 \text{ or } 3 \text{ or } 4} \times \frac{3}{2 \text{ or } 3 \text{ or } 4}$   
27 ways  
 such no's are there

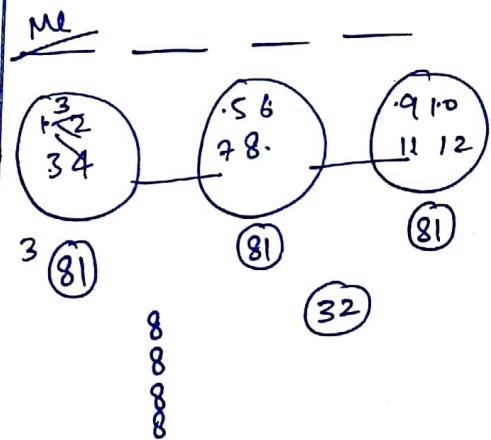
① 3222 but two 2's are allowed  
 → invalid no. also 3333

other way

$\frac{2}{3/4} \frac{3}{2/3/4} \frac{3}{2/3/4} = \frac{54}{-3} = 51$

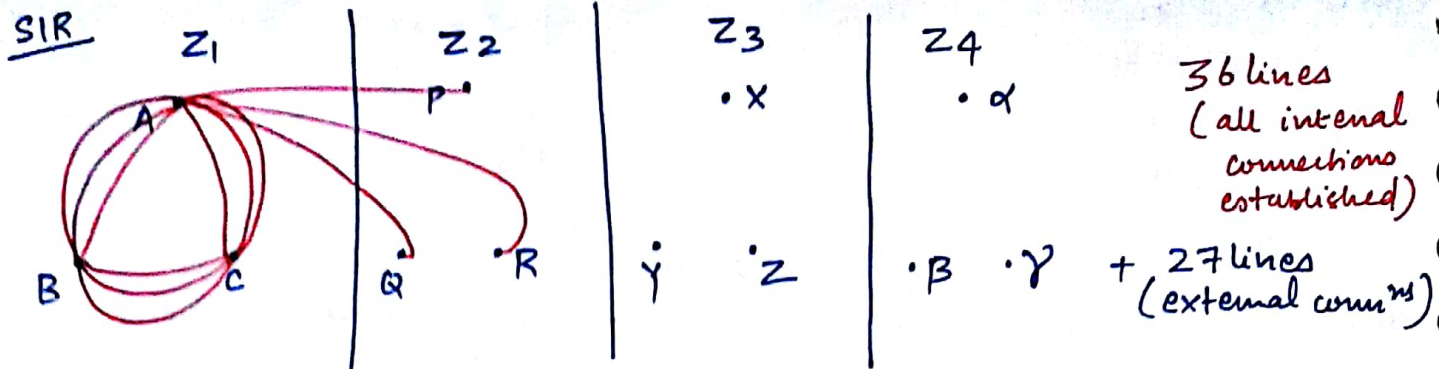
Q There are 12 towns equally to be divided into 4 zones. each town is connected to every other town in the same zone by 3 direct lines and each town is each town is connected to every other town outside the zone by single direct line. How many lines are to be laid/built?

Sol 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

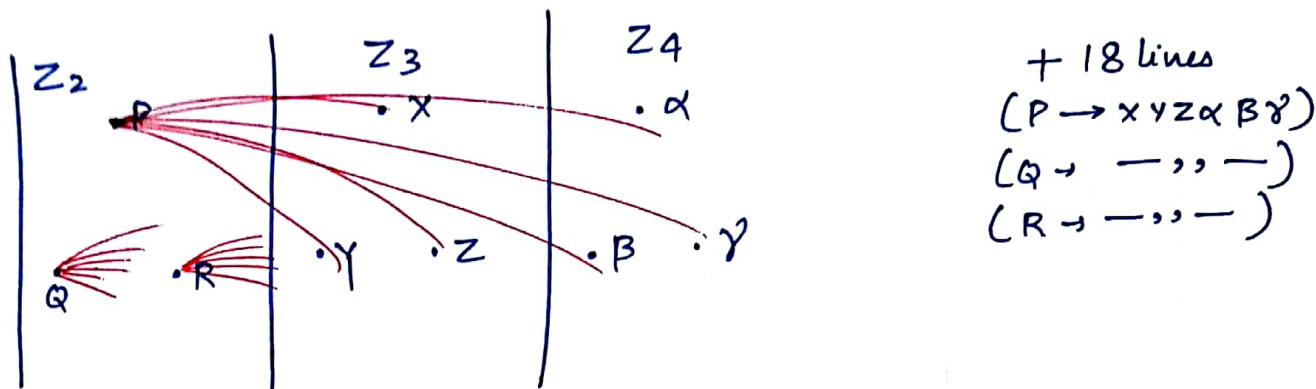


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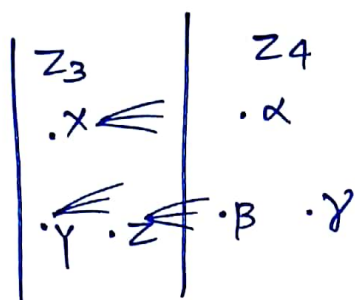
$\frac{1}{Th=4} \times \frac{3}{2 \text{ or } 3 \text{ or } 4} \times \frac{3}{2/3/4} \times \frac{3}{2/3/4} = 27$   
 $- 1 (4222) \rightarrow \text{invalid}$   
 Total no. =  $54 - 3 = 51$  no's Ans  
 (valid)



Now



Now

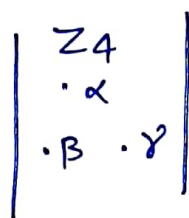


---

Total = 90 Ans ∴

---

Now



Q > 10 identical Balls are to be distributed among 3 friends. In how many ways can the distribution be done?

Sol > whole no. soln.

$$a + b + c = 10$$

→ 11

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$$a + b + c = 10$$

$$\begin{array}{r} 1 \quad 0 \quad 9 \\ 2 \quad 8 \\ 9 \quad 0 \end{array} \left. \vphantom{\begin{array}{r} 1 \\ 2 \\ 9 \end{array}} \right\} \rightarrow 10$$

$$\begin{array}{r} 2 \quad 0 \quad 8 \\ 8 \quad 7 \\ 8 \quad 0 \end{array} \left. \vphantom{\begin{array}{r} 2 \\ 8 \\ 8 \end{array}} \right\} \rightarrow 9$$

$$\begin{array}{r} 9 \quad 0 \quad 1 \\ 0 \quad 1 \quad 0 \end{array} \left. \vphantom{\begin{array}{r} 9 \\ 0 \\ 0 \end{array}} \right\} \rightarrow 2$$

$$\begin{array}{r} 10 \quad 0 \quad 0 \end{array} \left. \vphantom{\begin{array}{r} 10 \\ 0 \\ 0 \end{array}} \right\} \rightarrow 1$$

$$11 + 10 + 9 + 8 + 7 + 6 + 5 + 4 + 3 + 2 + 1 = 66$$

$$(or) \frac{11 \times 12}{2} = 66 \checkmark$$

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

Shortcut CONDITIONAL  
soln.

N. No. soln

$$a + b + c = 10$$

$$\uparrow \quad \uparrow \quad \uparrow$$

whole No. soln. ( $\because$  1 Ball all have)  
 $A + B + C = 7$

hence,

$$7 + 3 - 1 \quad C_{3-1}$$

$${}^9C_2 = \frac{9 \times 8}{2} = 36 \checkmark \text{ Ans.}$$

0 Balls can be possibly assigned to anyone

Shortcut

$${}^{(n+r-1)}C_{(r-1)}$$

①  $n \rightarrow$  identical objects

② whole no. soln.

applicable

whole no. soln.  $\rightarrow$  means can give 0 ball also.

$n \rightarrow$  identical objects

$r \rightarrow$  no. of people.

$$\text{here sol } (10 + 3 - 1) C_{(3-1)}$$

$$= {}^{12}C_2 = \frac{12 \times 11}{2} = 66.$$

Now

Natural No. soln.

$$a + b + c = 10$$

$$\begin{array}{r} 1 \quad 1 \quad 8 \\ 2 \quad 7 \\ 8 \quad 1 \end{array} \left. \vphantom{\begin{array}{r} 1 \\ 2 \\ 8 \end{array}} \right\} \rightarrow 8$$

$$\begin{array}{r} 2 \quad 1 \quad 7 \\ 2 \quad 6 \\ 7 \quad 1 \end{array} \left. \vphantom{\begin{array}{r} 2 \\ 2 \\ 7 \end{array}} \right\} \rightarrow 7$$

$$\frac{8 \times 9}{2} = 36$$

$$\begin{array}{r} 7 \quad 1 \quad 2 \\ 2 \quad 1 \\ 8 \quad 1 \quad 1 \end{array} \left. \vphantom{\begin{array}{r} 7 \\ 2 \\ 8 \end{array}} \right\} \rightarrow 2$$

Noneed

$$\left\{ \because {}^nC_2 = \frac{n(n-1)}{2} \right\}$$

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Q 15 identical Balls are to be distributed among 4 friends (A, B, C, D) such that A should get atleast 3 balls, B atleast 2, C atleast 1. In how many ways can the distribution be done

Sol

$$\begin{matrix} A & + & B & + & C & + & D & = & 15 \\ 3 & \rightarrow & 2 & \rightarrow & 1 & \rightarrow & 0 \end{matrix}$$

$$15 - 6 = 9$$

$$A + B + C + D = 9$$

$$\begin{aligned} 9 + 4 - 1 C_{4-1} &= {}^{12}C_3 = \frac{12!}{3!9!} = \frac{12 \times 11 \times 10 \times 9!}{9! \times 3!} \\ &= \frac{12 \times 11 \times 10}{6} \\ &= 220 \end{aligned}$$

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\* GEOMETRICAL P and C :-

12 points  
~~ooooo~~

st. lines

$${}^{12}C_2 \text{ (if no points are collinear)} - {}^5C_2 \text{ (5 points are collinear)} + 1 \text{ (one line possible)}$$

~~${}^n C_2$~~

12 points  
~~ooooo~~

$\Delta$ 's

$${}^{12}C_3 \text{ (if no points are collinear)} - {}^5C_3 \text{ (5 points collinearity)}$$

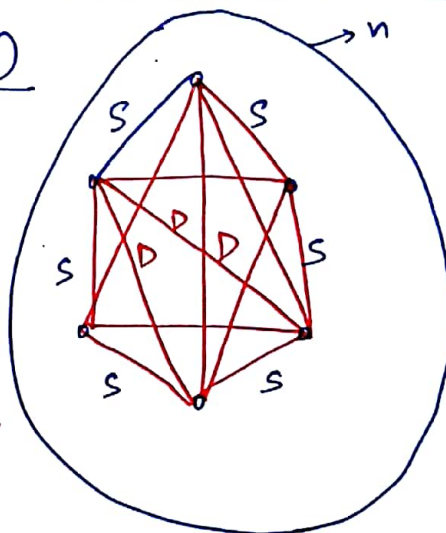
~~${}^n C_3$~~

No. of diagonals of any 'n' sides polygon =  $\frac{n(n-3)}{2}$

${}^n C_2 = \text{All sides} + \text{All Diag}$

any 2 vertex makes handshake  
↓  
side, Diagonal

$$\left\{ \begin{aligned} {}^n C_2 - n &= \text{All diagonals} \\ \frac{n(n-1)}{2} - n &= \frac{n(n-3)}{2} \end{aligned} \right\}$$



Polygon  
n sides  
↑  
n vertex



Q> If no. of diagonals of a n sided polygon is 50% more than its no. of sides then the polygon is —

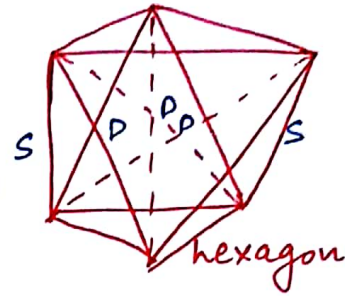
Sol  $\therefore 1.5n = \frac{n(n-3)}{2}$

$n-3 = 3$

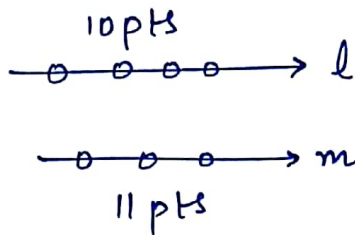
$n=6$

→ sides, 9 diagonals

$\begin{matrix} S & D \\ \downarrow & \downarrow \\ 6 & 9 \end{matrix}$



Q>  
211m

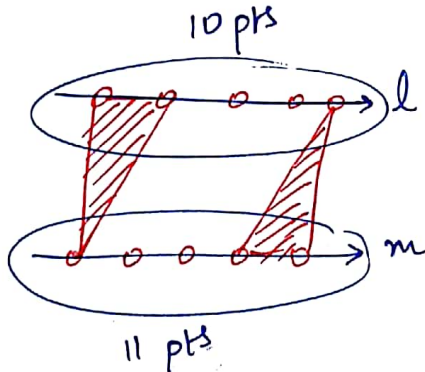


how many  $\Delta$ 's can we get from these 21 pts.

Sol

$21C_3 - {}^{10}C_3 - {}^{11}C_3$   
 $1330 - 1 - 1$

SIR



$\frac{{}^{11}C_2 \times 10 + {}^{10}C_2 \times 11}{550 + 445 = 1045} \checkmark$

$21C_3 - {}^{10}C_3 - {}^{11}C_3 = \underline{1045} \checkmark$

{ all 3 should not from the same line }

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# Chess Board

$$n+1C_2 \rightarrow n+1C_2 = \left[ \frac{(n+1)n}{2} \right]^2$$

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

$$9C_2 \times 9C_2 = 1296 \text{ Rectangles}$$

$$204 \text{ squares}$$

$$\sum n^3 = \left[ \frac{n(n+1)}{2} \right]^2 = 1296$$

1) Rectangles (n x n)

2) Squares

3) different types of Rectangles

$$204$$

$$\sum n^2 = \frac{n(n+1)(2n+1)}{2} = 204$$

put  $n=8$

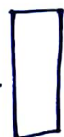
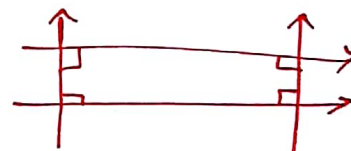
$$\sum n = \frac{n(n+1)}{2} = 36$$

put  $n=8$

|   |  |
|---|--|
| 1 |  |
| 2 |  |
| 3 |  |
| 4 |  |
|   |  |
|   |  |
|   |  |
|   |  |
|   |  |
|   |  |

area & perimeter same  $\rightarrow$  then same type

orientation diff.



4x1

4x1

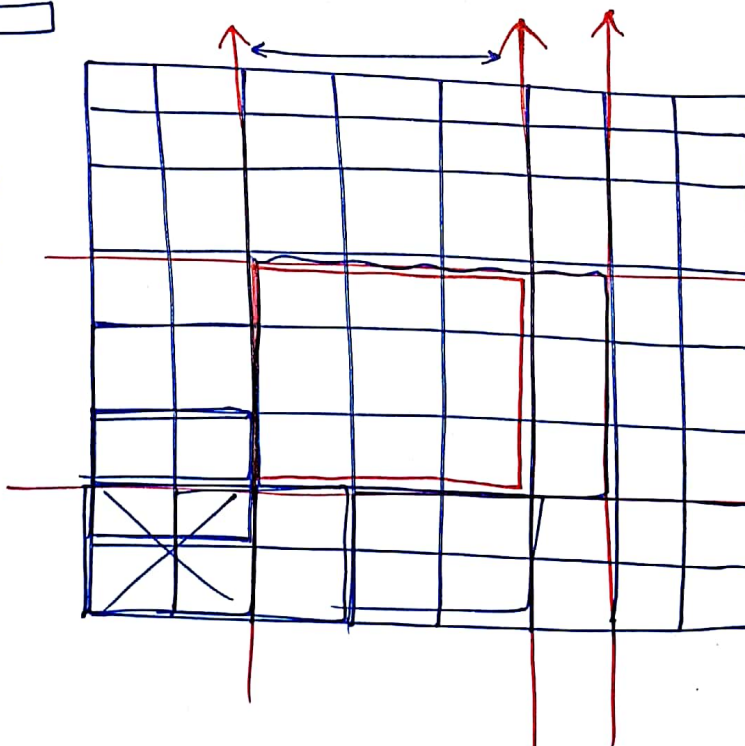
$$P=10$$

$$P=10$$

$$A=4$$

$$A=10$$

hence same Rectangle.



$$1 \times 1 \rightarrow 64 \rightarrow 8^2$$

$$2 \times 2 \rightarrow 7^2 \rightarrow 49$$

$$3 \times 3 \rightarrow 8^2 \rightarrow 36$$

$$\vdots$$

$$7 \times 7 \rightarrow 4 \rightarrow 2^2$$

$$8 \times 8 \rightarrow 1 \rightarrow 1^2$$

$$204$$

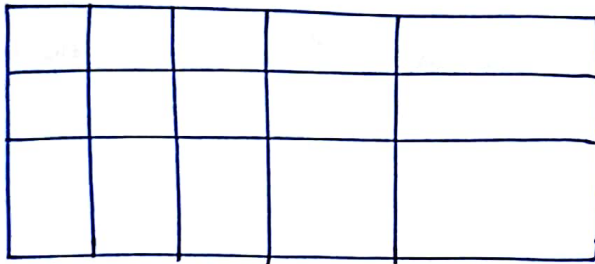
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$1 \times 1, 1 \times 2, 1 \times 3, \dots, 1 \times 8 \rightarrow 8 \text{ types}$   
 $2 \times 2, 2 \times 3, 2 \times 4, \dots, 2 \times 8 \rightarrow 7 \text{ types}$   
 $3 \times 1, 3 \times 2, 3 \times 3, 3 \times 4, 3 \times 5, \dots, 3 \times 8 \rightarrow 6 \text{ types}$   
 $\vdots$   
 $8 \times 8 \rightarrow 1 \text{ type}$

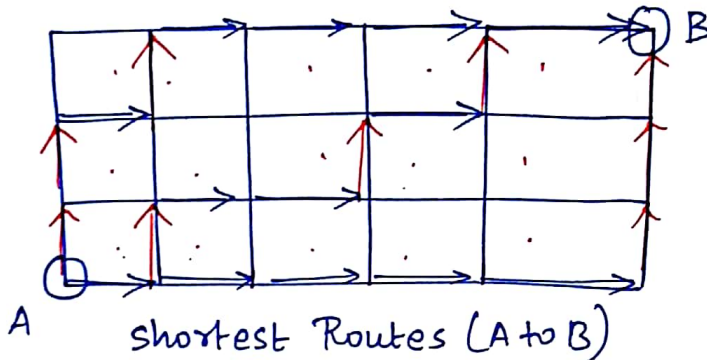
all squares are included (जाने दो)

36

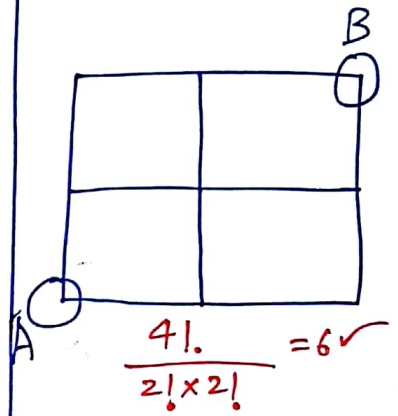
Gate 2017  
2 marks



Redraw



CSAT (2011)



how many shortest routes are possible b/w A & B?

Sol

$$\frac{(R+C)!}{R! \times C!} = \frac{(5+3)!}{5! \times 3!} = 56.$$

Ex:- Apple =  $\frac{5!}{2!} = 60$

BANANA =  $\frac{6!}{3! \times 2!}$

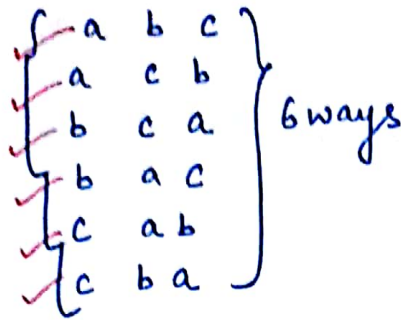
[HHHHH VVV] =  $\frac{8!}{5! \times 3!} = 56$

{H V H V H V H H}

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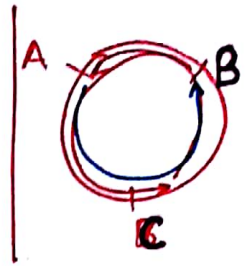
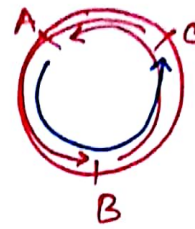
## \* Linear Arrangement / Permutation :-

$$3 \times 2 \times 1 = 3! \quad (n!)$$



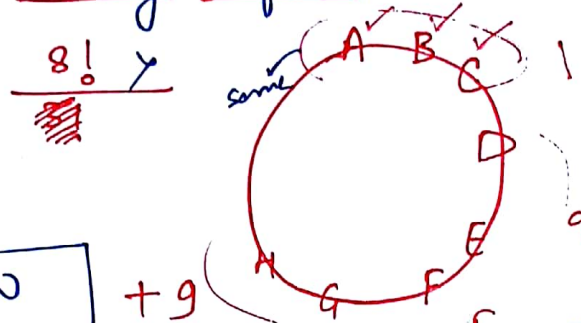
## circular Pn / circular arrangement:

$$(n-1)! \\ (3-1)! = 2! \quad (2 \text{ ways})$$



Q> A couple invited their 10 friends to a dinner party <sup>to be held</sup> across a circular dinning table having 12 chairs such that there ~~has to~~ have to be exactly 1 friend b/w the couple.

Sol



SIR

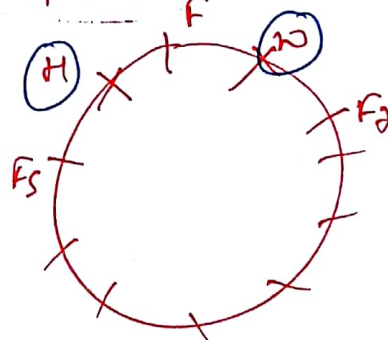


$$2! (10 \times 9!)$$

$$2! \times 10!$$

$$2 \times 10! \quad \text{Ans}$$

H, W can interchange



Q> all 5 digitd natural No.'s are being formed from 1st five natural no.'s without repetition. what is <sup>sum</sup> ~~sum~~ of all of those no.'s

$$(n-1)! \times \underbrace{11111}_{n \text{ times}} (\sum d)^{\text{digits}}$$

$$(5-1)! \times 11111 (1+2+3+4+5)$$

$$4! \times 11111 \times 15$$

CAT 2009

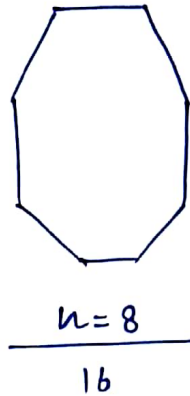
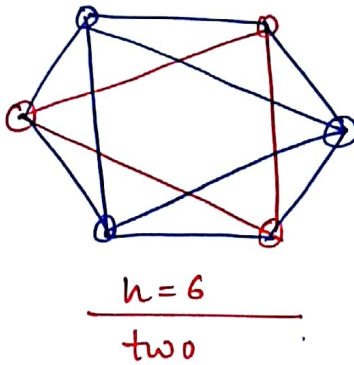
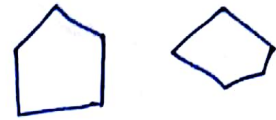
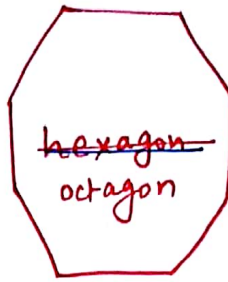
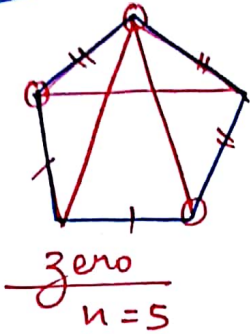
1, 3, 5, 7, 9

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Q> vertex of a octagon are joined and  $\Delta$ 's are formed. How many  $\Delta$ 's are there whose vertex belongs to the vertex of octagon but none of its sides should belong to the side of octagon?

Sol SIR



me ✓

$$n=6$$

$$\Delta = \frac{n(n-5)}{3}$$

$$\frac{6 \times 1}{3} = 2$$

$$\frac{8 \times 2}{3} = \frac{16}{3}$$

$$\frac{8(3)}{3} = 8$$

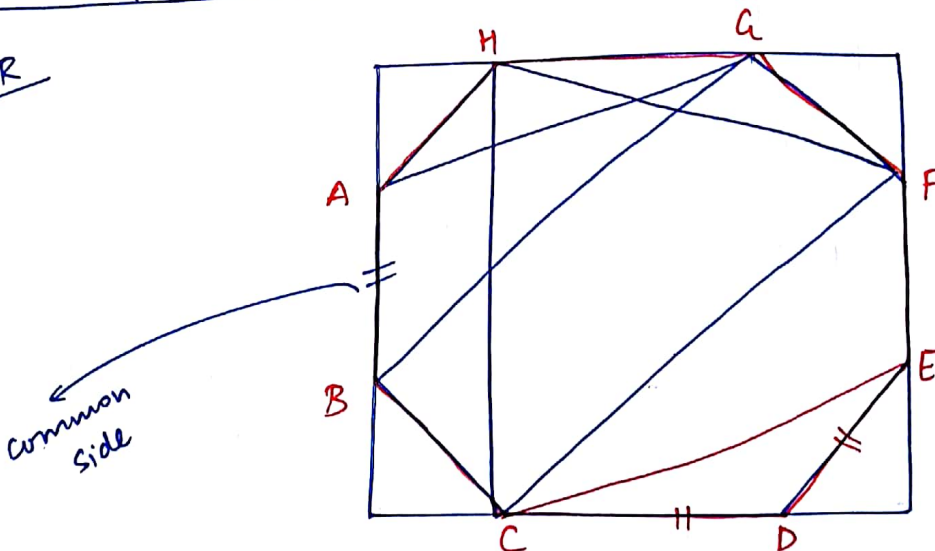
$$\frac{5 \times 2}{3} = \frac{10}{3}$$

$$\frac{11}{3}$$

$8(3) \times$

$$\left. \begin{array}{l} n^2 - (n^2 - 2) \\ 36 - 34 \\ 2 \end{array} \right\} \begin{array}{l} 0 \downarrow 6 \\ 5 \downarrow 2 \end{array}$$

SIR



$$T(\Delta) \Rightarrow {}^8C_3$$

(no 3 collinear)

$$T(\Delta) = \Delta(1)$$

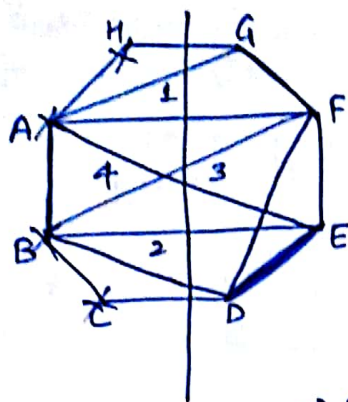
common side

$$+ \Delta(2) (CDE)$$

$$+ \Delta(0) \rightarrow HCF$$

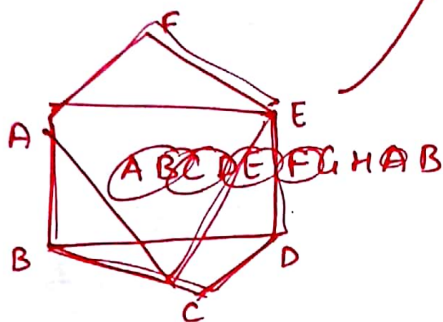
$$8C_3 = \Delta(1) + \Delta(2) + \frac{\Delta(0)}{?}$$

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AB gone  
HC also

AB side  $\rightarrow 4\Delta$   
8 side  $\rightarrow 8 \times 4\Delta$



$$T(\Delta) = \Delta(1) + \Delta(2) + \left( \frac{\Delta(0)}{?} \right)$$

$$n_3 = (4\Delta \times 8) + \binom{n}{8} + \Delta(0)$$

$$56 = 32 + 8 + \Delta(0)$$

$$\Delta(0) = 16$$

0 side common

$$n_3 = n(n-4) + n + \Delta(0)$$

4 points  
gone

$$\Delta(0) = n_3 - n(n-4+1)$$

02/10/2016

## PROBABILITY

Classical Def<sup>n</sup>:-

$$P = \frac{\text{favourable chances}}{\text{Total chances}} = \text{Probability}$$

Sample space =  $\{1, 2, 3, 4, 5, 6\}$   
in case of a dice

SS =  $\{H, T\}$   
in case of a coin

unbiased Events  $\rightarrow$  every event (equally likely)

$$P(1) = \frac{1}{6}$$

$$P(2) = \frac{1}{6}$$

$$P(3) = \frac{1}{6}$$

$\vdots$

$$P(6) = \frac{1}{6}$$

$$P(H) = \frac{1}{2}$$

$$P(T) = \frac{1}{2}$$

Mutually exclusive events

and

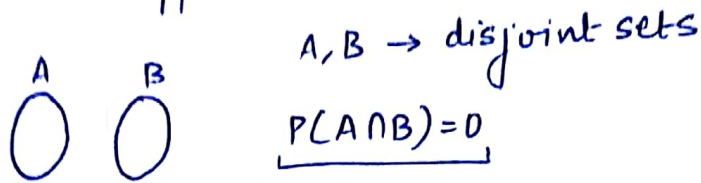
Independent Events

{ Next Page }

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✓ Mutually Exclusive events are events where happening of one event guarantees non-happening of the other.  
means  $A \rightarrow \text{happen}, B \rightarrow \text{not happen}$ .



for M.E.E.

Additive Rule  $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

only one of the events happen @ time.

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

"oh"

English identifying key-word.

Q → Dice

$P(\text{even}) + P(\text{odd}) - P(\text{even and odd}) = P(\text{even oh odd})$   
 $= \frac{3}{6} + \frac{3}{6} - 0 = P(\text{even})$

✓ Independent Events are Events where more than one event can happen at a time without influencing the result of each other.

Ex:- Coin and dice is tossed simultaneously.

"and"

hint (1).

Product Rule  $P(3m)$  and  $P(t)$   
 multiply  $\rightarrow$  tossed  $\rightarrow$  (tail)

$\frac{2}{6} \times \frac{1}{2} = \frac{1}{6}$

$P(A) \times P(B) \times P(C)$

Q7  $P(A) = 60\% \rightarrow$  A speaks Truth in 60% cases.

$P(B) = 75\%$

while answering the same qn. in either "Yes" or "No" they are likely to fight with each other in what % chances.

Sol:  $P(A) = \frac{3}{5}, P(\bar{A}) = \frac{2}{5}$

$P(B) = \frac{3}{4}, P(\bar{B}) = \frac{1}{4}$

mutually exclusive

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$$A \times \bar{B} + B \times \bar{A}$$

$$\frac{3}{5} \times \frac{1}{4} + \frac{3}{4} \times \frac{2}{5}$$

$$= \frac{9}{20} \approx \frac{45}{100} \approx 45\%$$

Q> There are 2 vacancies for which the husband and wife applied,  $P(h) = 1/7 \rightarrow$  Probability of husband gets the job.  
 $P(w) = 1/5$

| only one gets the job | both | None | atleast one |
|-----------------------|------|------|-------------|
| ?                     | ?    | ?    | ?           |

Q>  $x$  is randomly chosen from 1st 100 natural no., what is the probability that chosen  $x$  satisfies the inequality

a)  $\frac{28}{50}$

$$\frac{(x-40)(x-70)}{(x-30)} < 0$$

b)  $\frac{29}{50}$

$$x \in [0, 100]$$

c)  $\frac{59}{100}$

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d)  $30/50$

Q> A and B decided to meet b/w 6 and 7 p.m. on 14th Febr. 2017. what is the probability that they will meet provided one cannot wait for other for more than 20 minutes?

Q> Gate Qn.

Sol> ①  $P(h) = 1/7$   $P(\bar{h}) = 6/7$   
 $P(w) = 1/5$   $P(\bar{w}) = 4/5$

$$\left(\frac{1}{7} \times \frac{4}{5}\right) + \left(\frac{6}{7} \times \frac{1}{5}\right)$$

$$4/35 + 6/35$$

$$10/35$$

$$0.28$$

$$\frac{10}{35}$$

$$0.02$$

$$0.68$$

③ 1 hr 20 min  $\frac{5}{9}$

$$0.33 \times 0.33$$

$$0.66$$

$$0.25 \times \rightarrow 0.0625$$

②  $x-40 < 0$   $\frac{29}{50}$  ✓  
 $x < 40, x < 70$

$$x < 30$$

40% 70%  
 $\sqrt{30\%}$

0 100  
 101 98  
 3 101

$$0.97$$

④ Gate  $\frac{7}{16}$

SIR (1)  $P(h) = 1/7$ ,  $P(\bar{h}) = 6/7$   
 $P(w) = 1/5$ ,  $P(\bar{w}) = 4/5$

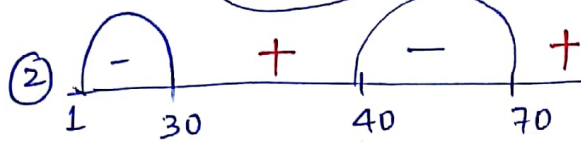
| only one  | both   | none  | @ least one |
|---|--|---|-------------|
| $h \times \bar{w} + \bar{h} \times w$<br>$1/7 \times 4/5 + 1/5 \times 6/7$<br>$\frac{10}{35}$ | $h \times w$<br>$1/7 \times 1/5$<br>$\frac{1}{35}$ | $\bar{h} \times \bar{w}$<br>$6/7 \times 4/5$<br>$\frac{24}{35}$ |             |

1 = only one + both + None

1 =  $\frac{10}{35} + \frac{1}{35} + \frac{24}{35}$

$\downarrow$   
 $\frac{11}{35} \leftarrow P(\text{@least one})$

$1 - \frac{24}{35}$



$\frac{(x-40)(x-70)}{(x-30)} < 0$

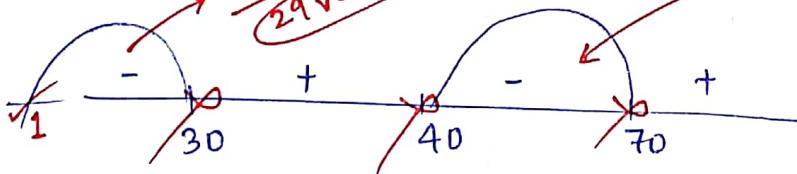
similarity

signs can be putted on the no. line in alternate fashion.

for  $x > 70$

1 to 29  
29 values

41 to 69  
29 values



$x=40$

$x=70$

not allowed  $\therefore < 0$

$\frac{\text{fav. chances}}{\text{Total chances}} = \frac{58}{100} = \frac{29}{50}$

MOHIT  
CHOUKSEY

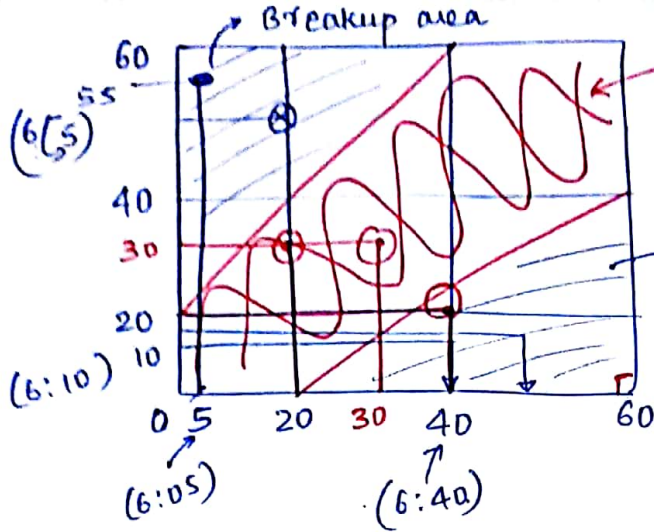
(3) Time  $\rightarrow$  Real No.

$\infty$  no. of values b/w 6 & 7.

$\frac{\text{favourable chances}}{\text{Total chances}} = \frac{\infty}{\infty} = \frac{f(A)}{T(A)}$

favourable area  
Total area





6:20 - 6:40 → Just a moment.

here,  $\Delta = \frac{1}{2} \times 40 \times 20 = 800 \text{ units}$

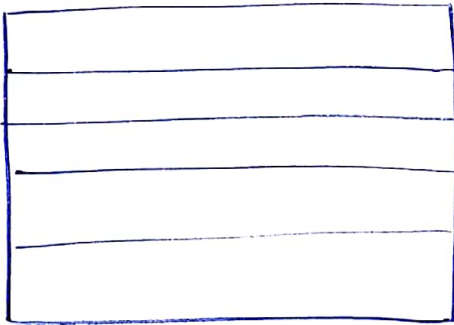
unfav Area = 1600 units.

Total area  $TA = 60 \times 60 = 3600$

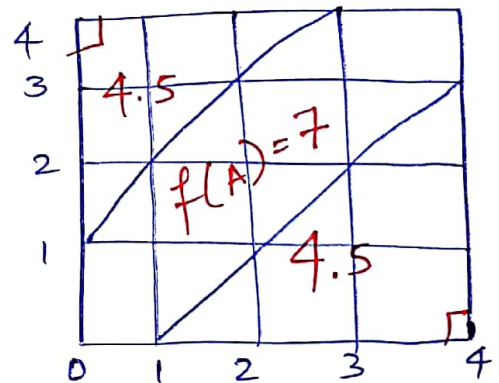
favourable area  $fA = 3600 - (800 \times 2) = 2000$

$$\frac{f(A)}{T(A)} = \frac{2000}{60 \times 60} = \frac{20}{36}$$

④



Red row →



$$\frac{f(A)}{TA} = \frac{7}{16}$$

Conclusion

if  $TA \rightarrow \frac{3 \times 3 - 2 \times 2}{3 \times 3} = \frac{5}{9}$  (unfav) (fav)

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

if  $TA \rightarrow \frac{4 \times 4 - 3 \times 3}{4 \times 4} = \frac{7}{16}$

$$\frac{6 \times 6 - 5 \times 5}{6 \times 6} = \frac{11}{36}$$

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Maths behind it

$$\begin{cases} 0 \leq x \leq 60 \\ 0 \leq y \leq 60 \end{cases} \text{ TA}$$

$$|x-y| \leq 20 \text{ f(A)}$$

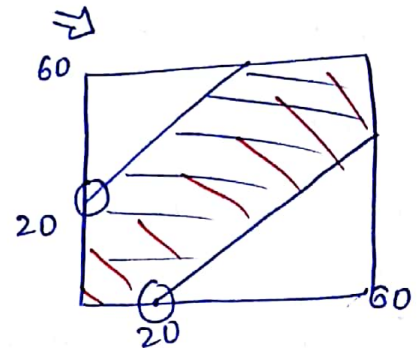
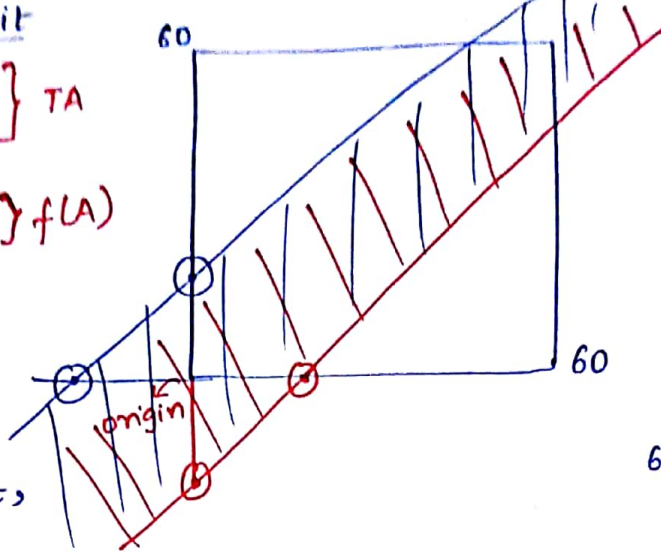
$$x-y = 20$$

if  $x-y \leq 20$

if y comes first,

$$y-x = 20$$

$y-x \leq 20 \rightarrow$  To satisfy this <sup>in</sup> equality, we have to move towards origin.



Do  $\rightarrow$  (33) (41) Pg 72

(33) 1 - - - - - 100

2 digit integers

not divisible by 7

$$7 \times 7 = 49$$

~~7~~, ~~14~~, ~~21~~, ~~28~~, ~~35~~, ~~42~~, ~~49~~, ~~56~~, ~~63~~, ~~70~~,  
~~77~~, ~~84~~, ~~91~~, ~~98~~

(14) no.

10

$$10 - 100$$

$$\begin{array}{r} \textcircled{91} \\ - 14 \\ \hline 77 \end{array}$$

SIR [1-100]  $\div$  by 7

$$\frac{100}{7} = 14 \quad [\cancel{7}, 14, 21, \dots, 98]$$

[10-99]  $\rightarrow$  Total No.'s = (90)

$$\text{div. by } 7 \Rightarrow (14-1) = (13)$$

$$\frac{\text{fc}}{\text{TC}} = \frac{77}{90} \checkmark$$

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42)  $11Y = 366d = (52 \times 7) + 2 \text{ odd day}$  → 2 chances of Saturday

53rd Saturday

fc =  $\frac{2}{7}$  ✓

7

7

Ans:  $\frac{2}{7}$

\* Sample space (dice) =  $\{1, 2, 3, \dots, 6\}$

$P(\text{even}) = \frac{3}{6} \rightarrow \{2, 4, 6\}$

$P(\text{prime}) = \frac{3}{6} \rightarrow \{2, 3, 5\}$

Q> (Conditional Probability Based).

A dice is thrown at random. What is the probability of getting a prime no. on the dice provided the dice had shown an even number.

↓  
already shown.

Sol:  $S_{\text{new}} = \{2, 4, 6\}$

$P(\text{prime}) = P\left(\frac{\text{prime}}{\text{even}}\right) = \frac{1}{3} \checkmark$

Pg 71 (20) X, Y

$X \rightarrow 60\% \rightarrow 96\% \text{ reliable}$

$Y \rightarrow 40\% \rightarrow 72\% \text{ reliable}$

$\frac{96}{100}$

$0.576 \quad 0.288$

T.S.A. (100)

X (60) →  $X_R = 0.96 \text{ of } 60$

Y (40) →  $Y_R = 0.72 \text{ of } 40$

$X_R = 57.6 \quad + \quad Y_R = 28.8$

$T_R = X_R + Y_R = 86.4$

$\frac{Y_R}{T_R}$

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(53)

$$\frac{10}{100} \rightarrow \text{HIV}^+$$

Pg 75

$$\text{HIV}^+ \rightarrow 95\% \text{ (True)}$$

$$\text{HIV}^- \rightarrow 89\% \text{ (-ve)}$$

SIR

$$\frac{0.1 \times 0.95}{(0.1 \times 0.95) + (0.9 \times 0.11)}$$

$\uparrow \quad \uparrow \quad \quad \uparrow \quad \uparrow$   
 +ve +ve -ve m/c  $\rightarrow$  +ve  
 (-ve)

0.4896 Ans

Pg 54

$$(5) P(2) = 1$$

$$P(3) = 2$$

$$P(4) = 3$$

$$P(5) = 4$$

$$P(6) = 5$$

$$P(7) = 6$$

$$P(8) = 5$$

$$P(9) = 4$$

$$P(10) = 3$$

$$P(11) = 2$$

$$P(12) = 1$$

Pg 54

$$(6) \frac{1}{3} \times \frac{1}{4} \times \frac{1}{5} \times \frac{1}{6}$$

independent events

SIR

None of them solves qn.

$$\bar{A} \times \bar{B} \times \bar{C} \times \bar{D}$$

Qn is not solved

$$Qn. \text{ is solved} \Rightarrow 1 - (\bar{A} \times \bar{B} \times \bar{C} \times \bar{D})$$

(or) atleast one of them solves Question

All of them solves the Qn.  $\Rightarrow A \times B \times C \times D$ 

Q7

4 times

2H, 2T

|      |      |      |      |
|------|------|------|------|
| HHHT | HHTH | HTHH | THHH |
| HHTT | HTHT | HTTH | THTH |
| HHTT | THHT | TTHT | TTTH |
| TTTT | HHHH |      |      |

$\frac{4}{16} \times 4 = \frac{1}{4}$

|   |   |   |   |
|---|---|---|---|
| H | H | T | T |
| H | T | H | T |
| H | T | T | H |
| T | H | H | T |
| T | H | T | H |
| T | T | H | H |

$$\frac{6}{16} \rightarrow \text{alter}$$

$$\text{alter method} \rightarrow 4C_2 \left(\frac{1}{2}\right)^2 \times 2C_2 \left(\frac{1}{2}\right)^2$$

$\frac{6}{16}$

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Q 10 penalty shootouts.  ${}^{10}C_4 \rightarrow$  chances in which goal happens.

$({}^{10}C_4 \cdot (0.8)^4)$  success  $'C_6(f)^6'$

$\frac{4!}{0!4!}$

Pg 90  
 $(1.77)$

${}^{10}C_6 \times$

$0.2508$

Pg 54  
 $(10) \frac{0.04}{100} = \left(\frac{1}{25}\right)$

Pg 54  
 $(1) {}^nC_2 = n \cdot \text{shakes}$

$\frac{n(n-1)}{2} = 153$

$(18) \checkmark$

$(2) \checkmark$

### \* LOGICAL REASONING \*

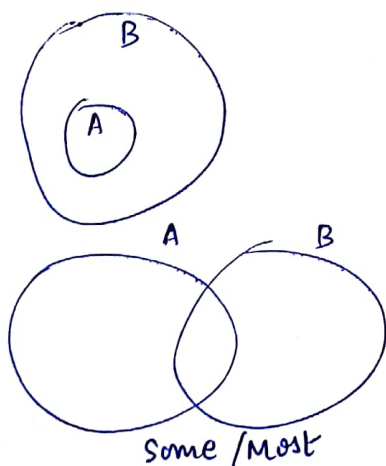
4 Rules  $\rightarrow$  Rule 1  $\rightarrow$  draw all possibilities/cases.

Rule 2  $\rightarrow$  for a statement to be True, it have to be true in all the cases.

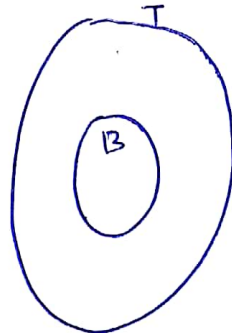
Rule 3  $\rightarrow$  If a statement is false even in one of the case, then it will be considered false forever.

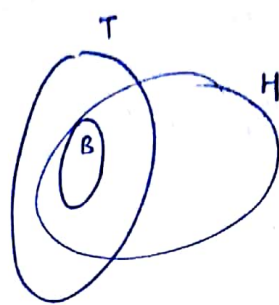
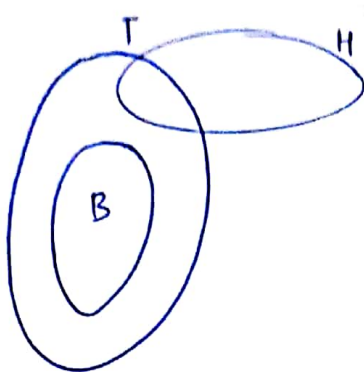
Rule 4  $\rightarrow$  Try to proof a statement false as early as possible.

Rules/General  $\rightarrow$  Read dirn's carefully  $\uparrow$



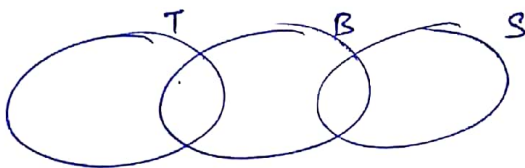
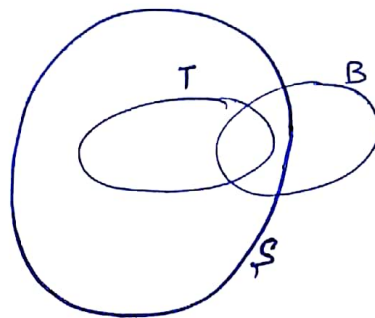
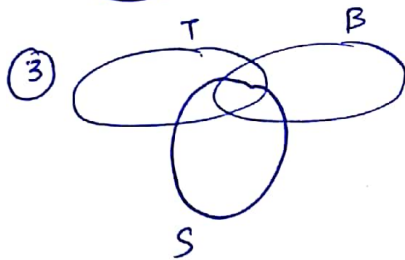
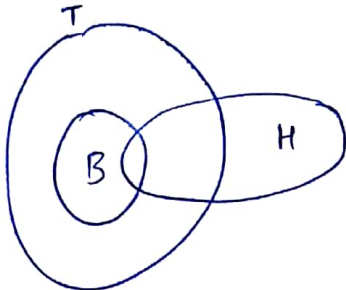
Q2



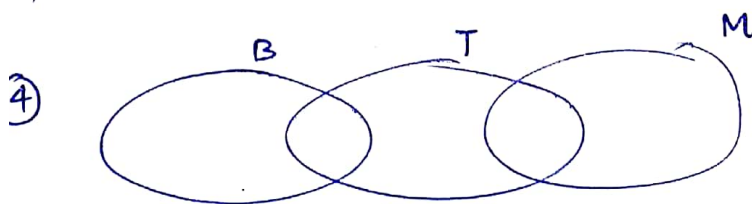


no informn. about  
Hens and Birds  
hence  
3 possibilities.

conc i ✗  
ii ✓ (b)

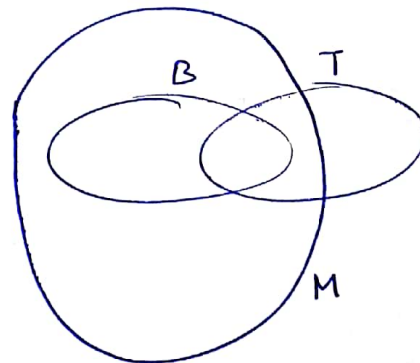
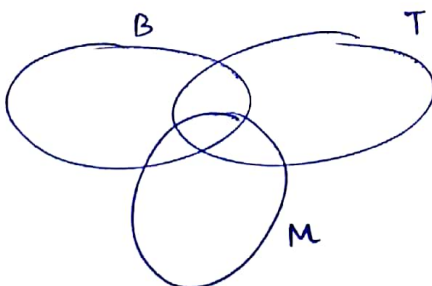


i. ✓  
ii ✗ (a) ✓



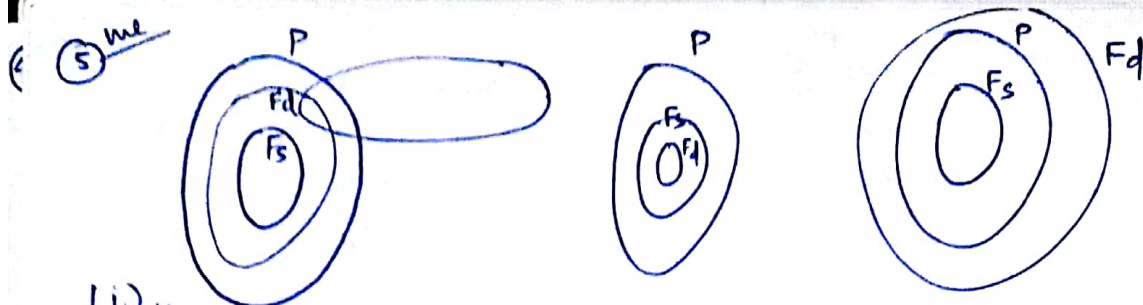
(i) ✗  
(ii) ✗

(d) ✓

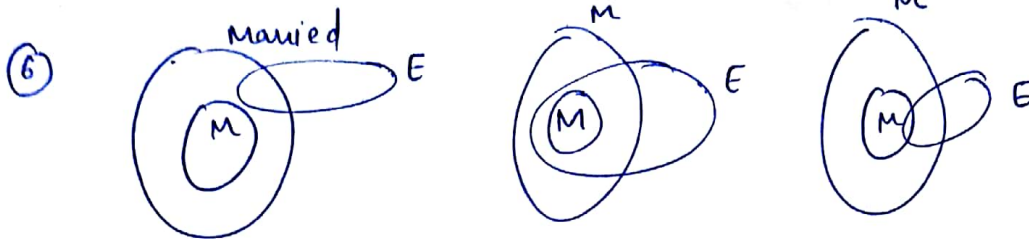


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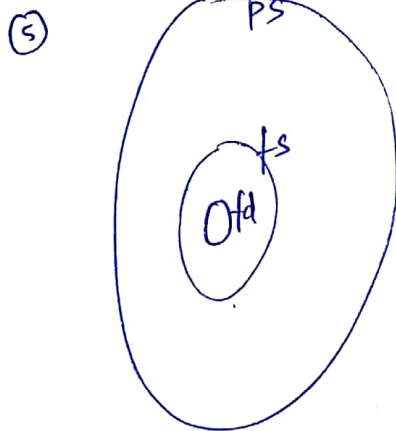
(i) ✗  
(ii) ✓ (b) ✓



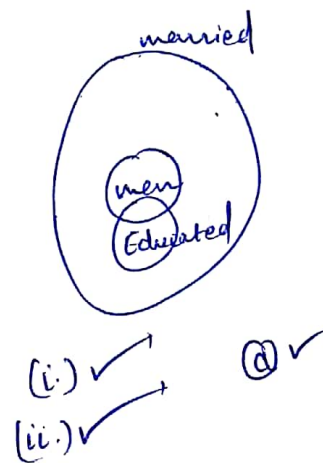
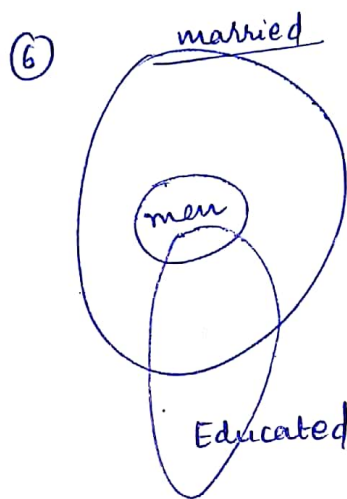
(i) ✓  
(ii) ✓ (c)



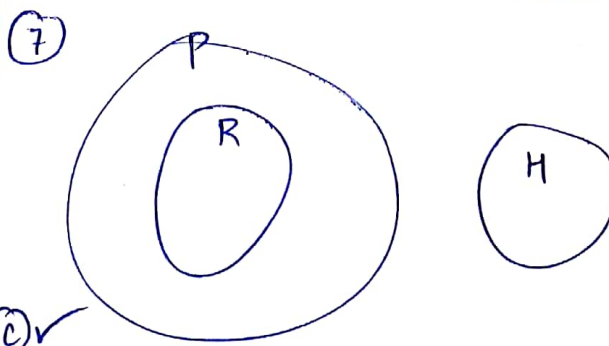
SIR



i ✓  
ii ✓ (d) ✓



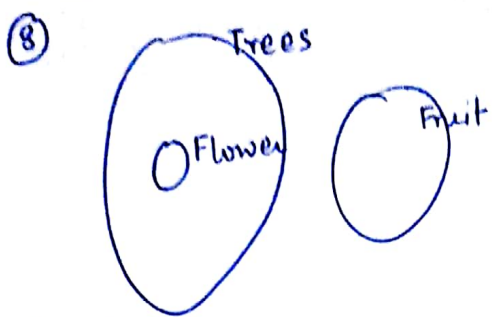
(i) ✓  
(ii) ✓ (d) ✓



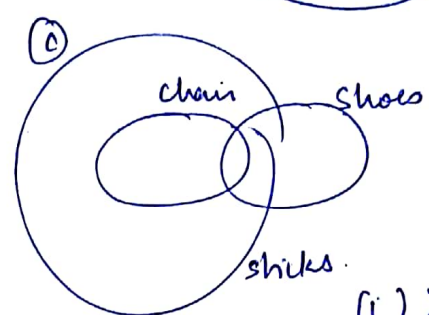
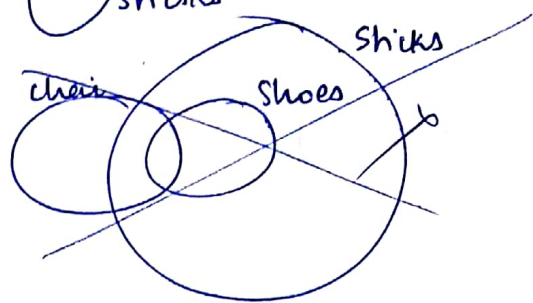
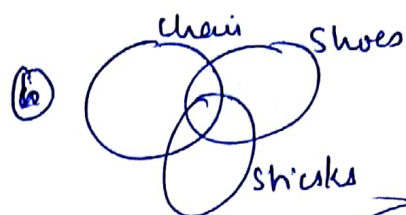
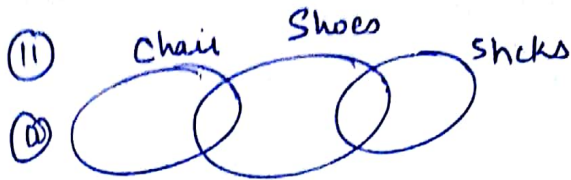
(1) ✗  
(2) ✗ (c) ✓

MOHIT CHOUKSEY

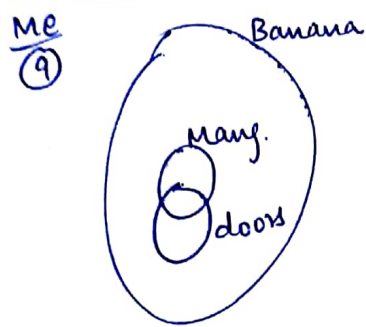




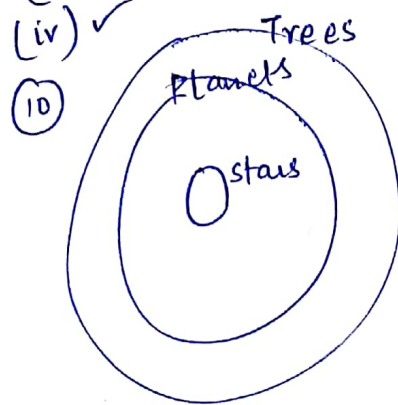
- (1) ✓  
(2) ✓  
(d) ✓



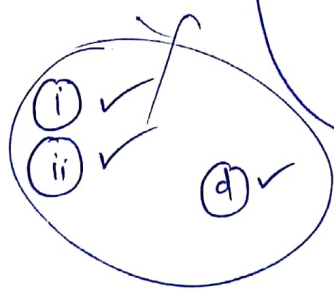
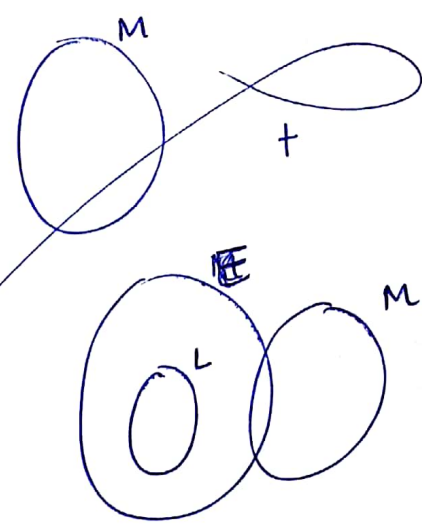
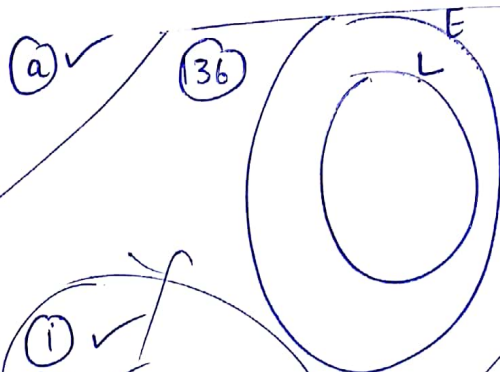
- (i) ✗  
(ii) ✗  
(iii) ✗  
(iv) ✗  
(d) ✓



- (i) ✗  
(ii) ✗  
(iii) ✓  
(iv) ✓  
(c) ✓



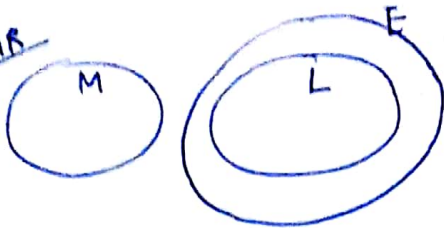
- (i) ✗  
(ii) ✓  
(iii) ✗  
(iv) ✓



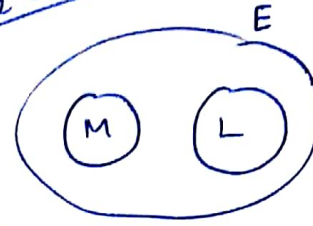
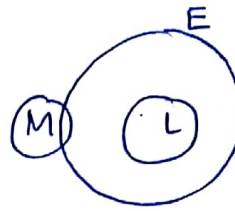
MOHIT CHOUKSEY

Q 136

SIR



No inform<sup>n</sup> about Manager and Executive



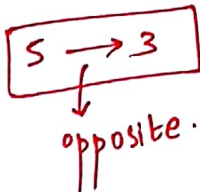
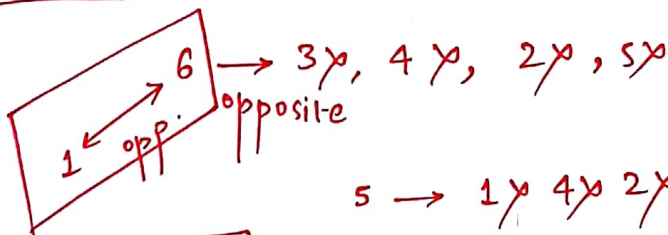
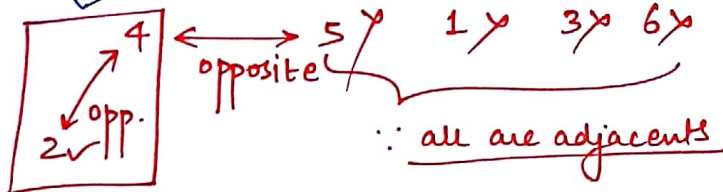
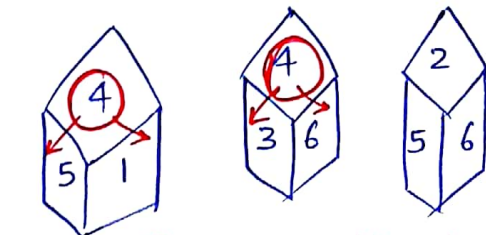
(i) ✗ (Bullshit)

(ii) ✗ — " —

(c) ✓

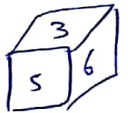
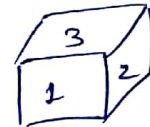
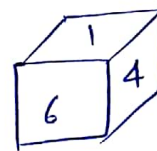
Pg no. 57

8 to 9



Q 137

1, 2, 3, 4, 5, 6

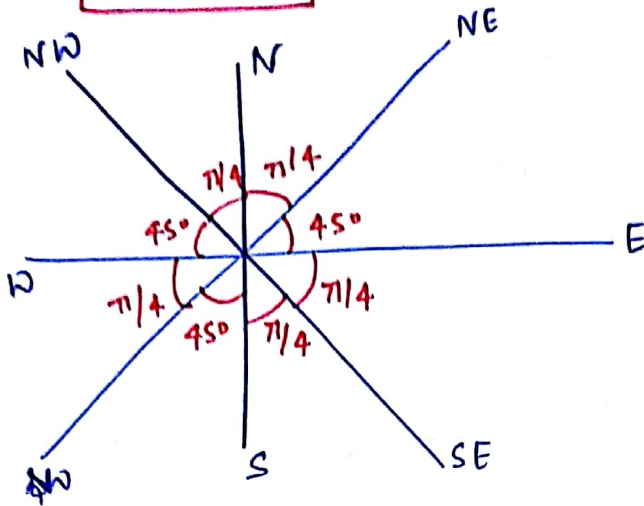


1 → 2 ✗ 3 ✗ 4 ✗ 6 ✗  
opp.

1 ← 5  
opp. (a) ✓

MOHIT CHOUKSEY

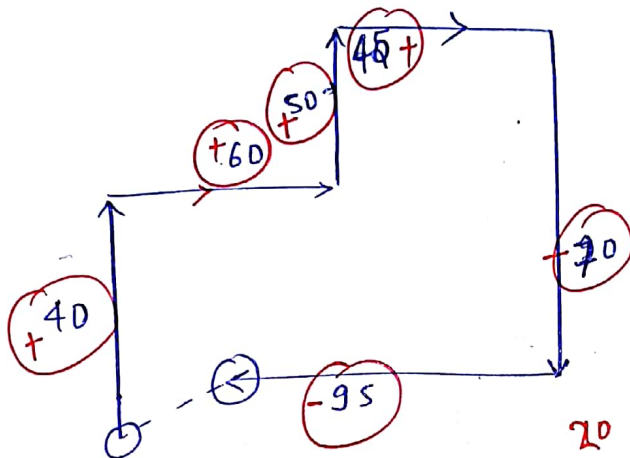
\* DIRECTION :-



Horizontal <sup>(H)</sup> = E<sup>+</sup>, W<sup>-</sup>  
 Vertical <sup>(V)</sup> = N<sup>+</sup>, S<sup>-</sup>  
 Apply pythagoras.

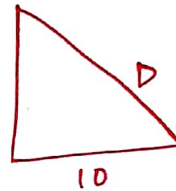
$$D = \sqrt{H^2 + V^2}$$

Q> Person goes 40m North take a Right turn goes 60m takes a left Turn <sup>& goes</sup> 50m and takes another " " " 45m . . . . .



$$H = |60 + 45 - 95| = 10$$

$$V = |40 + 50 - 70| = 20$$



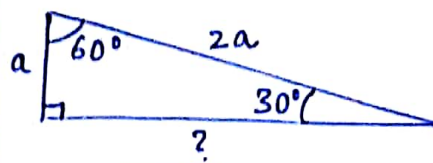
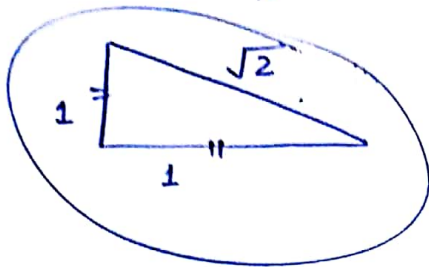
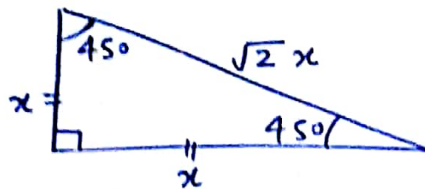
$$D = \sqrt{10^2 + 20^2}$$

$$D = \sqrt{500}$$

$$D = 10\sqrt{5} \text{ Ans} \therefore$$

MOHIT CHOUKSEY

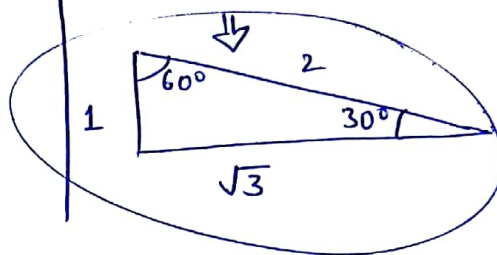
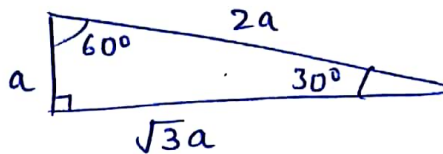
Isosceles Right  $\triangle$



$$\sqrt{a^2 + ?^2} = (2a)^2$$

$$a^2 + ? = 2a$$

$\Rightarrow$



$$\sin 30^\circ = \frac{a}{h}$$

$$\frac{1}{2} = \frac{a}{h}$$

$$h = 2a$$

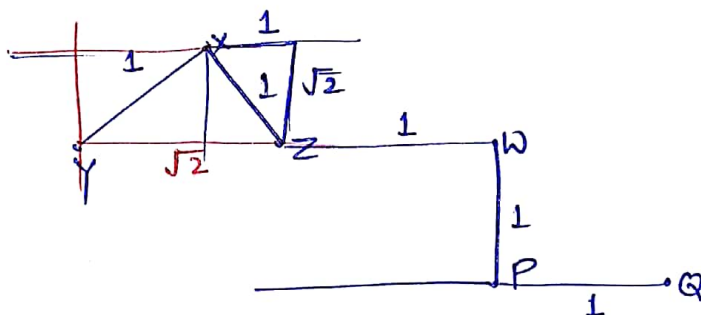
Pg 74

Q 52

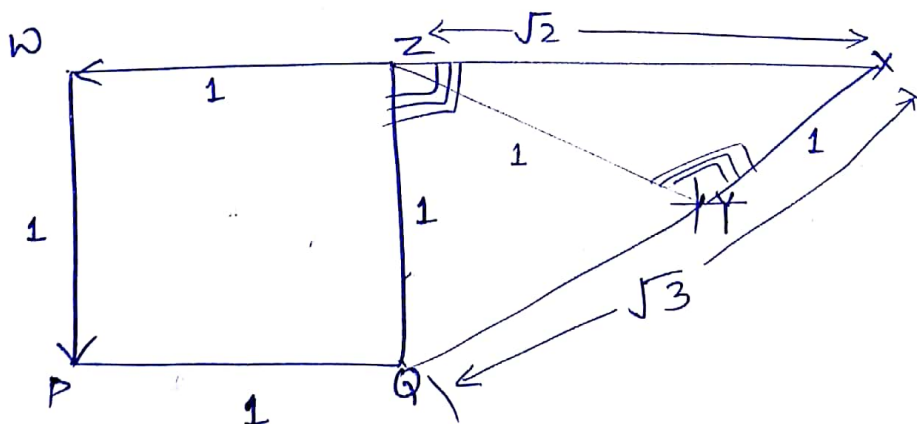
$$+\sqrt{2} + 1 - \cancel{1} + \cancel{1}$$

$$+1 - \sqrt{2} + 1 - \cancel{1} + \cancel{1}$$

2



SIR



(149)  $\rightarrow$  H.W. ©

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17/11/2016

# Data Interpretation

$$\% \text{ change} = \left[ \frac{\text{change}}{\text{IV}} \right] \times 100$$

IV  $\rightarrow$  final value

IV  $\rightarrow$  initial value

if % change  $\rightarrow$  +ve  $\rightarrow$  IV  $>$  IV  $\rightarrow$  %  $\uparrow$   $\rightarrow$  growth rate

$\rightarrow$  -ve  $\rightarrow$  IV  $<$  IV  $\rightarrow$  %  $\downarrow$   $\rightarrow$  decline rate

Ex (a) 40  $\rightarrow$  20  $\Rightarrow \frac{-20}{40} = -\frac{1}{2} \times 100 \approx -50\% \downarrow$

(b) 40  $\rightarrow$  50  $\rightarrow \frac{10}{40} = \frac{1}{4} \approx 25\% \uparrow$

(c) 40  $\rightarrow$  55  $\rightarrow \frac{15}{40} = \frac{3}{8} \approx 37.5\% \uparrow$

% change maxm.  $\rightarrow$  | change |

%  $\uparrow$  is maxm.  $\rightarrow$  +ve value in account.

%  $\downarrow$  is maxm.  $\rightarrow$  -ve value in account.

Ex :-

| 2015 | 2016 | 2017 |
|------|------|------|
| 50   | 60   | 72   |

$$-\frac{10}{50} = -\frac{1}{5} \approx 20\% \uparrow \checkmark$$

$$50 \times 1.2 = 60 \times 1.2 = 72$$

$$50 \quad 40 \quad 12$$

$$50 \times 0.8 = 40 \times 0.8 = 32 \checkmark$$

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Rs 10,000

$\frac{90^\circ}{360^\circ} = \frac{1}{4} \rightarrow 25\%$

$\frac{1}{4} \text{ of } 10,000 = 2500$

$100\% \rightarrow 360^\circ$

$1\% \rightarrow \frac{360^\circ}{100} = 3.6^\circ$

$360^\circ \rightarrow 100\%$

$1^\circ \rightarrow 5/18\%$

Pg 58 CH # 13

Q2.  $\left[ \frac{63^\circ - 36^\circ}{36^\circ} \right] = \frac{27}{36} = \frac{3}{4} \approx 75\%$

Q3.  $\frac{81^\circ + 63^\circ}{360^\circ} = \frac{144^\circ}{360^\circ} = \frac{2}{5} \text{ of Total}$

$= \frac{2}{5} \text{ of } (200) = 80 \text{ Lakh}$

Method

44%  $\times \frac{5}{18} = 12.22\%$

40% of the Total  $\leftarrow$  other method

40% of T

Q6.  $0.04 \text{ of } \text{TCP} = 15730$

$\text{TCP} = 393250$

$\text{Total selling Price (TSP)} = \frac{393250 \times 1.3}{5500} = 92.95$

1 copy

1%  $\approx$  4 Thousand

4% TCP  $\approx$  16 Th

TCP = 4 lakh

TSP =  $4 \times 1.3 = \frac{5.242}{5.500}$   
lwp  
9

(10) ✓

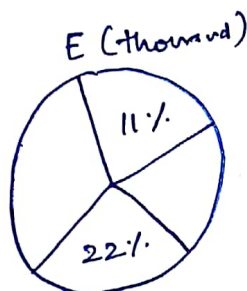
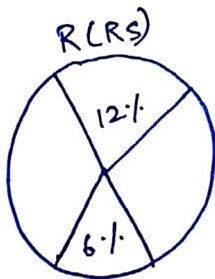
(11) ✓

(12) ✓

(15) Total quantity = 5 lakh tonnes  
Total Revenues = 250 Crore

Ratio of Revenue  $\frac{1/Kg}{4/Kg}$

(16) SIR



$$I_1 = \frac{2 \times 12\% \text{ of } R}{14\% \text{ of } E}$$


---


$$I_4 = \frac{1 \times 8\% \text{ of } R}{22\% \text{ of } E} = \frac{4}{1}$$

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Pg 77

Q 75

200 units

SIR

15 of TCP = 4.5 lakh

✓ TCP = 30 lakh  
2012

✓ Profit 2012 = 10 lakh

T.S.P. 2012 = 40 lakh

S.P./per unit =  $\frac{40 \times 10^5}{200} = 20,000$

Pg no. 60

Q 18

$\frac{M_{2008}}{F_{2008}} = 2.5$  ✓

assume  $F_{2008} = 100$  ✓  
and  $M_{2008} = 250$  ✓ (Bec. ratio is fixed)

$\frac{M_{2009}}{F_{2009}} = \frac{600}{200}$  (3) ✓  
(Bec. ratio is fixed)

Final value of male  $\frac{600 - 250}{250}$  initial value of male  
 $= \frac{35}{25} = \frac{7}{5} = 1.4 \times 100 = 140\%$

(19) 2012-2013  $\rightarrow$  GDP  $\uparrow$  7%  
2012-2013  $\rightarrow$  50 to 60 USD

|     |                      |          |         |                          |
|-----|----------------------|----------|---------|--------------------------|
| SIR | GDP before 2012-2013 | GDP in ₹ | 1 US \$ | GDP in 1 US \$           |
| Q19 |                      | 100 ₹    | 50 ₹    | $\frac{100}{50} = 2$     |
|     | GDP after 2012-2013  | 107 ₹    | 60 ₹    | $\frac{107}{60} = 1.783$ |

$$\left[ \frac{2 - 1.783}{2} \right] \times 100 = -10.83\% \downarrow$$

$$20 \uparrow \rightarrow 16.6\% \downarrow \rightarrow \frac{7}{x} \times \frac{xy}{100}$$

production purchase ↓ power

Q20

| Type III         | Type II          | Type I          | Type X           |
|------------------|------------------|-----------------|------------------|
| $\frac{46}{114}$ | $\frac{40}{144}$ | $\frac{40}{75}$ | $\frac{40}{108}$ |

Pg 84  
Q123

|   | (cm) | (kwh) |
|---|------|-------|
| M | 20   | 12    |
| N | 45   | 25    |
| O | 75   | 45    |
| P | 100  | 57    |

|       |                   |                        |                        |
|-------|-------------------|------------------------|------------------------|
| 20 km | → 12 kwh          | 45 → 25                | 75 → 45                |
| 1 km  | = $\frac{12}{20}$ | 1 km → $\frac{25}{45}$ | 1 km → $\frac{45}{75}$ |
| 0.6   |                   | 1 → $\frac{57}{100}$   |                        |
|       |                   |                        | 0.57                   |

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|   |  | (km) | (kwh) |
|---|--|------|-------|
| M |  | 20   | 12    |
| N |  | 25   | 13    |
| O |  | 30   | 20    |
| P |  | 25   | 12    |

$$\left(\frac{13}{36}\right) \quad \left(\frac{13}{25} \uparrow\right)$$

(116) ✓ (87) ✓  
Same

Pg 78 Q87 →

$$\begin{array}{l} 21 \times 2 = 42 \\ 15 \times 3 = 45 \\ 23 \times 2 = 46 \end{array}$$

$$42 + 45 + 46 = 133$$

SIR

$$\begin{array}{l} 21 \times 2 = 42 \\ 15 \times 3 = 45 \\ 23 \times 2 = 46 \\ \hline 133 \end{array}$$

Students Corrected  
Class + W + NA = students  
 $80 + 5 + 15 = 100$   
 $10 + 70 + 20 = 100$

Q. ESE 2017

| apna Qn   | M          | F          | T  |
|-----------|------------|------------|----|
| 5 L -     | 1 (38, 38) | 5 (34, 40) | 6  |
| 5 - 10 L  | 1 (32, 32) | 8 (35, 53) | 9  |
| 10 - 15 L | 8 (21, 65) | 3 (37, 13) | 11 |
| 15 +      | 2 (32, 33) | 2 (27, 40) | 4  |
| Total     | 12         | 18         | 30 |

this needed

(i) The percentage of the people older than 35 years can be almost

Sol 8

Extend the Table

| M | F | T  |
|---|---|----|
| 1 | 4 | 5  |
| 0 | 7 | 7  |
| 7 | 3 | 10 |
| 0 | 1 | 1  |
|   |   | 23 |

$$23 \times 100 / 30 = 76.6\%$$

(ii) Then the <sup>min</sup> % of people age less than 40 years

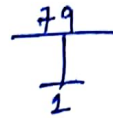
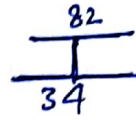
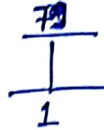
| M | F | T |
|---|---|---|
| 1 | 1 | 2 |
| 1 | 1 | 2 |
| 1 | 1 | 2 |
| 2 | 1 | 3 |

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Q 10 samples P Q  
 70 | 57 | 82 | 84 | 98 | 66 | 34 | 87 | 79 | 71

This shows the % of milk in each sample. If any two samples are mixed & form new sample then on maxm., how many distant pairs of samples will never give a composition of more than 80% milk.

Sol



$$\frac{6C_2}{2}$$

$$\frac{6!}{2!4!}$$

3RS (15)

Q —.

MOHIT CHOUKSEY

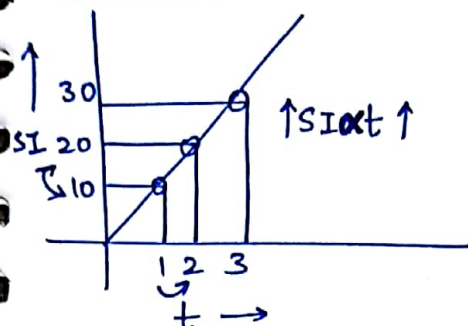


# SI/CI Simple Interest / Compound Interest

$$SI = \frac{P \times R \times T}{100}$$

$$y = mx$$

RS 100 @ 10%

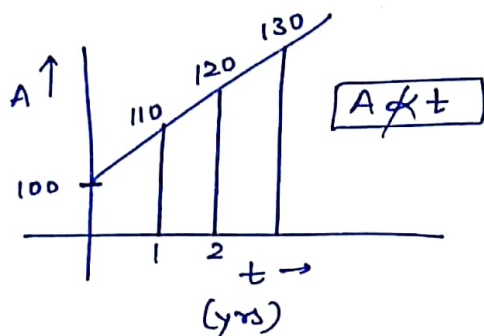


(A)

$$\text{Amount} = P + SI$$

$$y = c + mx$$

RS 100 @ 10%



$$8P \rightarrow 9 \text{ yrs}$$

@ CI

$$P_1 + I_1 = A_1 = P_2$$

$$P + \frac{PR}{100} = P \left(1 + \frac{R}{100}\right)^1 = A_1 = P_2$$

$$A_n = P \left(1 + \frac{R}{100}\right)^n$$

$$CI = A_n - P$$

Amount is compounded (half yearly)

$P, R = 10\%$  per year;  $t = 2 \text{ year}$  (hy)

$$A_2 = P \left(1 + \frac{5}{100}\right)^4$$

(Amount is compounded Quarterly) @ + 1 yr

$P, R = 5\%$  per half yearly (phy),  $t = 2y$

$$A_2 = P \left(1 + \frac{2.5}{100}\right)^8$$

$$* (CI - SI)_{2y} = P \left(\frac{R}{100}\right)^2$$

$$* (CI - SI)_{3y} = P \left(\frac{R}{100}\right)^3 + 3P \left(\frac{R}{100}\right)^2$$

RS 100 @ 10%

|                | CI         | SI  |
|----------------|------------|-----|
| P              | 100        | 100 |
| I <sub>1</sub> | 10         | 10  |
| P <sub>2</sub> | (100 + 10) | 100 |
| I <sub>2</sub> | (10 + 11)  | 10  |

@ certain sum of money becomes 25 times in 48 yrs at a S.I.  
In how many yrs will it become 49 times at S.I.?

Sol

Amount = P + SI

25P = P + 24P

25P = P + 24P

✓ 24P ∝ 48y

↑ SI ∝ t ↑

A = P + SI

49P = P + 48P

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$$\left(\frac{PR}{100}\right) \times \frac{R}{100} = P \left(\frac{R}{100}\right)^2$$

Q Certain sum of money doubles itself in 5yrs at C.I. In how many years will it become 8 times at C.I.

Q C.I.

$$\begin{array}{l} \text{'m' times in 'y' years} \\ \hline (m^n) \text{ --- } (n \times y) \text{ years} \\ \hline 2 \text{ times in 5 years} \\ \hline 8 \approx 2^3 \text{ (times) in } 3 \times 5 = 15 \text{ yrs} \end{array}$$

$$A = P \left(1 + \frac{R}{100}\right)^n \quad \rightarrow \quad 8P = P \left(1 + \frac{R}{100}\right)^{15}$$

$$\cancel{2P} = \cancel{P} \left(1 + \frac{R}{100}\right)^5$$

cubing

$$8P = P \left(1 + \frac{R}{100}\right)^{15}$$

Q49

Q79

then  
Pg 52

Q2

Q10

(49)

Smriti → 20% annually

$$\cancel{A = (1.2)^n}$$

$$\cancel{f(n=3)}$$

$$A = P \left(1 + \frac{R}{100}\right)^n$$

$$P \left(1 + \frac{20}{100}\right)^n$$

$$A = (1.2)^n$$

$$f(n=3) = 1.728 P$$

$$f(n=4) = 2.07 P$$

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$$A = P \left( 1 + \frac{R}{100} \right)^n$$

$$2P = P \left( 1 + \frac{R}{100} \right)^{10}$$

$$2^{1/10} = \left( 1 + \frac{R}{100} \right)$$

Q2

$$A = P + SI$$

$$3080 = P + \frac{PR \times 3}{100}$$

$$3400 = P + \frac{PR \times 5}{100}$$

$$320 \leftarrow 2y(SI)$$

$$160 \leftarrow 1y(SI)$$

$$2600 + \frac{\text{interest}}{(160 \times 3)} = 3080$$

$$2600 + 800 = 3400$$

$$\text{Tio } 5324 = P \left( 1 + \frac{R}{100} \right)^3$$

$$4840 = P \left( 1 + \frac{R}{100} \right)^2$$

Q A large cube was dipped in paint, taken out and then divided into 64 equal smaller cubes. how many cubes are painted on 3 sides, 2 sides, 1 side, 0 side.

Solution

$$T = (4 \times 4) \times 4 = 64$$

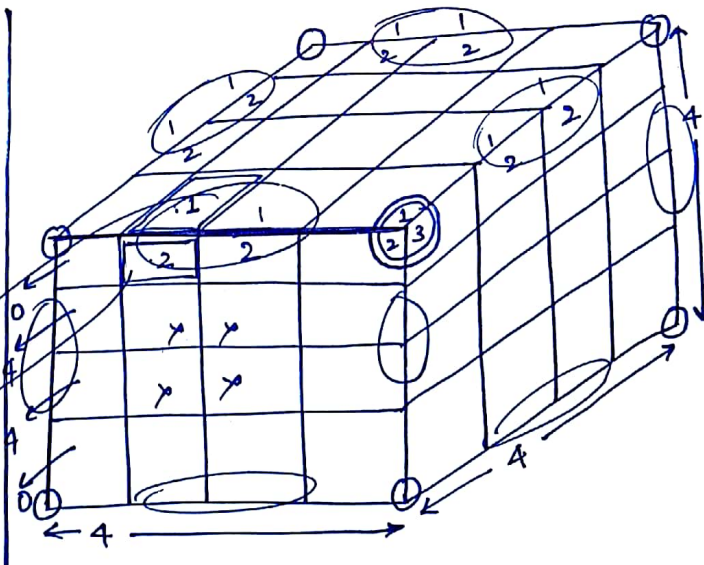
$$3S = 8$$

$$3 \text{ side} \quad +$$

$$2S = 2 \times 12 = 24$$

$$1S = 4 \times 6 = 24$$

Top  
front  
of the  
same cube



$$+ \\ 0S = \text{Remaining} \\ = 8$$

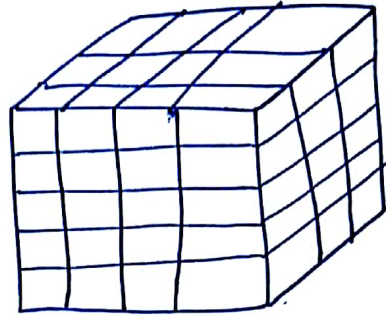
$$\frac{2S}{\text{side}} = 2 \times 12 = 24$$

MOHIT CHOUKSEY

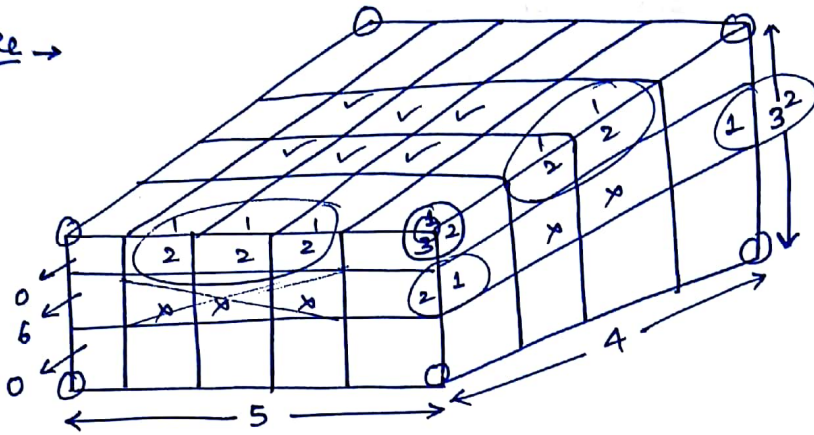


Q. A large cube was dipped in paint, taken out and then its length was divided into 5, width was divided into 4, height  $\rightarrow$  into 3 equal parts. then, how many cuboids are painted on 3S, 2S, 1S, 0S.

Sol.



Re  $\rightarrow$



$$T = (5 \times 4) \times 3 = 60$$

$$3S = 8 \cdot +$$

$$2S = 4[(3) + (2) + (1)] = 24 \cdot$$

$$1S = 2[(3) + (2) + 6] = 22$$

$$0S = 6$$

Q159 (56) ✓

$$T.S.A. = 6(\text{side})^2$$

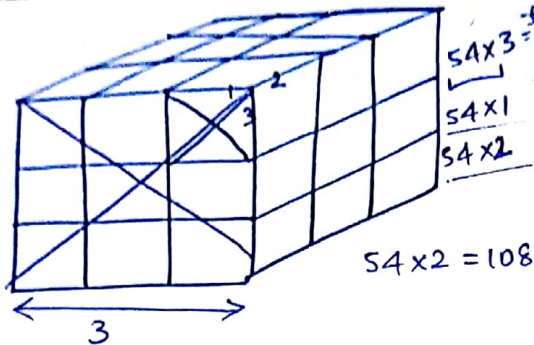
$$6(4)^2$$

$$TSA = 96 \checkmark$$

Q121

MOHIT CHOUKSEY

(121)



$$6(\text{Side})^2 = \text{TSA}$$

$$6(1)^2 \times 27 = \text{TSA}$$

$$6(3)^2 = \text{VSA}$$

$$54 \times 2 = 108 = \text{No VSA}$$

+, -, x, ÷

↑ ↓ x ÷

Rule on Averages → ① If each and every <sup>set</sup> of  $x_i$  is ↑, ↓, x, ÷ by a constant, then their arithmetic mean is also ↑, ↓, x, ÷ by the same constant.

# ② Sum of the deviations taken from arithmetic mean is equal to zero.

(19) Pg 71

$$\text{Standard deviation} = \sqrt{\frac{d_1^2 + d_2^2 + \dots + d_n^2}{n}}$$

$$* d_1 = -2 \quad d_2 = 0 \quad d_3 = 2$$

\*

1

3

5

$$\pi = 3$$

\*

8

10

12

$$\pi = 10$$

\*

$$d_1 = -2$$

$$d_2 = 0$$

$$d_3 = +2$$

Q47

a ✓

b x

d x

avg atleast.

avg every.

c ✓

(b) ✓

\* 'T'

95% ile

5% ile

94.3, 94, 95

Avg 93

92.3, 92, 91

consistently high

\* 'Q'

95% ile

5% ile

53, 51, 6

Avg 4

2, 3, 3.3

MOHIT CHOUKSEY

Scanned by CamScanner



$\beta$  95%, 97, 96  
 95/ile Avg 92  
 5/ile 2, 1, 3

highly inconsistent

Date 2016

(181)

37 (Pg 73)

2012  $\rightarrow$  M - W  $\rightarrow 41^\circ\text{C}$   
 T - T  $\rightarrow 43^\circ\text{C}$   
 T  $\rightarrow 15\% > M$

15% of 41

SIR

$$\frac{M + T + W}{3} = 41$$

$$\frac{T + W + Th}{3} = 43$$

$$M + T + W = 123$$

$$T + W + Th = 129$$

$$Th - M = 6$$

$$Th = 1.15M$$

2 The average weight of 25 students was 42 kg's. Two new student having weight 54 and 66 kg joins the class. What's the new average.

Sol

$$\frac{\text{Sum}}{N} = \bar{x} \leftarrow \text{average}$$

No.

$$\text{Sum} = N\bar{x}$$

$$\text{Sum} = 42 \times 25$$

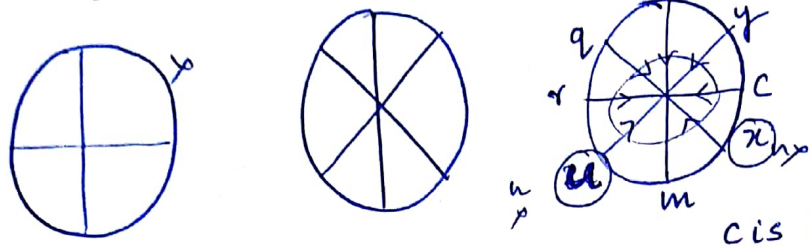
$$= 1050 + 54 + 66$$

07

$$\begin{array}{l} \left[ \begin{array}{l} 12 \leftarrow 54 \\ 24 \leftarrow 66 \end{array} \right] \\ \downarrow \\ \frac{36}{24} = 1.33 \\ \downarrow \\ \boxed{43.3} \end{array}$$

|    |    |                    |
|----|----|--------------------|
| 68 | -2 |                    |
| 75 | +5 |                    |
| 77 | +3 | $70 + \frac{1}{6}$ |
| 72 | +8 |                    |
| 69 | -1 | $70.66$            |
| 74 | +4 |                    |

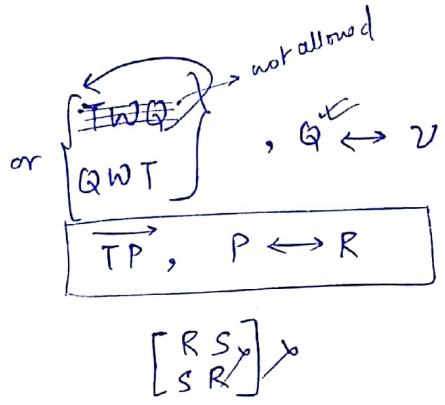
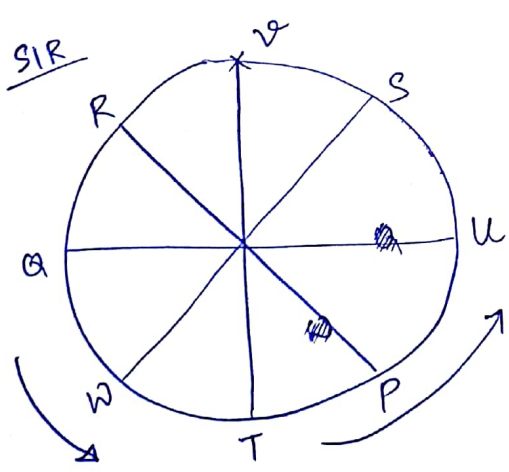
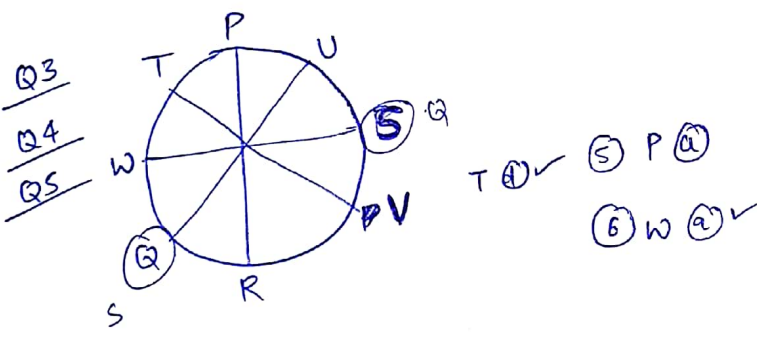
\* Seating Arrangement



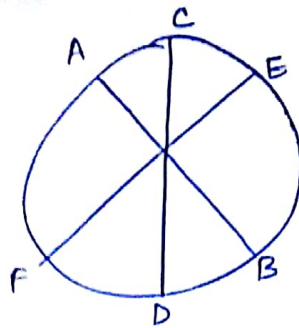
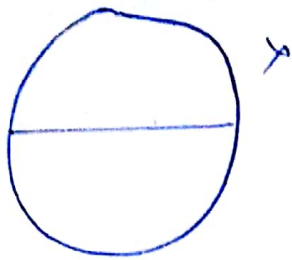
c is 2 places right of m.  
r is ——— left ———

- ① equal parts.
- ② @ centre.
- ③ R → Immediate Right.  
L → Immediate left.

- ④  $\begin{bmatrix} ACB \\ BCA \end{bmatrix}$
- ⑤ (m n)  
(n m)
- ⑥  $\leftarrow \text{mnp} \rightarrow$

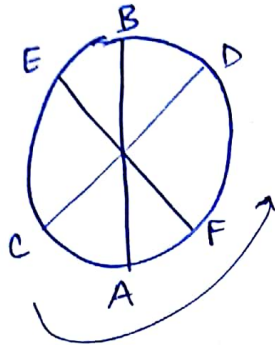


Q



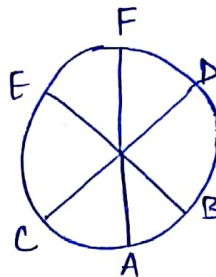
bv  
av

SIR



[GDB]  
[BDE]

; E ← A — D



## \* BLOOD RELATIONS

There are 5 Rules :-

① Draw family Hierarchy Tree

② keep on marking genders

③ Relationship

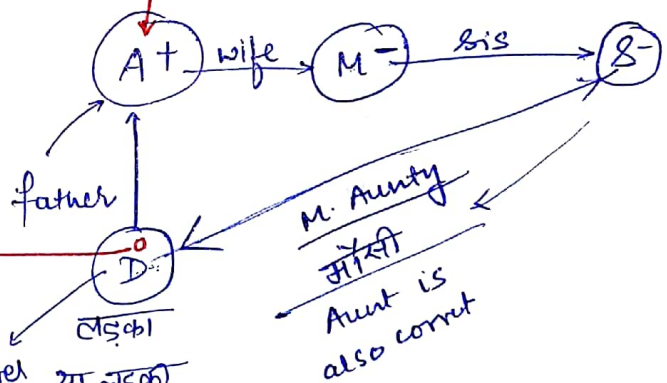
④ A+  $\xleftrightarrow{\text{wife}}$  M-

⑤ don't Assume  
don't Names

here gender is  
not known

Daughter  
या लड़की

A is the  
one level  
up in the  
family hierarchy



M. Aunty

मित्री

Aunt is  
also correct

Either Nephew or Niece (D with S-)

or

C.B.D  
cannot be  
determined.

but Nephew  
Niece

MOHIT CHOUKSEY

Q1

M

woman

B

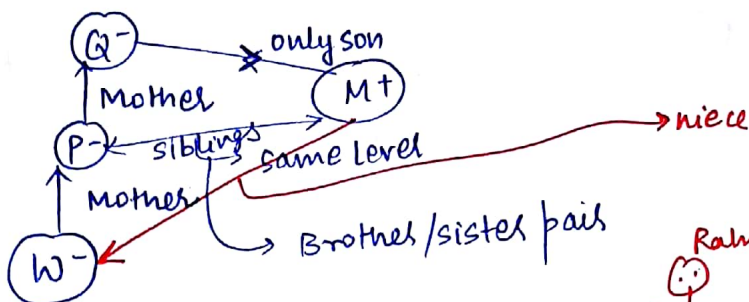
A (mother)

B (mother)

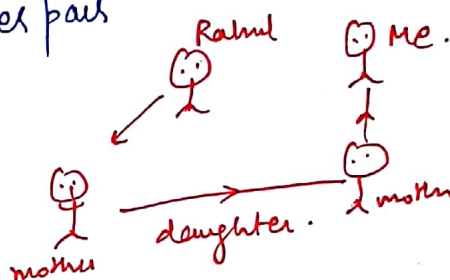
Q1 ✓

Q2

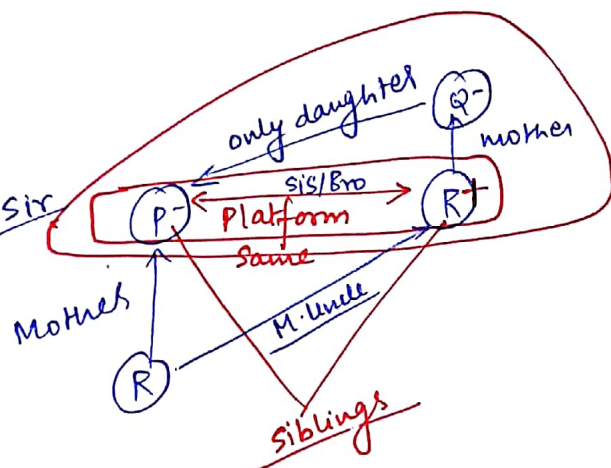
Q1 Sir



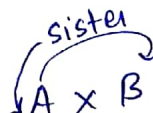
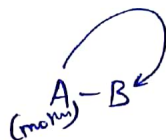
women related to man



Q2 Sir



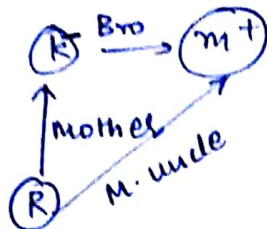
Q9



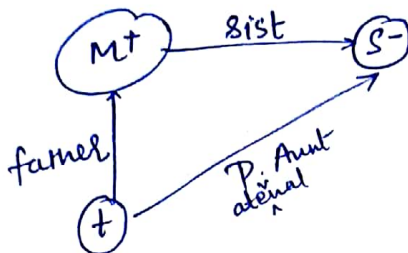
MOHIT CHOUKSEY



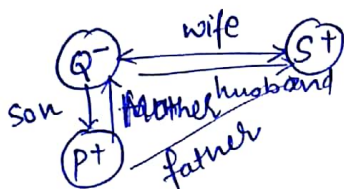
Q 9 M, K, R



Q 10 X, M, T



Q 11 P, Q, S



categories 6

| Pg no. 66 | Hock. | volly | chick | base | foot |
|-----------|-------|-------|-------|------|------|
| Q1 R      | ✓     | ✓     |       | ✓    |      |
| K         | ✓     | ✓     | ✓     |      |      |
| S         | ✓     |       |       | ✓    | ✓    |
| Q         |       | ✓     | ✓     | ✓    | ✓    |
| M         |       |       |       | ✓    | ✓    |

## Analytical Reasoning

Pg 66

Q 3

| A | B | C | D | E | F |
|---|---|---|---|---|---|
| 1 | 1 | 1 | 1 | 1 | 1 |

Support

Ds support → Finance

E, F → marketing

F → operations support  
C & E support

A → Finance & IT  
main

Q 3 cv ✓

Q 4 operat @ ✓

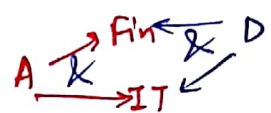
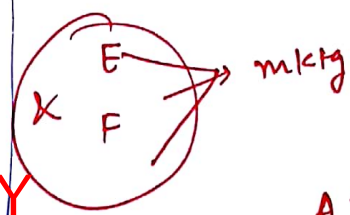
Q 5 A & @ ✓

categories here are only 2

SIR

|   | co-ordinat | support |
|---|------------|---------|
| A | Finance    | IT      |
| B | Finance    | IT      |
| C | Finance    | opr     |
| D | IT         | Fin     |
| E | mkty       | opr     |
| F | opr        | mkty    |

[3 people - Co-ordinate - Fin]



MOHIT CHOUKSEY

- ① Solio.
- ② Educ.
- ③ Acc.
- ④ < English
- ⑤ Eco
- ⑥ Psycho
- ⑦ Hindi

Eco  
Psycho  
Hindi

Eco

⑦ 5 Girls

K → 2nd height

- ① A → K < R
- ② W → P > R
- ③ W → P > M
- ④ A → R & M
- ⑤ W → R > M
- ⑥ W → N > P
- ⑦ A → R > N
- ⑧ A < K
- ⑨

↑ ascending  
P > R  
P > M  
R > M  
N > P  
N > P > R > M  
④ 7 ✓  
K < R  
R & M = R = M  
R > N  
K < R = M > N

- ⑧ A < B
- C < D
- B < C
- A > E

SIR solutions

⑦ Height

- 1 K
- 2 P > R
- 3 P > M
- 4 R > M
- 5 N > P

shortest one have to come from Rand P  
left side aa gaya to count wahi hoga shortest

ascd ↑  
N > K > P > M > M

Age

K ≠ Youngest

- ① K < R
- ② P < M
- ③ R = M
- ④ R < N

N > R = M > K > P  
1 2 3 4  
3 2 4  
↓ des

③ ✓

Rules (एगान दे कृपया) :-

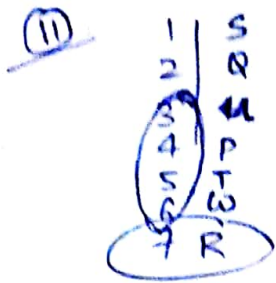
B follow A  
OR  
A is followed by B  
↓  
8AM → A  
8:15AM → B

A > B shortest  
B > C  
C > F

WB Pg 67

5 girls

R > P  
P > R  
P > M  
N > P



U  
P  
T  
W

(20 to 22)

A K S, R N  
 R Y W G B B  
 R P O S W  
 (K) → S → X Y  
 S → R → X R\* & W\*  
 N → P → X B & Y  
 A → W  
 R → X Y or G

|      | Red | Yellow | Blue | white | Green           |         |
|------|-----|--------|------|-------|-----------------|---------|
| Amar |     |        |      |       | <del>Read</del> | Reading |
| Kap  |     |        |      |       |                 | Playing |
| Sas  |     |        |      |       |                 | Outing  |
| Roh  |     |        |      |       |                 | Singing |
| Nag  |     |        |      |       |                 | Working |

(d) ✓

(21)

|         | Red          | Yellow | Blue | white        | Green | Read | Play | outing | Sing | Working |
|---------|--------------|--------|------|--------------|-------|------|------|--------|------|---------|
| Amar    |              | X      |      |              | X     |      |      |        |      | ✓       |
| Kapil   | —            | X      | —    | —            |       |      |      |        | ✓    |         |
| Salvesh | ✓            |        |      |              |       | X    |      |        |      | X       |
| Rohan   |              |        |      |              |       |      |      |        |      |         |
| Nagesh  | <del>✓</del> | X      | X    | <del>—</del> |       |      | ✓    |        |      |         |

N.P.

MOHIT CHOUKSEY



SIR's Solution

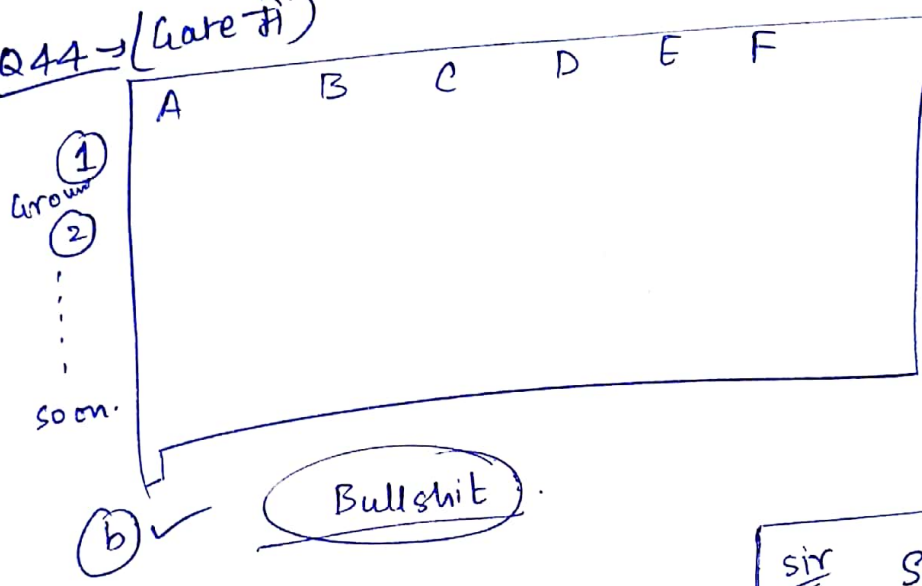
|   | colour                | hobby                              |
|---|-----------------------|------------------------------------|
| A | <del>Red</del> yellow | write ✓                            |
| K | Yellow                | Sing ✓                             |
| S | Red ✓                 | Reads out ✓<br>writes ✓            |
| R | Yellow ✓<br>green ✓   | Blue or green or white ✓<br>Read ✓ |
| N | Blue ✓<br>Yellow ✓    | white or green ✓<br>Play ✓         |

Not unique

(23) R → Blue

(24) Kapil → can't be determined ✓

Q44 → (Gate Pi)



A → even  
B → odd

Eswal does not live on floor number Bhola.

Don't tabulate.

(50) 4 children

SOM < Riaz  
Shin < Ansu  
Ansu < group  
↓  
youngest

Sir  
SOM < Ria ✓  
Anshu < Shiv ✓  
shiv (or) Riaz

(a) ✓



|   | P | Q | R | S | T | U |
|---|---|---|---|---|---|---|
|   | H | P | D | T | F |   |
| P |   |   |   |   |   |   |
| Q |   |   |   |   |   |   |
| R |   |   |   |   |   |   |
| S | ✓ |   |   |   |   |   |
| T |   |   |   |   |   |   |
| U |   |   |   |   |   |   |

don't Tabulate the data

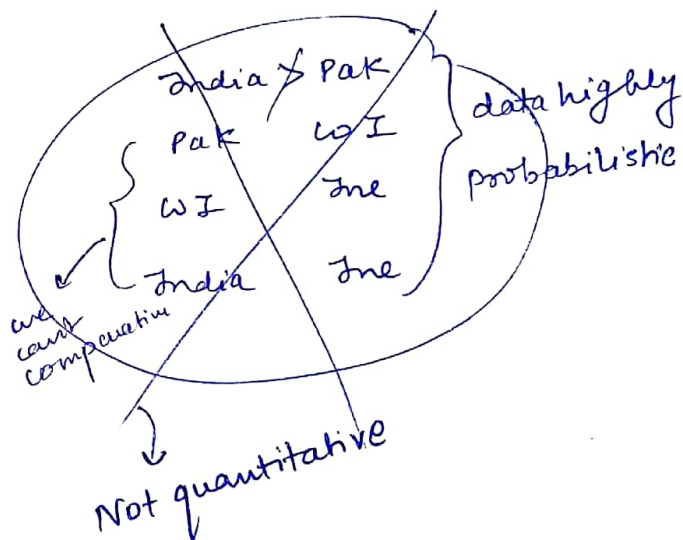
- (a) ✗ R - Defence  
 (d) ✗ R - Telecom  
 (c) S & U can't be together

(b) ← Ans

Q161 Pg 88

$A > B$   
 $B > C$   
 $A > B > C$

Since data is quantitative



1 — 2 — 3

A — B — C

MOHIT CHOUKSEY

161 Sir (a) ✓

Copy Cohen  
↑  
Book ✓

## Lettering

(1) A (2) B (3) C D - - E (5) - - F - - G - - H I (10) J K  
L M N (15) P Q R S (20) T U V  
W X Y (25) Z (26)

M = 13 + 

|   |    |    |    |    |
|---|----|----|----|----|
| E | J  | O  | T  | Y  |
| 5 | 10 | 15 | 20 | 25 |

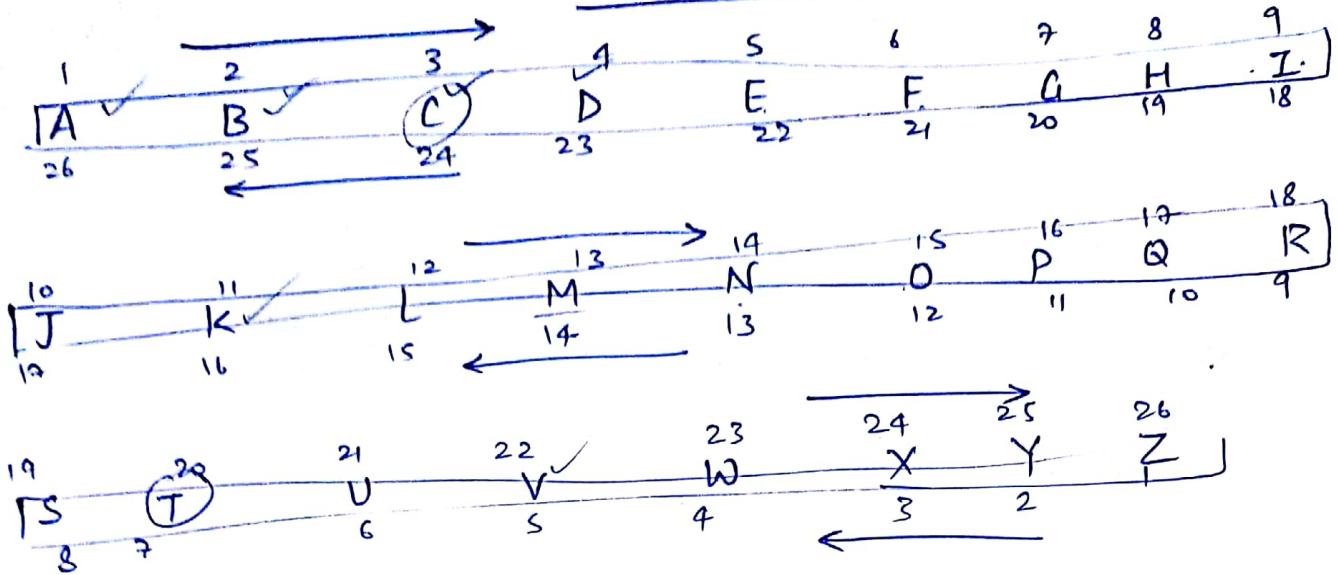
Pg no. 64  
Q5  
Q8  
Q12  
Q16

(5)  $\begin{matrix} 1 & 2 & 5 \\ AB = & E & \end{matrix}$   $\begin{matrix} 3 & 4 & 25 \\ CD = & Y & \end{matrix}$   
 $EA = Y$   $BC = M$   
 $51 \quad 25$   $13$

(8) CAT =

MOHIT CHOUKSEY

# LETTERING



M = 13 + E | J | O | T | Y  
5 10 15 20 25

15) ABK : V :: BCD : \_\_\_\_\_

8  
10

12) ✓

12) CARPET : TCEAPR :: \_\_\_\_\_ : LNAAANTOI

↓ ↓ ↓ ↓ ↓ ↓  
5 20 20 5

13) ✓

5 →

SIR (5)

|                |                |   |   |
|----------------|----------------|---|---|
| A              | B              | = | E |
| 1 <sup>2</sup> | 2 <sup>2</sup> |   | 5 |

---

|                |                |   |    |
|----------------|----------------|---|----|
| C              | D              | = | Y  |
| 3 <sup>2</sup> | 4 <sup>2</sup> |   | 25 |

E A ≠ y  
5<sup>2</sup> + 1<sup>2</sup> = 26 = Z

LNAAAN

12) CARPET : TCEAPR  
% TCEAPR  
NATIONAL : LNAAANTOI

A B K : 18  
: 22

1 x 2 x 11

B C D

2 x 3 x 1 = 2X

B ← D → E  
O ← R → P → E

(2) BOARD : CPBSE

CHAIR :

BHOPAL EERMDI

NAGPUR

Q21  
22  
24  
25  
27

SIR (BHOPLAL) : (EERMDI)  
(2) (28/5/11) (5/8/14)

+3/-3/+3/-3/+3/

(22) MONKEY ← Y : X D J M N L  
-1 -1 -1 -1 -1

Tiger : Q  
(-1)

Y E K N O M  
MONKEY : X D J M N L  
-1 -1 -1 -1 -1

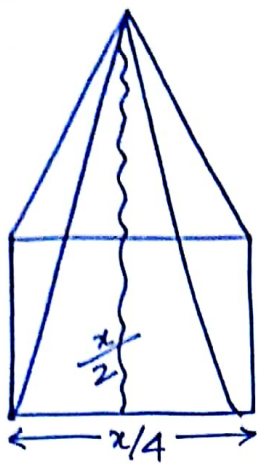
MOHIT CHOUKSEY



10  
← Best of luck : Kalf TSB  
Good wishes : shsw DA  
10 6

NS  
Alg  
Gate Qns  
Doubt

MOHIT CHOUKSEY



$$\frac{1}{2} \times \left(\frac{x}{4}\right) \times \left(\frac{x}{2}\right)$$

$$\left(\frac{x^2}{16}\right) \times 4$$

Q172

$$\frac{x \times x/2}{2}$$

$$\frac{x^2}{4}$$

Q163  $L \uparrow \quad N \downarrow \rightarrow e^x$

80 units  
Load  $\uparrow$

100 cycles  
 $N \uparrow$

40 units

$10,000 \leftarrow N$

$5,000 \leftarrow N$

$\sqrt{100} \rightarrow 80 \checkmark$   
 $\sqrt{10000} \rightarrow 40 \checkmark$   
 $\sqrt{5000} \rightarrow \text{---}$

$10,000 \rightarrow 5000$

$$y = k e^{ax}$$

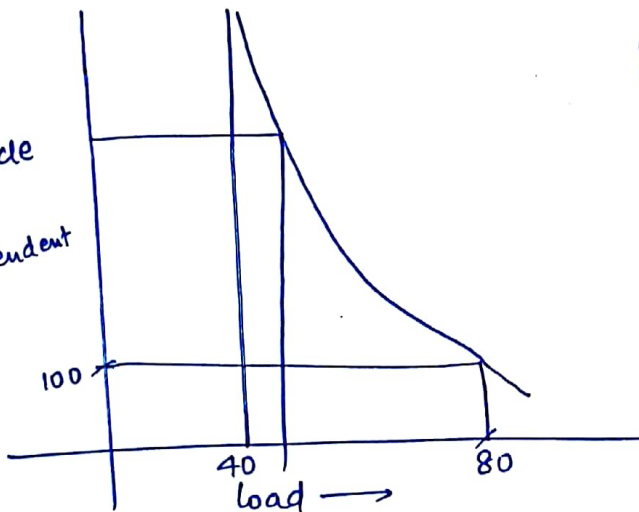
$$y = e^{ax}$$

$$y = k a^x$$

$$\frac{k a^{80}}{k a^{40}} = \frac{100}{10000}$$

$$a^{40} = \frac{1}{100}$$

cycle  
dependent



independent  
variable

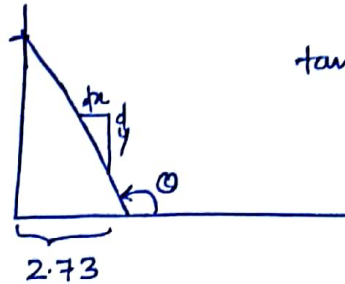
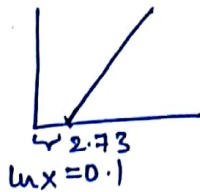
MOHIT CHOUKSEY

(169)  $\frac{x}{100}y + \frac{y}{100}x$

$\frac{2xy}{100}$

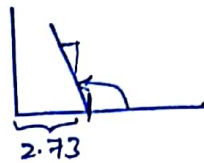
2% of  $xy$

(157)  $(\ln x, y)$

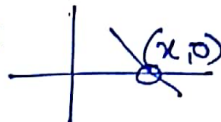


$\tan \theta = -0.02$

$\log_e x = 1$   
 $x = e^1$



(SIR)  $(y - y_1) = m(x - x_1)$



$(x_1, y_1) \rightarrow m$   
 $\ln x$   $\rightarrow$  general

$\ln x = .1$

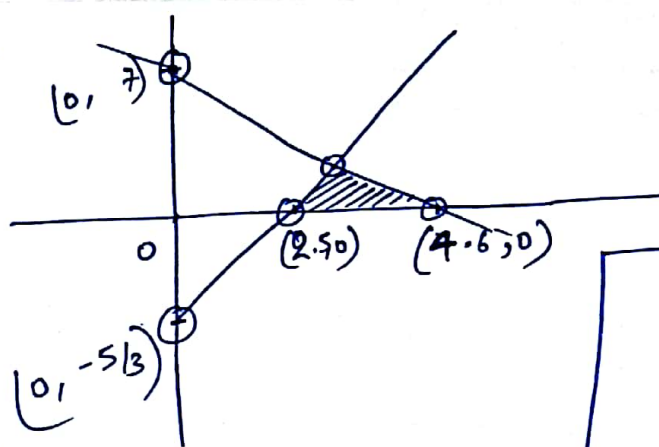
$(y - 0) = m(x - .1)$

$(y - 0) = -.02(x - .1)$

$y = \frac{-2}{100}(x - .1)$

$y = \frac{-2}{100}(\ln 5 - .1)$

(156)  $3x + 2y = 14$   
 $2x - 3y = 5$



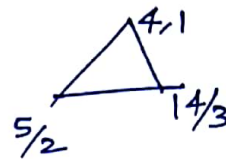
$3x + 2y = 14$

$x=0$   $y=0$   $4.66$   
 $y=7$   $x=14/3$   
 $x=4.6$

$2x - 3y = 5$

$x=0$   $y=0$   $2.5$   
 $y=-5/3$   $x=5/2$

$\frac{1}{2} \times \frac{14}{3} \times 7 - \frac{1}{2} \left( \frac{14}{3} - \frac{5}{2} \right) 1$



$\frac{13}{7} \times \frac{6}{8}$

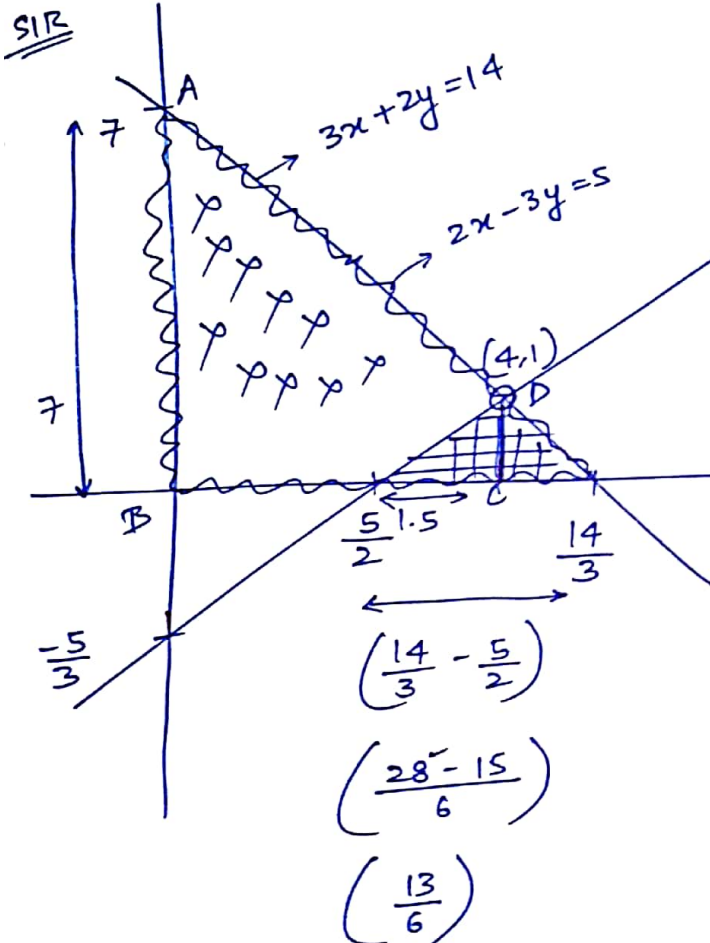
$\frac{98}{6} - \frac{13}{12}$

$\frac{12 \times 98 - 13 \times 6}{72}$

$\frac{1086 - 78}{72}$   
 $\frac{1008}{72}$   
 $14$

$\frac{1086 - 78}{72}$

$\frac{1008}{72}$



ABCD (Trapezium)

$\Rightarrow \frac{1}{2} (7 + 1) \times 4 = \frac{8}{2} \times 4$

$= \frac{32}{2} = 16$

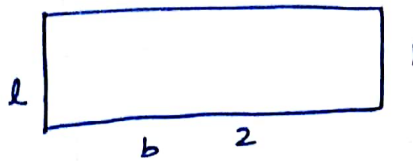
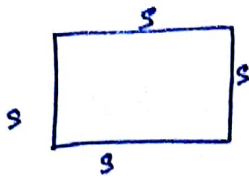
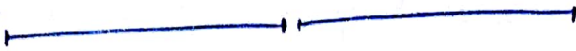
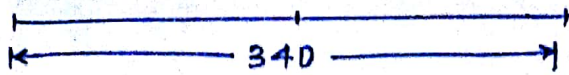
$\frac{1}{2} \times 1.5 \times 1 = -0.75$

$15.25$

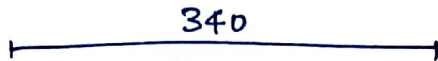
MOHIT CHOUKSEY



(150)



$$A_S + A_R \rightarrow \min.$$

SIR

$$\boxed{x^2}$$

 $x$ 

$$\boxed{2l^2}$$

 $l$ 

$$4x + 6l = 340$$

$$\left[ l = \frac{340 - 4x}{6} \right]$$

$$A = x^2 + 2l^2$$

$$A = x^2 + \left( \frac{340 - 4x}{6} \right)^2$$

(141)

50%  $\leftarrow$  prone TB  $\rightarrow$  infection30%  $\leftarrow$  ~~infected~~  $\rightarrow$  develops the disease.

70%  $\checkmark$  (C)  $\checkmark$

(146)

S, M, E, F

$$M \rightarrow 2\gamma \rightarrow \frac{1}{2} E$$

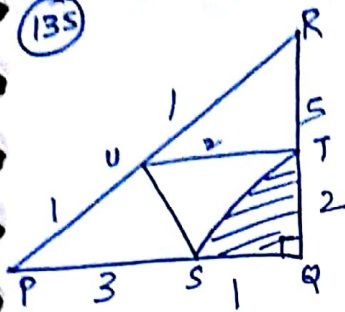
$$S, M \rightarrow 6h$$

$$E, F \rightarrow 12h$$

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Q135 Q132 Q138

135



$$\frac{PS}{QS} = \frac{3}{1}$$

$$\frac{PU}{UR} = \frac{1}{1}$$

$$\frac{RT}{QT} = \frac{5}{2}$$

$$A_{QTS} = 20 \text{ cm}^2$$

$$\frac{1}{2} \times UT \times RT + \frac{1}{2} UT \times TQ + \frac{1}{2} \times PS \times QT$$

$$\frac{1}{2} UT (RT + QT) + \frac{1}{2} PS (QT)$$

$$\frac{1}{2} \frac{UT}{QS} QT \left( \frac{RT}{QT} + 1 \right) + \frac{1}{2} \frac{PS}{QS} (QT \times QS)$$

$$\frac{1}{2} UT QT \left( \frac{5}{2} + 1 \right) + \frac{1}{2} \frac{3}{1} (QT \times QS)$$

$$\frac{1}{2} QT \times QS = 20$$

40

$$12 = \sqrt{5^2 + 6^2}$$

$$1 - 5^2 =$$

-4

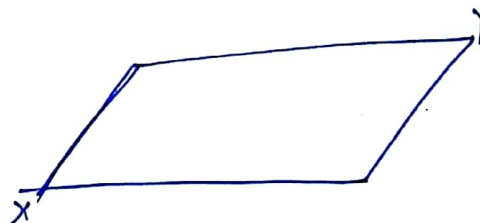
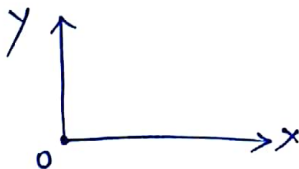
$$\frac{1}{2} (UT \times QT) \left( \frac{7}{2} \right) + 60$$

$$\frac{1}{2} \frac{UT}{QS} \times (QT \times QS) \frac{7}{2} + 60$$

$$\frac{UT}{QS} \frac{35}{7} + 60$$

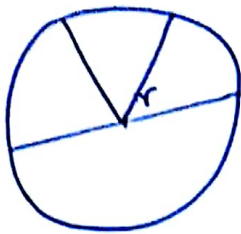
$$7 + 60 \checkmark$$

38



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132.



$$r = 30 \text{ cm}$$

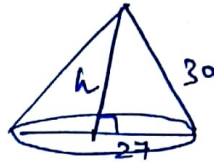
$$\text{Remaining area} = 0.9 \times \pi (30)^2 = \text{lateral surface area of the cone}$$

$$= \pi R (l)$$

slant height (l)

$$\Rightarrow R = 27$$

$$\Rightarrow r = 30$$



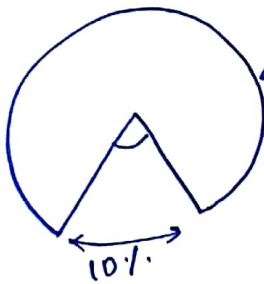
$$h^2 + 27^2 = 30^2$$

$$h = \sqrt{30^2 - 27^2}$$

$$\frac{R}{h} = \frac{27}{13.076}$$

$$h = 13.076$$

\*



← arc length

$$\frac{10}{360} (2\pi R)$$

area also 10% ↓

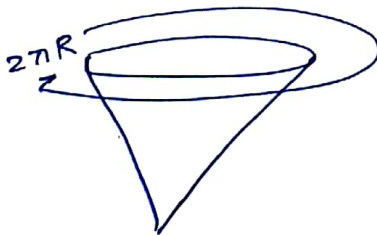
$$\frac{10}{360} (\pi R^2)$$

Linear dependency.

$$\Rightarrow (2\pi R) 0.9 = 2\pi R$$

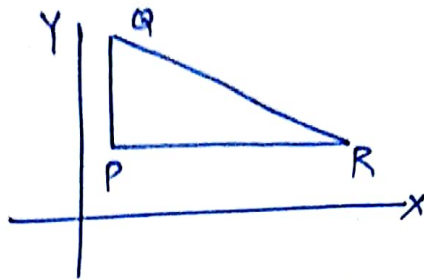
$$30$$

$$R = 27$$

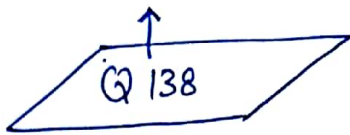


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138



$P(x_1, y_1)$   
 $Q(x_2, y_2)$   
 $R(x_3, y_3)$



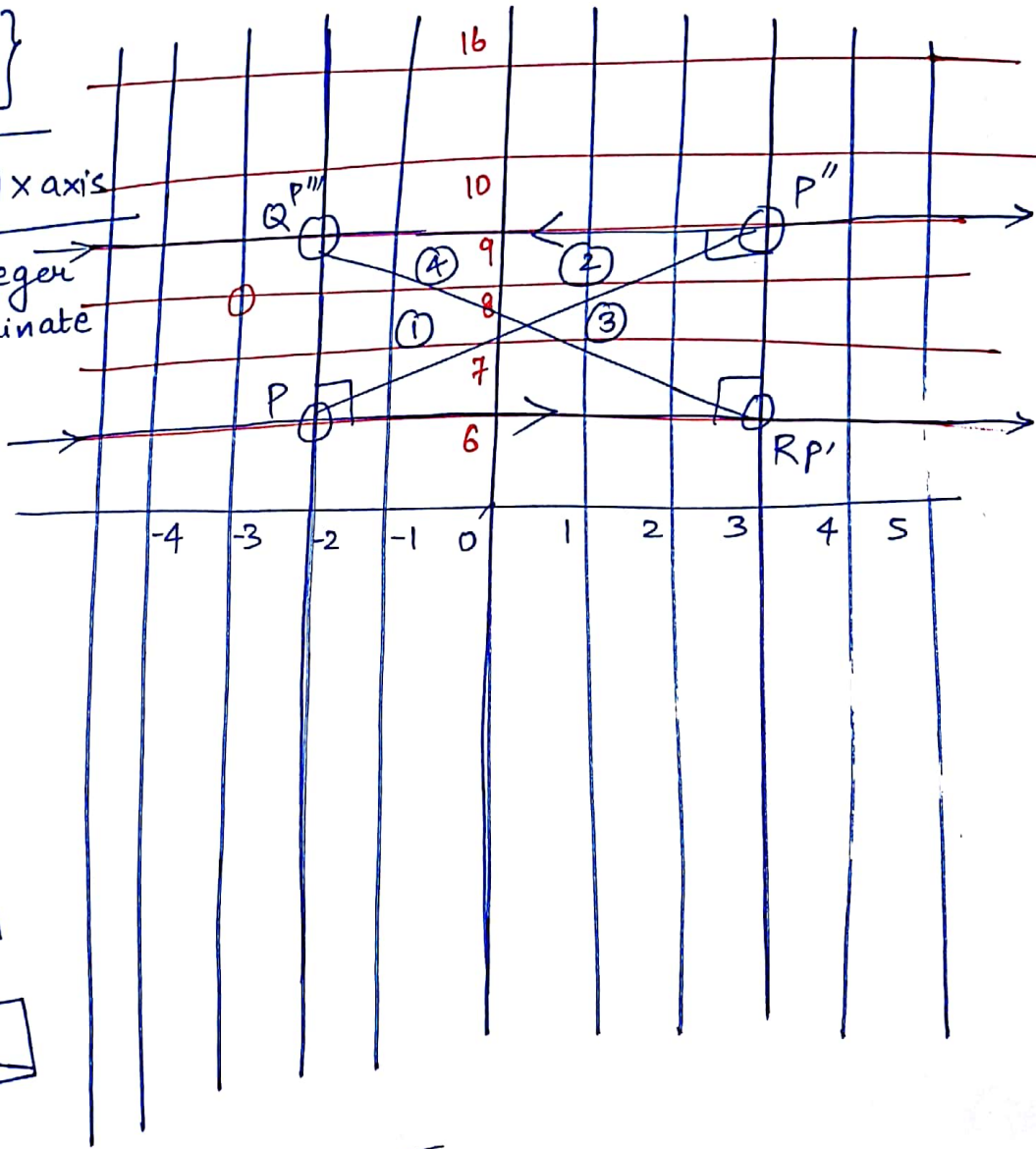
$$-4 \leq x \leq 5$$

$$-6 \leq y \leq 16$$

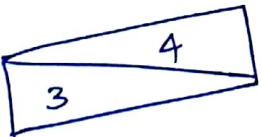
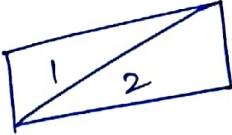
$$\left\{ \begin{array}{l} -4 \leq x \leq 5 \\ -6 \leq y \leq 16 \end{array} \right\}$$

$\angle P = 90^\circ$ ,  $PR \parallel x$  axis

$PQR \rightarrow$  integer coordinate



$$[{}^{11}C_2 \times {}^{10}C_2] \times 4$$



126, 127, 136, ✓

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126

$$a^2 + b^2 + c^2 = 1$$

$$ab + bc + ca$$

$$(a+b+c)^2 = \underbrace{a^2 + b^2 + c^2}_1 + \underbrace{2ab + 2b + 2ca}_{+2(ab+bc+ca)}$$

$$1 + 2$$

$$(a+b+c)^2 - (a^2 + b^2 + c^2) = 2(ab + bc + ca)$$

$$\textcircled{-1} + \underbrace{(a+b+c)^2}_{\substack{\nearrow +ve/0 \\ \downarrow \text{for making} \\ \text{min this value} \\ \text{make } = 0}} = \underbrace{2(ab+bc+ca)}_{\substack{\nearrow \text{min} \\ (-1/2)}} \quad \textcircled{b} \checkmark$$

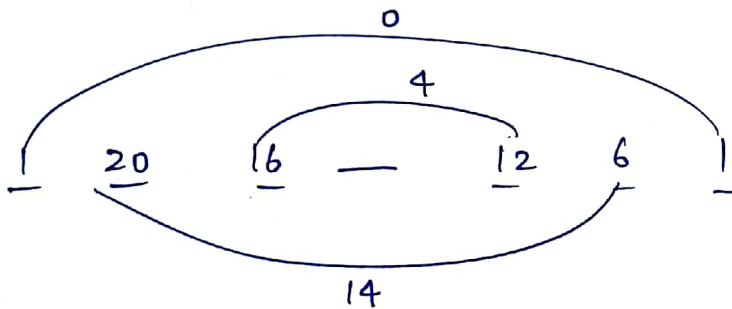
But

$$\left[ -\frac{1}{2}, \frac{1}{2} \right] \left[ -\frac{1}{2}, 1 \right] \text{ in cat}$$

$$(a-b)^2 + (b-c)^2 + (c-a)^2 = 2(a^2 + b^2 + c^2) - 2(ab + bc + ca)$$

$$2(ab+bc+ca)_{\max} = 2(1) - [(a-b)^2 + (b-c)^2 + (c-a)^2]_{\min}$$

122



SIR

$$\begin{array}{rcl} & 15 \checkmark & \\ 2 \times \frac{6}{3} & 21 \checkmark & \\ 3 \times \frac{3}{1} & 24 \checkmark & \\ & 15 \checkmark & \\ 4 \times \frac{36}{3} & 41 & \end{array}$$

$$\begin{array}{ccc} \textcircled{6} & 5 \checkmark & \textcircled{4} \\ \textcircled{7+4} & \checkmark 7 & \textcircled{2+1} \\ \textcircled{1+9+2} & \checkmark 8 & \textcircled{1+2+1} \end{array}$$

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118

$$\begin{matrix} M & \rightarrow & M \\ P & \rightarrow & P \\ C & \rightarrow & C \end{matrix}$$

$$P + M + C = 27/20$$

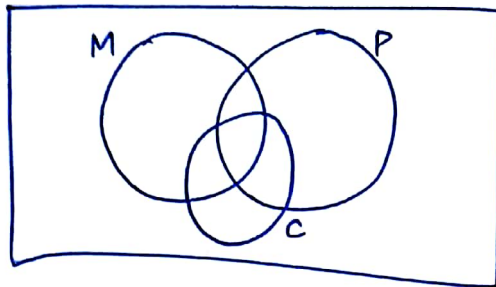
$$P + M + C = 13/20$$

$$P \times M \times C = 1/10$$

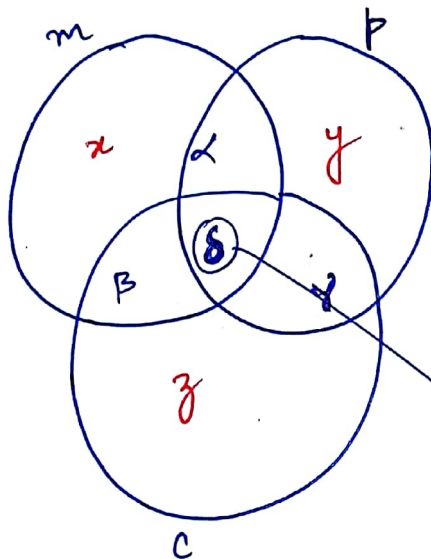
75%  $\rightarrow$  atleast one

50%  $\rightarrow$  atleast two

40%  $\rightarrow$  exactly two



SIR



$$S = 10\% \cdot \frac{1}{10}$$

$$R + B + S = 75$$

$\downarrow \quad \downarrow \quad \downarrow$   
 $25 + 40 + 10 =$

$$m \times p \times c = 1/10$$

$$(2) \quad m + p + c = \frac{13}{20} = \frac{65}{100} = 65\% \quad \therefore < 75\%$$

$$m + p + c = \frac{135}{100} = \frac{27}{20}$$

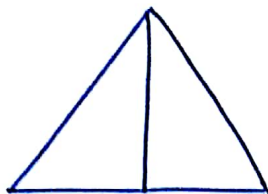
$$R + 2B + 3S$$

$$25 + 2(40) + 3(10) = 135$$

112/113

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112



113 only read h

$\text{rem}\left(\frac{p \times q}{r \times s}\right)$  if  $(p \times q) > (r \times s)$

SIR

$$h = \text{Re}\left(\frac{7 \times 3}{5 \times 2}\right) = 1$$

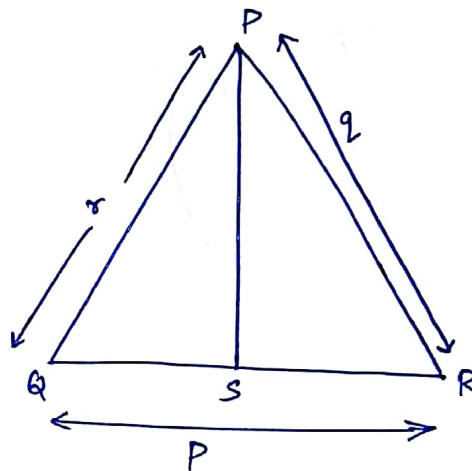
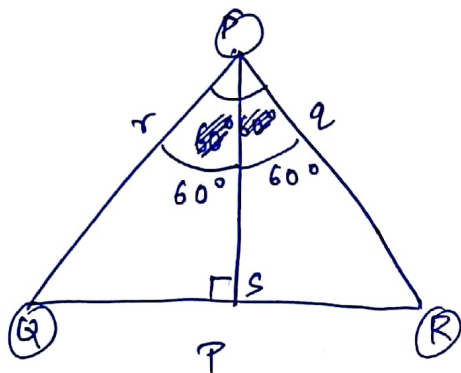
$fg(1, 6, 8)$

$f(1, 4, 6, 8) \quad g(1, 4, 6, 8)$

$\frac{\max(p, q, r, s) \min(p, q, r, s)}{}$

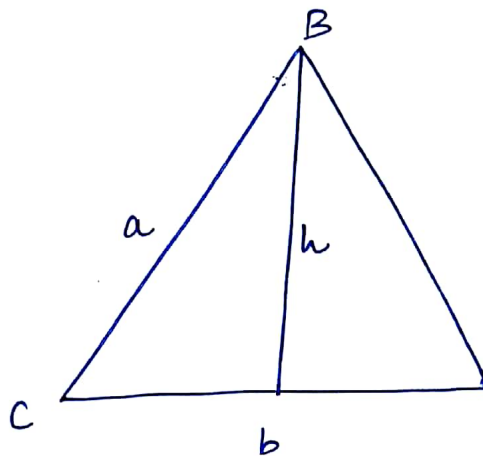
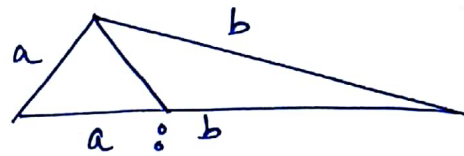
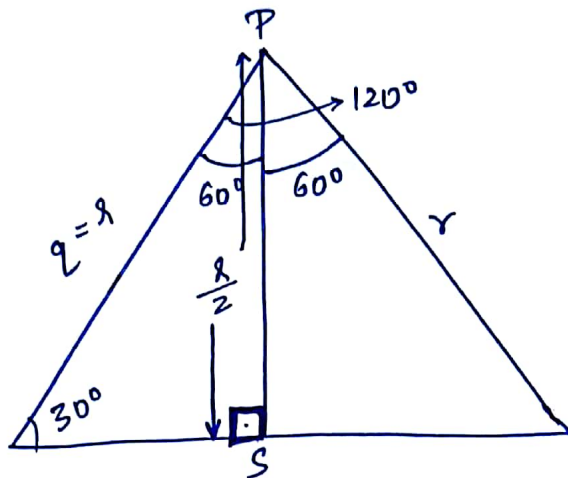
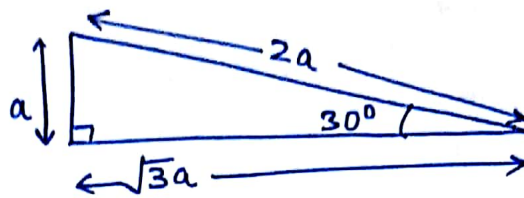
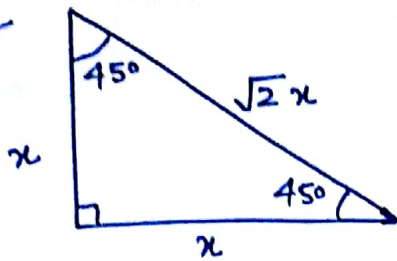
$$\max(8) \times (1) = \underline{\underline{8}}$$

112



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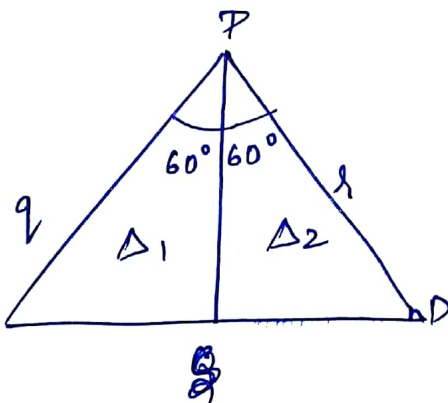
112



$$\frac{h}{a} = \sin C$$

$$h = a \sin C$$

$$\frac{1}{2} \times b \times h = \frac{1}{2} \times ab \sin C$$



$$\frac{1}{2} \times q \times PS \sin 60^\circ + \frac{1}{2} \times r \times PS \sin 60^\circ$$

$$\Delta = \frac{1}{2} q r \sin(120^\circ)$$

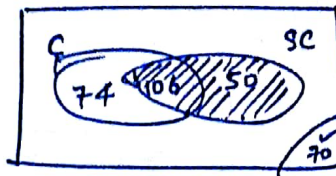
$$PS(q+r) = qr$$

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89

|      |     |
|------|-----|
| Car  | 74  |
| Sc   | 50  |
| Both | 106 |
| None | 70  |



$$\left[ \frac{74 + 70}{300} \right] \times 100$$

88

D → 10% → T.F.

SIR

$$(100 \times 2) S = 1000$$

$$\begin{array}{r} 100 - 10 \\ - 5 \\ \hline 15 \end{array}$$

$$\begin{aligned} \text{1 Ticket} &\rightarrow 85/- \\ (85 \times 2) \times 5 &= 850 \end{aligned}$$

76

100B → 4 B

R → 1B → defective  
5DB ✓

SIR

$$T = 100$$

$$D = 5$$

$$D = 95$$

$$\left| \begin{array}{l} f_c \\ T_c = \frac{{}^{95}C_4}{{}^{100}C_4} \\ \downarrow \\ \text{Total chances} \end{array} \right| (.95)^4$$

73

population

66

[HH] [HT] [TH]

$$\frac{1}{2} \times \frac{1}{2}$$

$$= \frac{1/4}{3/4} = \frac{1}{3}$$

$$\left[ \frac{1}{2} \times 1 + \frac{1}{2} \times \frac{1}{2} \right]$$

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