8/8/16

Reasoning & Aptitude

Gate

4Q x 2marks = 8m
1Q x 1m = 1m

(2010-2013) → 9marks

2014 (M.E.) → 12 marks

2015, 2016 → 10 marks

E.S.E.

R/A → 20 marks

P.S.U. → (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 → 3^n

1 — (3) 3^1 → 1

4 — (9) 3^2 → 2

10 — (27) 3^3 → 3

28 — (81) 3^4 → 4

82 — (243) 3^5 → (5) ✓ 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.

5B → 4B (10 gms)

→ 1B (9gms)

B.B Beam Balance.

→ previous qn. (B.Bo)

Spring Balance 2^n ✓

answer from this ball	Balls
1	(2) 2^1 → 1
3	(4) 2^2 → 2
5	(8) 2^3 → 3
09	16 → 4
17	32 → 5
33	64 → 6
65	(128) → 7

27

✓ (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.

2	72
2	36
2	18
3	9
3	3

Factors ⟷ Divisors. → examiner denotion.

$72 = 2^3 \times 3^2 = 4 \times 3$ = 12 factors

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

$2^0 \to 3^0$ (1), 3^1 (3), 3^2 (9)

$2^1 \to 3^0$ (2), 3^1 (6), 3^2 (18)

$2^2 \to 3^0$ (4), 3^1 (12), 3^2 (36)

$2^3 \to 3^0$ (8), 3^1 (24), 3^2 (72)

- $120 = 2^3 \times 3^1 \times 5^1 = 4 \times 2 \times 2$ = 16 factors

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

Note :-

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

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 = ?

$10800 = 108 \times 100$

$108 = 12 \times 9 = (2^2 \times 3) \times 3^2$

$100 = 5^2 \times 2^2$

$10800 = 2^4 \times 3^3 \times 5^2$

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

2	10800
2	5400
2	2700
3	900
3	300
2	100
2	50
5	25
5	5

$3 \times 5 \times 4 = 60$

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

① Total factor (Tf) (48)

② odd f (12) (3×4) (2 → ×)

③ even f (48 - 12 = 36)

④ perfect square (8) = 2×2×2 = 8

⑤ perfect cubes (4) = 2×1×2 = 4

Sol ① 4 × 3 × 4 = 48

② → 2 ×

$3^0, 3^1, 3^2$

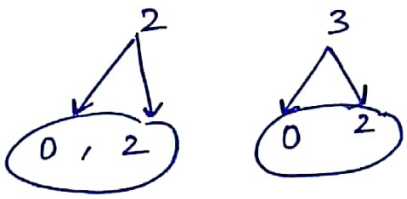
1, 3, 9

④ for perfect square, power should be multiply of 2 (even) and 0.

$2^4 \times 3^2$

$2^2 \times 3^2$

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



$2 \times 2 = 4$

$2^0 - 3^0 (1)$
$\quad - 3^2 (9)$

$2^2 - 3^0 (4)$
$\quad - 3^2 (36)$

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

$2^6 \times 3^3$

$2^3 \times 3^9$

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

Sol

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

$(2\times3)(2^2\times3^1)$

$3\times2=6$ ✓ Ans

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

6 | 72

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

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

$2\times2=4$ ✓ Ans.

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

Q 30 ↑ $(2\times3\times5)(2^2\times3^1\times5^2)$

$(3\times2\times3)$ ↙ 18 ✓ Ans

* Prime factor :-

$(60)^{72} \times (98)^{60} \times (44)^{50} \times (45)^{96}$ ← To hell of higher powers.

↓ ↓ ↓ ↓

$(2^2\times3\times5)$ $(2,7)$ $(2,11)$ $(3,5)$

Pf

(2, 3, 5)

↑

Pf

2, 3, 5, 7, 11 → Prime 5 factors

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

Q $1!_0 + 2!_0 + 3!_0 + 4!_0 + 5!_0 + 6!_0 + 7!_0 - - + 99!_0$ ⇒ unit digit

$1!_0 \downarrow 1$, $2!_0 \downarrow 2$, $3!_0 \downarrow 6$, $4!_0 \downarrow 24$, $5!_0 \downarrow 0$, $6!_0 \downarrow 0$, $7!_0 \downarrow 0$, $99!_0 \downarrow 0$

Sol $5!_0 = 1 \times (2) \times 3 \times 4 \times (5) = 120$.

$6!_0 = 6 \times 5!_0 = 720$

$7!_0 = 7 \times 6 \times 5!_0 = 5040$

first 4 no.'s

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

Ans → 3 ✓

Note :- $5!_0$ onwards, every ! ends with atleast a single 0.

Q $100!_0$ ends with how many 0 ?

Sol $100!_0 = 1 \times (2) \times 3 \times (4) \times 5 \times (6) - 10 - - - \times 99 \times 100$

$5 \rightarrow$ कम ही

$\frac{100}{5} = 20$ $\left[5, 10, 15, 20 - - - - 100\right] \approx 5^1$

$+$

$\frac{20}{5} = 4$ $\left[25, 50, 75, 100\right] \approx 5^2$

24

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

Sol $100! = 1 \times 2 \times 3 \times 4 \times 5 \times 6 \times \text{-------} \times 100$

$\frac{100}{3} = 33$ $[3, 6, 9, 12, 15, \text{---} 99] \approx 3^1$

$\frac{33}{3} = 11$ $[9, 27, 36, \text{----} 99] \approx 3^2$

$\frac{11}{3} = 3$ $[27, 54, 81] \approx 3^3$

$\frac{3}{3} = 1$ $[81] \approx 3^4$

48 ✓

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

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

$\frac{14}{7} = 2$ $[49, 98] \approx 7^2$

$= 16$ ✓

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

Sol $\frac{100}{15} = 6$ [15, 30, ---- 90]

$100! = 1 \times 2 \times 3 \times 4 \times 5 \times \text{----} \times 99 \times 100$

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

↓ roti ↓ sabji since limitation → $100!|5^n \Rightarrow 24$ times

$100!_{0} = 3^{48} \times 5^{24}$

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

$= (15)^{24}$ ✓

(15 → not prime no. hence, बार बार अनेक बार)

Q A no. ~~(of exact)~~ has exactly 3 prime factors $(a^b \times b^q \times c^r)$

125 factors of the number are perfect squares.

~~Ans~~ 27 factors of the number are ⊣ cube.

then overall Total factors of the No. are ? .

Q Find the No. of trailing 0's.

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

(b) $1!_{0} \times 2!_{0} \times 3!_{0} \times \ldots\ldots\ldots \times 100!_{0}$.

* BASE SYSTEM :-

$(25)_{10} = (2^4\ 2^3\ 2^2\ 2^1\ 2^0)_{2}$ for Reaching to the Base (2).

$(16*8 + 0 + 0 + 1)$

$(25)_{10}$

2	25	Remainder
2	12	1 ↑
2	6	0
2	3	0
	1	1

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hr	Min.	Sec
3	24	36
+2	35	24
6	0	0

$b = 60$

if hr Min. Sec → not given,
Then also Base 60.

every time we are making Base 60 to zero.

(1)	(1)	
(1) 8	7	3
+ 1	2	7
10	0	0

Base
10 → 0

hr	Min.	Sec
(1)	(1)	
3	24	36
+2	45	32
6	10	8

$b = 60$

(60 → 1 → (1))

3	24	36
2	45	32
6	10	8

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

$b = 60$

Q (Gate) 2010 (2 marks)

$7 + b = b + 5 \rightarrow b = 8$

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

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

$1 + 2 =$

$7 + b = 8 + 5$

(13) ↓ Base

carry forward तब करेंगे when = or > base

Q

$$\begin{array}{r} \overset{8}{\not 7}\ \overset{8}{\not 6} \\ (-)\ 6\ \ 7\ \ 2 \\ \hline 0\ \ 3\ \ 7 \end{array} \qquad b = 8$$

borrow

(1 − 2 ✗ Not possible hence Borrow करेंगे)

Q

$$\begin{array}{r} 1\ \ 1\ \ 1\ \ 1 \\ 4\ \ 4\ \ 4\ \ 2 \\ +\ 2\ \ 2\ \ 2\ \ 6 \\ \hline 1\ 0\ \ 0\ \ 0\ \ 1 \end{array}$$

alter

$2 + 6 = b + 1$

(8) $b \rightarrow 7$

$2 + b = 8$ but 1 ≠ 7 more

↓

hence 7 is base

$$\begin{array}{r} \overset{7}{\not 2}_1\ \overset{7}{\not 3}_2\ \overset{7}{\not 4}_3\ \overset{7}{2} \\ -\ 1\ \ 6\ \ 5\ \ 6 \\ \hline 0\ \ 3\ \ 5\ \ 3 \end{array} \qquad b = 7$$

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Q95
(Gate 2014)

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

$$\begin{array}{r} 7\ 5\ 2\ 6 \\ (-)\quad\quad\ 6 \\ \hline 4\ 3\ 6\ 4 \end{array}_8$$

$$\begin{array}{r} \cancel{7}\ \ \cancel{5}\,{}^{8}4\ \ 2\ \ 6 \\ -\ 4\ \ 3\ \ 6\ \ 4 \\ \hline 3\ \ 1\ \ 4\ \ 2 \end{array}_8$$

$6 + Y_1 = 6 + 4$

$6 + Y_1 = 8 + 4$

$6 + Y_1 = 12$

$Y_1 = 6$

* 3 ⟶ 3, 6, 9, 12, - - - - - - - -

4 ⟶ ~~4~~, 8, 12, - - - - - - - -

$k \times LCM(3 \times 4)$

12K

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

↳ LCM (2, 3, 5) k

30K

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Q Red light flashes → [R (3 times → 2 min (every) → 120 sec.
G (5 t → 3 min → 180 sec]

$\begin{pmatrix} R_1 & , & G_1 \\ 40\,sec & & 36\,sec \end{pmatrix}$

$\begin{pmatrix} R_1 & , & G_1 \\ 40 & & 36 \end{pmatrix}$ secs

= 360 secs ✓

≈ 6 mins

2	40, 36
2	20, 18
2	10, 9
5	5, 9
3	1, 9
	1, 3

✓ 1 hr = $\frac{60 \times 60}{360}$

10 times

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

Method 2 alter

↳ $LCM\left(\frac{R_1}{2}, \frac{G_1}{3}, \frac{2}{3}, \frac{3}{5}\right)$ min = $\left(\frac{6}{1}\right)$ mins ✓

So within 1 hr → $\frac{60\,min}{6}$ = 6 times ✓

→ if question says, they flash together at the begining add '1' to the answer.

↓

means (t = 0, 0, 0)

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9/8/16

CYCLICITY

:- If a no. is ending in 2, its square have to end in 4, cube → 8, quad → 6.

$2^5, 2^9, 2^{13}$ → 4n+1

$2^4, 2^8, 2^{12}, 2^{16}$ → 4n

4n+1 → 2

4n+2 → 4

4n+3 → 8

4n → 6

Q $(732)^{4(\frac{47}{4})\text{Re } 3}$ = ------ = (u =)

4n+3

refer to cyclicity chart of 2

Ans u = 8 ✓

unit place

4n+1 →	2 ✓	3 ✓	7 ✓	8 ✓
4n+2 →	4	9	9	4
4n+3 →	6	7	3	2
4n →	8	1	1	6

4 ↙ odd, 6 ↙ even

9 ↙ odd, 1 ↙ even

[0, 1, 5, 6] ✗

Q $(74)^{91(\text{odd})}$ unit place = ---(4)

$(74)^{92(\text{even})}$ ---"--- (6)

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

$\frac{54}{7}$ 5 Re $\quad \frac{27}{8}$ 3 Re $\quad 2 \times 6 \times 9$

$\frac{254}{4}$ $\quad (23\,7)$ $4n+2$ $\quad \frac{27}{4}$ $4n+3$ $\quad 7(6)^{\text{any}} \times (9)^{\text{odd}}$

$9 \times 3 \times 6 \times 9$

$18 \longrightarrow \times 6 \quad 48$

$7(2)$ Ans ∴

Pg 90 Gate 2016

Q 178 $21(8)^{\text{any}}70 * 146(2)^{\text{any}}7 \times (3)^{4n}\frac{24}{4}$

~~$1 * 6 * 8 \; 1$~~

~~(7) Ans ∴~~

$1 + 6 \times 1 = 7$ Ans

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

$N = (\text{Remainder})_{\text{mod}}(\text{Divisor})$

✓ $80 = 8\,m\,(9)$ ↓ mod

✓ $26 = 5\,m\,(7)$.

$x = y \bmod m$

$x - y = 0 \bmod m$

Take $80 = 8 \bmod (9)$

$72 = 0 \bmod 9$

---

80 chocolates ⟶ 9 students

$80 = (-1) \bmod (9)$

$80 + 1 = 0 \bmod (9)$

$81 = 0 \bmod (9)$

$26 = -2 \bmod (7)$

Rule-1 ⟶ [+, −, ×]

$a = b \bmod c$

$d = e \bmod c$

$f = g \bmod c$

$a \times d \times f = b \times e \times g \bmod c$

$b \times e \times g < c$

if $a + d - f$, $b + e - g$

$b + e - g < c$

Q Eg:-

$$\frac{1421 \times 1423 \times 1425}{12}$$

$5 \times (-5) \quad 12 \times (-3) = 75$ Rem 3 Ans

$5 \times 7 \times 9 \quad 12$

$= \frac{315}{12}$

$= 3$ Rem

$1421 = 5 \bmod (12)$

$1423 = (-5) \bmod (12)$

$1425 = (-3) \bmod (12)$

$1421 \times 1423 \times 1425 = 315 \bmod (12)$

$= 3 \bmod (12)$

Rule-2

$a = b \bmod c$.

$a^n = b^n \bmod c$.

$b^n < c$

Q $2^{600} \div 15$

$2^4 = 1 \bmod (15)$

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

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

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Pg 40
Q6 and Q7

784 ÷ 342

Sol

$7^3 = (1) \bmod (342)$

$(7^3)^{28} = (1)^{28} \bmod (342)$

1 ✓

6
49
×7
343

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

$(15)^{23} = (-4)^{23} \bmod (19)$

$+ (23)^{23} = (+4)^{23} \bmod (19)$

$15^{23} + 23^{23} = 0 \bmod (19)$

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

Sol $(10)^{10} = (1)^{10} \bmod (3)$

$+ (10)^{100} = (1)^{100} \bmod (3)$

$+ (10)^{1000} = (1)^{1000} \bmod 3$

$+ (10)^{1000} = (1)^{1000} \bmod 3$

$= 2 + 1 - 1$

$= 2$ ✓

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

$5^5 = 3 \bmod 7$

$(5^5)^{125} = (3)^{125} \bmod 7$

$3^{125} \div 7$

$(3^5)^{125} \div (5)^{125} \bmod 7$

2
25
×5
125
×5
625
×5
3125
446
7)3125
28↓
32↓
28
45
42
3

9
×3
27
×3
81
×3
243
34
7)243
-21
33
-28
5

SIR $5^{625} \div 7 \Rightarrow 5^3 = 6 \bmod 7$

also

$5^3 = (-1) \bmod 7$

$(5^3)^{208} = (-1)^{208} \bmod 7$

$5^{624} = 1 \bmod 7$

$\times (5)^1 = (-2) \bmod 7$ or (5)

$(-2)^5$ ✓ $\bmod 7$

$5 \bmod 7$

5 < 7

0
7)5
-0
5

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* $(5)^{625} = (-2)^{625} \text{ m } 7$

No need any no.

hence, Taken smallest power.

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

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

agaya -1

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

✓ $(5^2)^3 = (4)^3 \text{ m } 7$

$64 \text{ m } 7$

$\frac{64}{7} =$ Re → 1

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

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

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CHAPTER 2

~~Time and Work~~ Calender

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

365 d ≈ 6 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)

1 (O. Y.) ← ordinary year = 365 d = 52×7^{6} + 1 odd day

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

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

within 1st 100 Y ⟶ 24 (L. Y.) + 76 (O. Y.)

× 2 (Re) + × 1 (Re)

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

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

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4) ×100 Y → 5 odd days

×200 Y → 3 odd days

×300 Y → 1 " "

✓400 Y → 6 " " + 1 = $\frac{7}{7}$ = 0 Re ↓ 0 odd days

×4 ↑ leave

extra 1 day

5) 1st odd day is MONday

(gregorian calender → 01 01 AD)

Q 28 Hr Re 0 Aug 1994 ?

4

1900 → 1

6) (a) 400 → 0

1600 → 0

300 → 1

1900 → 1

Sol 0 - 1900 → 1

1900 - 93 → 4

94 → 2

7

0 → 6 → sunday'

93 = 23 + 70

×2 + ×1

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

1994

J 31 ← do well

$\frac{31}{7}$ Re (3) ↓ odd

F 29 → 94 is not a leap year

1

F M A My J Jly Aug

0 3 2 3 2 3 0

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Q. 9th Aug 2016

<G>(b) (∵ 400 → 0)
0 - 2000 → 0

Sol

2000 → 0
15 → 4
16 → 5
9

Y = L.Y. + O.Y.
15 = 3 + 12
x 2 x 1
6 + 12 = 18/7 Re 4

2016 → Leap year

J F M A M J J A
3 1 3 2 3 2 3 2

9/7 Re 2

9/7 Re (2) → Tuesday

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

Sol 26th Jan. 1950

0 - 1900 → 1

49 → LY NLY
12 37
x 2 x 1
48 + 27 = 75/7

24 + 37 = 61

61/7 =

(12) (48)
-50
4

7)75
-7↓
05

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Sir

26th Jan 1950

Paper print → sunday
1st odd day → Monday

1900 → 1
49 → 5
50 → 5
11/7 Re 4

49 | LY | OY
12 | 37
x 2 | x 1
24 + 37 = 61/7 Re 5

1950 | 26/7 Jan Re 5
Thursday

Alternate Method

Let 15th August 1947 = Fri° = 0th odd day

	Aug (16/7)	Sep	Oct	Nov.	Dec
1948	2	2	3	2	3
1948	2 ← 366/7 (L.Y.)				
1949	1 ← 365/7 (O.Y.)				
1950	5 ← 26th Jan./7				

2 +2 +3 /7 = 7/7

2 3 2 /7 = 7/7

6 → Thursday

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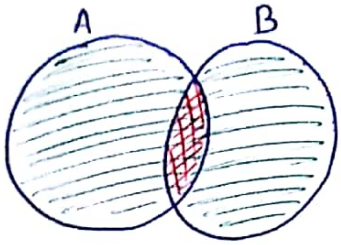
CHAPTER 3

SET THEORY



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

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

$$n(A \cup B \cup C) \overset{VD}{\wedge} = +\Sigma n(A) - \Sigma n(A \cap B) + \Sigma n(A \cap B \cap C) - n(A \cap B \cap C \cap D)$$

$\Sigma n(A)$ → 4 values

$\Sigma n(A \cap B)$ → $^4C_2 = 6$ values: AB, AC, AD, BC, BD, CD

$\Sigma n(A \cap B \cap C)$ → $^4C_3 = 4$ values: ABC, ACD, ABD, BCD

$n(A \cap B \cap C \cap D)$ → 1 values

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C → Cricket

B → Basketball

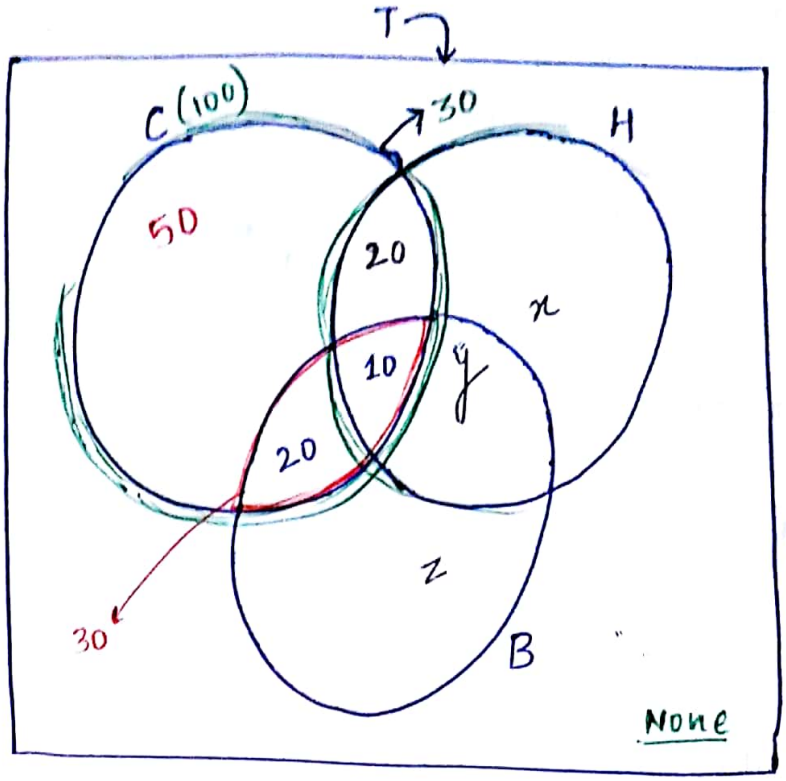
H → Hockey

C & H → outside → 30

C & H only → inside → 20

C & H but not B → C & H only ↓ 20

Discussion → Important



Q How many students are playing any of these 3 games

(or) atleast one of 3 games

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

let → x, y, z ← naming

Q none of these 3 games

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

Total

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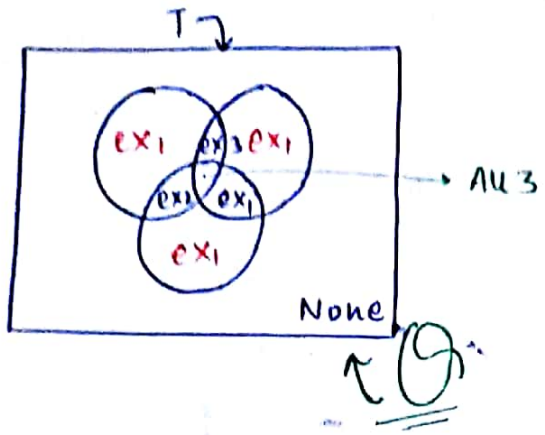


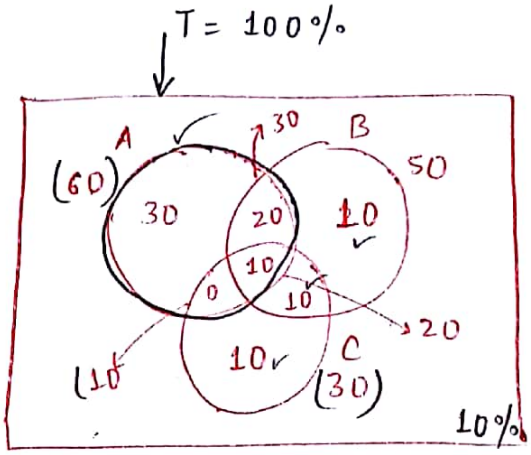
(a) atleast 2 of games = (B) + (B)

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

= Sum of all the values.

Cricket only → (inside)

Cricket → (लाइन)



1,2,3 Pg 48

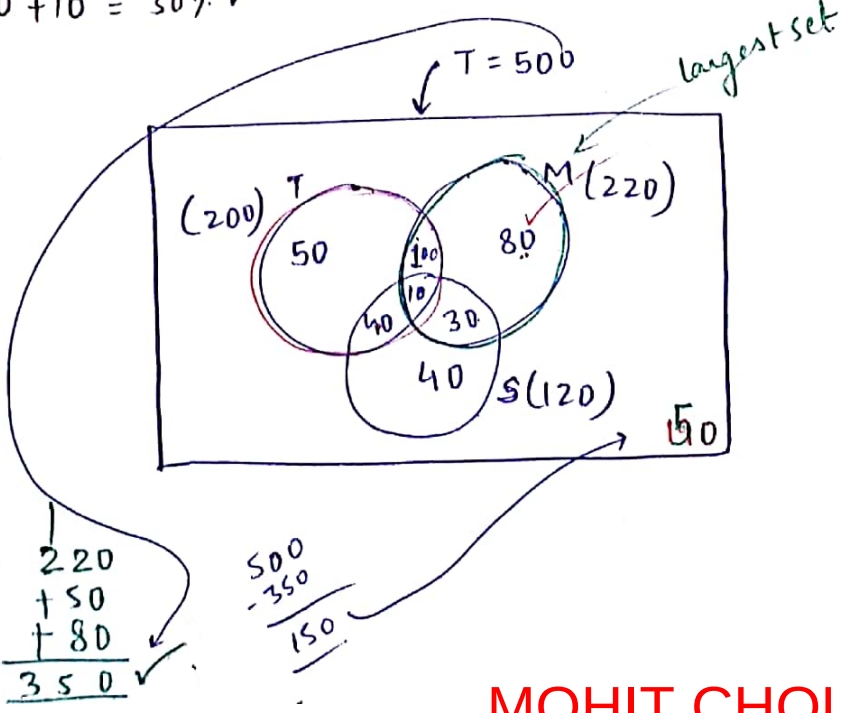
a 20% ✓

b 10% ✓

c 20 + 0 + 10 = 30% ✓

Pg 48 8 to 11

80 ✓
170 ✓
150 ✓
30 ✓

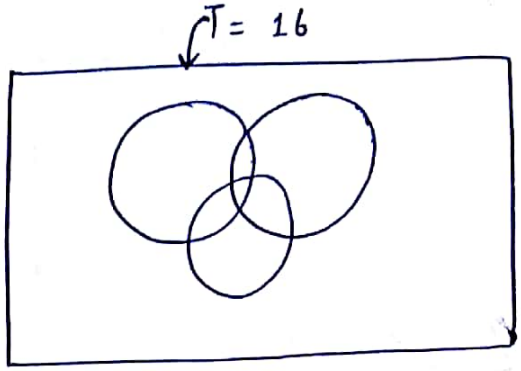


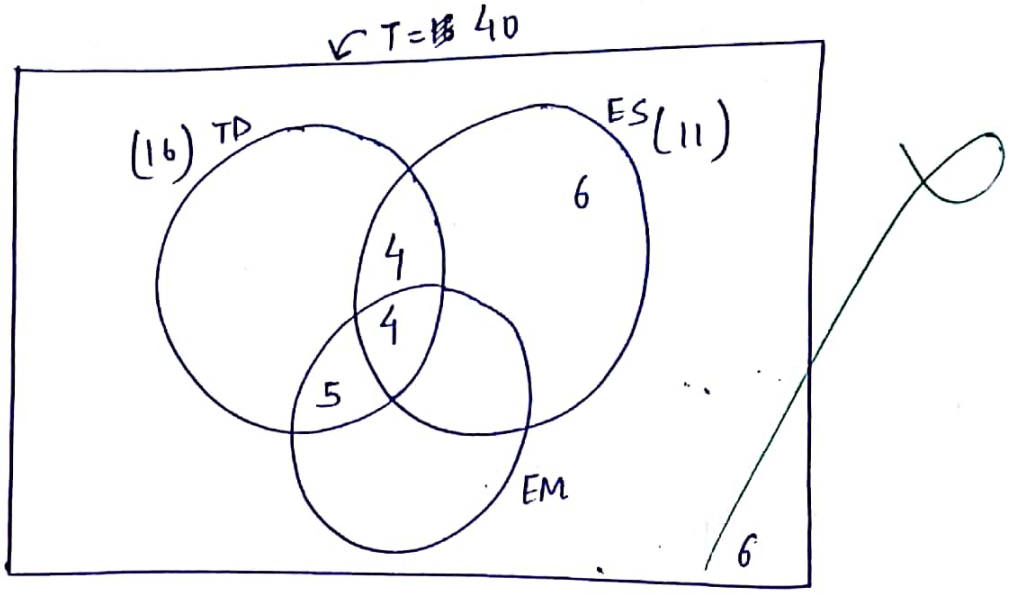
110

200
80
30
40
350

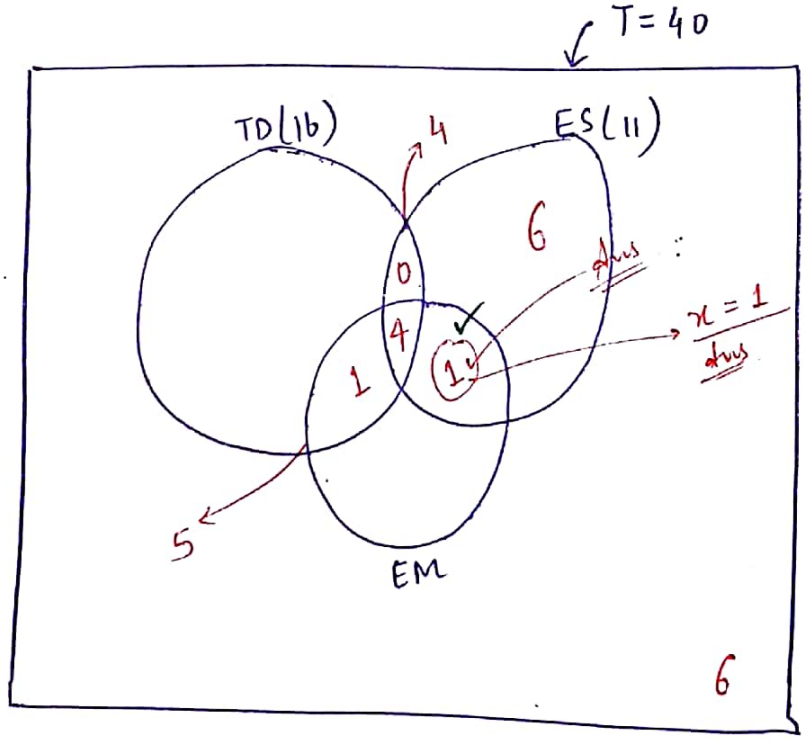
200
220
120
540

Pg 81
Q 107



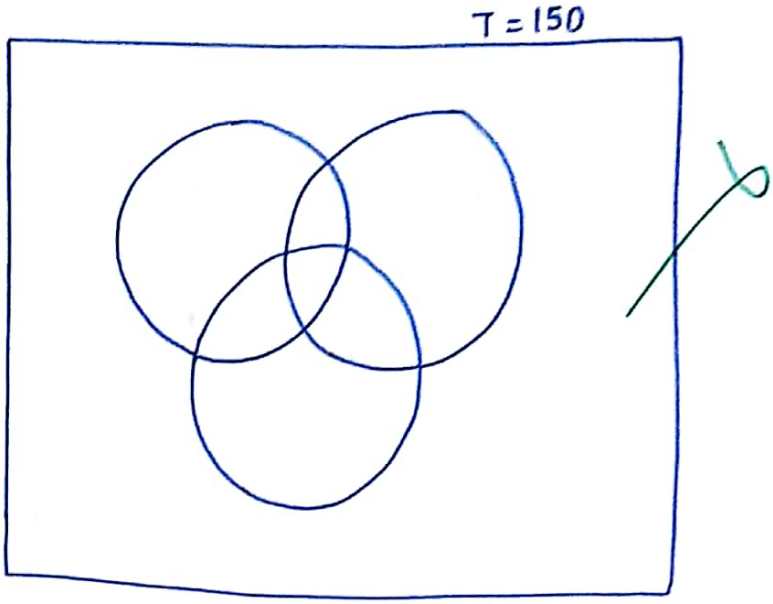


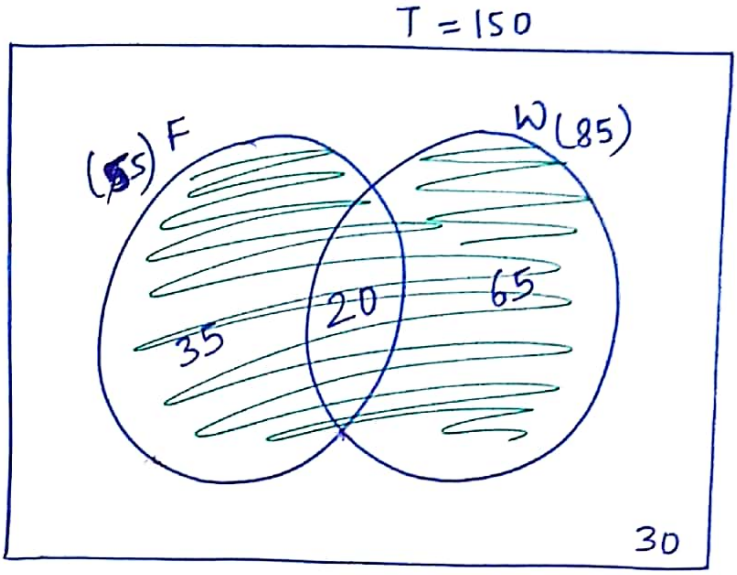
Sol



MOHIT CHOUKSEY

Q 166





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

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

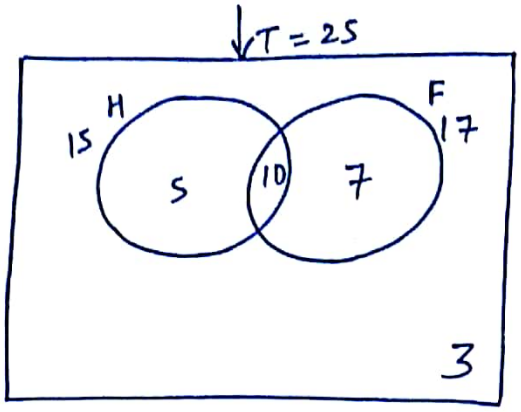
$55 + 85 - \text{〃} = 120$

$n(A \cap B) = 20$

MOHIT CHOUKSEY

Pg 68

Q1.



Pg ~~49~~
Q 13 to 16 → logical Venn Diagram → eyesight Test.

10/8/16

Q9 $S_2 = 1 \times 2 + 2 \times 3$

$S_2 = 8$

put $n = 2$ opns

$S_2 = 8$ (c)

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

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

QT1 $\Rightarrow A = 2^{172} - 2^{171}$

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

$A = 2^{171} =$

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

$\boxed{S_N + P_N = N}$

Q $(1\ 2\ 1\ 2\ 1\ 2\ 1\ 2\ 1\ 2 \ldots\ldots\ldots 12)$ (12 written) (150 times) calc. Remainder

99 (300 digited no.)

Q n is a 3 digited natural no. on the base of 10 and converted into base of 7 and base 9, how many such no's are there.

$(a\ b\ c)_7$ $(c\ b\ a)_9$

digits reverse ho jati hai

TIME & WORK

A ⟶ 16 d

1 day work of A ⟶ 1/16

13 day work of A ⟶ 13/16

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

$= 3/16$

$1/2 \times 10$ (A) = 2 B ⟶ 10 days

(A → 5 days)

A = 1/2 B ⟶ 10 days

$2 \times 10 = 20$ 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

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

$3x = 15$

$\boxed{x = 5}$

A ⟶ 5 days ⟶ one day work ⟶ 1/5

B ⟶ 20 days ⟶ 〃 ⟶ 1/20

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

in one day, 1/4 th of work is completed

so 4 days

Ans

MOHIT CHOUKSEY

Alternate work concept

alone → A = 12 days
↳ B = 16 days

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

Sol

$$2 \text{ day work} = \left[\left(\frac{1}{12}\right)_{\text{1st day of A}} + \left(\frac{1}{16}\right)_{\text{2nd day of B}}\right] = \frac{7}{48} \times 6 = \frac{42}{48} = \frac{7}{8}$$

($\frac{1}{12} = \frac{4}{48}$, $\frac{1}{16} = \frac{3}{48}$)

12 days work = $\frac{7}{8}$ || (low) = $\frac{1}{8}$

on 13th day (A) $\frac{1}{8} - \frac{1}{12} = \frac{1}{24}$ (LOW)

on 14th day (B) $\frac{1/24}{1/16} = \frac{2}{3}$

$13\frac{2}{3}$ A starts

Q if B starts the work.

Sol 12 days work = 7/8 , LOW = 1/8

on 13th day (B)

MOHIT CHOUKSEY

Sir

1st day of B 2nd day of A

2dw × 6 = [1/16 + 1/12] = 7/48 × 6 = 42/48 = 7/8

12dw = 7/8 | LOW = 1/8

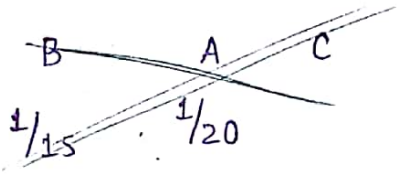
on 13th day (B) → 1/8 − 1/16 = 1/16 [LOW]

on 14th day (A) → 1/16 / 1/12 = 3/4 → 13 3/4 days Ans

if B starts

Pg 47
Q6

A → 20
B → 15
C → 12



SIR

2dw

1st day work of (A & B) [1/20 + 1/15] = (3/60 + 4/60) = 7/60

2nd day work of (A & C) [1/20 + 1/12] = (3/60 + 5/60) = 8/60

7/60 + 8/60 → 2dw = 15/60

2dw × 4 = 1/4th × 4

8 dw = 1

2 days → 1/4th work

Q A = 10 days
alone, B = 12 days
↳ C = 15 days

maxm. 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

Mon → 1st dw of (A and B) $\left(\frac{1}{10} + \frac{1}{12}\right) = \frac{11}{60}$ (most efficient, lesser efficient)

Tues → 2nd dw of (A & C) $\left(\frac{1}{10} + \frac{1}{15}\right) = \frac{10}{60}$

$+$

2 dw $= \frac{21}{60}$

$\times 2 \quad \times 2 = \frac{42}{60}$

4 dw $= \frac{42}{60}$ | LOW $= \frac{18}{60}$

on 5th day A & B $\quad \frac{18}{60} - \frac{11}{60} = \frac{7}{60}$ (LOW)

on 6th day A & C $\quad \frac{7/60}{1/60} = \frac{7}{10}$

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

Ans

* Men-days Concept

Inversely proportional

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

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

$a \times b = k$

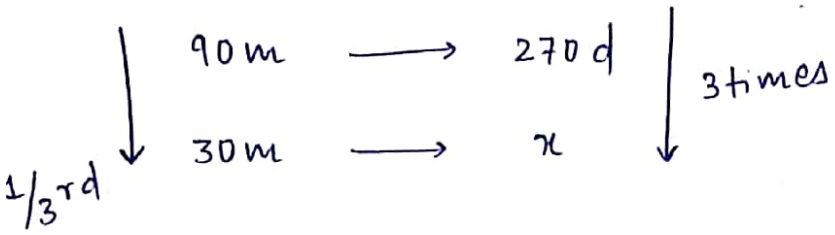
$a_1 \times b_1 = a_2 \times b_2$

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

$m \times d = k$

$m_1 \times d_1 = m_2 \times d_2$

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



$90 \times 270 = 30 \times x$

$x = 810$

Q5

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

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

$2m = 3w$, $1m = 1.5w$

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

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

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

$x = 2$ days

Q11 ~~$(5M + 7B) 24 =$~~

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

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

$x = 45$ days

MOHIT CHOUKSEY

Q8

A = 15 × 8 = 120 hrs

B = $6\frac{2}{3} \times 9$ = 60 hrs

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

$$10\left[\frac{3}{120}\right]x = 1$$

4

$$x = 4$$

Q9

A = 24 days

B = 36 days

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

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

4 6

$$x/24 = 7/12$$

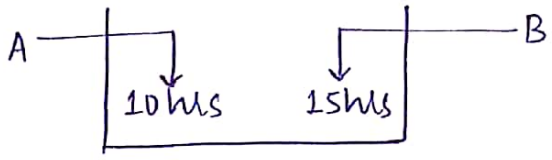
2

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

Q

6 hrs

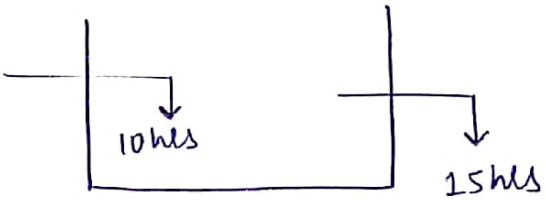
$$\left[\frac{1}{10} + \frac{1}{15}\right] = \frac{1}{6}$$



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

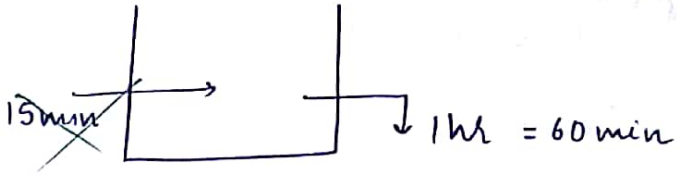
drainage pipe

30 hrs



MOHIT CHOUKSEY

Q



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

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

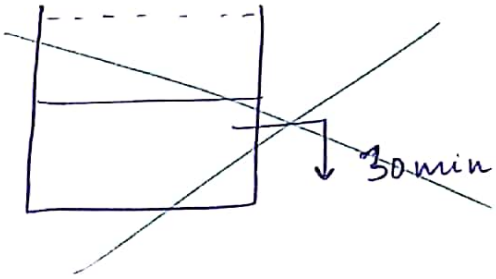
SIR

$x \longrightarrow$ mins

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

$\frac{1}{60}$ → 1 min work

Pg 77
Q 71

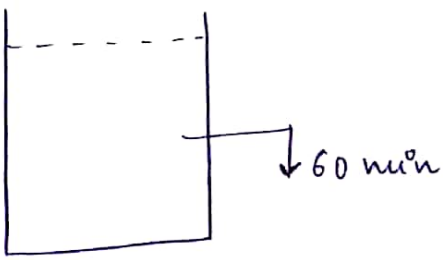


$\frac{1}{30}$

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

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

$$\frac{1}{x} = \frac{3+1}{300}$$



SIR

$x \longrightarrow$ mins

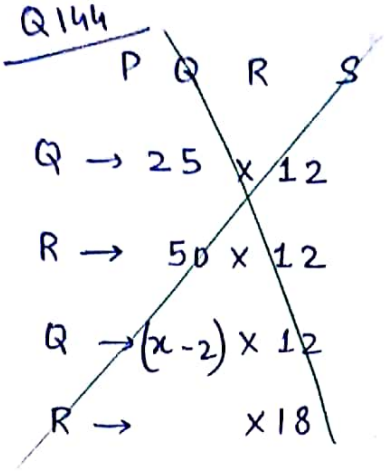
$$10\left[\frac{1}{x} - \frac{1}{60}\right] = 1/2$$

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

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

MOHIT CHOUKSEY

Q144



Previous Qn.

y → min

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

half the tank

$y = 7.5$ min

25
12
50
25×
300

SIR Q = 25×12 = 300 hls.

1/300 → 1 hr work of Q

R

50×12 = 600 hrs

1/600 ← 1 hr work of R

$\left(\frac{5\times 12}{300}\right)$ → 1/5th of work : $\left(\frac{18\times 7}{600}\right)$ → own fraction of work

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

$\frac{60}{300}$: $\frac{63}{600}$

20 : 21 ✓

Q173
G2016

A → 6 hr

B → 4 hr

A: 1/6 → 1/6

B: 1/4

SIR

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

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

Pg 24

A = 3×4 = 12 Re A = 12

B = 3×6 = 18 Re B = 6

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

MOHIT CHOUKSEY

Pg47
Q12

~~m~~

$m + B = 160$ Rs

$m = 3B$

$3B + B = 160$ Rs

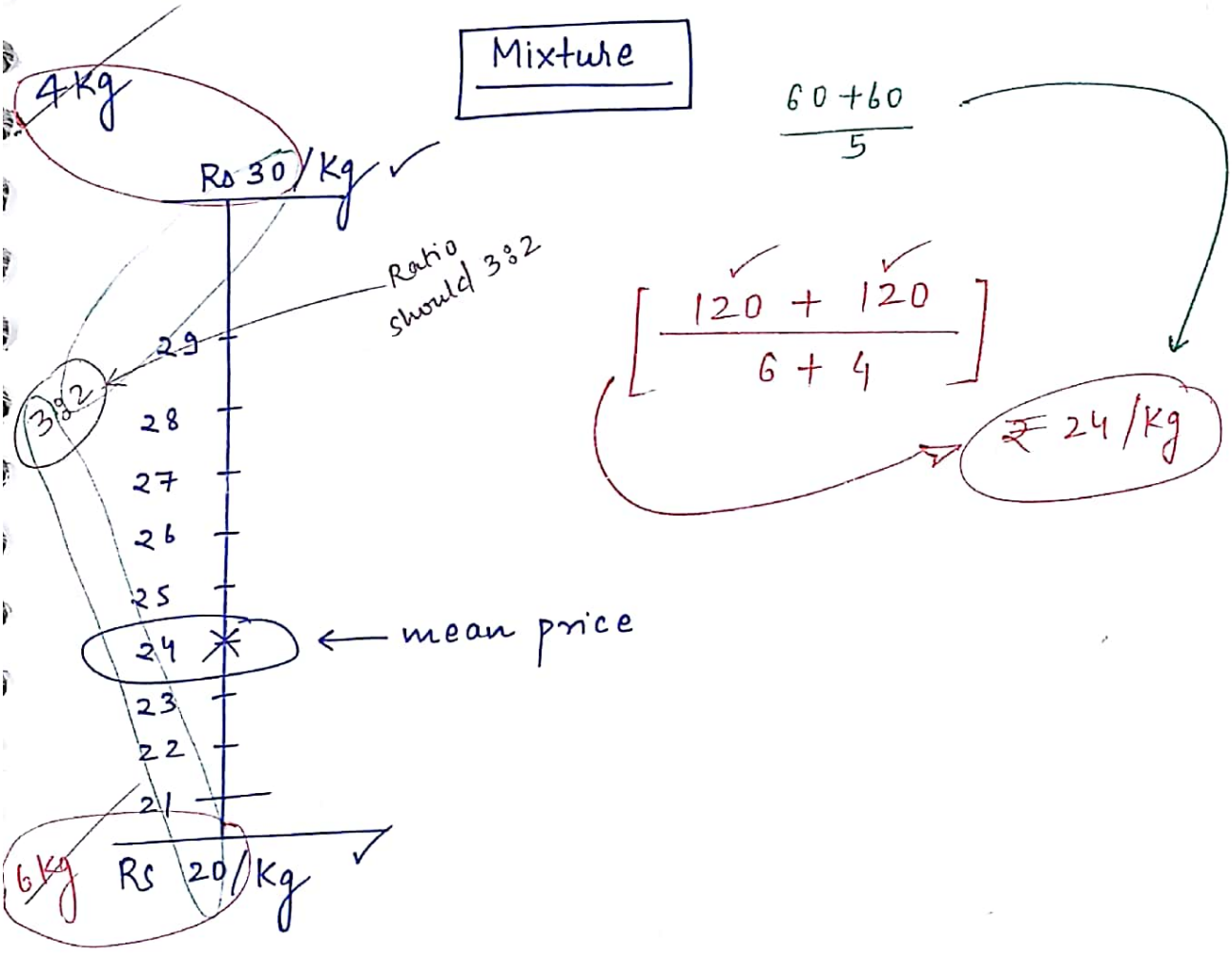
$B = 40$ Rs

$m = 3 \times 40 = 120$ Rs

Q2

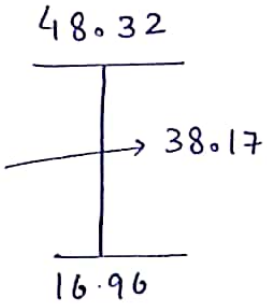
$4m \times 40 = 7w \times 40$

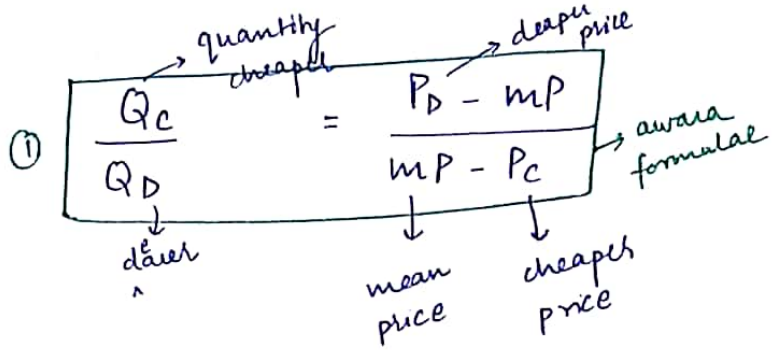
$4m = 7w$



MOHIT CHOUKSEY

Q

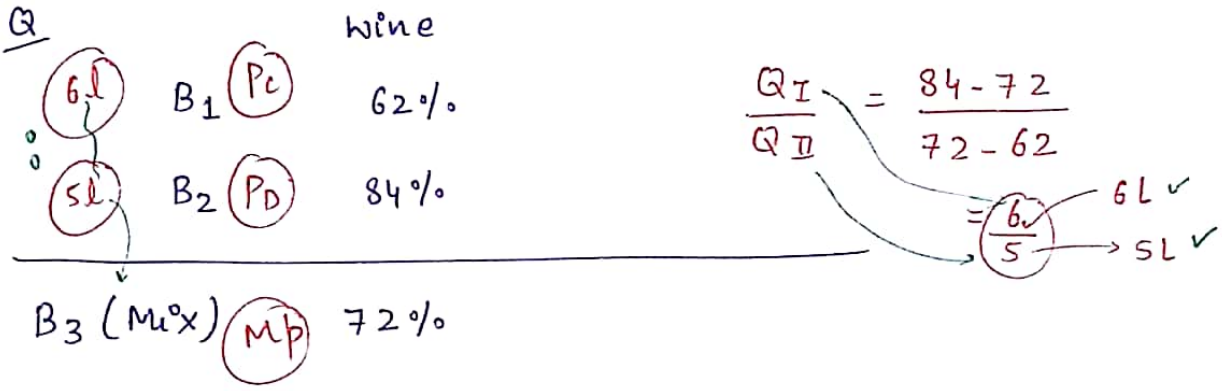




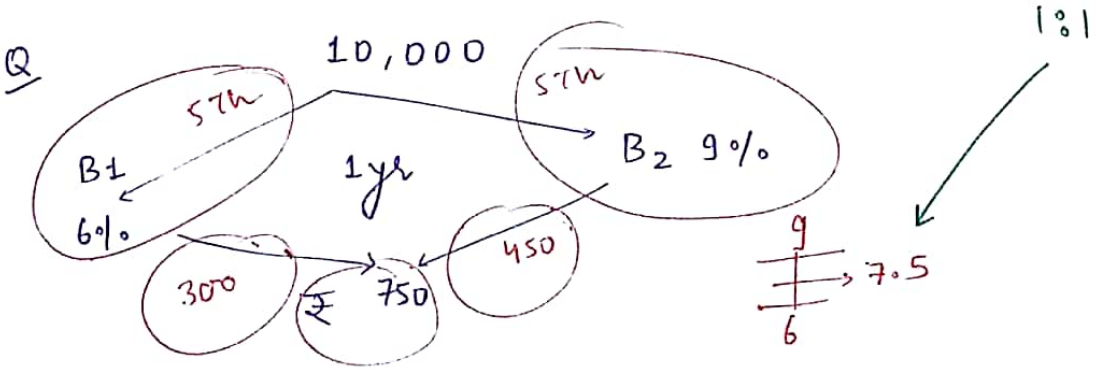
$$\frac{Q_{20}}{Q_{30}} = \frac{30-24}{24-20} = \frac{6}{4} = \frac{3}{2}$$

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

Q



Q

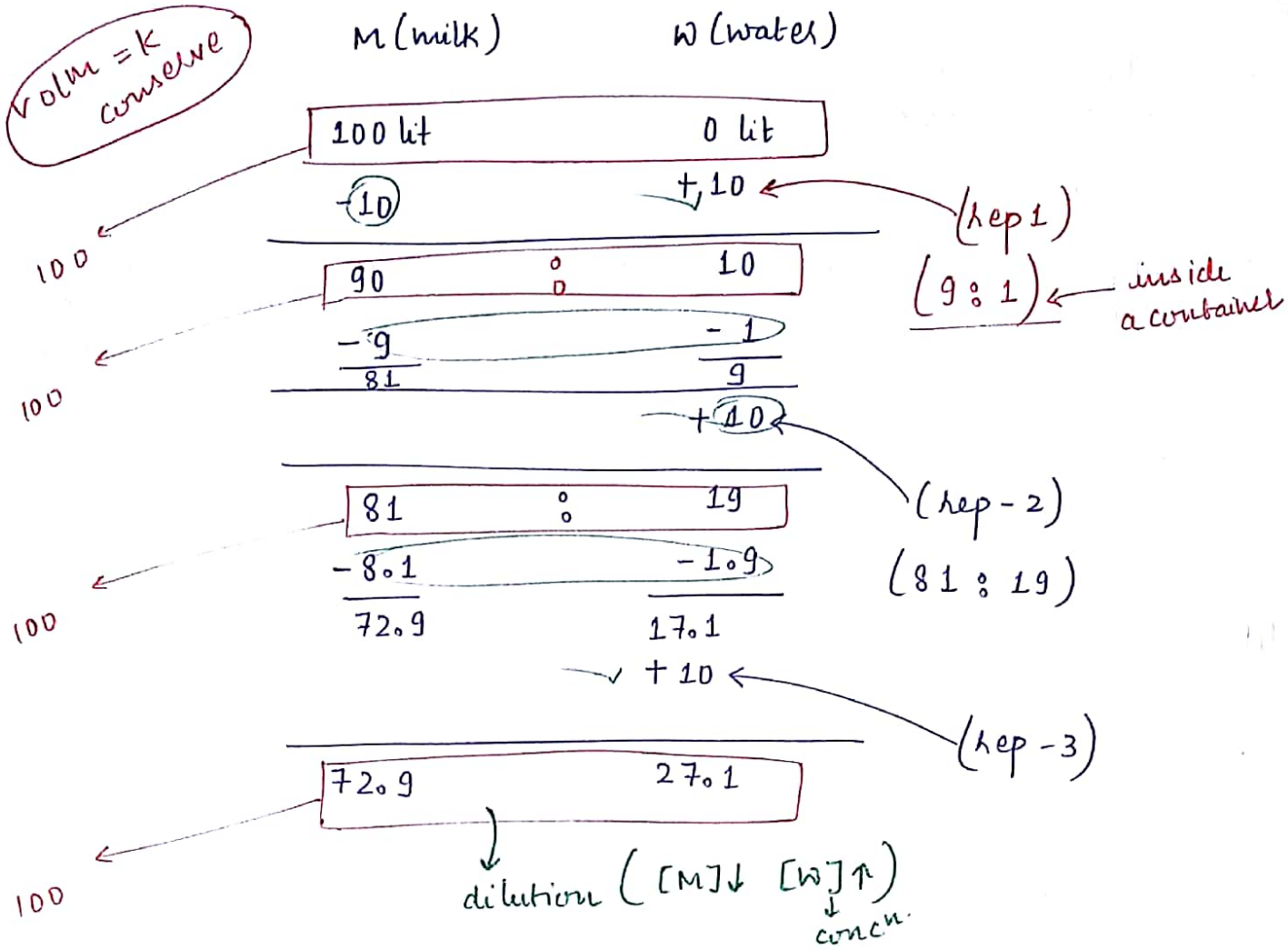


10,000 → 750

100 → 7.5%

MOHIT CHOUKSEY

(2) Replacement's formulae / Replacements.



Quantity of milk left after n^{th} operation

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

Qu. of Milk left after n^{th} 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.

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

$\uparrow$ $\quad \downarrow$

1.10x $\quad$ 0.90x

1.20x $\quad$ 0.80x

1.30x $\quad$ 0.77x

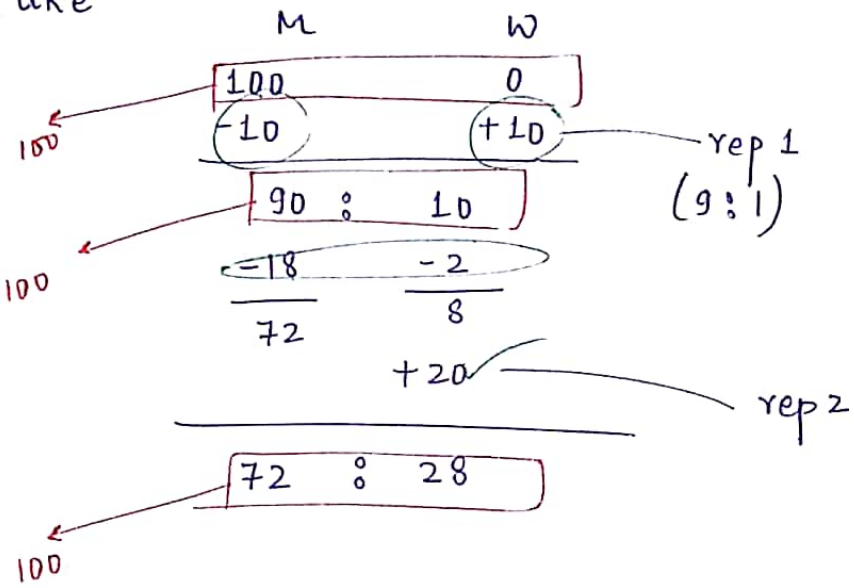
1.23x

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

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

3rd " " " " $= 72.9$ and so on

like



Now

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

$= 100 \times 0.9 \times 0.8$

$= 72\%$

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

$= (A)$

water left $= 40 - (A)$

Pg 69 / Q 7

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

1 is 10% of 10.

11/8/16

T4

Pg 48

$A = 16d$

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

$T_5 \rightarrow 48$

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

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

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

$C = 24$

PERCENTAGE

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

Sol

$B = 100$, $A = 120$ (20% ↑)

$\frac{-20}{120} = -1/6 \approx 16.6\%$ ↓

let

$100 \xrightarrow{10\% \uparrow} 110$

$\frac{-10}{110} = \frac{-1}{11} \approx 9.09$ ↓

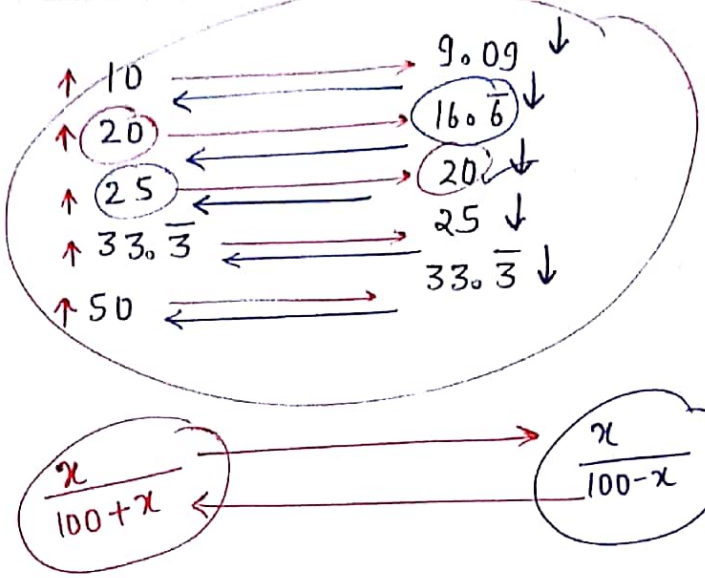
Q> A's salary is 20% less than that of B. By how much % is B's salary is more than that of A.

$B = 100$, $A = 80$ (20% ↓)

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

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

$\frac{+25}{75} = 1/3 \approx 33.\overline{3}$ ↑



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

25%

* $R = a \times b$

a changes by x%

b changes by y%

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

MOHIT CHOUKSEY

Ex:- $A = l \times b$

$D = s \times t$

Revenue (R) = Price of car (P) × (N) No. of car

* $l = 20\uparrow \quad b = 10\uparrow$

$A = l \times b$

$A' = 1.2l \times 1.1b$

$A' = 1.32\,lb$

32%

→ other

$20 + 10 + \frac{20 \times 10}{100}$

$= 32\%$

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

$A = l \times b$

$A' = 1.2l \times 0.9b$

$A' = 1.08\,lb$

8%

or

for every ↑ ↓ 20 $-10 + \frac{20(-10)}{100}$

every for decrease

$= 8\%$

✱✱✱✱✱ PROFIT & LOSS

$$P = (SP - CP)$$

- ✓ selling price (SP)
- ✓ cost price (CP)

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

(Pr)

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

(Loss)

20% Profit ⟶ $SP = CP \times 1.2$

↳ SP is 20% above the cost price.

20% loss ⟶ $SP = CP \times 0.8$

↳ 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

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

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

$$=$$

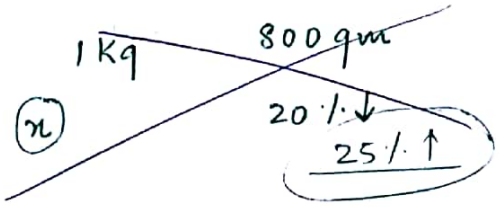
MOHIT CHOUKSEY

Q① A dishonest shopkeeper uses a false weight of 800gm instead of 1 kg weight. If he promises to sell the goods and at the cost price, then his profit %

Q② on selling 36 mangoes, a shopkeeper recovers a CP of 33 mangoes only. Find loss %

Sol 1

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



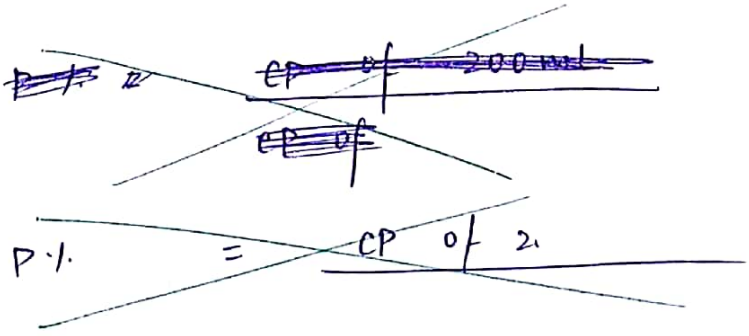
SIR → $\frac{\text{Profit}}{CP} = \frac{(CP \text{ of } 200 \text{ gms})}{(CP \text{ of } 800 \text{ gms})} = 1/4 \approx 25\%$

Sol 2

$$\frac{L}{CP} = \frac{CP \text{ of } 3 \text{ Mangoes}}{(CP \text{ of } 36 \text{ mangoes})} = 1/12 \approx 8.\overline{3}\%$$

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

Sol



1st cheating → $\frac{CP \text{ of } 200 \text{ ml}}{CP \text{ of } 800 \text{ ml}} = 1/4 \times$ (25%.) ✓

1st cheating (without mixing waters) ⟶ 25%

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

or

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

ex

1 ml = 1 Rs

1000 ml (m) = 1000 Rs

(+) 200 ml (w) = 0 Rs

1200 ml = 1000 Rs = Total cost Price (TCP)

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

800 ml ⟶ Rs. 1000

400 ml ⟶ Rs. 500

1200 ml ⟶ TCP = Rs 1500

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

other ex

1 ml = 1 Rs (1/6)

800 ml (m) ⟶ Rs 800

160 ml (w) ⟶ Rs 0.

960 ml ⟶ Rs. 800 = TCP

adulterate → add. puts

mixture does not contain 20% water

800 ml ⟶ Rs 1000

160 ml ⟶ Rs. 200

960 ml ⟶ 1200 Rs

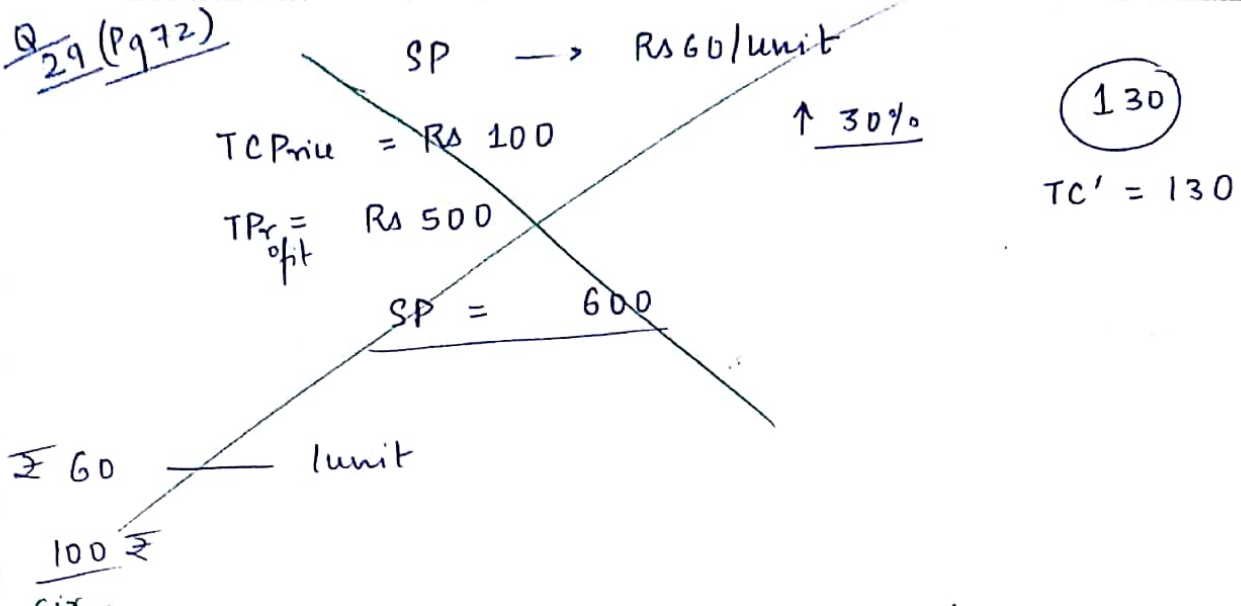
beaker 1/5th

beaker 1/5th

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

MOHIT CHOUKSEY

Q 29 (Pg 72)



↑ 30%

130

TC' = 130

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

~~60~~

Profit' = 650 Rs (+130)

SP' = 780

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

30%

60 × 1.3

NOW SIR

SP = CP × 1.P ✓

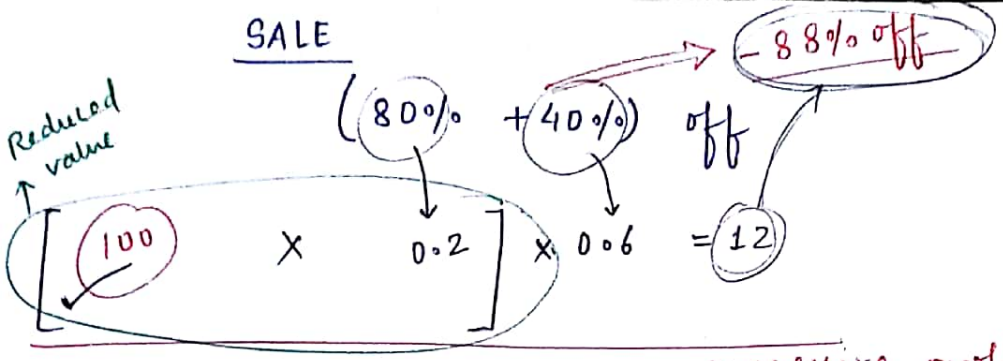
SP × 1.3 = CP × 1.3 × 1.P ✓

SP' = CP'

Profit doesn't depends on no of units.

MOHIT CHOUKSEY

SALE



milkman

1.25×1.20

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

$= 50\%$

successive profit condn → dhamaka pey dhamaka.

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

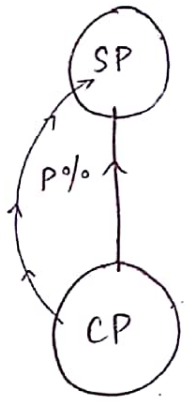
$-120 + 32$

100 ↓ ×0.9
90 ↓ ×0.9
81 ×0.9 ↓
72.9

Q (70% + 30%) off → -79% if ~~+~~ 10%

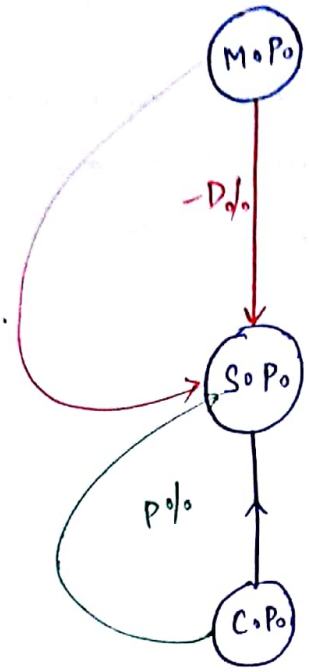
100 × 0.3 × 0.7 = 21 × 0.9 =

MARKED PRICE → list Price, Labelled price, print price, MRP



[N.P]

MOHIT CHOUKSEY

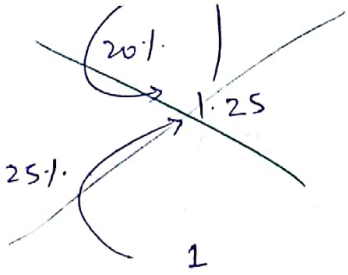


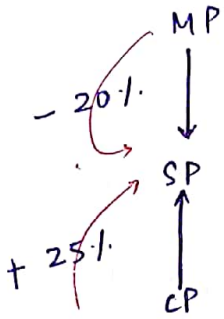
marked price per discount selling price and CP per SP → Profit.

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

$MP \times 0.8 = SP$ $\quad SP = CP \times 1.25$





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

$MP = CP \times 1.5625$

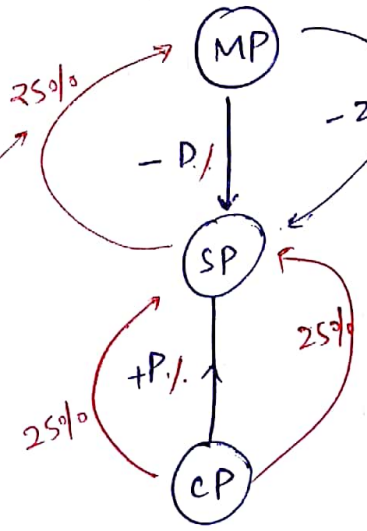
56.25%

✓ $MP \times .8 = SP$

$MP \times 4/5 = SP$

$MP = SP \times 5/4$

$MP = SP \times 1.25$



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

56.25%

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

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

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

↳ **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 another at a loss of 20%. then find loss and loss %.

Sol

$SP_1 = SP_2 = ₹\ (480)$ each

$SP_1 = CP_1 \times 1.2$

$480 = CP_1 \times 1.2$ ⇒ $CP_1 = 400$

$SP_2 = CP_2 \times 0.8$

$480 = CP_2 \times 0.8$ ⇒ $CP_2 = 600$

$TSP = 960$; $TCP = 1000$

Loss = 40 Rs

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

$= 4\%$

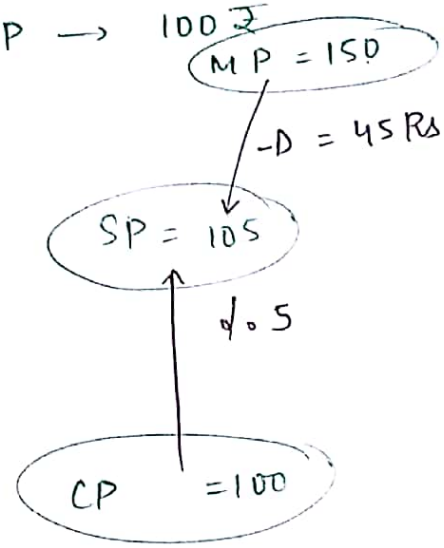
OR $\quad$ Loss $= \dfrac{2 \times 20 \times 20 \times 480}{80 \times 120} = 40$ ₹

Loss % $= \dfrac{20 \times 20}{100} = 4\%$

Pg 52
Q10

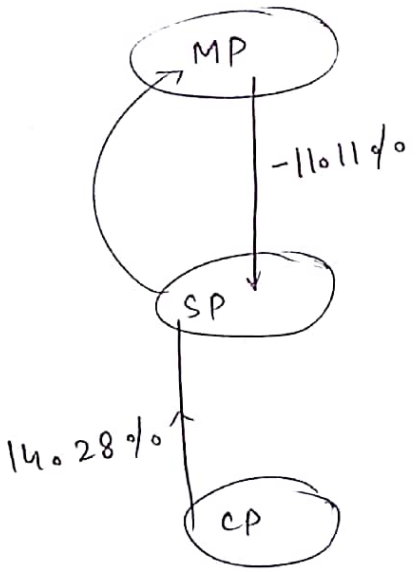
~~50%~~ ~~CP~~

CP → 100 ₹



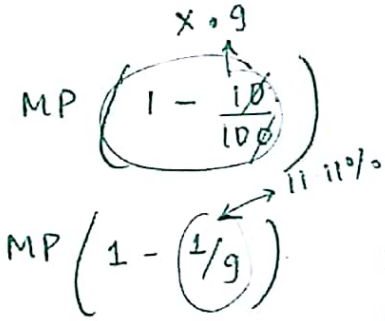
hence $\dfrac{45}{150} \times 100 = 30\%$

TQ



SIR

11.11 → 1/9



$MP\left(1 - \frac{1}{9}\right)$ $\quad$ 14.28%

$= SP = CP \times \left(1 + \frac{1}{7}\right)$

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

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

$MP = 1.2856\ CP$

MOHIT CHOUKSEY

51
P9 Q7

80% $\xrightarrow{P}$ E

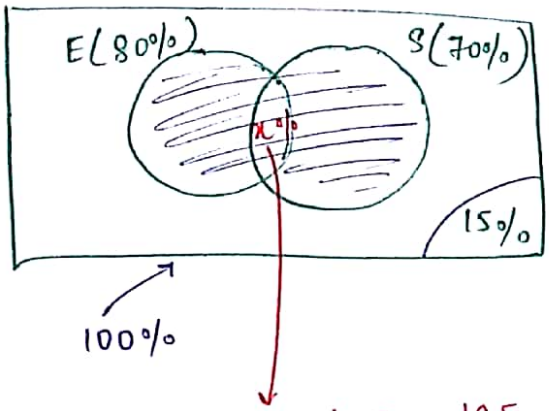
70% $\xrightarrow{P}$ S

15% $\xrightarrow{F}$ E & S

195 $\xrightarrow{P}$ E&S

~~24 + 21~~

SIR



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

$85\% = 80\% + 70\% - x\%$

$x = 65\%$

65% of T = 195

T = 300

RATIO

comparison b/w 2 quantities

Q. 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

~~He scored = $\frac{5}{100} \times \frac{6}{100} \times \frac{07}{100} \times \frac{8}{100} \times \frac{9}{100}$ = 300~~

$5x + 6x + 7x + 8x + 9x = 300$

$35x = 300$

$x = 60/7$

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

MOHIT CHOUKSEY

PROPORTION

I II III IV

$a : b :: c : d$

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

$a \times d = b \times c$

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

$\uparrow a \propto b \uparrow$

$a = kb'$

$a/b = K$

→ $a_1/b_1 = a_2/b_2$ (division constant)

→ unitary method

→ $y = mx$

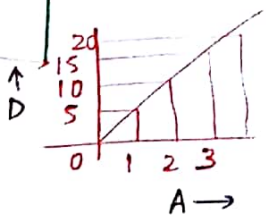
↑ A ∝ D ↑

M [1 ∝ 5]

3 ∝ 15 Rs

6 ∝ 30

[10 ∝ 50]



ONGC 2012

Q Reduction in speed of a Railway engine is directly ∝ to the sq. root of no. of ~~Emperor~~ 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

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

Redn $\propto \sqrt{n}$

Redn $= k\sqrt{n}$

$Sp = Spmax - k\sqrt{n}$

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

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

$k = 6$

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

$6\sqrt{n} = 42$

$\sqrt{n} = 7$

$n = 49$

engine stops so at n = 48 engine enlarge.

Redn $\propto \sqrt{n}$

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

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

$k = 6$

$42 - 0 = 6\sqrt{n}$

$n = 49$

INVERSE PROPORTION

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

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

$a \times b = k$

$a_1 \times b_1 = a_2 \times b_2$

~~unitary method.~~ never applicable

$x \times y = c$

Rect. hyperbola → x-axis, y-axis (asymptotes)

if 40 m → 100 day

20 m → x = 200 "

CHAIN RULE

m	d	l	b	h
30	15	40	60	90
20	x	50	45	80

DP

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

IP

$a \times b = k$

d ↑ : 15, x

m ↓ : 30, 20

l ↑ : 40, 50

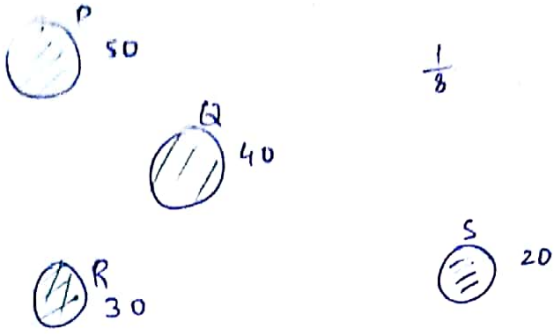
b ↑ : 60, 45

h ↑ : 90, 80

$$\frac{15 \times 30}{40 \times 60 \times 90} = \frac{x \times 20}{50 \times 45 \times 80}$$

MOHIT CHOUKSEY

Pg69
Q9



1/8

P Q R S
50 40 30 20

V

SIR

$D \propto P$
$\propto t$
$\propto g$

$D = K pgt$

varies proportionately → graphs

↑D ∝ ↑Growth → growth of a single microbe surviving human immunity system within 24 hrs of entering the body

↑Potency (Probability of microbe overcoming H. immunity)

↓1/t Toxicity (milligram of Mic req.)

$$D = \frac{pgK}{t}$$ formulae

LR DI

Logical Reasoning Data interpretation

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

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

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

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

dangerous Level

Pg no. 50

Q3 → 25p → $\frac{1}{5}$ rs

10p → $\frac{1}{10}$ rs = 6l

Q7 $\frac{a}{b} = \frac{b}{c}$ ✓ $\frac{36}{48} = \frac{48}{x}$

Q9 0.7, 2.8

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

Q6 $\frac{a}{b} = \frac{c}{d}$

Q10

investment, Time

$$\frac{\text{Profits}_A}{\text{Profit}_B} = \frac{I_A \times T_A}{I_B \times T_B}$$

In A → $5 \times 8 + 4 \times 4$

In B → $6 \times 4 + 3 \times 8$

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

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

T_B = 10 months

Q

MOHIT CHOUKSEY

12/8/16

SPEED, DISTANCE, TIME

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

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

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

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

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

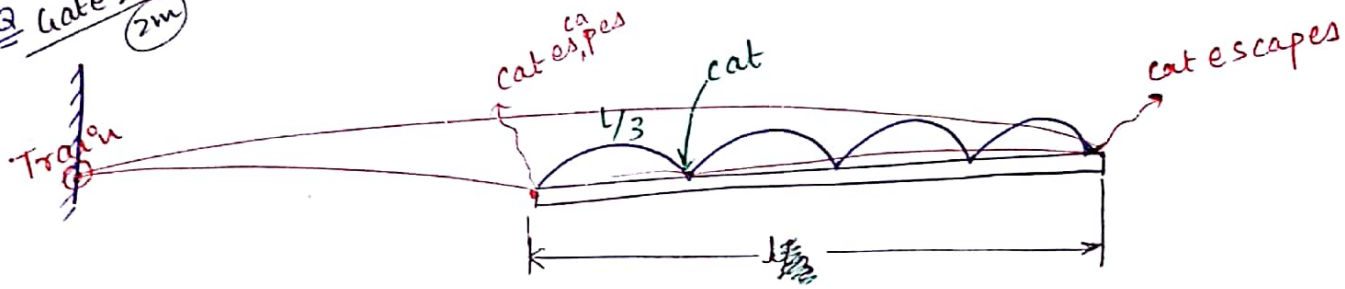
$(\because D = K)$

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

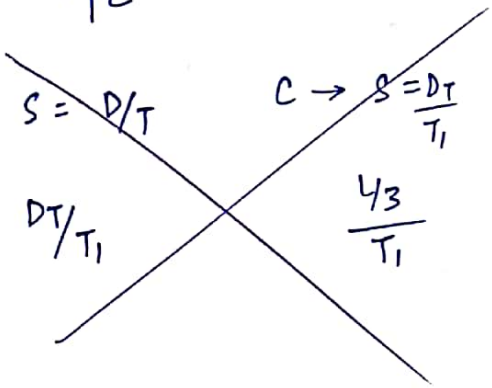
$S \times t = K$

$\boxed{S_1 \times t_1 = S_2 \times t_2}$

Q Gate 2017 (2m)



$\frac{Sp_T}{Sp_C} = ?$



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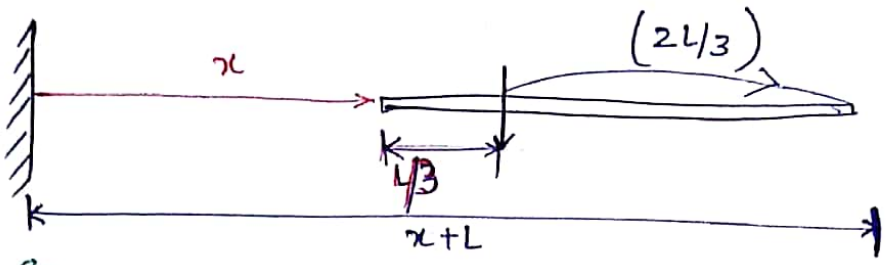
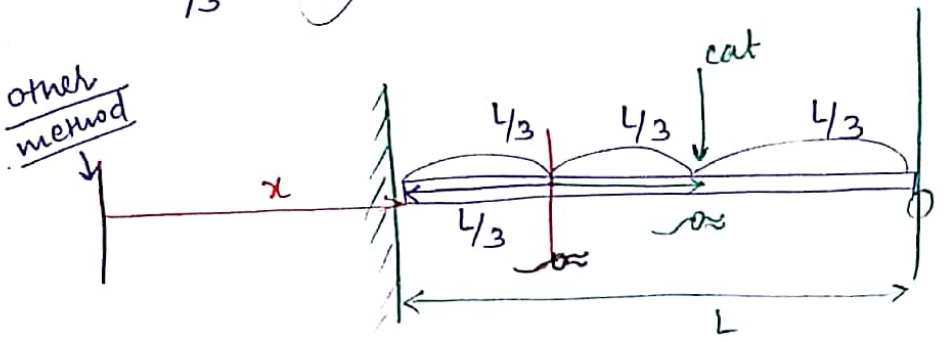


$$\frac{Sp_T}{Sp_C} = \frac{x}{L/3} = \frac{x+L}{2L/3} \Rightarrow \boxed{2x = x+L} \Rightarrow \boxed{x = L}$$

$$\frac{L}{L/3} = \frac{3}{1}$$

other method



they reach simultaneously

$$\frac{Sp_T}{Sp_C} = \frac{L}{L/3} = \frac{3}{1} \quad (\because t = k)$$

AVERAGE SPEED = $\dfrac{\text{Total Distance}}{\text{Total time}}$

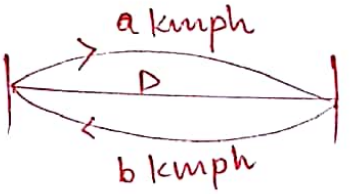
AM ≥ GM ≥ HM

50
52.5
51.5
48 ✓

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

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

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

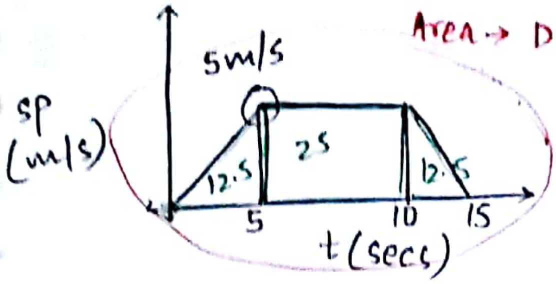


$$\text{Avg sp} = \frac{TD}{TT} = \frac{2D}{D/a + D/b}$$

$$\text{Avg sp} = \boxed{TD = \frac{2ab}{a+b}}$$

harmonic mean of a & b.

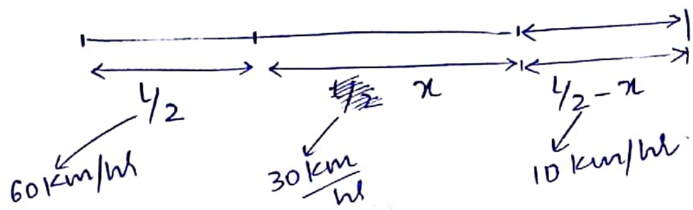
Area → Distance



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

Avsp $= \frac{50}{15} = 3.\bar{3}$ (m/s) (during entire journey)

Q34
Pg72



Avg sp = $\frac{1/2 + 1/2}{\frac{1/2}{60} + }$ → 1 $= \frac{1}{\frac{1}{120} + \frac{x}{30} + \frac{1}{20} - \frac{x}{20}}$

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

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

$\frac{7 - 2x}{120} = \frac{1}{2}$

$\frac{6}{120}$ 20

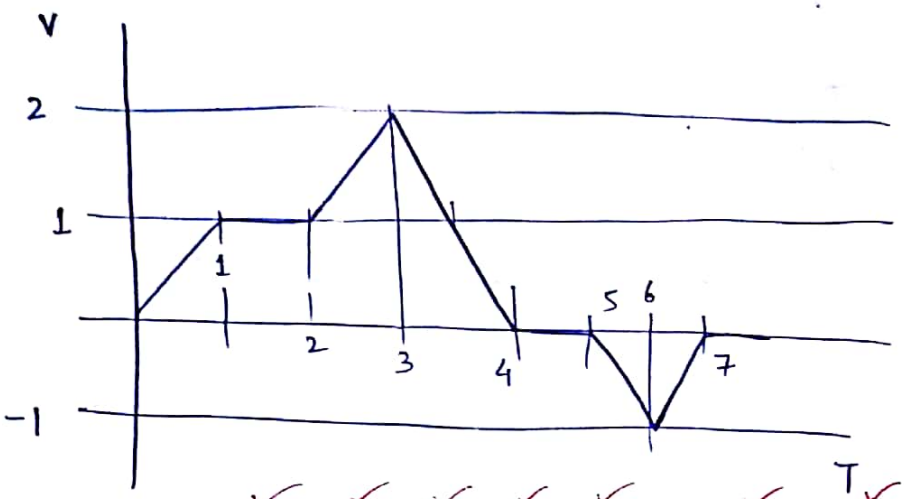
(The above working is struck through.)

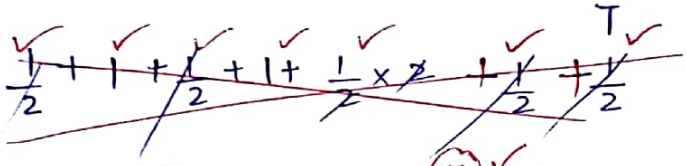
(34) $\frac{120 \text{ Kms}}{\left(\frac{60}{60} + 30/30 + 30/10\right) \text{hrs}} = \underline{24 \text{ kmph}}$

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

MOHIT CHOUKSEY

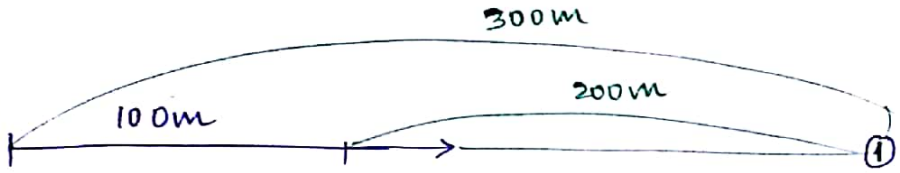
Q154





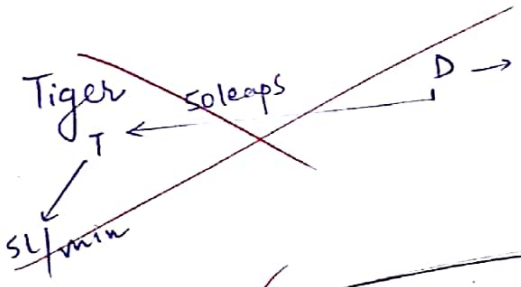
1 + 2 + 1 + 1 = 5

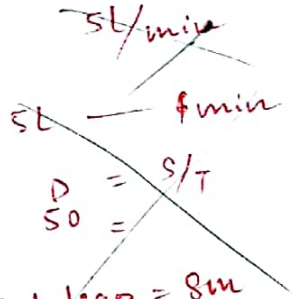
Q



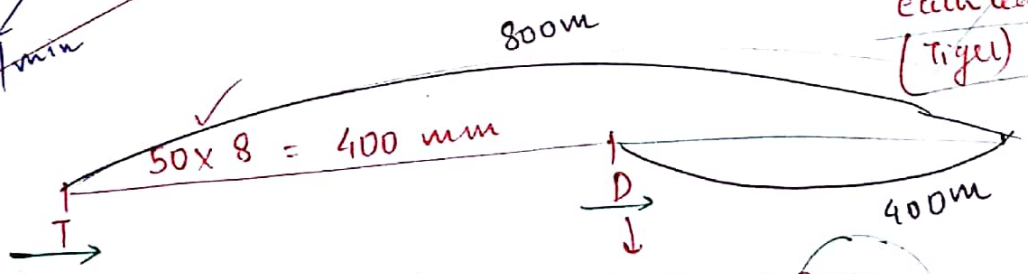
$\frac{100m}{(15-10)\ m/sec} = 20\ sec$ Relative speed

127





SIR

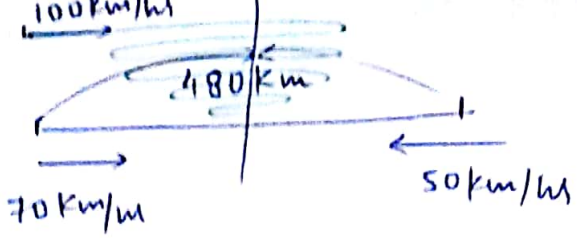


$5 \times \frac{8\ m}{min} = \frac{40\ m}{min}$

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

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

QT13
Pg 54



Bird remain in here and do to & fro motion in 4 hrs

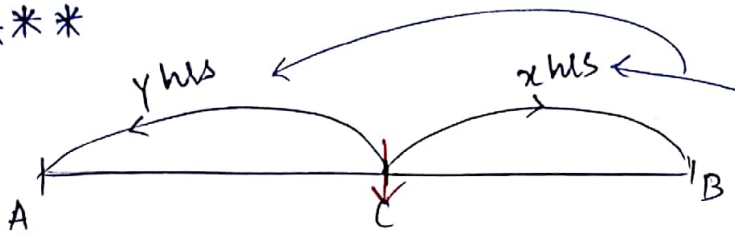
$$RS = \frac{480\ km}{(70+50)\ \frac{km}{hr}} = \frac{48}{12} = 4\ hrs$$

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

$DB = SP_B \times t$

$= 400\ kms$

***



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

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,

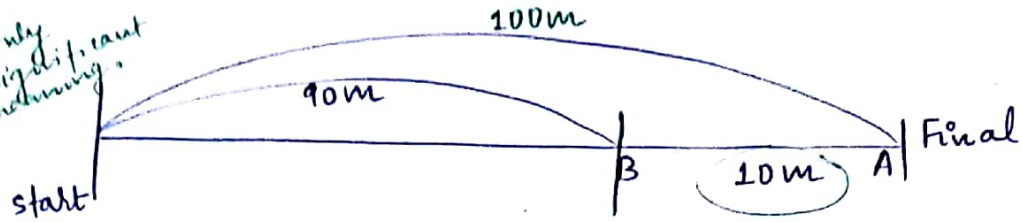
$$SP_B = \frac{AC}{y} = \frac{SP_A \times t}{y} \quad \text{②}$$

T12 →

RACES → pure application of Ratio / nothing but Ratio

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

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

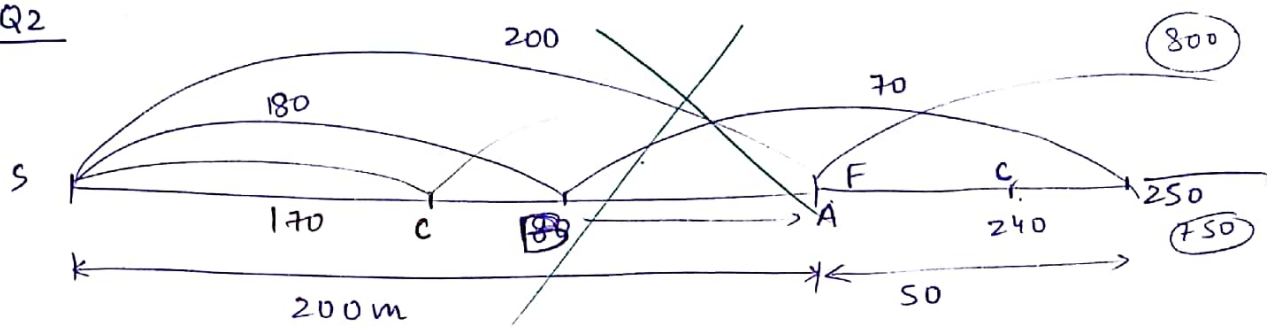


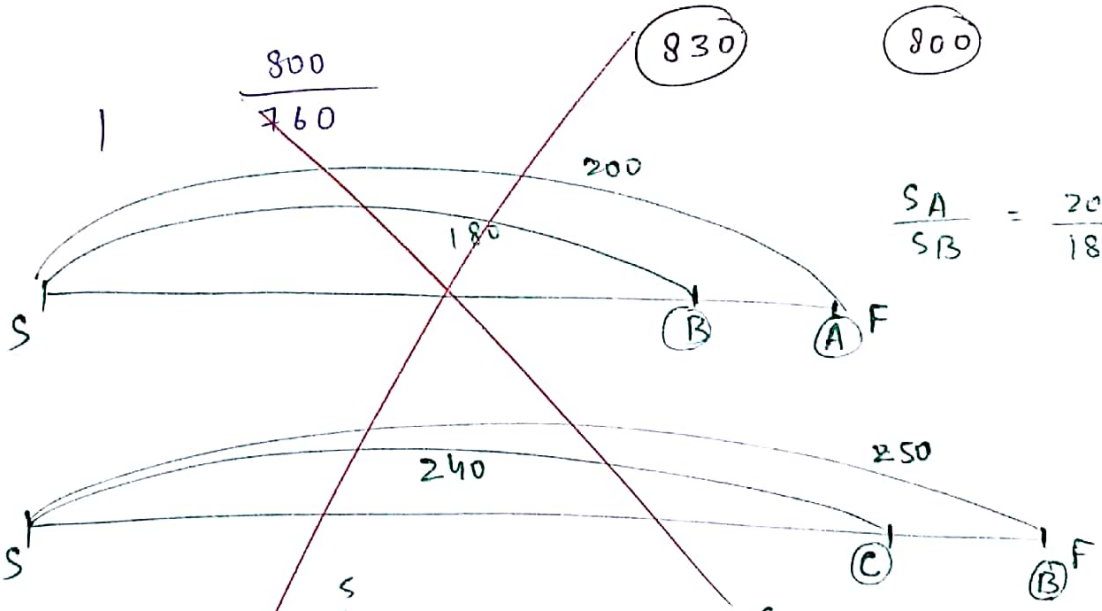
$$\left[\frac{S_A}{S_B} = \frac{100}{90}\right] (\because t = k)$$

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





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

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

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

$\frac{125}{108}$

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Q1 Sol

Pg 53

$\frac{A}{B} = \frac{200}{180}$ $\left[\frac{A}{C} = \frac{A}{B} \times \frac{B}{C}\right]$

$\frac{B}{C} = \frac{250}{240}$ $\frac{A}{C} = \frac{20}{18} \times \frac{25}{24}$

$\frac{A}{C} = \left(\frac{500}{432}\right)$ ✓ $\times 2 =$ $\frac{1000}{-864}$ $\times 2$

136 means ✓

Q2

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

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

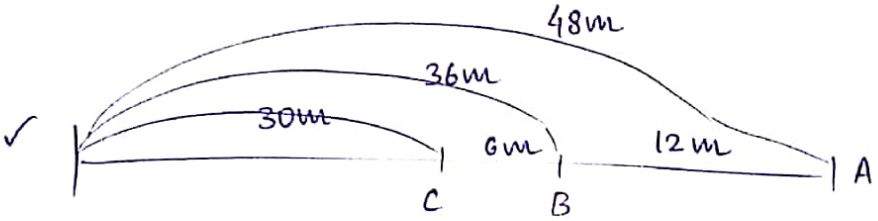
$\frac{B}{C} = \frac{L}{L-8}$

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

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

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

use options → $L=48$



$\frac{B}{C} = \frac{36}{30} = \frac{6}{5} \times \frac{8}{8} = \frac{48}{-40}$

$\frac{8}{m}$

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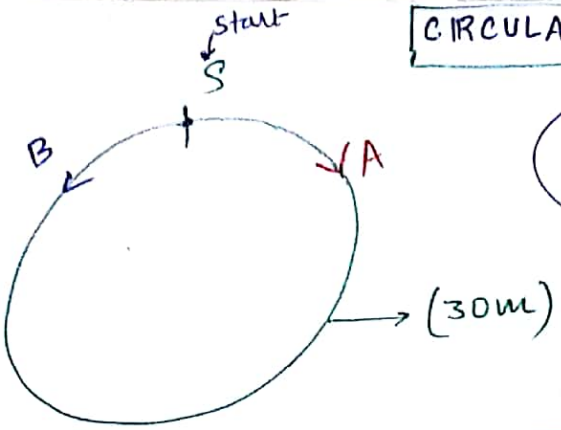
CIRCULAR RACES



A = 15m/s
B = 10m/s

(1) Time taken for meeting @ Start Point for the first time

$$LCM\left(t_{A_1}, t_{B_1}\right)$$

$$LCM\left(\frac{\text{circumference}}{SP_A}, \frac{\text{circum}}{SP_B}\right)$$

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

@ 6 secs

$D_A = 15 \times 6 = 90m = 3$ laps

$D_B = 10 \times 6 = 60m = 2$ laps

@ 12 secs

$D_A = 15 \times 12 = 6$ laps

$D_B = 4$ laps

} @ SP.

(2) Time taken for meeting for the 1st time

$$\frac{\text{circumf.}}{\text{Rel.}\left(SP_A \pm SP_B\right)} = \frac{30}{(15+10)} = 1.2 \text{ secs}$$

@ 1.2 secs

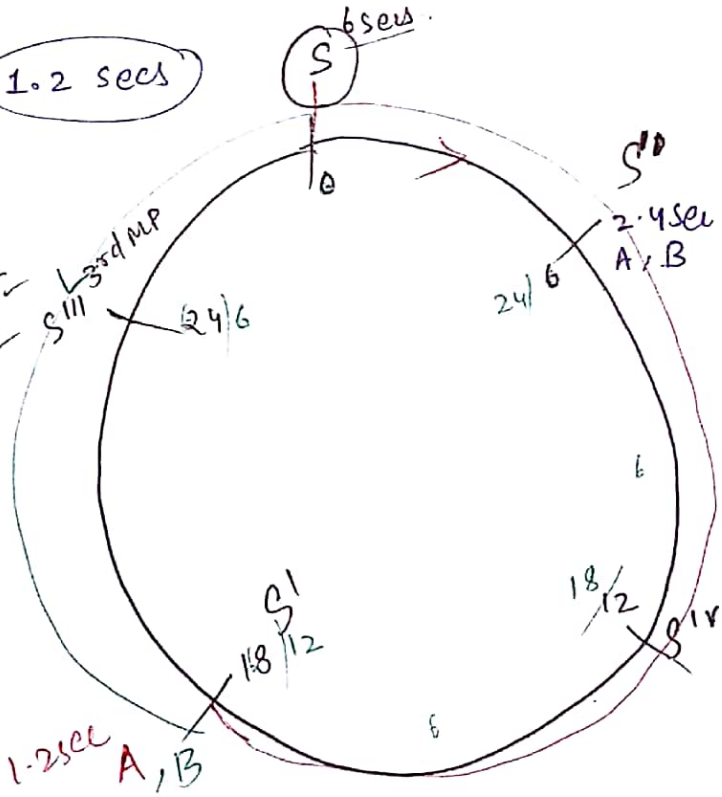
$D_A = 15 \times 1.2 = 18m$ (2 complete laps)

$D_B = 10 \times 1.2 = 12m$

@ 2.4 sec

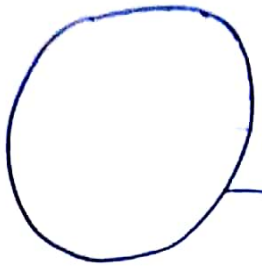
$D_A = 36m$

$D_B = 24m$



Pg 53

(7) ✗



A → 6km/hr

B → 12km/hr

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

30 / 18 ~~× 6~~

(8) @SP

$$\text{LCM}\left(\frac{600}{15}, \frac{600}{20}\right)\frac{\text{m}}{\text{m/sec}} = \frac{600}{5} = 120\text{ sec} \approx 2\text{ mins}$$ ✓

3rd formula No. of distant int meeting points on the track

$$= \frac{P}{Q}$$ → value after (1) formula

6 → value after (2) formula

1.2

4th formula Time taken for meeting at the start point is independent of the dirn. of the Runners.

5th formula if 3 Runners. LCM (tA, tB, tC)

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

Q Time taken ~~to~~ → train passes poll → $\frac{L_T}{S_T}$

→,— platform → $\frac{L_T + L_P}{S_T}$ platform

→,— to cross each other → $\frac{L_1 + L_2}{S_1 \pm S_2}$

2 trains

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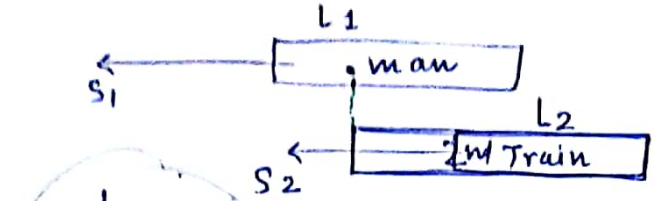
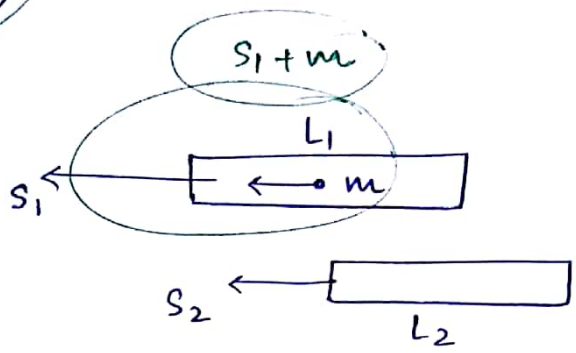
Q



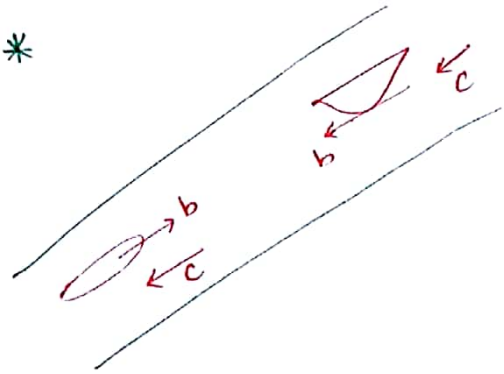
$$\frac{L_2}{(S_1 \pm S_2)}$$

Q



$$\frac{L_2}{S_2 - (S_1 \bigcirc m)}$$

*



↓ sp = (b+c) → time less

↑ sp = (b−c) → time more

Pg 53 Q2

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

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

$c = 4$

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

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Q74
P977

$x = 8$ km/hr

$x - y = \frac{D}{3t}$ | $x + y = \frac{D}{t}$

$\frac{D}{3t} \div \frac{D}{t}$

~~$x - y = (x+y)\frac{D}{D}$~~

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

$3x - 3y = x + y$

$24 - 3y = 8 + y$

$16 = 4y$

$y = 4$.

SIR

$\frac{D}{\downarrow(8+c)} = t$

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

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

Pg 64
Q9

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

use options

put $v = 60$

$\frac{840}{60} - \frac{84}{7} = 2$

$14 - 12 = 2$ ✓

through options

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CLOCK

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

Min. hand

60 min → 1 round → 360°

1 min → $\frac{1}{360}$ round → (6°)

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

for RG of (1°) Min hand → $\left(\frac{12}{11}\right)^\circ$

Hr. hand

12 hrs → 360°

(60 min) ≈ 1 hr → 30°

1 min → $\left(\frac{1}{2}\right)^\circ$

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

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

$11 \rightarrow 12$

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

Relative gain which the Min. hand over Hr. hand (RG) = $\left(5\frac{1}{2}\right)^\circ$

Q. 1st variety → 12 hrs

① coincide → 11

② Right angle → 22

① opposite → 11

24 hrs

22

44

22

day

FORMULAES

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

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

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

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

$x > 6$ (−)

$x < 6$ (+)

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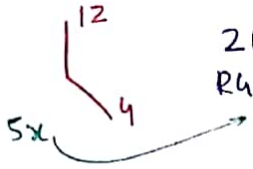
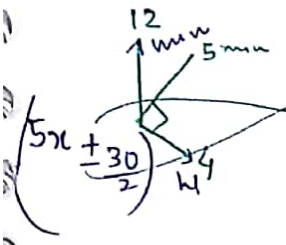


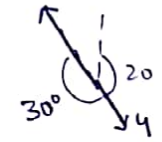
$\frac{20 \times 12}{11}$ RA $= \frac{240}{11} = 21\frac{9}{11} \rightarrow 4:21\frac{9}{11}$ (coincidence).



$\frac{5 \times 12}{11}$ RA $= \frac{60}{11} = 5\frac{5}{11} \rightarrow$ $4:5\frac{5}{11}$ ← rt. Lnd

$4:38\frac{2}{11}$

$(20+15)$ RA $\times \frac{12}{11} = \frac{420}{11} = 38\frac{2}{11}$



$(5x \pm 30)$

$(20+30) \times \frac{12}{11} = \frac{600}{11} = 54\frac{6}{11} \Rightarrow$ $4:54\frac{6}{11}$ ← opposite

Q. if b/w 7 and 8

$(5 \times 7 - 30)$

$35 - 30 \quad 5 \times \frac{12}{11} = \frac{60}{11} = 5\frac{5}{11}$ ✓

$7:5\frac{5}{11}$

* $6^\circ \longrightarrow 1\text{min}$

$1^\circ \longrightarrow (1/6)\text{m}$

$\left[5x + \left(\frac{0^\circ}{6}\right)_m\right] \frac{12}{11}$ ← Coin 0°

$\left[5x \pm \left(\frac{90^\circ}{6}\right)_m\right] \frac{12}{11}$ ← L∠ 90°

$\left[5x \pm \left(\frac{180^\circ}{6}\right)_m\right] \frac{12}{11}$ ← opp 180°

$x \geq 6(-)$

$x \leq 6(+)$

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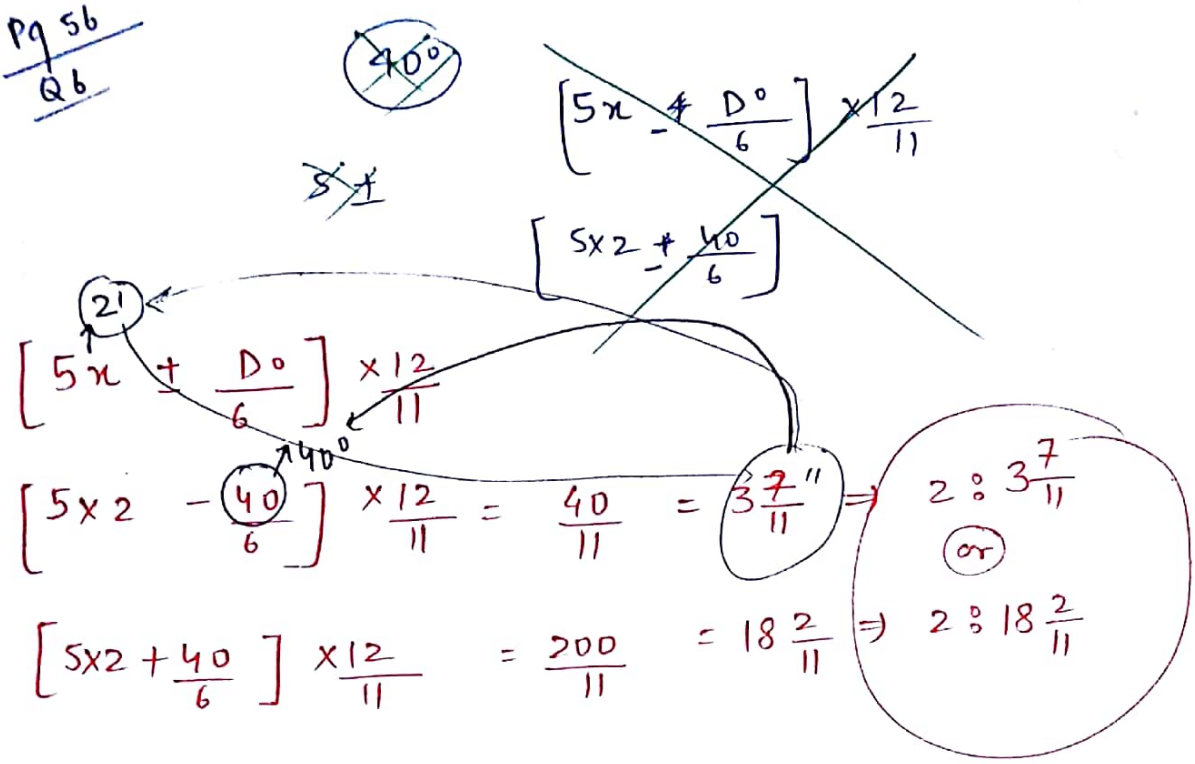
*

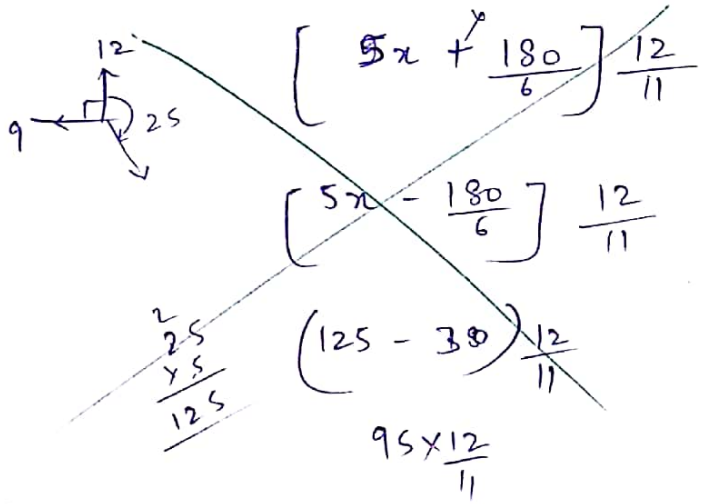
$$\left[5x \pm \left(\frac{D^\circ}{6}\right)\right] \times \frac{12}{11}$$

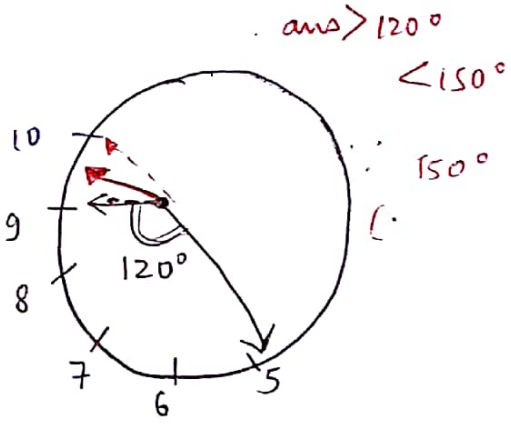
Pg 56
Q6



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

Sol





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

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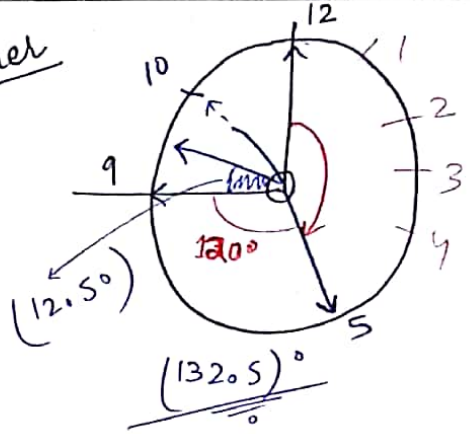
other



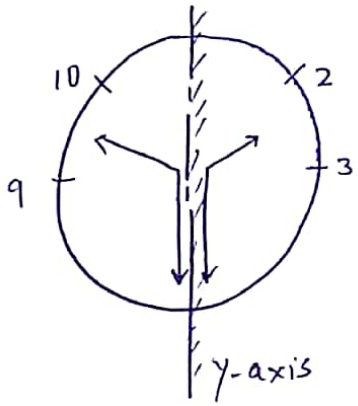
(132.5)°

hr hand

1 min → $\frac{1}{2}$°

25 min → 12.50

Mirror image → symm. about Y axis



Q.) How much time / or minu hand hr hand kitni dei baad mile?

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

✓ 12 hrs = 12 × 60 = 720 min

$\frac{720}{\frac{720}{11}}$ = 11 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 Qn's out of 30 Qn's

F.P.C. → Additive Rule → only one thing at a time

10 Boys 12 Girls → 'a' monitor → 22 ways

10 + 12 = 22 ways

'OR' → additive Rule can be applicable

hidden in the meaning of question.

→ Product Rule → 1B & 1G monitor

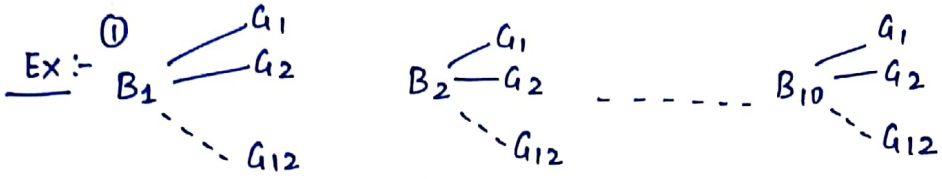
More than one thing

10 × 12 = 120 ways

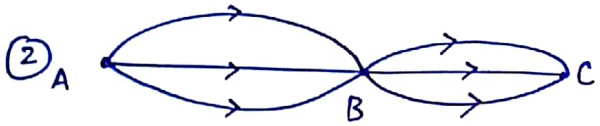
and

qn. → hidden or given or available

Ex :-



10 × 12 = 120



A → C

6 ways + 3 = 9 ways

(3 × 3)

* Arrangement

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

6 chairs, 6 members.

Ex :- 6 × 5 × 4 × 3 × 2 × 1

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

if 2 chairs broken

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

Q:> {a, b, c} → {ab, bc, ca}

selen.

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

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)

$^{12}C_2 = 66$

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

Q1> All 6 digited natural no.'s are being formed from 1st 6 natural no.'s without repeatition. (W.K.T). 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 repeatition are not allowed?
[Gate Q.2015] [Qn. 105]

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?
(Q4 Pg 69) (Gate 2010)
(a) 50 (b) 51 (c) 52 (d) 54.

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

Me

Sol> ① 1 2 3 4 5 2 → 1, 2, 3, 4, 5, 6

× × × × × (240)

3 4
× 5
(120)

② 0, 1, 2, 3, 4, 5, 6, 7, 8, 9

9 9 8 7

56
×
4 × 3 12

4536

③ 2 7 6 5 = (5103) 420

1, 2, 3, 4, 5

④ 5 5 5 1

(250)

(125)

Sir → ① 192
② 4536
③ 51
④ 125

explanations

① [1 × 2 × 3 × 4] (T U) 8 ways

1, 2, 3, 4, 5, 6

TU	TU
12	36
16	52
24	56
32	64

20	28
40	48
60	68
80	88
08	✗
04	
✗	

44 ✓

⇒ 4 × 3 × 2 × 1 × 8 = 192 ways

② 9 × 9 × 8 × 7 = 4536
(1 to 9) (0 to 9) (0-9) (0-9)

④ 5 × 5 × (T U) → 5
1, 2, 3, 4, 5

1	2
2	4
3	2
4	4
52	

→ 5 ways

125 Ans

③ 2, 2 3, 3, 3, 4, 4, 4, 4

① × ③ × ③ × ③

Th = 3

2 or 3 or 4

27 ways such no.'s are there

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

other way

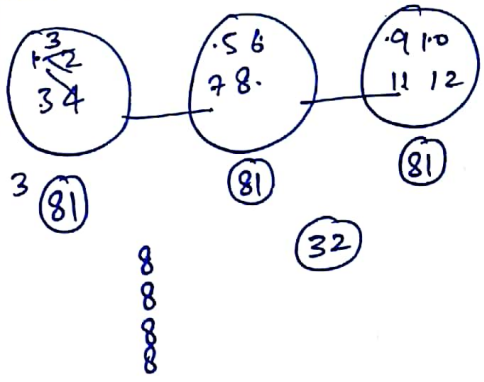
② ③ ③ ③ = 54 − 3 = 51

3/4 | 2, 3, 4 | 2/3/4 | 2/3/4

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

Ans



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1 × ③ × ③ × ③ = 27

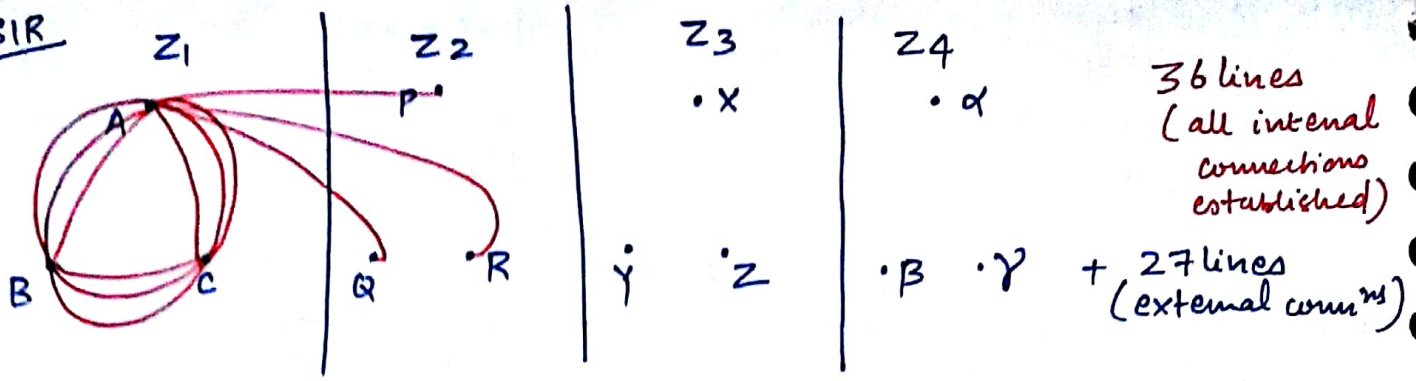
Th = 4

2 or 3 or 4

−1 (4222) → invalid

Total no. = 54 − 3 = 51 no.'s Ans (valid)

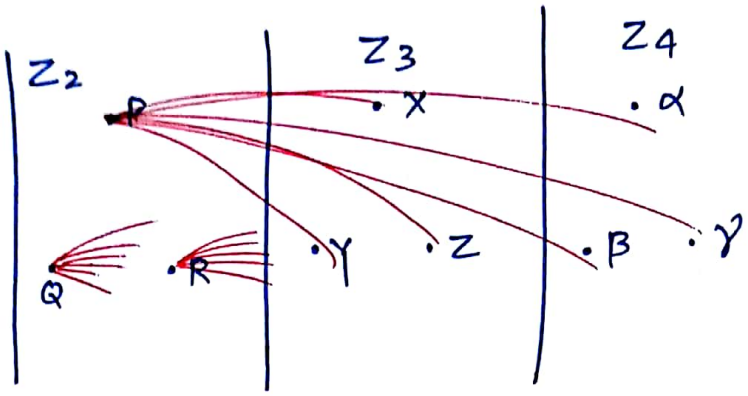
SIR



36 lines (all internal connections established)

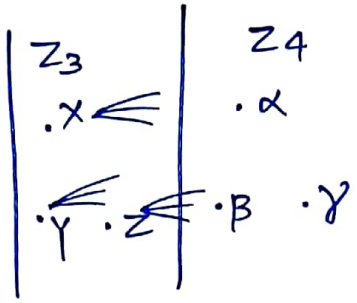
+ 27 lines (external comm^{ns})

Now



+ 18 lines
(P → x y z α β γ)
(Q → — ,, —)
(R → — ,, —)

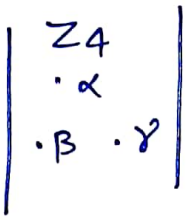
Now



+ 9 lines
(R → α β γ)
(Y → α, β, γ)
(Z → α, β, γ)

Total = 90 Ans ∴

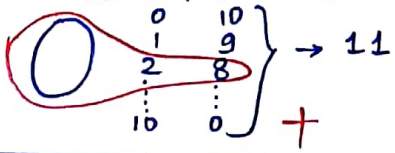
Now



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

Sol:> whole no. soln.

$a + b + c = 10$



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$a + b + c = 10$

1 → 0 2 … 9 ; 9 8 … 0 } → 10 +

2 → 0 8 ; 7 … 8 0 } → 9 +

+

9 ; 0 1 … 1 0 } → 2

10 0 0 } → 1

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

(or) $\frac{11 \times 12}{2} = 66$ ✓

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

Shortcut

① $(n + r - 1) C_{(r-1)}$

① $n \rightarrow$ identical objects

② whole no. soln. applicable

whole no. soln. → means can give 0 ball also.

$n \rightarrow$ identical objects

$r \rightarrow$ no. of people.

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

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

Now

Natural No. soln.

$a + b + c = 10$

1 → 1 2 … 8 ; 8 7 … 1 } → 8 +

2 → 1 2 … 7 ; 7 6 … 1 } → 7 +

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

7 → 1 2 … 7 ; 2 1 } → 2 +

8 → 1 1 → 1 +

Noneed

Shortcut → **CONDITIONAL soln.**

↓

N. No. soln

$a + b + c = 10$

↑1 ↑1 ↑1

whole No. soln. (∵ 1 Balls all have)

$A + B + C = 7$ ← 0 Balls can be possibly assigned to anyone

hence,

${}^{7+3-1}C_{3-1}$

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

$\left\{ \because {}^{n}C_2 = \frac{n(n-1)}{2} \right\}$

MOHIT CHOUKSEY

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

$A + B + C + D = 15$

$3 \quad 2 \quad 1 \quad 0$

$15 - 6 = 9$

$A + B + C + D = 9$

$^{9+4-1}C_{4-1} \quad ^{12}C_3 = \frac{12!}{3!\,9!} = \frac{12\times11\times10\times9!}{9!\times3!} = \frac{12\times11\times10}{3\times2} = 220.$

MOHIT CHOUKSEY

* GEOMETRICAL P and C :-

12 points

st. lines

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

$^nC_2$ $^5C_2$

12 points

Δ's

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

$^nC_3$ $^5C_3$

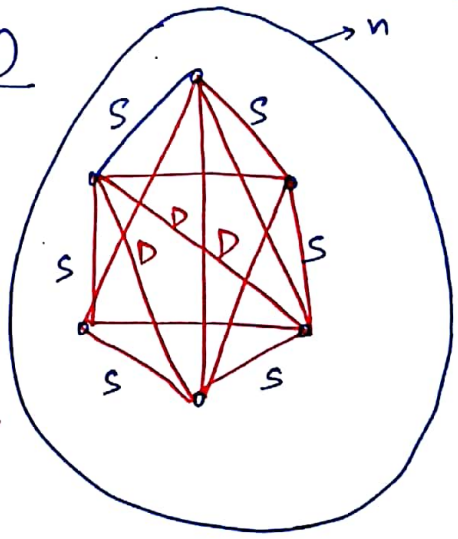
No. of diagonals of any 'n' sides polygon $= \frac{n(n-3)}{2}$

$^nC_2$ = All sides + All Diag

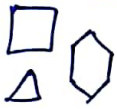
$^nC_2$ → any 2 vertex makes hand shake → side, Diagonal

$^nC_2 - n$ = All diagonals

$\frac{n(n+1)}{2} - n = \frac{n(n-3)}{2}$



Polygon
n sides
n vertex



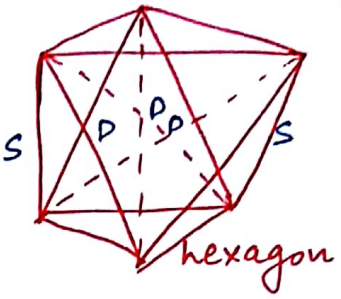
Q> If no. of diagonals of a n sided polygon is 50% more than its no. of sides then the polygon is ——

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

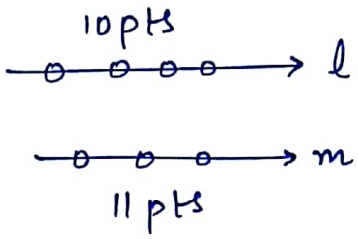
$n - 3 = 3$

$\boxed{n = 6}$ → sides, 9 diagonals

S ↓ 6 , D ↓ 9



Q> $l \parallel m$

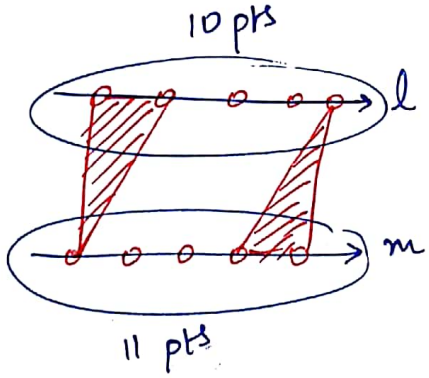


how many Δ's can we get from these 21 pts.

Sol $^{21}C_3 - {}^{10}C_{10} - {}^{11}C_{10}$

$1330 - 1 - 1$

SIR



$^{11}C_2 \times 10 + {}^{10}C_2 \times 11$

↓ 550 , 445 = 1045 ✓

$^{21}C_3 - {}^{10}C_3 - {}^{11}C_3 = \boxed{1045}$ ✓

{all 3 should not from the same line}

MOHIT CHOUKSEY

Chess Board → $^{n+1}C_2 \times {}^{n+1}C_2 = \left[\frac{(n+1)n}{2}\right]^2$ → 204 squares

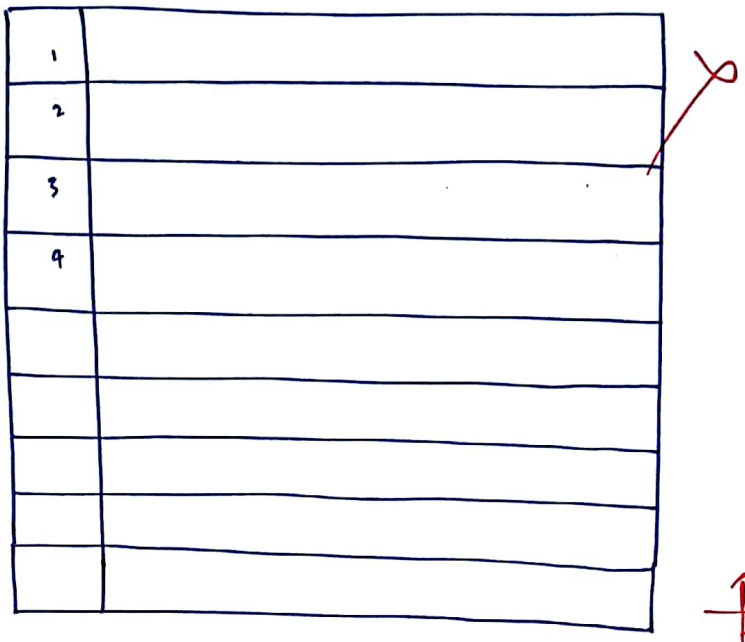
$^{9}C_2 \times {}^{9}C_2 = 1296$ Rectangles

$^{n}C_2 = \frac{n(n-1)}{2}$

1) Rectangles ($n \times n$) → $^{9}C_2 \times {}^{9}C_2$ → 1296 | $\Sigma n^3 = \left[\frac{n(n+1)}{2}\right]^2 = 1296$

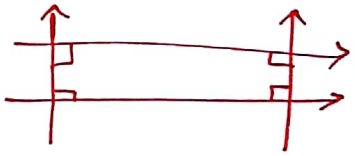
2) Squares → 204 | $\Sigma n^2 = \frac{n(n+1)(2n+1)}{2} = 204$, put $n = 8$

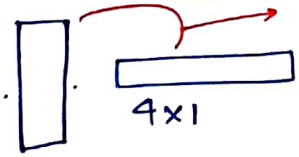
3) different types of Rectangles → $\Sigma n = \frac{n(n+1)}{2} = 36$, put $n = 8$



area & perimeter same → then same type

orientation diff^{r}.



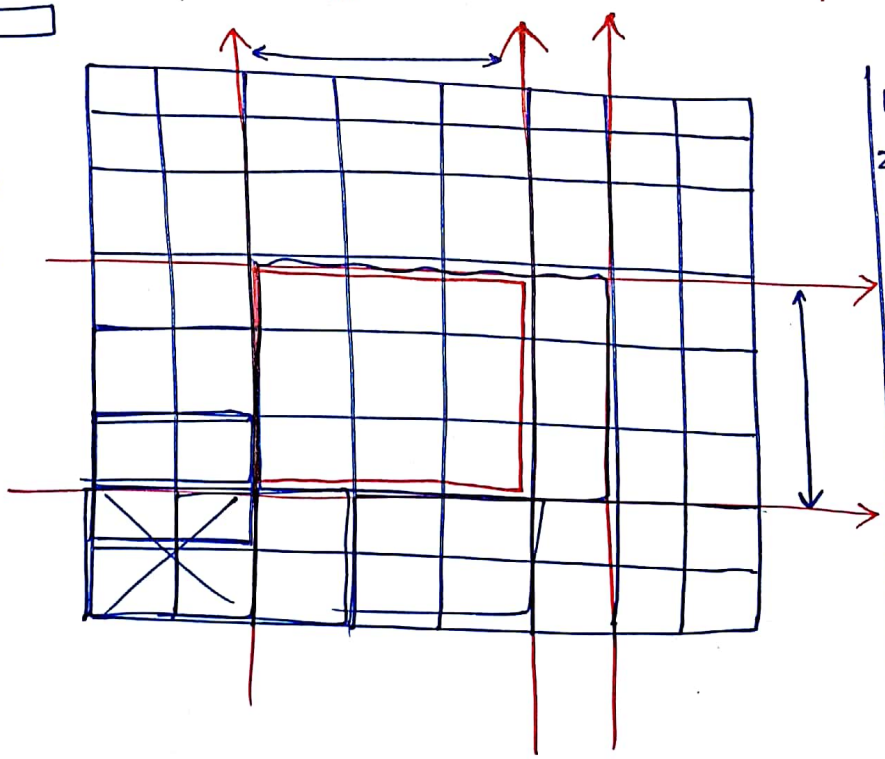


4×1

P = 10 A = 4

P = 10 A = 10

hence same Rectangle.



1×1 → 64 → 8^2

2×2 → 7^2 → 49

3×3 → 6^2 → 36

⋮

7×7 → 4 → 2^2

8×8 → 1 → 1^2

204

MOHIT CHOUKSEY

1×1, 1×2, 1×3, - - - - - - 1×8 → 8 types

2×1 2×2, 2×3, 2×4, - - - - 2×8 → 7 types

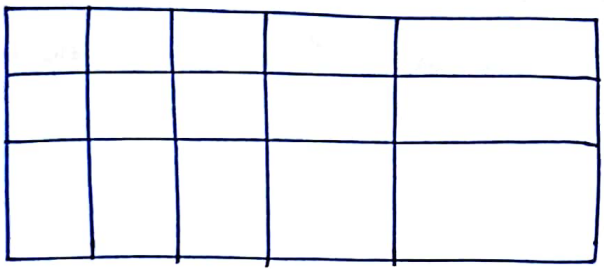
3×1 3×2, 3×3, 3×4, 3×5, - - - - 3×8 → 6 types

8×8 → 1 types

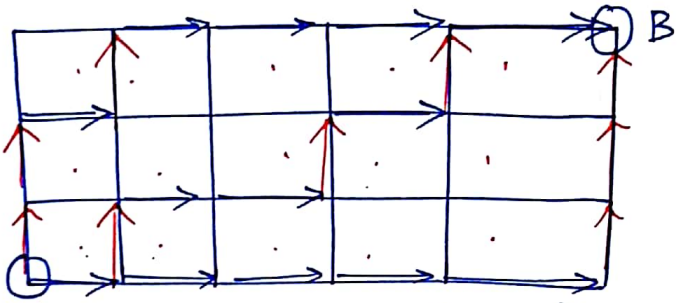
→ all squares are included (जाने दो)

36

Gate 2017
2 marks



↴ Redraw

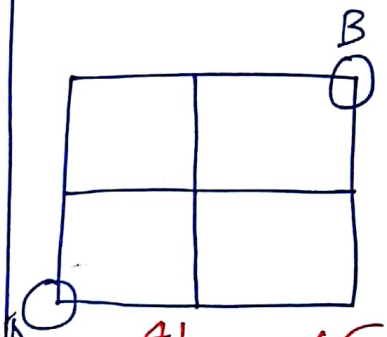


Shortest Routes (A to B)

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

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

CSAT (2011)



$\frac{4!}{2! \times 2!} = 6$ ✓

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

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

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

{HVHVHVHH}

MOHIT CHOUKSEY

* Linear Arrangement / Permutation :-

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

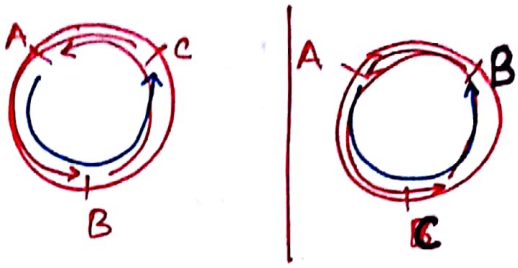
a	b	c
a	c	b
b	c	a
b	a	c
c	a	b
c	b	a

6 ways

circular Pm / circular arrangement.

$(n-1)!$

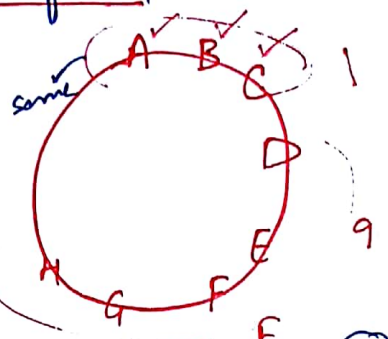
$(3-1)! = 2!$ (2 ways)



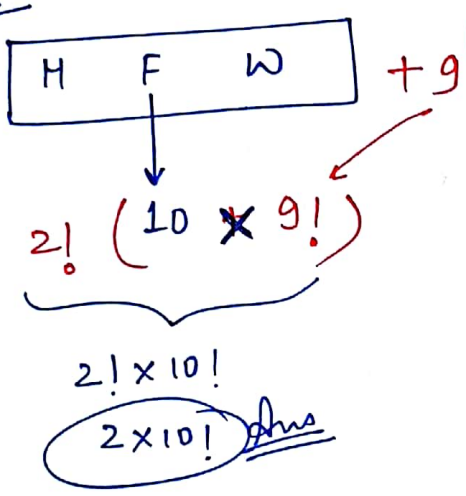
Q.> A couple invited their 10 friends to a dinner party, to be held across a circular dinning table having 12 chairs such that there have to be exactly 1 friend b/w the couple.

Sol

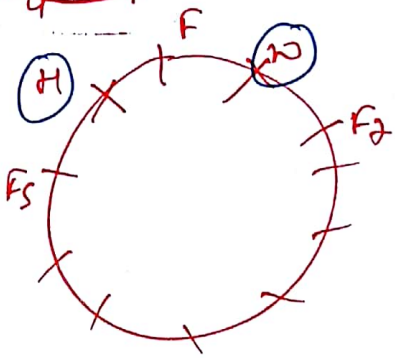
$8!$



SIR



H, W can interchange



Q.> all 5 digited natural No.'s are being formed from 1st five natural no's without repeatition. what is sum of all of those no's

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

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

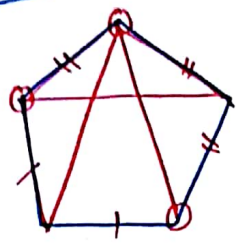
$4! \times 11111 \times 15$

CAT 2009

1, 3, 5, 7, 9

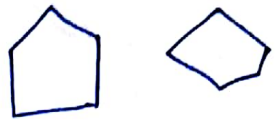
Q> vertex of a octagon are joined and Δ's are formed. How many Δ's are there whose vertex belongs to the vertex of octagon but none of its sides should belong to the side of octagon?

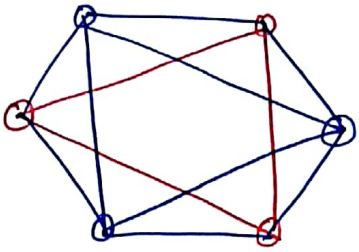
Sol SIR



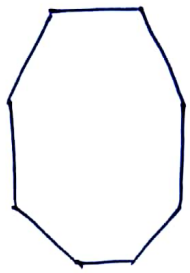
zero
n = 5

~~hexagon~~
octagon





n = 6
two



n = 8
16

n = 6

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

$\frac{8 \times 1}{3}$

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

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

4

0 — 6 — 2 — 8

5 — 3 — 2 — 14 — 16

11

$8(3)$

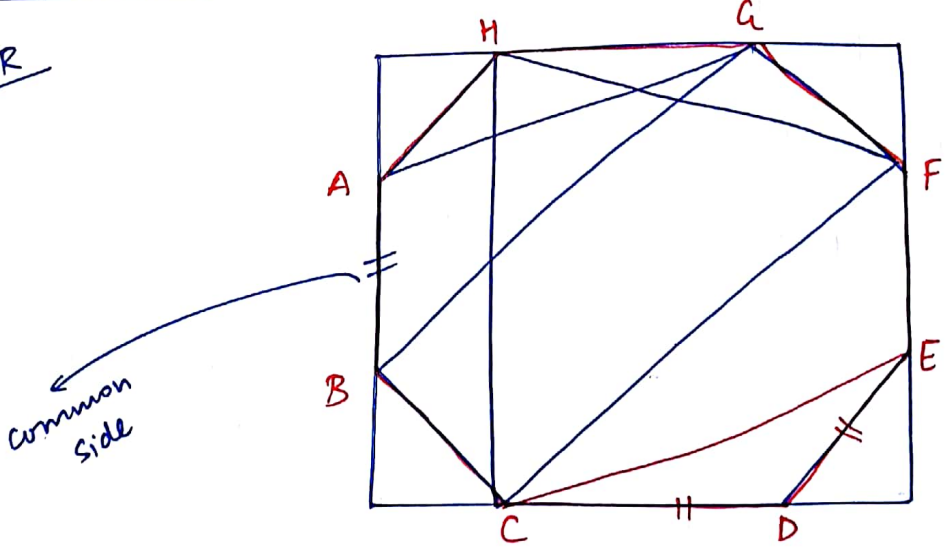
$n^2 - (n^2 - 2)$

36 − 34

2

0 ↓ 5 , 6 ↓ 2

SIR

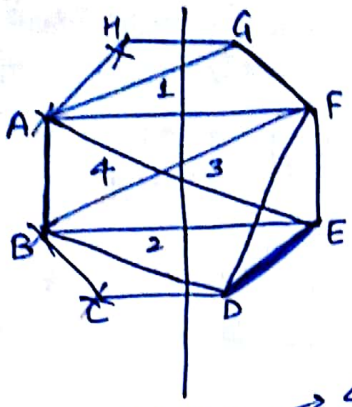


$T(\Delta) \Rightarrow {}^8C_3$
(no 3 collinear)

$T(\Delta) = \Delta(1)$ ↓ common side $+ \Delta(2)$ (CDE) $+ \Delta(0) \rightarrow$ HCF

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

MOHIT CHOUKSEY



$T(\Delta) = \Delta(1) + \Delta(2) + \Delta(0)$?

$^8C_3 = (4\Delta \times 8) + (^n_8) + \Delta(0)$

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

$\Delta(0) = 16$

0 side common

AB gone HC also)

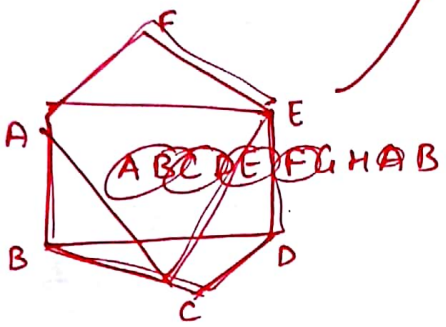
AB side → 4Δ

8 side → 8×4Δ

$^nC_3 = n(n-4) + n + \Delta(0)$

4 points gone

$\Delta(0) = {}^nC_3 - n(n-4+1)$



02/10/2016

PROBABILITY

Classical Defⁿ :-

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

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

S.S = {H, T} → in case of a coin

Unbiased Events → every event (equally likely)

$P(1) = 1/6$

$P(2) = 1/6$

$P(3) = 1/6$

$P(6) = 1/6$

$P(H) = 1/2$

$P(T) = 1/2$

Mutually exclusive events

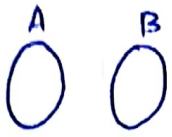
and

Independent Events

{Next Page}

✓ Mutually Exclusive events are events where happening of one event guarantees non-happening of the other.
means A → happen, B → not happen

A, B → disjoint sets



$P(A \cap B) = 0$

for M.E.E.

Additive Rule $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ → 0

only one of the events happen @ time.

$P(A \cup B \cup C) = P(A) + P(B) + P(C)$.

"or" — English identifying key-word.

Q → Dice

$P(\text{even}) + P(\text{odd}) - P(\text{even and odd}) = P(\text{even or odd})$ → 0

$= 3/6 + 3/6 - 0$

$P(e \cup o)$

✓ Independent Events are Events where more than one event can happened at a time without influencing the result of each other.

"and" — hint (∩).

Ex:- Coin and dice is tossed simultaneously.

Product Rule $P(3m)$ and $P(t)$ → tossed → (tail)

multiply

$2/6 \times 1/2 = 1/6$

$P(A) \times P(B) \times P(C)$

Q.) $P(A) = 60\%$ ⟶ 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:) $P(A) = 3/5$, $P(\bar{A}) = 2/5$

$P(B) = 3/4$, $P(\bar{B}) = 1/4$

mutually exclusive

$A \times \bar{B} + B \times \bar{A}$

$\frac{3}{5} \times \frac{1}{4} + \frac{3}{4} \times \frac{2}{5}$

$= \frac{9}{20} \approx \frac{45}{100} \approx$ (45%)

Q> There are 2 vacancies for which the husband and wife applied, $P(h) = 1/7$ → Probability of husband gets the job.

$P(w) = 1/5$

only one gets the job	both	None	atleast one
?	?	?	?

Q> X is randomly choosen from 1st 100 natural no., what is the probability that choosen x satisfies the inequality

$$\frac{(x-40)(x-70)}{(x-30)} < 0 \qquad x \in [0, 100]$$

a) $\frac{28}{50}$

b) $\frac{29}{50}$

c) $\frac{59}{100}$

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 $P(h) = 1/7$ ✓ $P(\bar{h}) = 6/7$

$P(w) = 1/5$ $\bar{h}(\bar{w}) = 4/5$

$(1/7 \times 4/5) + (6/7 \times 1/5)$

$4/35 + 6/35$

$10/35$ (10/35)

0.28

0.02

0.68

③ 1 hr 20 min (5/9)

0.33×0.33

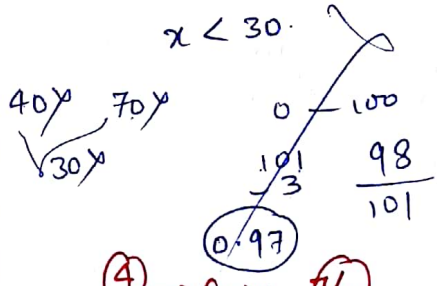
0.66

$0.25x$ → $0.0\cancel{6}25$

② $x - 40 < 0$ (29/50) ✓

$x < 40$, $x < 70$

$x < 30$.



④ → Gate 7/16

SIR (i) $P(h) = 1/7$, $P(\bar{h}) = 6/7$

$P(w) = 1/5$, $P(\bar{w}) = 4/5$

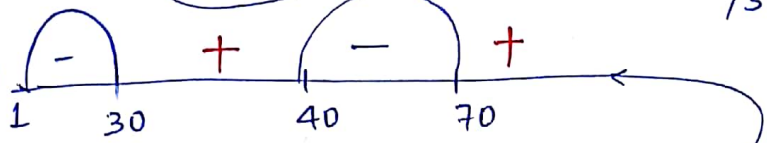
only one	both	none	@ least one
$h\bar{w} + \bar{w}h$	$h \times w$	$\bar{h} \times \bar{w}$	
$1/7 \times 4/5 + 1/5 \times 6/7$	$1/7 \times 1/5$	$6/7 \times 4/5$	
$10/35$	$1/35$	$24/35$	

1 = only one + both + None

$1 = 10/35 + 1/35 + 24/35$

$1 - 24/35 \leftarrow$ P(@least one) $= 11/35$

(2)



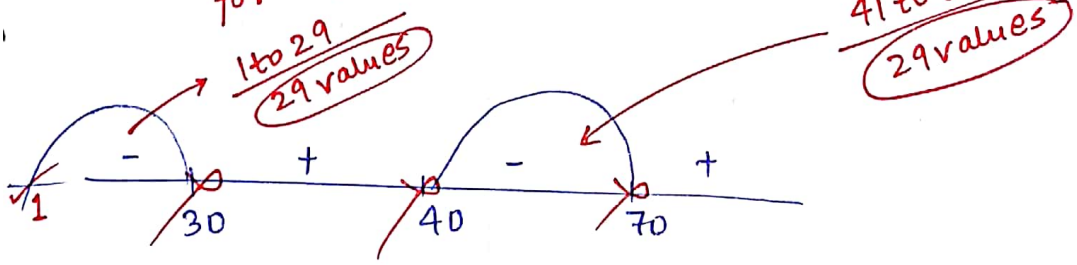
signs can be putted on the no. line in alternate fashion.

Similarly

$\frac{(x-40)(x-70)}{(x-30)} < 0$

+ + +

for $x > 70$



$\frac{\text{fav. chances}}{\text{Total chances}} = \frac{58}{100} = 29/50$

MOHIT CHOUKSEY

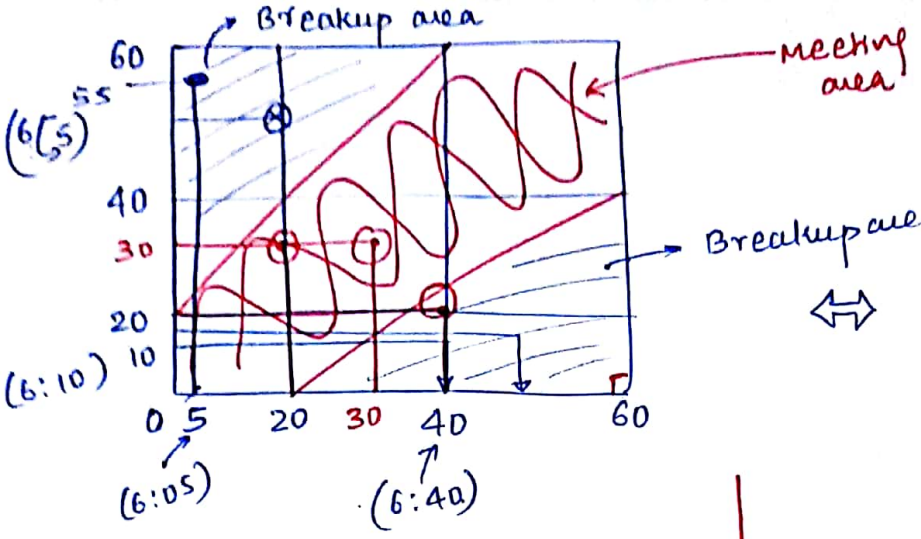
(3) Time ⟶ Real No.

∞ no. of values b/w 6 & 7.

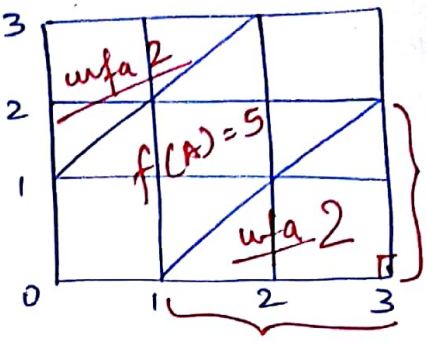
$\frac{\text{favourable chances}}{\text{Total chances}} = \frac{\infty}{\infty} = \frac{f(A)}{T(A)}$

$f(A)$ → favourable area

$T(A)$ → Total area



$TA = \overline{9}$



6:20 - 6:40 → Just a moment.

here, $\Delta = \frac{1}{2} \times 40 \times 20 = 800$ units

unfav Area = 1600 units.

Total area TA = $60 \times 60 = 3600$

favourable area fA = $3600 - (800 \times 2)$
$= 2000$

$$\frac{f(A)}{T(A)} = \frac{2000}{60 \times 60} = \frac{20}{36}$$

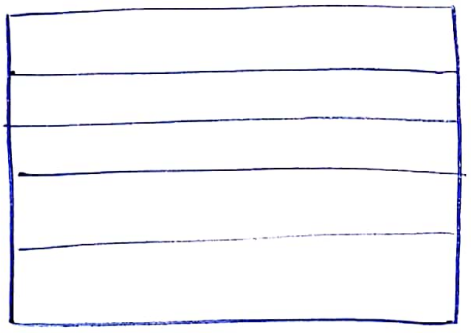
area $(\Delta) = \frac{1}{2} \times 2 \times 2 = 2$ units

unfavourable area = $2 \times 2 = 4$ units

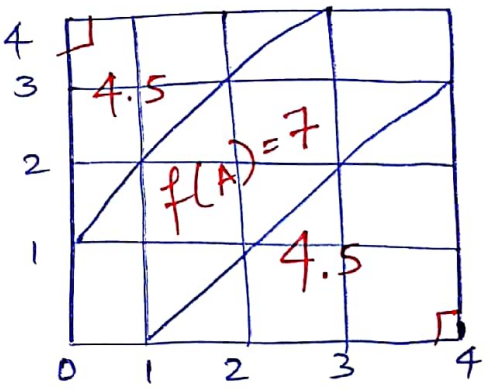
favourable area = $9 - 4 = 5$ units

hence, $\frac{f(A)}{T(A)} = 5/9$

④



Redraw →



$$\frac{f(A)}{TA} = \frac{7}{16}$$

Conclusion → if TA → $\frac{3 \times 3}{3 \times 3}$ (TA) $-$ $\frac{2 \times 2}{3 \times 3}$ (unfav) $= \frac{5}{9}$ (fav)

formulae $\frac{(2n-1)}{n^2}$ Ans.

if TA → $\frac{4 \times 4 - 3 \times 3}{4 \times 4} = \frac{7}{16}$

$\frac{6 \times 6 - 5 \times 5}{6 \times 6} = \frac{11}{36}$

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Maths behind it

$0 \le x \le 60$
$0 \le y \le 60$ } TA

$|x-y| \le 20$ } f(A)

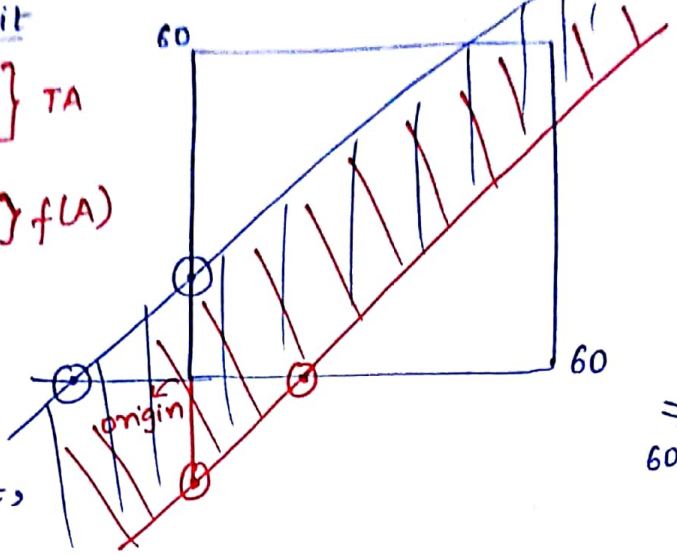
$x - y = 20$

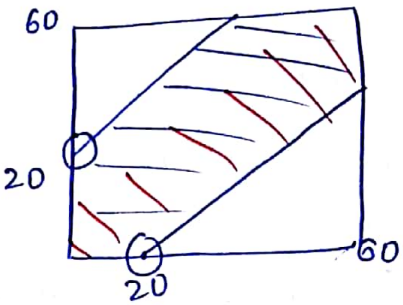
if $x - y \le 20$

if y comes first,

$y - x = 20$

$y - x \le 20$ → To satisfy this in equality, we have to move towards origin.





Do → (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

(91)
- 14
77

SIR [1-100] ÷ by 7

$\frac{100}{7} = 14$ [~~7~~, 14, 21, - - - 98]

[10 - 99] → Total No.'s = (90)

div. by 7 = (14 - 1) = (13)

$\frac{fc}{TC} = \frac{77}{90}$ ✓

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(12) 1 LY = 366 d = 52×7 + 2 odd day → 2 chances of saturday

53rd saturday

SS
SM
MT
TW
WT
TF
(7)

$\frac{2}{7}$ ← Ans:

$\frac{fc}{TC} = \frac{2}{7}$ ✓

* Sample space (dice) = {1, 2, 3, - - - 6}

P(even) = 3/6 ⟶ {2, 4, 6}

P(prime) = 3/6 ⟶ {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> $SS_{new} = [2, 4, 6]$

$P(\text{prime}) = P\left(\frac{\text{prime}}{\text{even}}\right) = \frac{1}{3}$ ✓

Pg 71 (20) X, Y

X → 60% ⟶ 96% reliable

Y → 40% ⟶ 72% —"—

96/100

0.576 0.288

T.S.A.(100)

X(60) y(40)

X_R = 0.96 of 60

Y_R = 0.72 of 40

$X_R = 57.6$ + $Y_R = 28.8$

$T_R = X_R + Y_R = 86.4$

Y_R/T_R

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(53) $\frac{10}{100}$ → HIV +

Pg 75

HIV + → 95% (Time)

HIV - → 89% (-,,-)

SIR

$$\left(\frac{0.1 \times 0.95}{(0.1 \times 0.95) + (0.9 \times 0.11)}\right)$$

↑ +ve ↑ +ve ↑ -ve ↑ m/c → +ve (-vecीजा)

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

{1,6 / 2,5 / 3,4}

{6,1 / 5,2 / 4,3}

Pg 54

(6) $\frac{1}{3} \times \frac{1}{4} \times \frac{1}{5} \times \frac{1}{6}$.

SIR

None of them ⇒ solves qn. $\bar{A} \times \bar{B} \times \bar{C} \times \bar{D}$ (independent events)

Qn is not solved

36

Qn. is solved ⇒ $1 - (\bar{A} \times \bar{B} \times \bar{C} \times \bar{D})$.

Or

atleast one of them solves Question

All of them solves the qn. ⇒ A × B × C × D.

Q7 4 times

2H, 2T

HHHT HHTH HTHH THHH

HHTT HTHT HTTH THTH

HHHT THTT TTHH TTTH

TTTT HHHH

4/16 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	

6/16 ← $^4C_2$ ← 6 alter.

alter. method → $^4C_2 (1/2)^2 \, ^2C_2 (1/2)^2$

6/16

Q 10 penalty shootouts.

$^{10}C_4$ ⟶ chances in which goal happens.

$^{10}C_4 (\frac{8}{}) ^4$ ↳ success $^6C_6 (\frac{f}{})^6$

Pg 90

(1) 77 $^{10}C_6 \times$ 0.2508

Pg 54

(10) $\frac{0.04}{100} = \frac{1}{25}$

Pg 54

(1) $^nC_2$ = h shakes

$\frac{n(n-1)}{2} = 153$

(18) ✓

(2) ✓

* **LOGICAL REASONING :-**

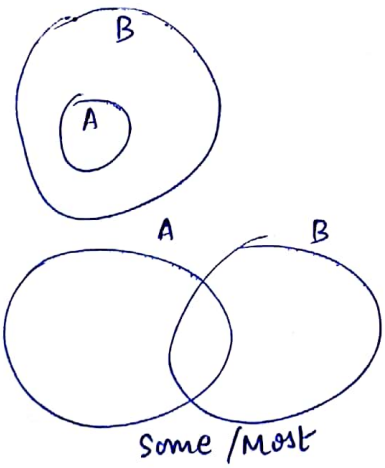
4 Rules :→ Rule 1 → draw all possibilities/(Cases).

Rule 2 → for a statement to be True, it have to be true in all the cases.

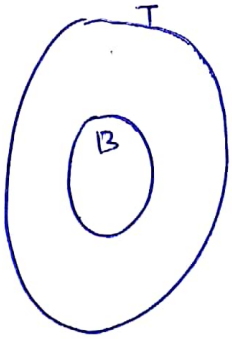
Rule 3 → If a statement is false even in one of the cases, then it will be considered false forever.

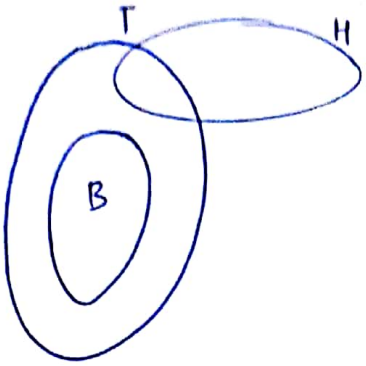
Rule 4 → Try to proof a statement false as early as possible.

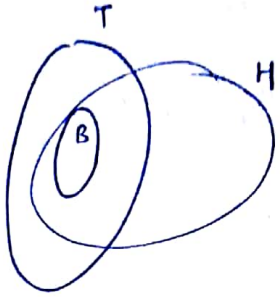
Rules/General → Read dirns carefully



Q2

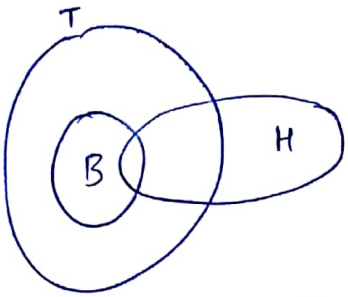




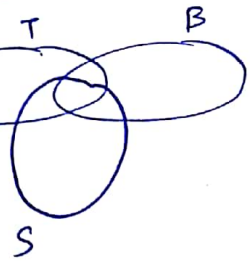


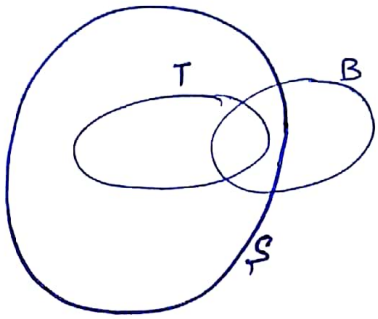
no inform^n about Hens and Birds hence ← 3 possibilities.

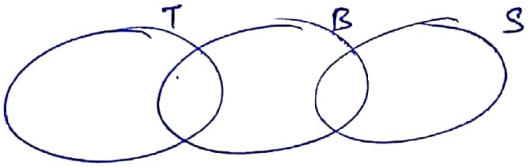
conc i ✗
ii ✓ (b)



(3)

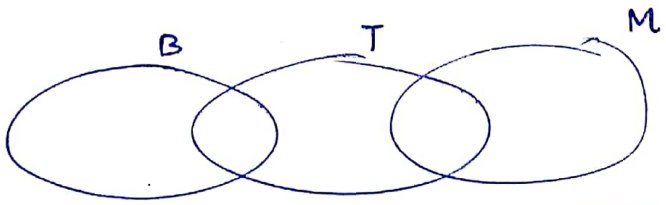






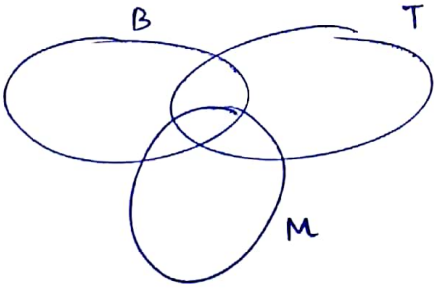
i. ✓ (a) ✓
ii ✗

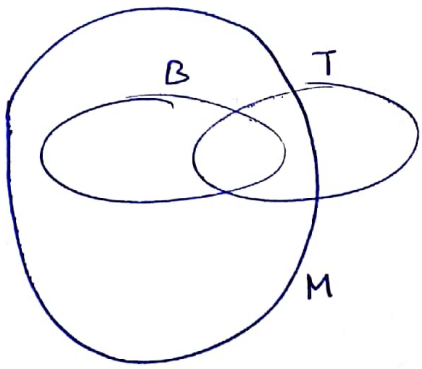
(4)



(i.) ✗
(ii.) ✗

(d) ✓





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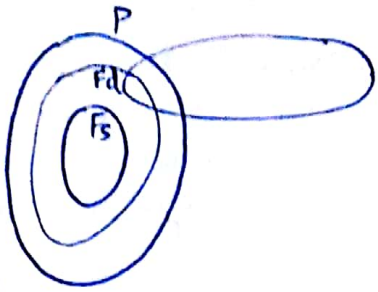
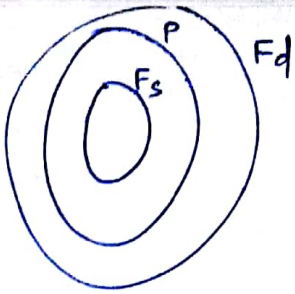
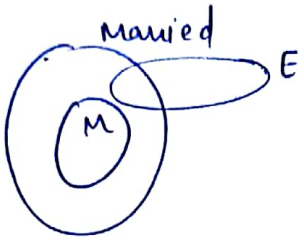
(5) Ans

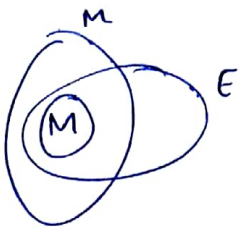


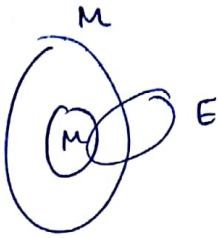


(i) ✗
(ii) ✓ (b) ✓

(6)





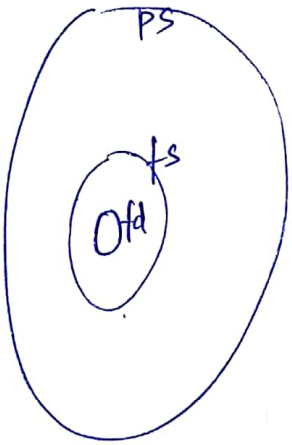


(i.) ✓
(ii.) ✓ (c)

(7)

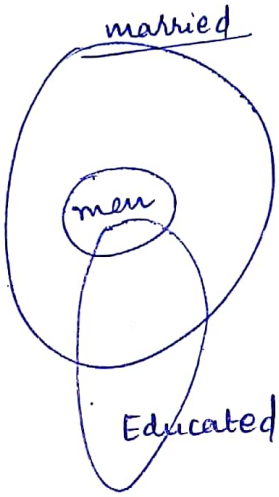
SIR

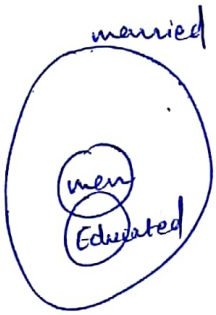
(5)



i ✓
ii ✓ (d) ✓

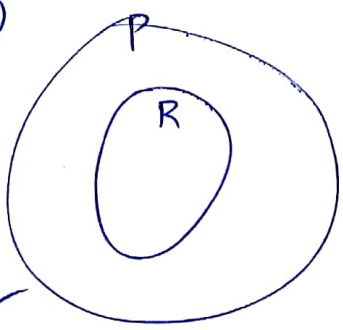
(6)





(i.) ✓
(ii.) ✓ (d) ✓

(7)



(1) ✗
(2) ✗ (c) ✓

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(8) Trees, Flower, Fruit

(1) ✓
(2) ✓
(d) ✓

(11) Chair, Shoes, Sticks

(a)

(b) Chair, Shoes, Sticks

Me
(9) Banana, Many, doors

Banana, Many, doors

Sticks, Chair, Shoes

(i.) ✗
(ii.) ✗
(iii.) ✓
(iv) ✓

(c) ✓

(c) Chair, Shoes, Sticks

(10) Trees, Planets, Stars

(i) ✗
(ii) ✗
(iii.) ✗
(iv) ✗
(d) ✓

(i) ✗
(ii) ✓
(iii) ✗
(iv) ✓

(a) ✓

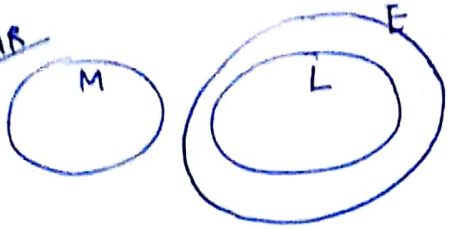
(36) E, L, M, t

(i) ✓
(ii) ✓
(d) ✓

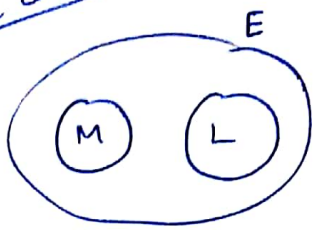
E, L, M

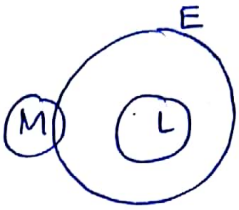
MOHIT CHOUKSEY

(136) SIR



No inform about Manager and Executive → hence cases





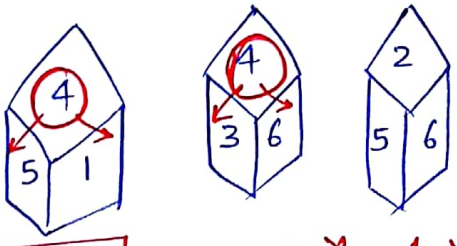
(i.) ✗ (Bullshit)

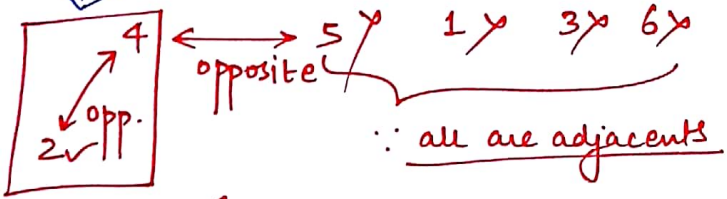
(ii.) ✗ —"— —

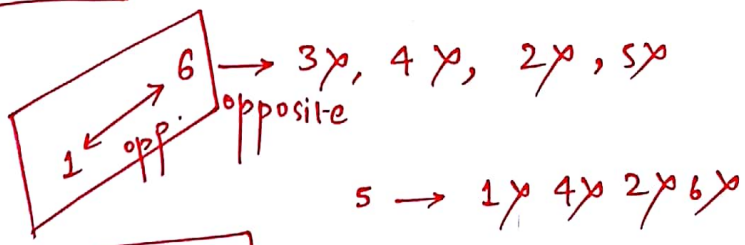
(c) ✓

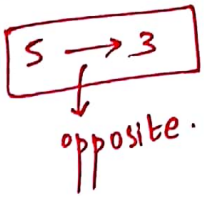
Pg no. (57)

8 to 9

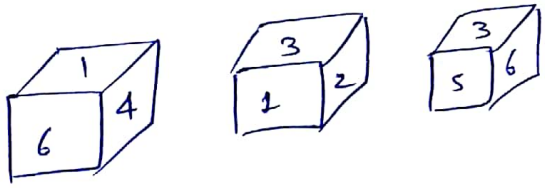








(m) 1, 2, 3, 4, 5, 6



1 → opp. 2 ✗ 3 ✗ 4 ✗ 6 ✗

1 ⟷ opp. 5 (a) ✓

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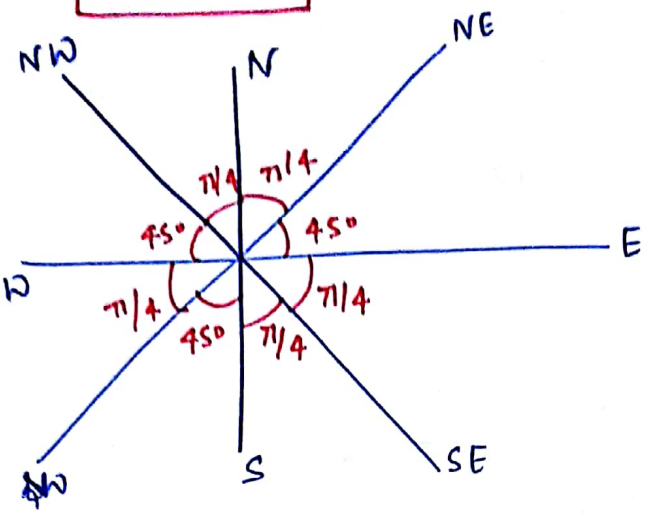
* **DIRECTION** :-



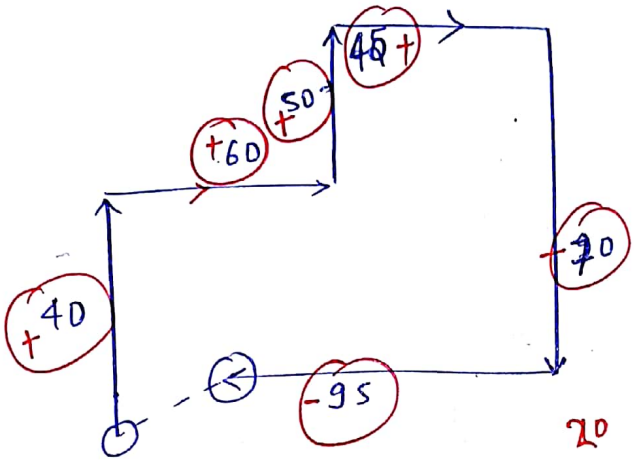
(H)
Horizontal = E +, W −

(V)
Vertical = N +, S −

Apply pythagoras.

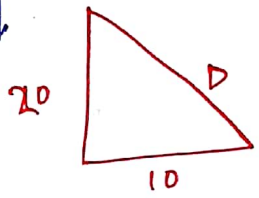
$$D = \sqrt{H^2 + V^2}$$

Q> Person goes 40m North take a Right turn goes 60 m takes a left Turn & goes 50m and takes another —"— —"— 45m . . . . . .



$$H = |60 + 45 - 95| = 10$$

$$V = |40 + 50 - 70| = 20$$



$$D = \sqrt{20^2 + 20^2}$$

$$D = \sqrt{500}$$

$$D = 10\sqrt{5}$$ Ans ∴

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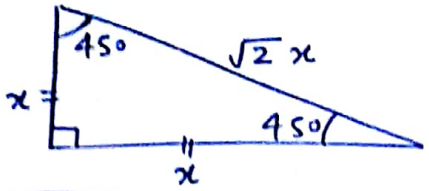
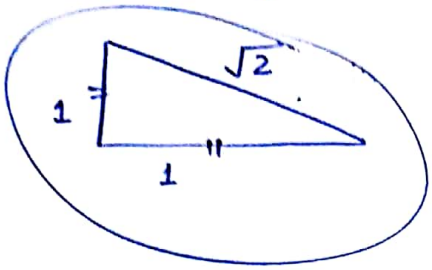
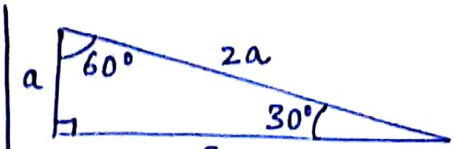
(1:

Isosceles Right ∠ Δ

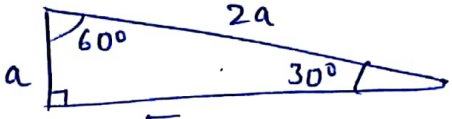


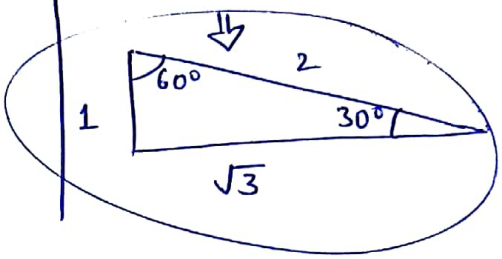




$\sqrt{a^2 + ?^2} = (2a)^2$

$a^2 + ? = 2a$





$\sin 30° = \frac{a}{h}$

$\frac{1}{2} = a/h$

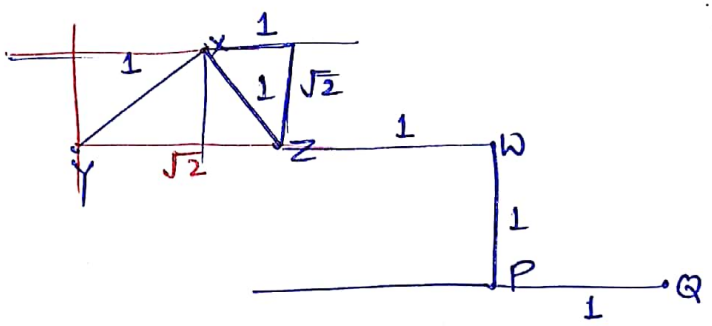
$\boxed{h = 2a}$

Pg 74
Q 52

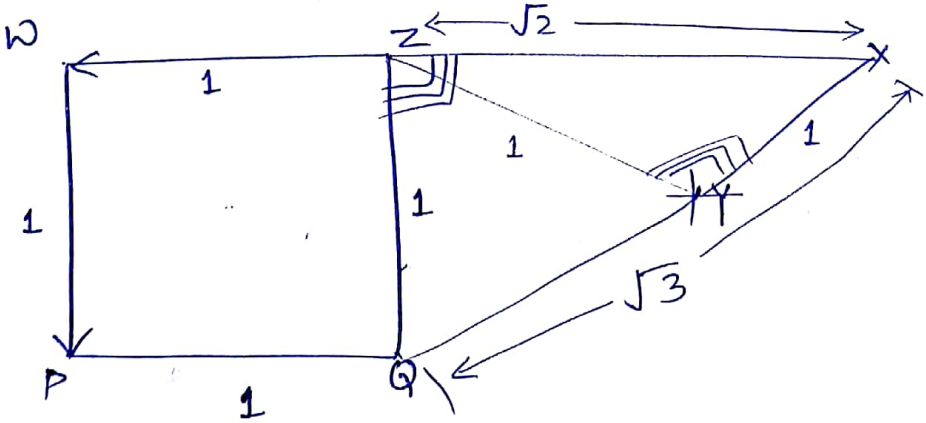
$+\sqrt{2} + 1 - 1 + 1$

$+1 - \sqrt{2} + 1 - 1 + 1$

2



SIR



149 → H.W. ©v

MOHIT CHOUKSEY

17/11/2016

Data Interpretation

$$\% \text{ change} = \left[\frac{\text{change}}{\frac{FV - IV}{IV}}\right] \times 100$$

FV → final value

IV → initial value

if % change → +ve → FV > IV → % ↑ → growth rate

" → -ve → " < " → " ↓ → decline rate

Ex (a) 40 ⟶ 20 ⇒ $\frac{-20}{40} = \left(-\frac{1}{2}\right) \times 100 \approx -50\% \downarrow$

(b) 40 → 50 ⟶ $\frac{10}{40} = \frac{1}{4} \approx 25\% \uparrow$

(c) 40 ⟶ 55 ⟶ $\frac{15}{40} = \frac{3}{8} \approx 37.5\% \uparrow$

Ans ∵ (a) is

% change maxm. ⟶ | change |

% ↑ is maxm. ⟶ +ve value in account.

% ↓ is maxm ⟶ -ve value in account.

Ex :-

2015	2016	2017
50	60	72

$-10/50 = -1/5 \approx 20\% \uparrow$ ✓

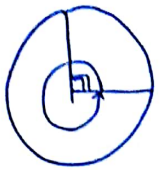
$50 \times 1.2 = 60 \times 1.2 = 72$

50	40	12

$50 \times 0.8 = 40 \times 0.8 = 32$ ✓

MOHIT CHOUKSEY

Rs 10,000



$\frac{90^\circ}{360^\circ}$ → 1/4 → 25%

$= \frac{1}{4}$ of 10,000 = 2500

1,00,00,000

100% ⇒ 360°

1% ⇒ $\frac{18}{5}$ or 3.6°

360° → 100%

1° → 5/18 %

Pg 58 CH # 13

Q2 $\left[\frac{63^\circ - 36^\circ}{360^\circ}\right] = \frac{27}{36} = \frac{3}{4} \approx 75\%$

Q3 C h

$81^\circ + 63^\circ = \frac{144^\circ}{360^\circ}$ = 2/5 of Total

= 2/5 of (2 cr)

= 80 Lakh

1 method

144 × 5/18 %

40% of the Total ← other method

↓

40% of T ✓

Q6 0.04 of TCP = 15730

TCP of 5500 = 393250

cost

Total selling Price (TSP) of 5500 = $\frac{393250 \times 1.3}{5500}$ = 92.95

1 copy

MOHIT CHOUKSEY

1% ≈ 4 Thousand

4% TCP ≈ 16 Th

TCP = 4 lakh

TSP = 4 × 1.3 = 5.242 / 5500

1 copy

9

(10) ✓

(11) ✓

(12) ✓

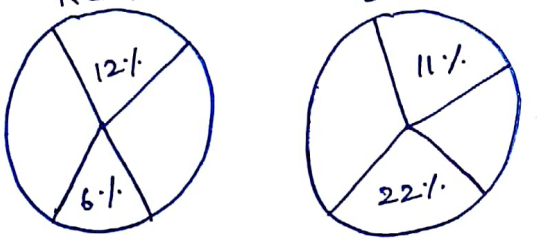
(15) Total quantity = 5 lakh tonnes

Total Revenues = 250 Crore

Ratio of Revenue 1/Kg

4/Kg

(15) SIR



$I_1 = \frac{2 \times 12\% \text{ of } R}{11\% \text{ of } E}$

$I_4 = \frac{1 \times 6\% \text{ of } R}{22\% \text{ of } E} = 4/1$

2

Pg 77

Q 75

200 units

SIR

.15 of TCP = 4.5 lakh ✓

TCP_{2012} = 30 lakh ✓

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 ✓ (Bec. ratio is fixed)

and M_{2008} = 250 ✓

$\frac{M_{2009}}{F_{2009}} = \frac{600}{200}$ (3) ✓ (Bec. Ratio is fixed)

Final value of male − initial value of male / 25

$= \frac{35}{25} = \frac{7}{5} = 1.4 \times 100$

$= 140\%$

(19) 2012 - 2013 → GDP ↑ 7%.

2012 - 2013 → 50 to 60 USD

MOHIT CHOUKSEY

SIR
Q19

	GDP in (₹)	1 US $	GDP in 1 US $
GDP before 2012-2013	100 ₹	50 ₹ ✓	$\frac{100}{50} = 2$ $ ✓
GDP after 2012-2013	107 ₹	60 ₹	$\frac{107}{60} = 1.78\overline{3}$ $ ✓

$$\left[\frac{2-1.78\overline{3}}{2}\right] \times 100 = -10.83\% \downarrow$$

20 ↑ → 16.6% ↓ → production ↓, purchase power ↓. → $\frac{7}{x}$ → $16.66\% + \frac{xy}{100}$

Q20

Type III	Type II	Type I	Type IV
46/114	40/144	40/75	40/108

Pg 84
Q123

	(km)	(kwh)
M	20	12
N	45	25
O	75	45
P	100	57

20 km → 12 kwh
1 km = $\frac{12}{20}$
0.6

45 → 25
1 km → $\frac{25}{45}$
0.5 ✓

1 → $\frac{57}{100}$
$0.\overline{57}$

75 → 45
1 km → $\frac{45}{75}$ 0.6

SIR

	(km)	(kwh)
M	20	12
N	25	13
O	30	20
P	25	12

$\left(\frac{13}{36}\right)$ $\left(\frac{13}{25}\uparrow\right)$

116 ✓ 87 ✓ same

Pg 78 Q87 →

21×2 = 42
15×3 = 45
23×2 = 46
(15)

$\frac{42+45+46}{3}$ → α.

SIR

21×2 = 42
15×3 = 45
23×2 = 46
133

(i)
(ii)

Students corrected: Class + W + NA = Total students
80 + 5 + 15 = 100
10 + 70 + 20 = 100

GQ. ESE2017

apna Qn

	M	F	T
5L⁻	1 (38, 38)	5 (34, 40)	6
5-10L	1 (32, 32)	8 (35, 57)	9
10-15L	8 (21, 65)	3 (37, 13)	11
15+	2 (32, 33)	2 (27, 40)	4
Total	12	18	30

30 → This is 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
1	3	10
0	1	1
		23

$\frac{23}{30} \times 100 \approx 76.6\%$

(ii) Then the min % of people age less than 40 years

M	F	T
1	1	2
1	1	2
1	1	2
2	1	3

MOHIT CHOUKSEY

Q

10 samples

P Q Y

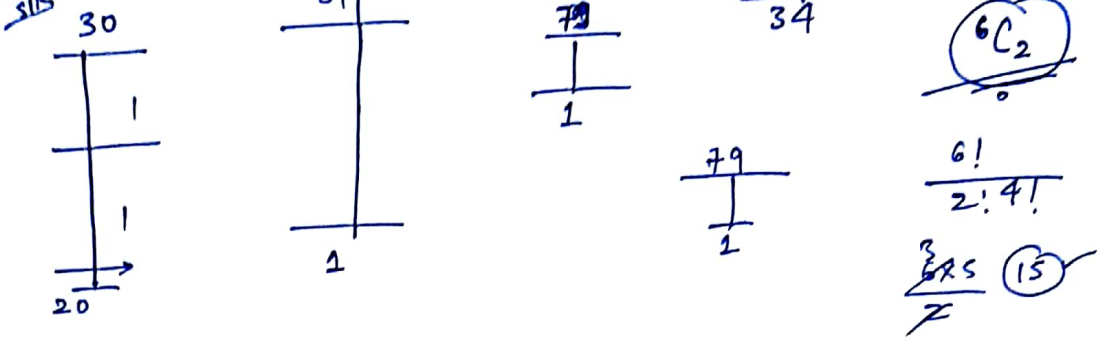
70 | 57 | 82 | 84 | 98 | 66 | 34 | 87 | 79 | 71

This shows the % of milk in each sample. If any two samples are mixed & form new sample then on maxm., how many distinct pairs of samples will never give a composition of more than 80% milk.

Sol

10

SIB



Q —.

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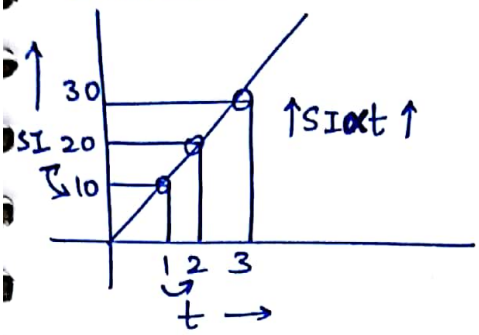
SI / CI

Simple Interest / Compound Interest

$SI = \frac{P \times R \times T}{100}$

$y = mx$

Rs 100 @ 10%

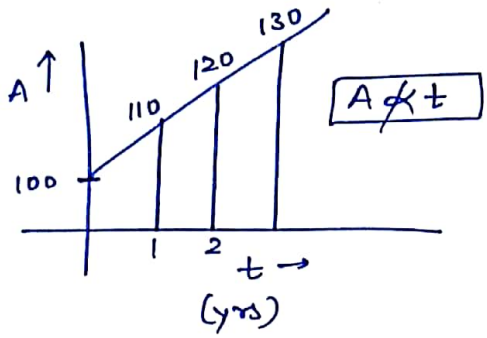


(A)

Amount = P + SI

$y = c + mx$

Rs 100 @ 10%.



Q. certain sum of money becomes 25 times in 48 yr's at a S.I.. In how many yr's will it become 49 times at S.I. ?

Sol

Amount = P + SI (P → Principal)

$25P = P + 24P$

$\sqrt{24P \propto 48y}$

$\uparrow SI \propto t \uparrow$

$A = P + SI$

$49P = P + 48P$

↑ 8P → 96 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 (hy)}

P, R = 10% per year; t = 2 year

$A_2 = P\left(1 + \frac{5}{100}\right)^4$

~~Amount is compounded Quately~~ (@ + 1 yr)

P, R = 5% per half yearly (phy), t = 2y

$A_2 = P\left(1 + \frac{2.5}{100}\right)^8$

$* (CI - SI)_{2yr} = P\left(\frac{R}{100}\right)^2$

$* (CI - SI)_{3yr} = P\left(\frac{R}{100}\right)^3 + 3P\left(\frac{R}{100}\right)^2$

Rs 100 @ 10%.

	CI	SI
P	100	100
I_1	10	10
P_2	100 (+10)	100
I_2	(10 + 1)	10

MOHIT CHOUKSEY

$$\left(\frac{PR}{100}\right) \times \frac{R}{100} = P\left(\frac{R}{100}\right)^2$$

Q Certain sum of money doubles itself in 5yrs at C.I. In how many years will it become 8 times at C.I.

Sol CI

'm' times in 'y' years

(m^n) —"— $(n \times y)$ years

2 times in 5 years

$8 \approx 2^3$ (times) in $3 \times 5 = 15$ yrs

$$A = P\left(1+\frac{R}{100}\right)^n$$

$$2P = P\left(1+\frac{R}{100}\right)^5$$

$$8P = P\left(1+\frac{R}{100}\right)^{15}$$

cubing

$$8P = P\left(1+\frac{R}{100}\right)^{15}$$

Q49
Q79
than
Pg 52
Q2
Q110

(49) → ~~Smillion~~ → ~~20% annually~~

~~$A = (1.2)^n$~~

~~$f(n=3)$~~

$$A = P\left(1+\frac{R}{100}\right)^n$$

$$P\left(1+\frac{20}{100}\right)^n$$

$$A = (1.2)^n$$

$f(n=3) = 1.728\ P$

$f(n=4) = 2.07P$

MOHIT CHOUKSEY

$$A = P\left(1+\frac{R}{100}\right)^n$$

$$2P = P\left(1+\frac{R}{100}\right)^{10}$$

$$2^{1/10} = \left(1+\frac{R}{100}\right)$$

Q2 $A = P + SI$

$3080 = P + \frac{PR\times 3}{100}$

$3400 = P + \frac{PR\times 5}{100}$

320 ← 2y (SI)

160 ← 1y (SI)

$2600 + (160\times 3) = 3080$

$2600 + 800 = 3400$

(interest)

T10 $5324 = P\left(1+\frac{R}{100}\right)^3$

$4840 = P\left(1+\frac{R}{100}\right)^2$

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

every layer

$T = (4\times 4)\times 4 = 64$

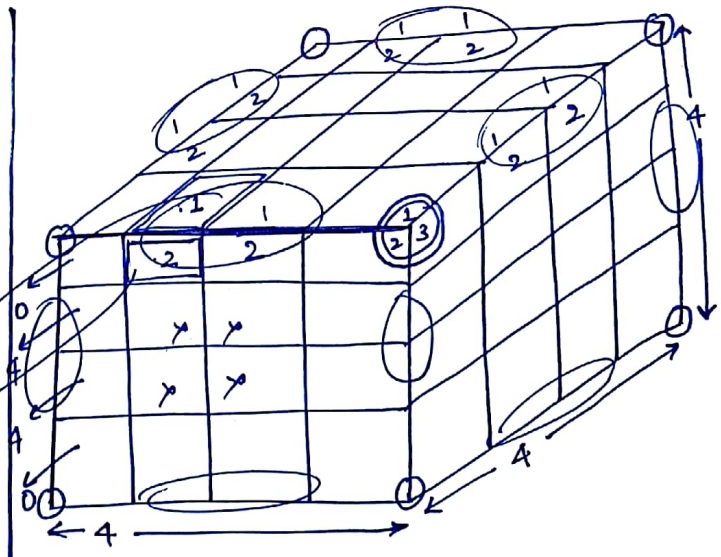
$3S = 8$ (↑ 3 side) +

$2S = 2\times 12 = 24$ +

$1S = 4\times 6 = 24$. (Top, front of the same cube)

$0S$ = Remaining

$= 8$

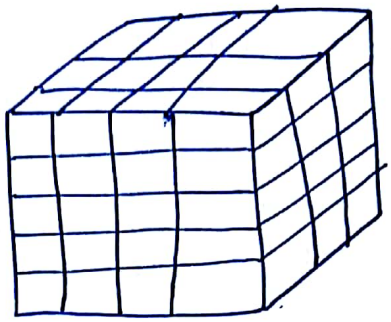


$2S = 2\times 12 = 24$.

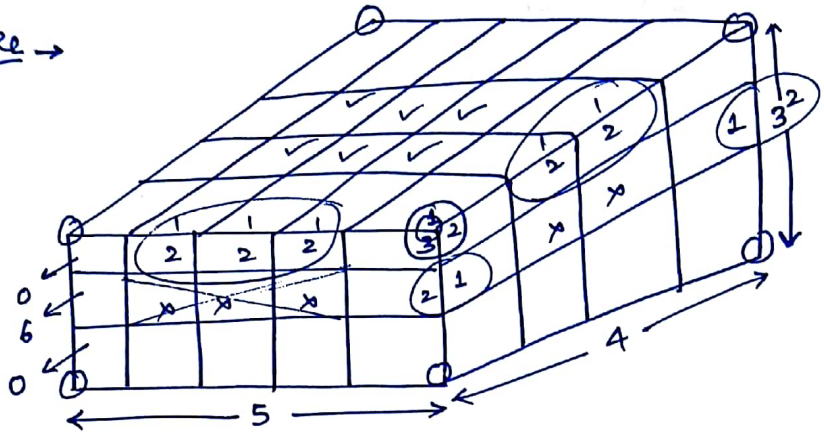
(2S ↓ side)

Q. A large cube was dipped in paints, taken out and then its length was divided into 5, width was divided into 4, height → into 3 equal parts. then, how many cuboids are painted on 3s, 2s, 1s, 0s.

Sol



Re →



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

$3s = 8 \cdot +$

$2s = 4[(3)+(2)+(1)] = 24 \cdot$

$+$

$1s = 2[(3)+(2)+6] = 22$

$0s = 6$

Q159 (56) ✓

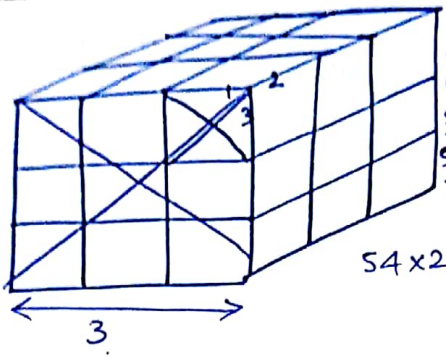
$T.S.A. = 6(side)^2$

$6(4)^2$

$TSA = 96$ ✓

Q121

(121)



54×3
54×1
54×2

$6(side)^2 = TSA$

$6(1)^2 \times 27 = T.S.A.$

$6(3)^2 = V.A.$

$54 \times 2 = 108$ ——— $= N.V.A.$

$+, -, \times, \div$

$\uparrow \downarrow \times \div$

Rule on Averages → ① If each and every obsr. set is $\uparrow, \downarrow, \times, \div$ by an constant, then their arithmetic mean is also $\uparrow, \downarrow, \times, \div$ by the same constant.

② Sum of the deviations taken from arithmetic mean is equal to zero.

(19) Pg 71

$$\text{Standard deviation} = \frac{\sqrt{d_1^2 + d_2^2 + \cdots + d_n^2}}{n}$$

* $d_1 = -2$ $d_2 = 0$ $d_3 = 2$
* 1 3 5 $\bar{x} = 3$
* 8 10 12 $\bar{x} = 10$
* $d_1 = -2$ $d_2 = 0$ $d_3 = +2$

Q47

a ✓
b ✗ avg atleast.
c ✓
d ✗ avg every.

(b) ✓

* "T" → 95% ile → 94.3, 94, 95 → consistency high
  5% ile → 92.3, 92, 91

"α" → 95% ile → 5.3, 5, 6
Avg 4
5% ile → 2, 3, 3.3

B | 95, 97, 96 | highly inconsistent
95%ile | Avg 12
5%ile | 2, 1, 3

Gate 2016

(181)

37) Q (Pg 73)

2012 → M - W → 41°C
T - T → 43°C
T → 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 kgs. Two new student having weight 54 and 66 kg joins the class. What's the new average.

Sol

$\frac{\text{sum}}{N} = \bar{x}$ ← average

N ← No.

$\text{Sum} = N\bar{x}$

$\text{Sum} = 42 \times 25$
$= 1050 + 54 + 66$
$= 1170$

07

12 ← 54
24 ← 66

$\frac{26}{273}\frac{4}{3} = 1.33$

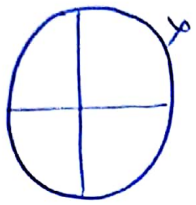
43.3

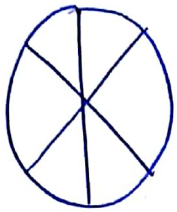
68	-2
75	+5
77	+3
62	-8
69	-1
74	+4

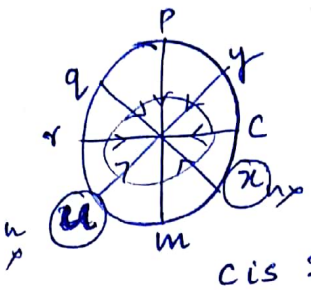
$70 + \frac{1}{6}$

70.66

* Seating Arrangement







c is 2 places right of m.

r is → → → left → → o

① equal parts.

② @ centre.

③ R → Immediate Right.

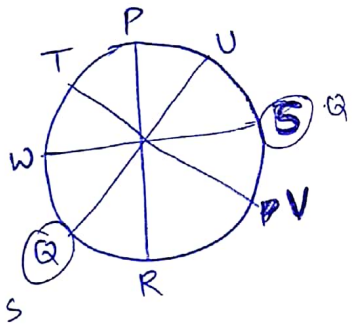
L → Immediate left.

④ $\begin{bmatrix} ACB \\ BCA \end{bmatrix}$

⑤ (m u)
(n m)

⑥ n m p

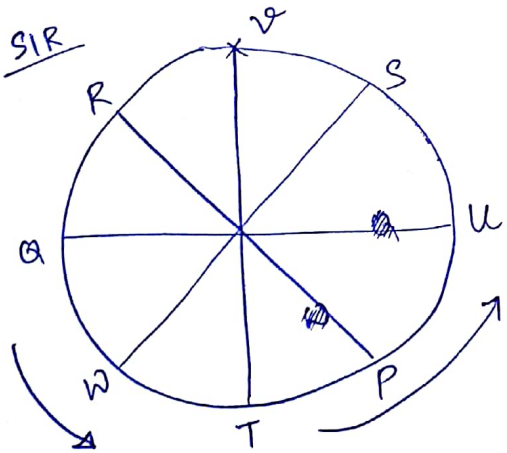
Q3
Q4
Q5



T ① ⑤ P ④

⑥ W ②

SIR



or $\begin{bmatrix} \cancel{TWQ} \\ QWT \end{bmatrix}$ → not allowed

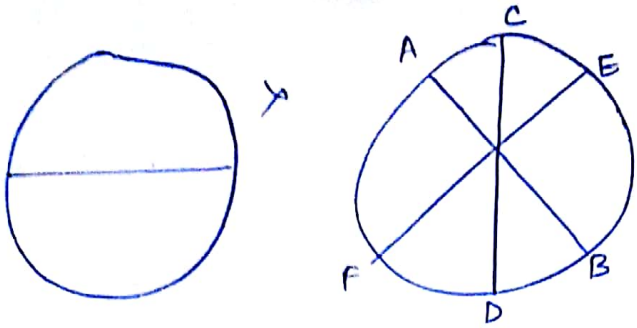
, Q ↔ V

$\overrightarrow{TP}$, P ↔ R

$\begin{bmatrix} RS \\ SR \end{bmatrix}$

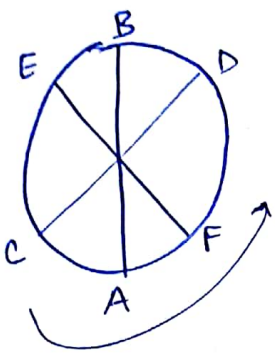
MOHIT CHOUKSEY

(9)



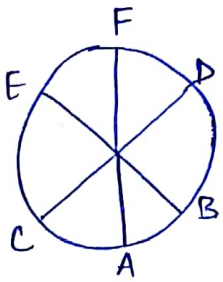
br
ar

SIR



[GDB]
[BDE]

; E — A — D



* BLOOD RELATIONS

There are 5 Rules :-

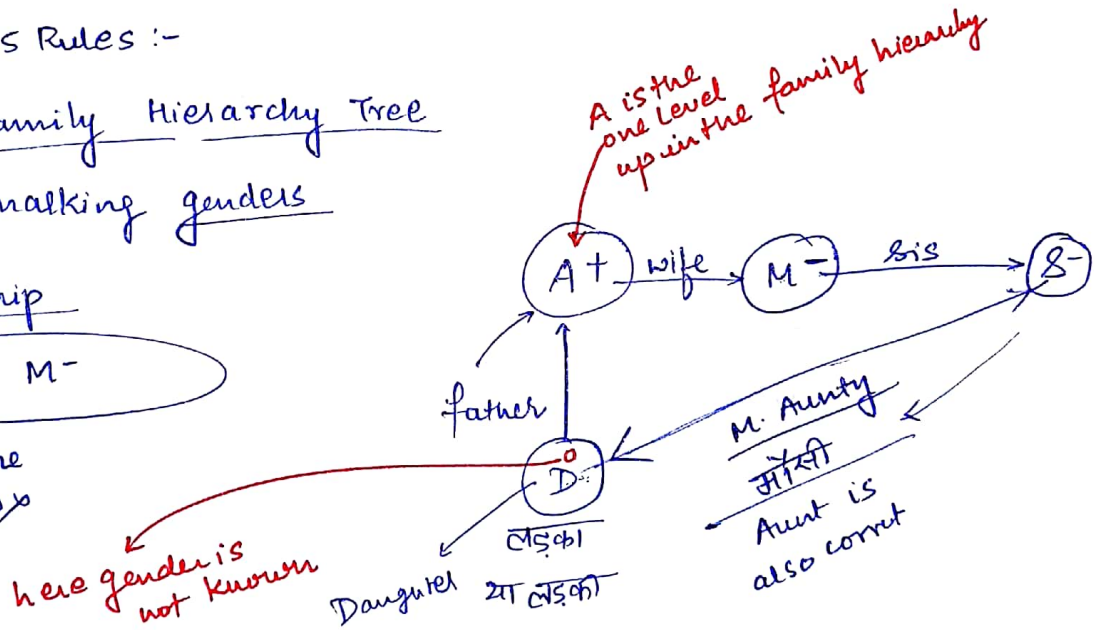
(1) Draw family Hierarchy Tree

(2) Keep on making genders

(3) Relationship

(4) A+ wife ⇄ M−

(5) dont Assume dont Names



Either Nephew or Niece (D with S−)

or

C · B · D

cannot be determined.

but Nephew ✗
Neice ✗

MOHIT CHOUKSEY

Q1 (M) woman

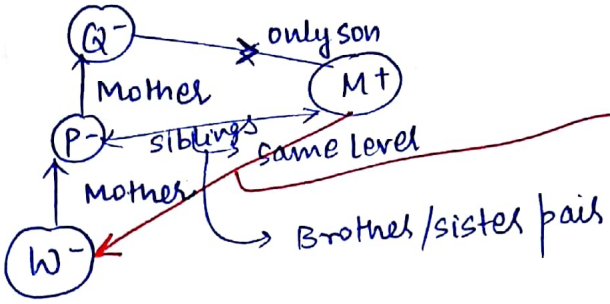
B — A (mother)

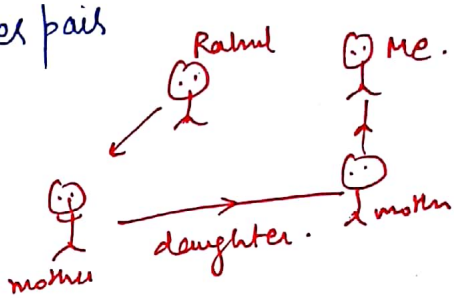
B (Mother)

(C) ✓

Q2

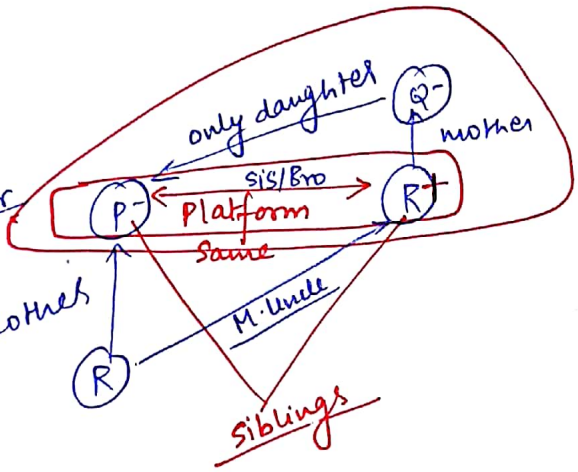
Q1 Sir



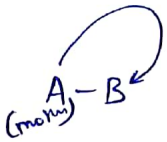


Women related to Man

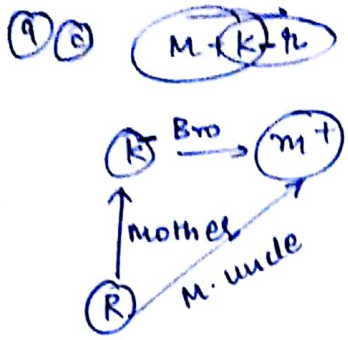
Q2 Sir

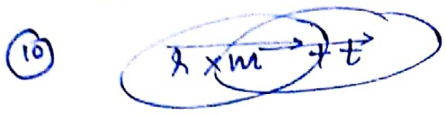


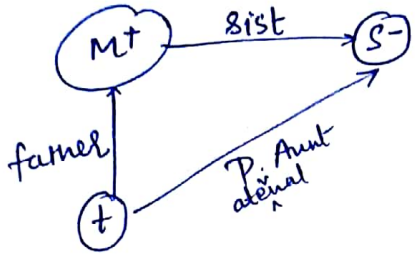
Q9

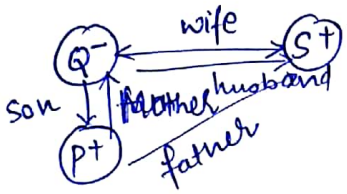


MOHIT CHOUKSEY









Pg no. 66

categories 6

	Hock.	volly	cricket	base	foot
R	✓	✓		✓	
K	✓	✓	✓		
S	✓			✓	✓
G		✓	✓	✓	✓
M				✓	✓

Q1

Q2

(3) c ✓

(4) strg

Analytical Reasoning

Pg 66

(3)

A	B	C	D	E	F
1	1				

Support

DS support → Finance

E, F → marketting

F → operations ← C & E

F → support coordi; C & E → support

A → Finance & IT (support)

A → main

(3) c ✓

(4) Operat (a) ✓ ✗

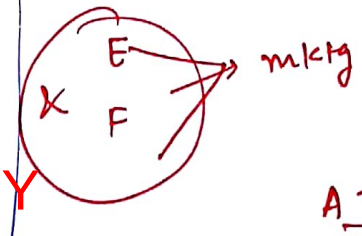
(5) A & (a) ✓ ✗

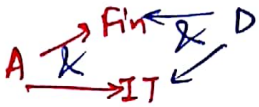
categories here are only 2

SIR

	co-ordinat	support
A	Finance	IT
B	Finance	strg (4)
C	Finance	opr
D	IT (3)	Fin
E	mktg	opr
F	opr.	mktg

[3 people - Co-ordinate - Fin]





MOHIT CHOUKSEY

(6) Pg67 7 books

please write in short

(1) Socio.
(2) Educ.
(3) Acc.
(4) < English
(5) Eco
(6) Psycho
(7) Hindi

Eco → सबसे आखिरी

Eco
Psycho
Hindi

Eco ✗

(c) ✓

Rules (ध्यान दें कृपया) :-

B follow A
OR
A is followed by B

8AM → A
8:15AM → B

A > B shortest
B > C
C > F

(7) 5 Girls

K → 2nd height

(A) → K < R ✓
(h) → P > R ✓
(h) → P > M
(A) → R & M
(h) → R > M
(h) N > P
(A) → R > N

1
2
3
4 (A) < K ✗
5

↑ ascending

P > R
P > M
R > M
N > P

N > P > R > M
(d) 7 ✓

K < R
R & M = R = M
R > N

R < R = M > N ✗
(d)

(8) A < B
C < D
B < C
A > E ✓

C > B > A > E

WB Pg67

5 girls

R
K

R > P ✗

P > R
P > M
N > P

SIR solutions

(7) Height
1 2
K

P > R ✗ ← shortest one have to come from R and P
P > M.
R > M.
N > P ✗

3 2 1
N > K > P > M > M

ascd ↑

दो एक बार और left side आ गया तो count करेंगे होगा shortest ही

Age

K ≠ Youngest

R < R ✗
P < M
R ≠ M
R < N

youngest one to have come from R P R

> P

N > R = M > K > P
1 2 3 4
3 2
dec

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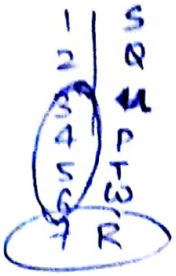
(11)



(20 to 22)

A K S, R N

R Y W G B

R P O S W

K → S → Y

S → R → R* & W*

N → P → B & Y

A → W

R → Y or G

(d)

	Red	Yellow	Blue	white	Green	
Amar					Read	reading
kap						playing
Sas						outing
Roh						singing
Nag						writing

(21)

	Red	Yellow	Blue	white	Green	Read	Play	outing	Sing	writing
Amal		✗			✗					✓
kapil	—	✗	—	—					✓	
Salvesh	✓					✗				✗
Rohan										
Nagesh		✗	✗				✓			

N.P.

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SIR's Solution

	colour		hobby
A	~~Red~~ yellow		write ✓
K	Yellow ✗	Blue or green or white	Sing ✓
S	Red ✓		Read ✗ out write ✗ ✓
R	yellow ✗ green ✗	Blue or white	Read ✓ ✓
N	Blue ✗ yellow ✗	white or green	Play ✓

Not single

(23) R → Blue

(24) Kapil → can't be determined. ✓

A → even

B → odd

Eswar doesnot live on floor number Bhola.

Dont tabulate.

Q44 → (Gate ~~fi~~)

	A	B	C	D	E	F
1 (Group)						
2						
⋮						
soon.						

(b) ✓ Bullshit.

(50) 4 children

SOM < Riaz

Shiv < Anshu

Anshu < group

youngest

sir

SOM < Ria ✓

Anshu < Shiv

Shiv (or) Riaz

(a) ✓

Pg (80) 101
Q>

P Q R S T U

	H	P	D	T	F
P					
Q					
R	✓				
S					
T					
U					

dont Tabulate the data

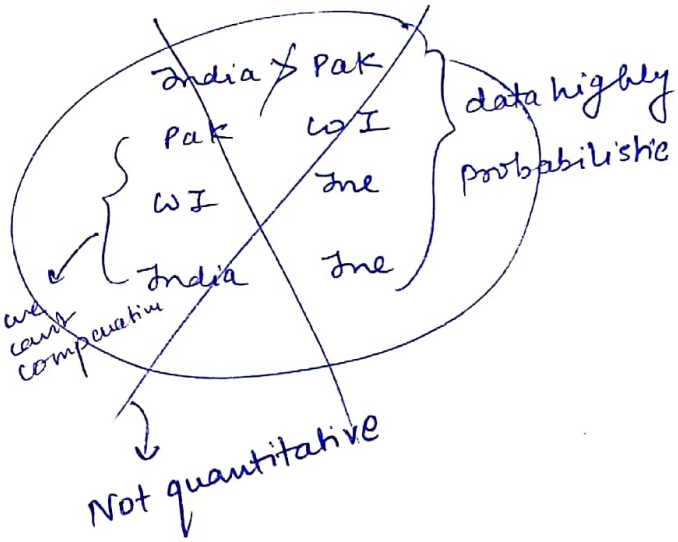
(a) ✗ R - Defence
(d) ✗ R - Telecom
(c) S & U cant be together

(b) ← Ans

Q161 Pg 88

A > B
B > C
A > B > C

} ~~if~~ Since data is quantitative



1 — 2 — 3
A — B — C

MOHIT CHOUKSEY

161 sir (4) ✓

copy cohen
↑
Book ✓

Lettering

A(1) B(2) C(3) D _ _ E(5) _ _ F _ _ G _ _ _ H I J(10) K

L M N O(15) P Q R S T(20) U W

V X Y(25) Z(26)

M = 13 + E | J | O | T | Y
5 10 15 20 25

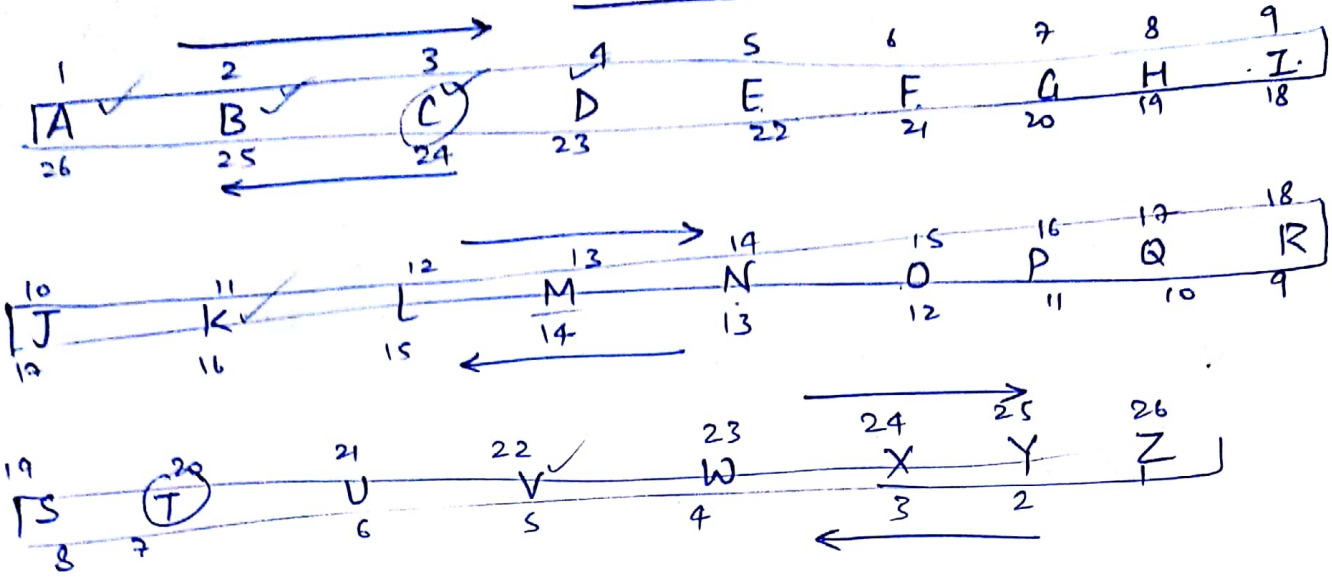
Pg no. 64
Q5
Q8
Q12
Q16

(5) AB = E (1 2 5)
EA = Y (5 1 25)
CD = Y (3 4 25)
BC = M (13)

(6) CAT =

MOHIT CHOUKSEY

LETTERING



M = 13 + E | J | O | T | Y
5 10 15 20 25

8

(16) ABK : V :: BCD : _____ 10

(c) ✓

(12) CARPET : TCEAPR :: _____ : LNAANTOI

5 20 20 5

(6) ✓

(5) →

SIR (5)

A B = E $1^2 + 2^2$ = 5	E A = y $5^2 + 1^2$ = 26 = Z
C D = y $3^2 + 4^2$ = 25	LNAAN

(12) CARPET : TCEA PR

: TCEAPR

NATIONAL : LNAANTOI

A B K : 12

1 × 2 × 11 : 22

B C D

2 × 3 × 4 = 2X

Q21
22
24
25 | 27

(21) BOARD : CPBSE

B ← D (C) → E

O ← (R) P → E

CHAIR :

BHOPAL EERMDI

NAGPUR

SIR (21)

(B H O P A L) : (E E R M D I)

2 8 15 16 1 5 5 18 13 4

+3 / −3 / +3 / −3 / +3

(22) MONKEY ← Y : X D J M N L

−1 −1

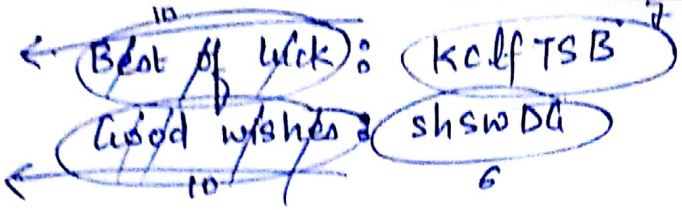
YEKNOM

MONKEY : X D J M N L

−1 −1 −1 −1 −1 −1

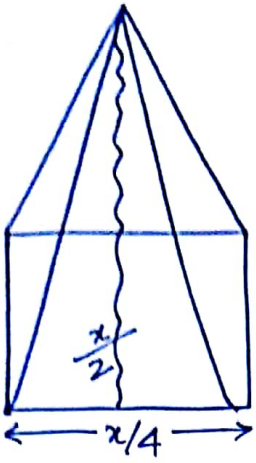
Tiger : Q

(−1)



NS
Alg
GateQns
Doubt

MOHIT CHOUKSEY



Q172 → $x \times \frac{x/2}{2}$

$\frac{x^2}{4}$

$\frac{1}{2} \times \left(\frac{x}{4}\right) \times \left(\frac{x}{2}\right)$

$\frac{x^2}{16} \times 4$

Q163 L↑ N↓ → e^x.

100 → 80 ✓

10000 → 40 ✓

5000 → ——

10,000 → 5000

80units — 100 cycles

Load↑ — N↑

40units — 10,000 ← N

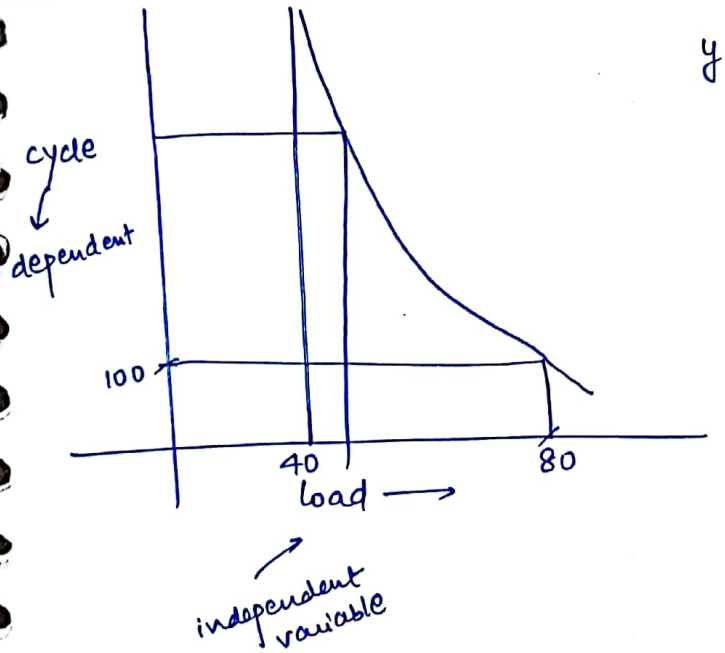
—— — 5,000 ← N

$y = ke^{ax}$

$y = e^{ax}$ | $y = ka^x$

$\frac{k a^{80}}{k a^{40}} = \frac{100}{10000}$

$a^{40} = 1/100$



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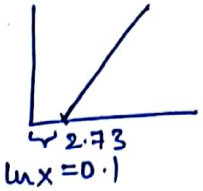
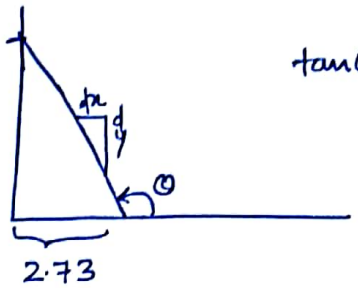
(169) $\frac{x}{100}y + \frac{y}{100}x$

$\frac{2xy}{100}$

2% of xy

(157) $(\ln x, y)$

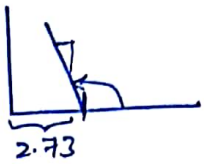




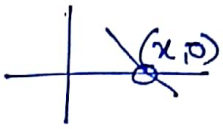
$\tan\theta = -0.02$

$\log_e x = 1$

$x = e^1$



(SIR) $(y - y_1) = m(x - x_1)$



$(x_1, y_1) \longrightarrow m$

x_1 → ln x, y_1 → general

$\ln x = .1$

$(Y - 0) = m(x - .1)$

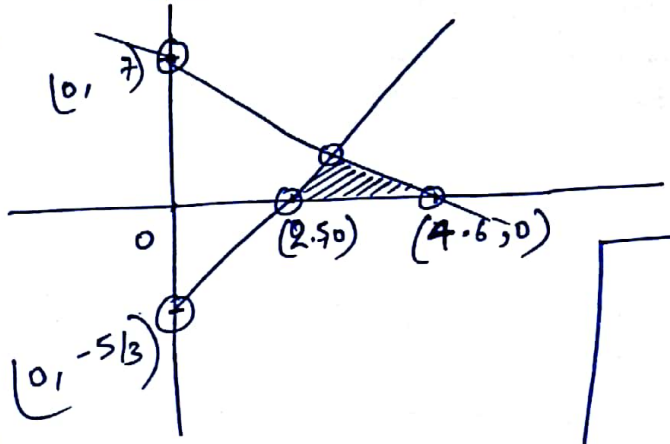
$(Y - 0) = -.02(x - .1)$

$Y = -\frac{2}{100}(x - .1)$

$Y = -\frac{2}{100}(\ln 5 - .1)$

(156) $3x+2y=14$

$2x-3y=5$



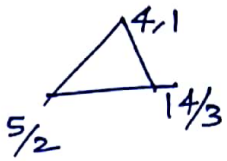
$3x+2y=14$

$x=0$	$y=0$ 4.66
$y=7$ ✓	$x=14/3$
	$x=4.\overline{6}$

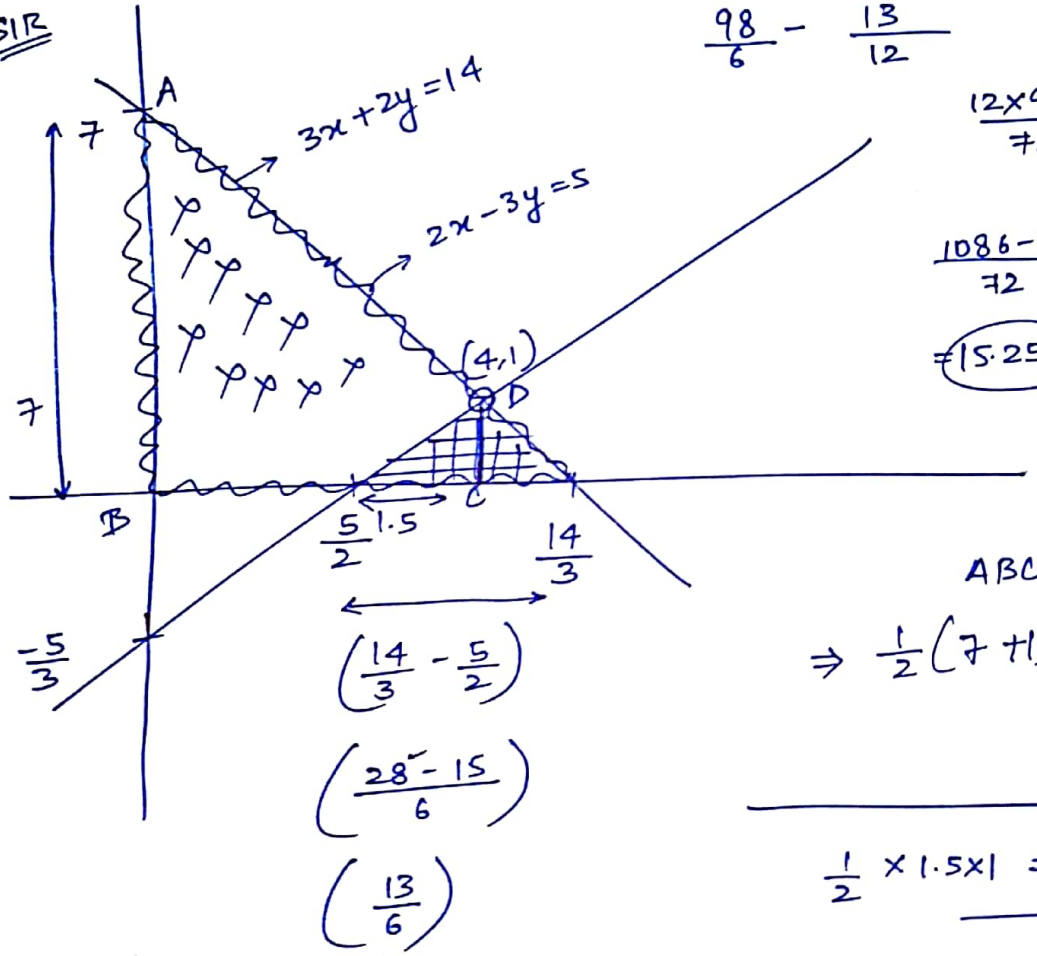
$2x-3y=5$

$x=0$	$y=0$ 2.5
$y=-5/3$	$x=5/2$

$\frac{1}{2}\times\frac{14}{3}\times 7-\frac{1}{2}\left(\frac{14}{3}-\frac{5}{2}\right)1$



SIR



$\left(\frac{14}{3}-\frac{5}{2}\right)$

$\left(\frac{28-15}{6}\right)$

$\left(\frac{13}{6}\right)$

$\frac{98}{6}-\frac{13}{12}$

$\frac{12\times 98-13\times 6}{72}$

$\frac{1086-78}{72}$

$=15.25$

13
×6
78

98
12
10 6
98×
1086

ABCD (Trapezium)

$\Rightarrow \frac{1}{2}(7+1)\times 4=\frac{8}{2}\times 4$

$=\frac{32}{2}=16$

$\frac{1}{2}\times 1.5\times 1=-.75$

15.25

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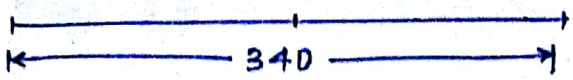
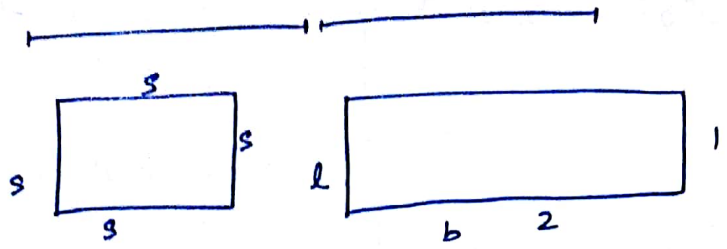
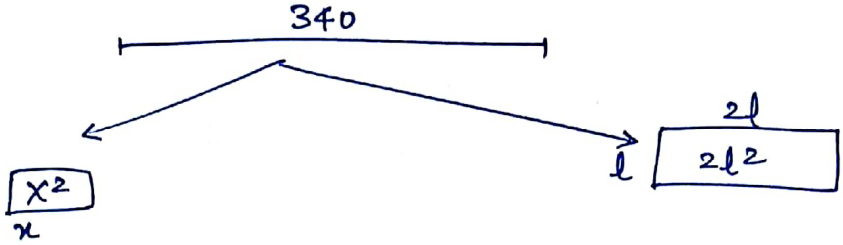
(150)





$A_S + A_R \rightarrow$ minm.

SIR



$4x + 6l = 340$

$\left[l = \frac{340-4x}{6}\right]$

$A = x^2 + 2l^2$

$A = x^2 + \left(\frac{340-4x}{6}\right)^2$.

(141) 50% ← prone TB → infection

30% ← ~~infected~~ → develops the disease.

70%. ✓ (c) ✓

(146) S, M, E, F

M → 2 y → ½ E

S, M → 6 hr

E, F → 12 hr

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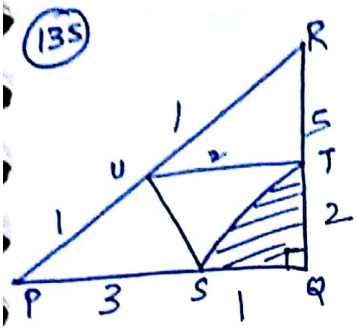
Q135 Q132 Q138

(135)



$\frac{PS}{QS} = \frac{3}{1}$ $\frac{PU}{UR} = \frac{1}{1}$ $\frac{RT}{QT} = \frac{5}{2}$ $A_{QTS} = 20 \text{ um}^2$

$\frac{1}{2} \times UT \times RT + \frac{1}{2} UT \times TQ + \frac{1}{2} \times PS \times QT$

$\frac{1}{2} UT(RT + QT) + \frac{1}{2} PS(QT)$

$\frac{1}{2} \frac{UT}{QT} QT\left(\frac{RT}{QT} + 1\right) + \frac{1}{2} \frac{PS}{QS}(QT \times QS)$

$\frac{1}{2} UT\, QT\, (5/2 + 1) + \frac{1}{2} 3(QT \times QS)$

40 20

$\frac{1}{2} (UT)(QT)\left(\frac{7}{2}\right) + 60$

$\frac{1}{2} \frac{UT}{QS} \times (QT \cdot QS) \frac{7}{2} + 60$

10 5

$\frac{UT}{QS}$ 35 +60

70 +60 ✓

$\frac{1}{2} QT \times QS = 20$

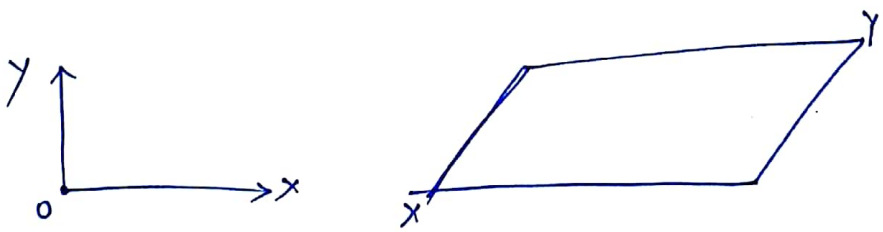
40

$1^2 = \sqrt{5^2 + b^2}$

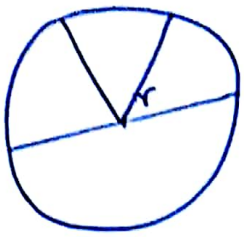
$1 - 5^2 =$

-4

(38)



132.



$r = 30cm$

Remaining area $= 0.9 \times \pi (30)^2$ = Lateral surface area of the cone

$= \pi R (30)$ ← slant height (l)

$\Rightarrow R = 27$

$\Rightarrow r = 30$

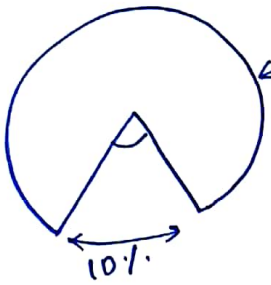
$h^2 + 27^2 = 30^2$

$h = \sqrt{30^2 - 27^2}$

$\frac{R}{h} = \frac{27}{13.076}$

$h = 13.076$

*



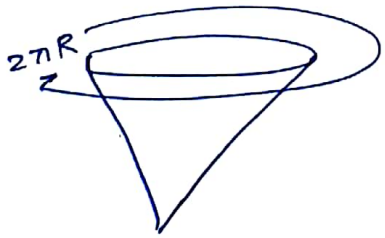
$\frac{\theta}{360^\circ}(2\pi R)$ area also 10% ↓

$\frac{\theta}{360^\circ}(\pi R^2)$

Linear dependency.

$\Rightarrow (2\pi R 0)\ 0.9 = 2\pi R$

30 $R = 27$



138 P Q R

Y Q P R X

Y X

Q 138

$P(x_1, y_1)$

$Q(x_2, y_2)$

$R(x_3, y_3)$

$-4 \le x \le 5$

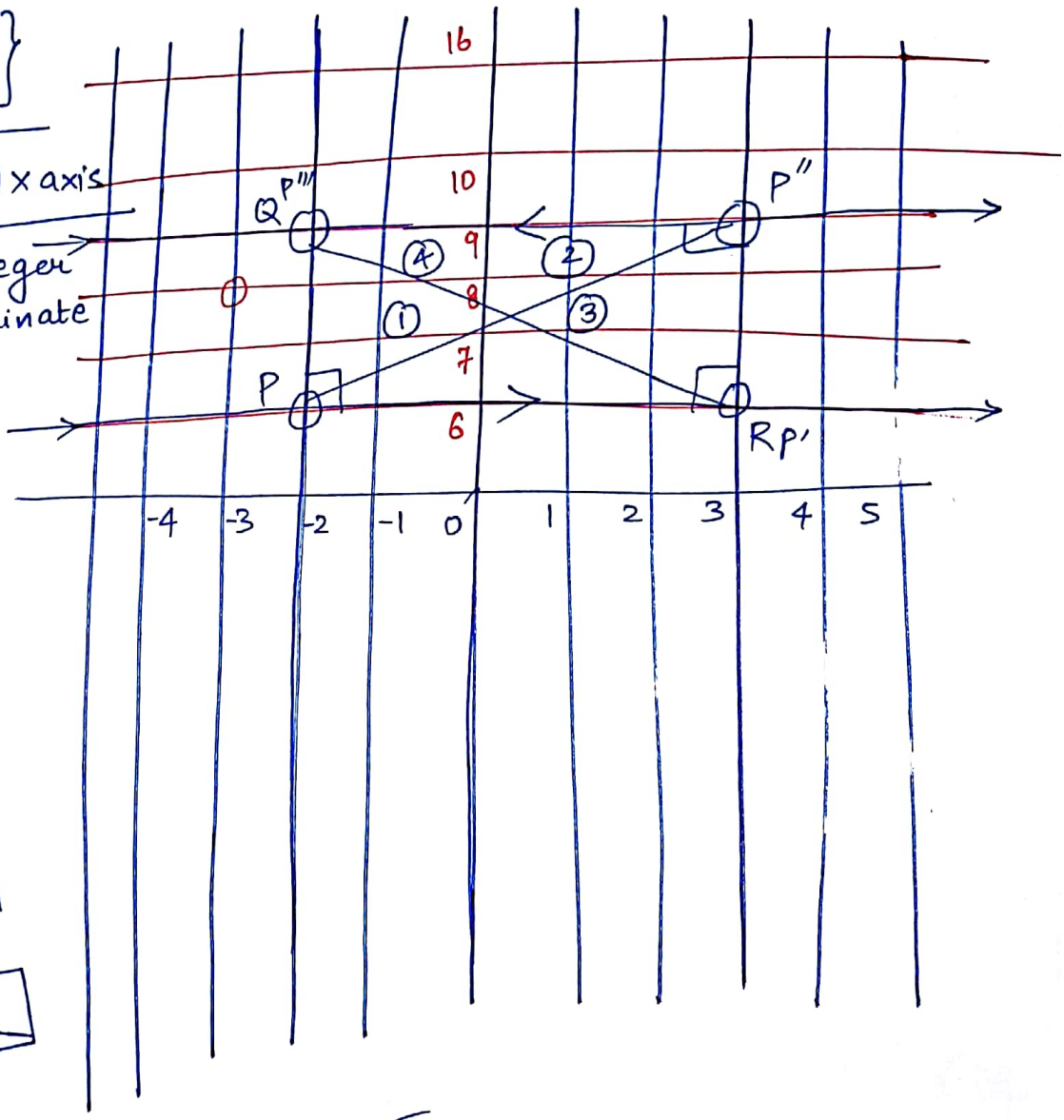
$-6 \le y \le 16$

$\{-4 \le x \le 5\}$

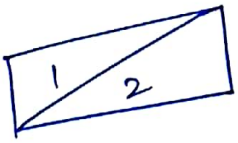
$\{6 \le y \le 16\}$

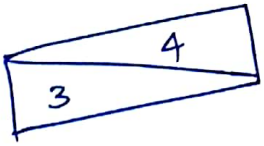
$\angle P = 90°$, PR || X axis

PQR → integer coordinate



$[{}^{11}C_2 \times {}^{10}C_2] \times 4$





126, 127, 136, ✓

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126 $a^2+b^2+c^2 = 1$ $\quad ab+bc+ac$

$(a+b+c)^2 = \underbrace{a^2+b^2+c^2}_{1} + 2ab+2b+2ca$

$1 \quad +2\underbrace{(ab+bc+ca)}$

$1 + 2$

$(a+b+c)^2-(a^2+b^2+c^2) = 2(ab+bc+ca)$

$(-1) + (a+b+c)^2 = 2(ab+bc+ca)_{min}$ (+ve/0)

$(a+b+c)^2$: for making min^m this value make = 0

$(ab+bc+ca)_{min}$: ↳ min $(-1/2)$ (-b) ✓

But..

$\left.\begin{matrix}[-1/2, 1/2] \\ [-1/2, 1]\end{matrix}\right\}$ in cat

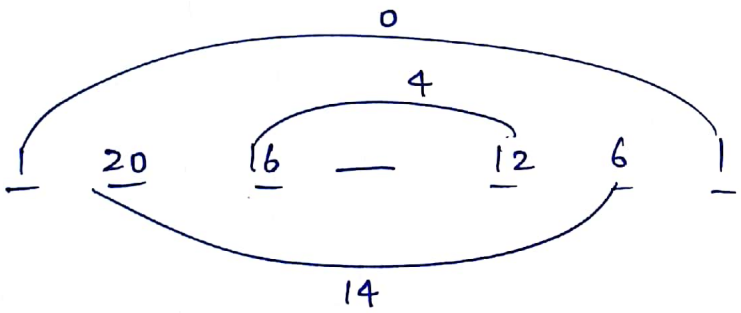
$(a-b)^2+(b-c)^2+(c-a)^2 = 2(a^2+b^2+c^2)$

$-2(ab+bc+ca)$

$2(ab+bc+ca) = 2(1) - [(a-b)^2 + (b-c)^2 + (c-a)^2]$

$(ab+bc+ca)_{max}$ (each square $\to 0$)

122



15 ✓

2×6 21 ✓

3×3 24 ✓

3×9 15 ✓

4×3^{31} 41

SIR

6 5 ✓ 4

7+4 ✓ 7 2+1

1+9+2 ✓ 8 1+2+1

118

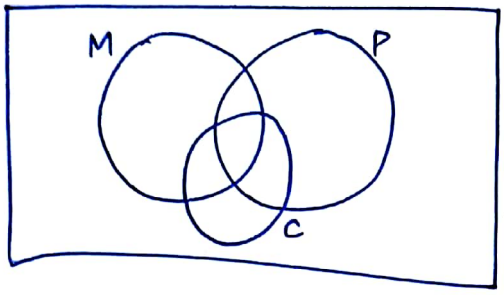
M → M
P → P
C → C

75% → atleast one
50% → atleast two
40% → exactly two

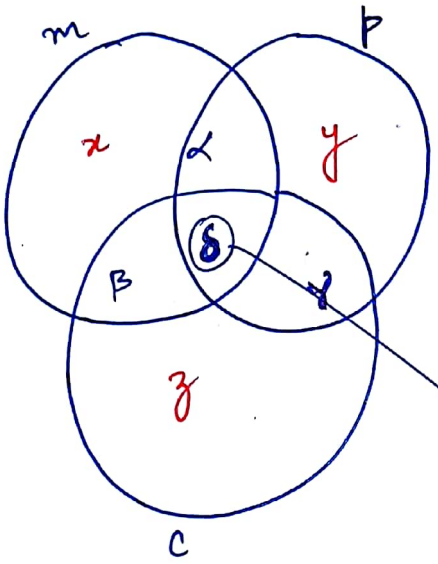
$P+m+C = 27/20$

$P+m+C = 13/20$

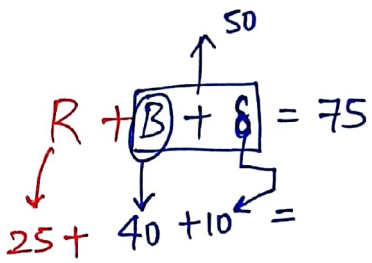
$P \times m \times C = 1/10$



SIR



$\delta = 10\% \ \frac{1}{10}$



$m \times p \times C = 1/10$

(2) $m+p+C = \frac{13}{20} = \frac{65}{100} = 65\%$ $\because < 75\%$

$m+p+C = \frac{135}{100} = \frac{27}{20}$

$R + 2B + 3\delta$

$25 + 2(40) + 3(10) = 135$

112/113

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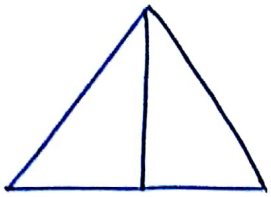


113 only read h

rem $\left(\frac{p \times q}{r \times s}\right)$ if $(p \times q) > (r \times s)$

SIR $h = Re\left(\frac{7 \times 3}{5 \times 2}\right) = 1$

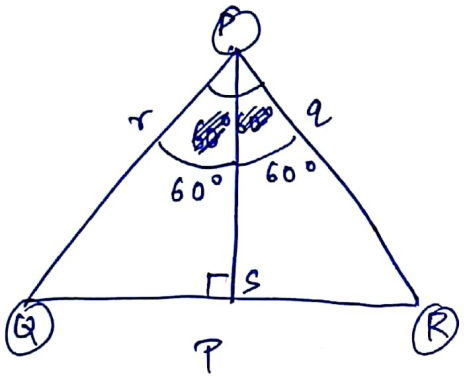
$fg(1,4,6,8)$.

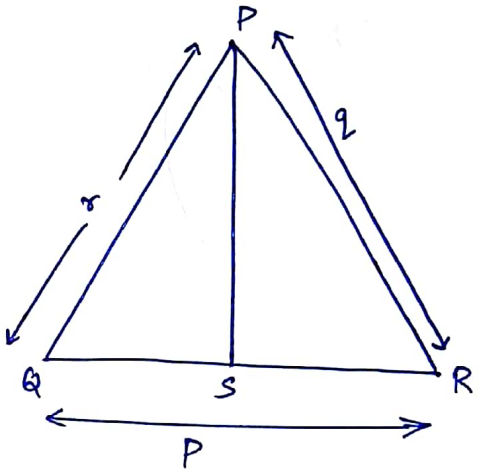
$f(1,4,6,8)$ $g(1,4,6,8)$

$\max(p,q,r,s)$ $\min(p,q,r,s)$

$\max$ (8) $\times$ (1) = (8)

112





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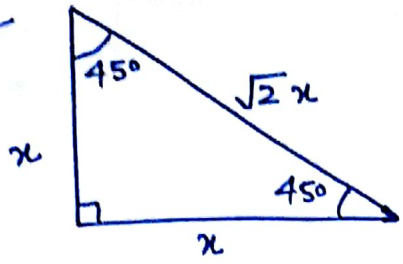
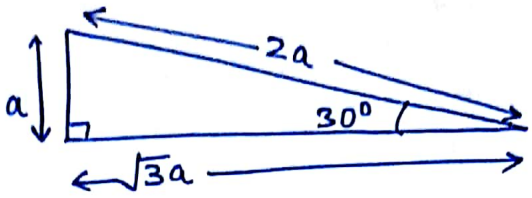
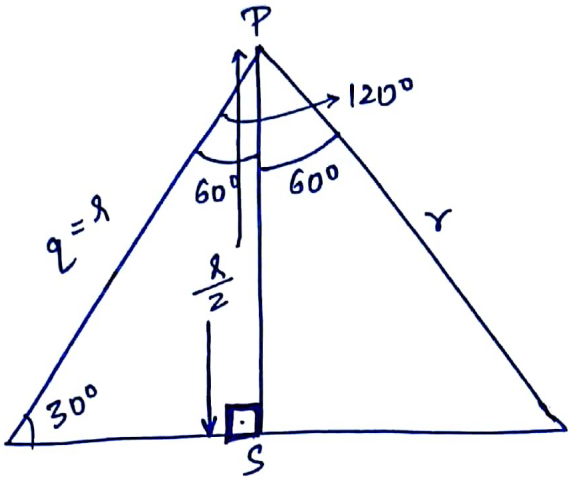
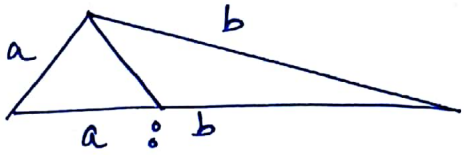
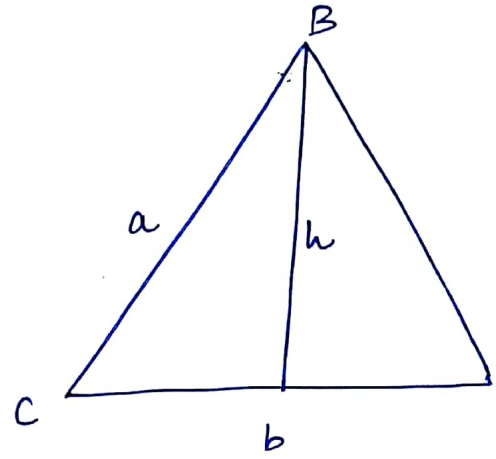






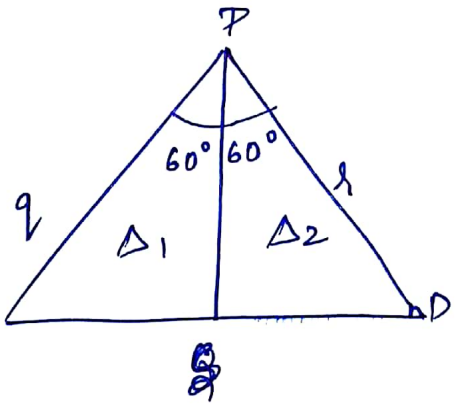




$\frac{h}{a} = \sin C$

$h = a \sin C$

$\frac{1}{2} \times b \times h = \frac{1}{2} \times ab \sin C$



$\frac{1}{2} \times qPS \sin 60° + \frac{1}{2} rPS \sin 60°$

$\Delta = \frac{1}{2} qr \sin(120°)$

$PS(q+r) = rq$

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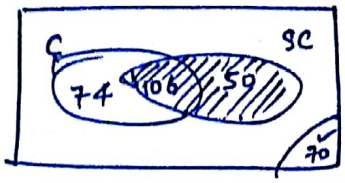
89. Car 74
SC 50
Both 106
None 70



$\left[\frac{74+70}{300}\right] \times 100$

88. D → 10% → T. F.

SIR $(100 \times 2)\ S = 1000$

100 − 10 ✓
− 5 ✓
15 ✓

1 Ticket → 85/-

$(85 \times 2) \times 5 = 850$

76. 100B → 4 B

R → 1B → defective

5 DB ✓

SIR $T = 100$
$D = 5$
$D = 95$

fc
$Tc = \frac{{}^{95}C_4}{{}^{100}C_4}$ ✓
Total chances

$(.95)^4$ ✓

73. Q Population

66. Q [HH] [HT] [TH]

$\frac{\frac{1}{2} \times \frac{1}{2}}{\left[\frac{1}{2} \times 1 + \frac{1}{2} \times \frac{1}{2}\right]} = \frac{1/4}{3/4} = \frac{1}{3}$

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