Date ___/___/___

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Start Date - 19/02/2023 (05/03/2023)
End Date - 28/05/2023

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1. Number system-1 19 Feb 23

Date 05 / 02 / 2023

WARRIOR

* Aptitude → - Quant
  - DI / LR
  - Verbal

10 Que ← Gate

5Q - 1M 5Q - 2M = 5×1 + 5×2 = 15 Marks

* Numbers :-

① Natural Numbers :- 1, 2, 3, 4, -----

Prime No.: 2, 3, 5, 7, 11, ----

Composite No.: 4, 6, 8, 9, 10, ----

#. ① is neither prime nor composite.
② is the only even prime number.

Que. Pick the odd one out in the following: 13, 23, 33, 43, 53
(a) 23 (b) 33 (c) 43 (d) 53
GATE-2016: IISC Banglore (EE)

Ans: b 33 Ans. → composite, others are primes

* 2 B
3 C
5 E
7 G
11 K Ans.

Que. 2014: IIT KGP (EC, ME)
Find the next term in sequence:
7G, 11K, 13M, ——.
(a) 15Q (b) 17Q (c) 15P (d) 17P

Ans:- b 17Q Ans.

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(*) NOTE :-

• $1^{\text{Natural No}}$	$\longrightarrow$ 1	$1^2 = 1^{2002} = 1$
• $5^{\text{Natural No}}$	$\longrightarrow$ 5	$5^2 = 25$, $5^3 = 125$
• $6^{\text{Natural No}}$	$\longrightarrow$ 6	$6^2 = 36$, $6^3 = 216$

(*) • $4^1 = 4$ $\quad 4^3 = 64$

$4^2 = 16$ $\quad 4^4 = 256$

$\rightarrow 4^{\text{odd}}$ $\longrightarrow$	UDV = 4
$\rightarrow 4^{\text{even}}$ $\longrightarrow$	UDV = 6

(*) $9^1 = 9$ $\quad 9^3 = 729$

$9^2 = 81$ $\quad 9^4 = 6561$

• 9^{odd} $\longrightarrow$	UDV = 9
• 9^{even} $\longrightarrow$	UDV = 1

$3456789^3 \rightarrow$ UDV = 9

$\simeq 9^3$

जितना digit पूछा जाए उतने digit पर ही ध्यान दो।

$\rightarrow 43498761 9^{2000} \simeq 9^{2000} \rightarrow 9^{\text{even}} \rightarrow$ UDV = 1 Ans

Que The unit's place in $2659174 9^{110016}$ is

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

IIT Delhi, Gate 2020

Ans :- [b] $\simeq 9^{110016} \rightarrow 9^{\text{even}} \rightarrow$ UDV = 1 Ans

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Saathi

(*) Break / Brake

आराम — bike scooty का brake

Que. The driver applied the _____ as soon as she approached the hotel where she wanted to take a _____.

(a) brake, break
(b) break, break
(c) brake, brake
(d) break, brake

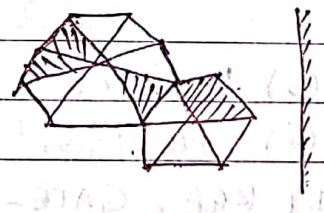
IIT Guwahati, GATE 2018

Ans. a

(*) IIT Bombay - 2021 → Spatial (स्पेटियल) Aptitude.

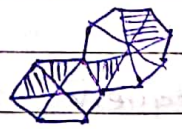
- Mirror Image
- Paper cutting
- Paper folding
- water Image, ... etc.

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



IIT Kharagpur, Gate 2022

Ans. a



Ans

(*) Perfect Square :-

1
4
9
16
25

Sequence : 1, 4, 9, 16, 25, 36

x^2

$x^2 \pm 1/2/3$

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Que. Which number does not belong to in the series below:

2, 5, 10, 17, 26, 37, 50, 64

(a) 17 (b) 37 (c) 64 (d) 26

Gate-2014: , IIT KGP, EE, CSE

Ans [c] 64, others are x^2+1 Ans.

(*) Fair / Fare

↓ उचित ↓ भाड़ा

Que. The ___ is too high for it to be considered ___.

(a) fair / fare (b) faer / fair

(c) fare / fare (d) fare / fair.

IIT KGP, GATE-2022

Ans:- [d] fare / fair.

(*) very / too

+ve −ve

Que. After playing ___ hours of tennis, I am feeling ___ tired to walk back.

(a) too / too (b) too / two

(c) two / two (d) two / too

IIT KGP, GATE-2022

Ans: [d] two / too

(*)

+1 (A C)

(B D) +1

(C E)

(D F)

+1 (E G) +1

Que. Given the sequence of terms:

AD, CG, FK, JP.

The next term is

(a) OV (b) OW (c) PV (d) PW

GATE-2012, IIT D, ME, CE, CSE

Ans: [a] AD CG FK JP [OV]

+3 +4 +5 +6

+2 +3 +4 +5

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2. Number System - II

Date 05/03/2023

NUMBERS

#01 To Find the Number of 0's at the End:

0's → Plural

Apostrophe → Name → Possession (Ravi's, ...)
→ Symbols/Numbers → Plural (0's, #'s)

Objective:-

100! → 2's ✓, 3's ✓, 0's ✓

1000! → 7's ? ✓, ...

NIT Raipur → DRDO: 8

#	CM (Cruze Missile)	BM (Ballistic Missile)
	Brahmos	P – Prithvi
		A – Agni
		T – Trishul
		N – Naag
		A – Akash

CM → E

BM → E

Que. Find Maximum no. of 3's in 10! ?

Ans:-

$10! = 10 \cdot 9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 4$ Ans.

(9 → 3, 3; 6 → 2, 3)

If Que. is 100!, 1000!, ... Then What?

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$N!$

1. Prime No.

2. Composite No.

(i) $10! \longrightarrow 3's = ?$

$$\left[\frac{10}{3}\right] + \left[\frac{10}{3^2}\right] + \left[\frac{10}{3^3}\right]$$

GIF

Conditions:-

1.) Prime No.
2.) Integral values
3.) Till $N \geq D$

$= 3 + 1 + 0$

$= 4$ Ans

(ii) $25!$

$2's = \left[\frac{25}{2}\right] + \left[\frac{25}{2^2}\right] + \left[\frac{25}{2^3}\right] + \left[\frac{25}{2^4}\right] + \left[\frac{25}{2^5}\right]$

$= 12 + 6 + 3 + 1$

$= 22$ Ans.

$12 + 6 + 3 + 1 = 22$ Ans

(iii) $50!$

a) $2's = \cancel{50} + 25 + 12 + 6 + 3 + 1 = 47$ Ans

b) $3's = 16 + 5 + 1 = 22$ Ans.

c) $7's = 7 + 1 = 8$ Ans

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Saathi

* **Test :-**

Que. 2's / 3's / 5's / 7's (Find)

(1) 100!

2's = 50 + 25 + 12 + 6 + 3 + 1 = 97

3's = 33 + 11 + 3 + 1 = 48

5's = 20 + 4 = 24

7's = 14 + 2 = 16 Ans

N!

1. Prime Number

2. Composite Number

↓

• Break into Prime Factors

(i) 25!

2's = 22

a.) 4's (2^2) = $\frac{22}{\text{power}}$ = $\frac{22}{2}$ = 11 Ans

b.) 8's (2^3) = $\frac{22}{3}$ = 7 Ans

c.) 16's (2^4) = $\frac{22}{4}$ = 5 Ans.

(ii) 25!

3's = 8 + 2 = 10

a.) 9's = (3^2) = $\frac{10}{2}$ = 5 Ans

b.) 27's = (3^3) = $\frac{10}{3}$ = 3 Ans

c) 81's = (3^4) = $\frac{10}{4}$ = 2 Ans

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Saathi

*. Test

(i) 100!

2's = 50 + 25 + 12 + 6 + 3 + 1 = 97

4's = (2^2) = $\frac{97}{2}$ = 48

8's = (2^3) = $\frac{97}{3}$ = 32

16's = (2^4) = $\frac{97}{4}$ = 24

3's = 33 + 11 + 3 + 1 = 48

9's = (3^2) = $\frac{48}{2}$ = 24

27's = (3^3) = $\frac{48}{3}$ = 16

5's = 20 + 4 = 24

25's = (5^2) = $\frac{24}{2}$ = 12 Ans.

(*) $2 \times 3 = 6^1$ $\quad 2^{10} \times 3^{1} = 6^{1}$ $\quad (6^1 \times 2^9)$

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

$2^3 \times 3^3 = 6^3$ $\quad 2^{10} \times 3^{100} = 6^{10}$ (lesser of the two power)

* 25! → 2's = 22 → 2^{22}

3's = 10 → 3^{10}

5's = 6

7's = 3

→ 6's = $2^{22} \times 3^{10}$ = 10 Ans.

→ 15's = $3^{10} \times 5^6$ = 6

→ 21's = $3^{10} \times 7^3$ = 3

* Test :-

100! → 32's

→ 343's

→ 6's

→ 15's

21's

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Date ___/___/___

$100! \rightarrow 2's = 97$ $\Rightarrow$ $32's = (2^5) = \frac{97}{5} = 19$

$3's = 48$

$5's = 24$ $\quad 343's = (7^3) = \frac{16}{3} = 5$

$7's = 16$

$6's = 2^{97} \times 3^{48} = 48$

$15's = 3^{48} \times 5^{24} = 24$

$21's = 3^{48} \times 7^{16} = 16$ Ans.

* 0's

$10 = 2 \times 5$ $\quad 100! \Rightarrow 2^{97} \times 5^{24} \rightarrow 0's = 24$ Ans

\# $\boxed{N!}$

$\downarrow$

$\boxed{0's = 5's}$

Que. No. of 0's at the end?

(i) $10! \rightarrow 2^8 \times 5^2 = 2$ $\quad [3628800]$

(ii) $25! \rightarrow 2^{22} \times 5^6 = 6$

(iii) $100! \rightarrow 2^{97} \times 5^{24} = 24$

Que. $5^{100} \times 10! \rightarrow 0's = 5^{100} \times 2^8 \times 5^2 = 8$ Ans.

* $25! \rightarrow 2^{22} \times 3^{10}$

1.) $12's = (2^2 \times 3) = 2\left(\frac{22}{2}\right) \times 2^{10} = 10$ Ans

2.) $18's = (2 \times 3^2) = 2^{22} \times 3^5 = 5$ Ans

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

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Saathi

* Students' Dharma

Que. Find 2's / 4's / 8's 6's 18's

3's / 9's 15's

5's / 25's 21's

7's / 49's 12's

① 100!

2's = 50 + 25 + 12 + 6 + 3 + 1 = 97

3's = 33 + 11 + 3 + 1 = 48

5's = 20 + 4 = 24

7's = 14 + 2 = 16

4's = $\frac{97}{2}$ = 48 , 8's = $\frac{97}{3}$ = 32

9's = $\frac{48}{2}$ = 24 , 27's = $\frac{48}{3}$ = 16

49's = $\frac{16}{2}$ = 8 , 6's = $2^{97} \times 3^{48}$ = 48

15's = $3^{48} \times 5^{24}$ = 24 , 21's = $3^{48} \times 7^{16}$ = 16

12's = $2^{97/2} \times 3^{48}$ = 48 , 18's = $2^{97} \times 3^{48/2}$ = 24

② 150!

2's = 75 + 37 + 18 + 9 + 4 + 2 + 1 = 146

4's = 146/2 = 73

8's = 146/3 = 48

3's = 50 + 16 + 5 + 1 = 72

9's = 72/2 = 36

5's = 30 + 6 + 1 = 37

25's = 37/2 = 18

6's = $2^{146} \times 3^{72}$ = 72

15's = $3^{72} \times 5^{37}$ = 37

21's = $3^{72} \times 7^{24}$ = 24

7's = 21 + 3 = 24

49's = 24/2 = 12

③ 200!

2's = 100 + 50 + 25 + 12 + 6 + 3 + 1 = 197

4's = 197/2 = 98

8's = 197/3 = 65

3's = 66 + 22 + 7 + 2 = 97

9's = 97/2 = 48

5's = 40 + 8 + 1 = 49

25's = 49/2 = 24

7's = 28 + 4 = 32

49's = 32/2 = 16

6's = $2^{197} \times 3^{97}$ = 97

15's = $3^{97} \times 5^{49}$ = 49

18's = $2^{197} \times 3^{97/2}$ = 48

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3. Number System – III

Date 05 / 03 / 2023

Saathi

#2 UDV (Unit Digit Value):-

IISc Banglore – 2016
IIT Roorkey – 2017
IIT Delhi – 2020
IIT Kanpur – 2023

Objective:-

$2^{23} \rightarrow$ __ __ ? $399 \rightarrow$ __ ? $13^{2023!} \rightarrow$?

$4^{96} \rightarrow$ __ ? $19^{2009} \rightarrow$ __ ? ..... etc.

* Power Cycle:-

$2^1 = 2$, $\cancel{2^5 = 32}$

It is the highest power of any number as long as we get unique/distinct digits at the unit place.

$2^4 = 16$ ✓ — $2^2 = 4$

$2^3 = 8$

⇒ Power cycle of 2 = 4
4 UDV = 6

$\boxed{2}$ → PC = 4, UDV = 6

$3^1 = 3$ | $\cancel{3^5 = 243}$

$3^4 = 81$ ✓ — $3^2 = 9$

$3^3 = 27$

$\boxed{3}$ → PC = 4, UDV = 1

$7^1 = 7$ | $\cancel{7^5 = 7}$

$7^4 = 2401$ — $7^2 = 49$

$7^3 = 343$

$\boxed{7}$ → PC = 4, UDV = 1

$8^1 = 8$ | $\cancel{8^5 = 8}$

$8^4 = 4096$ — $8^2 = 64$

$8^3 = 512$

$\boxed{8}$ → PC = 4, UDV = 6

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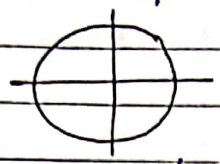
$4^1 = \underline{4}$ / $4^3 = 6\underline{4}$



$4^2 = 1\underline{6}$ / $4^4 = 25\underline{6}$

$9^1 = \underline{9}$ / $9^3 = 72\underline{9}$

$9^2 = 8\underline{1}$

$\boxed{4}$ → PC = 2, → UDV = 6

$\boxed{9}$ → PC = 2, → UDV = 1

(*)

Numbers	Power cycle	UDV
1	1	1
2	4	6
3	4	1
4	2	6
5	1	5
6	1	6
7	8	1
8	4	6
9	2	1

* UDV :-

(I) (i) 2^{23} → $2^{\text{power cycle}}$

$\frac{\text{Power}}{\text{PC}}$

$(2^4)^5 \times 2^3$ $\quad \frac{23}{4} = 5/3$

$\underbrace{6}^5 \times 2^3$

6×8

8 Ans.

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always 6

Saathi

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(ii) $2^{97} \rightarrow (2^4)^{24} \times 2^1$

$6^{24} \times 2^1$

6×2

2 Ans.

(iii) $2^{2009} \rightarrow (2^4)^{502} \times 2^1$

$6^{502} \times 2^1$

6×2

2 Ans

$6^1 \rightarrow 6$

$6^2 \rightarrow 36$

$6^3 \rightarrow 216$

$\Rightarrow \boxed{6^n \rightarrow 6}$

(iii) $2^{2009} \rightarrow (2^4)^{\text{—}} \times 2^1$

no matter what

$2^{20\boxed{09}} \rightarrow (2^4)^{\text{—}} \times 2^1 =$ 2 Ans.

($\because$ 4 - divisibility $\rightarrow$ only 2 digits)

$6 \times 2 = 12$

$6 \times 4 = 24$

$6 \times 8 = 48$

* $2^{12} \rightarrow (2^4)^3$ divisible by 4

$= 6^3$

$=$ 6 Ans.

$\therefore 2^{23} \rightarrow 2^3 =$ 8 Ans

$2^{97} \rightarrow 2^1 =$ 2 Ans.

$2^{2009} \rightarrow 2^1 =$ 2 Ans

$2^{77} \rightarrow 2^1 =$ 2 Ans

$2^{20212023} \rightarrow 2^3 =$ 8 Ans

$2^{1234567890} \rightarrow 2^2 =$ 4 Ans.

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* Test :-

Find UDV :

① $2^{99} \rightarrow 2^{3} = 8$ Ans

② $2^{9987654321} \rightarrow 2^{1} = 2$ Ans

③ $2^{44886644} \rightarrow 6$ Ans

④ $2^{2023!} \rightarrow (2^{4})^{-} \rightarrow 6$ Ans.

\# $4! = \frac{\cancel{4} \times 3 \times 2 \times 1}{\cancel{4}}$ $5! = \frac{5 \times \cancel{4} \times 3 \times 2 \times 1}{\cancel{4}}$

$\Downarrow$

$\boxed{N! \geq 4!} \rightarrow$ divisible by '4'.

* $\boxed{2 \longleftrightarrow 8}$ (भाई-भाई)

II

(i) $8^{23} \rightarrow (8^{4})^{5} \times 8^{3}$

$= 6 \times 2 = 2$ Ans.

(ii) $8^{101} \rightarrow 8^{1} = 8$ Ans.

(iii) $8^{3339} \rightarrow 8^{3} = 2$ Ans

(iv) $8^{2025!} \rightarrow (8^{4})^{-} = 6$ Ans.

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Saathi

III *. $\boxed{3}$

(i) $3^{23} = (3^4)^5 \times 3^3 = \boxed{1^5} \times 3^3 = 1 \times 7 = 7$ Ans.

(ii) $3^{23} \rightarrow 3^3 = 7$ Ans

(iii) $3^{2019} \rightarrow 3^3 = 7$ Ans

(iv) $3^{2029} \rightarrow 3^1 = 3$ Ans

(v) $3^{2031} \times 2^{4099!} = 3^3 \times (2^4)^{-} = 7 \times 6 = 2$ Ans

IV $\boxed{3 \longleftrightarrow 7}$ $\boxed{2 \longleftrightarrow 8,\ 3 \longleftrightarrow 7}$

(i) $7^{23} \rightarrow (7^4)^5 \times 7^3 = 1^5 \times 7^3 = 1 \times 3 = 3$ Ans.

(ii) $7^{55} \rightarrow 7^3 = 3$ Ans

(iii) $7^{99} \times 3^{100} \rightarrow 7^3 \times (3^4)^{-} = 3 \times 1 = 3$ Ans

(iv) $7^{2000!} \times 3^{3000!} \times 2^{2000!} = (7^4)^{-} \times (3^4)^{-} \times (2^4)^{-}$
$= 1 \times 1 \times 6 = 6$ Ans

V * (v) $4^{23} = (4^2)^{11} \times 4^1$
$= 6 \times 4 = 4$ Ans. $\Rightarrow 4^{23} = 4^{odd} = 4$ Ans.

OR

$4^1 = 4 \rightarrow \boxed{4^{odd} = 4}$

$4^2 = 16 \rightarrow \boxed{4^{even} = 6}$

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* Test :-

① $2^{1999!} \times 4^{1999} = (2^4)^{-} \times 4^{odd}$

$= 6 \times 4$

$= 4$ Ans

② $3^{2025} \times 4^{2029} = 3^1 \times 4^1$

$= 2$ Ans.

Bros!		Brothers
	$2 \leftrightarrow 8$	
	$3 \leftrightarrow 7$	
	$4 \leftrightarrow 9$	

VI *. $\boxed{9}$

(i) $9^{23} = (9^2)^{11} \times 9^1 = 1^{11} \times 9^1 = 1 \times 9 = 9$

$\boxed{9^{odd} \rightarrow 9}$

$\boxed{9^{even} \rightarrow 1}$

* Test :-

① $4^{9999} \times 9^{4444} = 4 \times 1 = 4$ Ans

* ② $4^{99^{99}} \times 9^{44^{44}} = \cancel{6 \times 1 = 6}$ Ans.

* ③ $4^{99!^{99!}} \times 9^{44!^{44!}} = 6 \times 1 = 6$ Ans.

① $4^{odd} \times 9^{even} = 4 \times 1 = 4$ Ans

② $4^{odd^{99=n}} \times 9^{even^n} = 4^{odd} \times 9^{even} = 4 \times 1 = 4$ Ans

③ $4^{even^n} \times 9^{even^n} = 4^{even} \times 9^{even} = 6 \times 1 = 6$ Ans

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(*) $3^1 = 3$
$3^2 = 9$
$3^3 = 27$
$3^4 = 81$

$\boxed{(odd)^n = odd}$

$2^1 = 2$
$2^2 = 4$
$2^3 = 8$
$2^4 = 16$

$\boxed{(even)^n = even}$

(*) $2! = 2 \times 1 = 24$
$3! = 3 \times 2 \times 1 = 6$
$4! = 4 \times 3 \times 2 \times 1 = 24$

$\boxed{N! \geq 2! \Rightarrow \text{Even No.}}$

Que- 12^{23}

$= (2 \times 6)^{23} \rightarrow 2^{23} \times 6^{23} = 8$ Ans

$= (3 \times 4)^{23} \rightarrow 3^{23} \times 4^{23} = 8$ Ans

$= (2 \times 6)^{23} = 2^{23} \times 6^{23} = 8$ Ans

$12^2 = 144$

$$\begin{array}{r} 12 \\ 12 \\ \hline 24 \\ 12 \\ \hline 144 \end{array}$$

$\Rightarrow$ जितने digit पूछे गए है उतने digit पर ही ध्यान दो।

$\Rightarrow 12^{23} \simeq 2^{23} \rightarrow 2^3 = 8$ Ans.

(h) $13^{99} \approx 3^{99} \rightarrow 3^3 = 7$ Ans.

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(iii) $21^{33} + 297^{333} + 9999^{4444}$

$= 1^{33} + 7^{\underline{333}} + 9^{4444}$

$= 1 + 7^{1} + 9^{\text{even}}$

$= 1 + 7 + 1 = 9$ Ans.

Que. The numeral value in the units position of $211^{870} + 146^{127} + 3^{424}$ is _____

~~(a)~~ Gate-2016, IISc Banglore, EE

Ans:- $= 1^{870} + 6^{127} + 3^{24}$

$= 1 + 6 + (3^{4})^{-}$

$= 1 + 6 + 1$

$= 8$ Ans.

Que. The last digit of $(2171)^{7} + (2172)^{9} + (2173)^{11} + (2174)^{13}$

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

Gate-2017, IIT Roorkee, CH, CE

Ans: $= 1^{7} + 2^{9} + 3^{11} + 4^{13}$

$= 1 + 2^{1} + 3^{3} + 4^{\text{odd}}$

$= 1 + 2 + 7 + 4$

$= 4$ Ans $\boxed{b}$

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4. Doubt clearing session

Date 06/03/2023

Saathi

* Test :-

Que. No. of 0's at the end ?

① $27! \rightarrow 0's = 5's = 5+1 = 6$ Ans

② $200! \rightarrow 0's = 5's = 40+8+1 = 49$ Ans.

Challenge

③ $27 \rightarrow 0's = 0$ Ans. None Ans

④ $27^{27} \rightarrow 0dd^{natural} = odd \rightarrow 0's = 0$ Ans. None Ans

⑤ $27^{27!} \rightarrow odd^{n} = odd \rightarrow 0's =$ None Ans.

⑥ $27! \rightarrow 0's = 5's = 5+1 = 6$ Ans.

* ⑦ $27!^{27} \rightarrow 0's = 6 \times 27 = 162$ Ans

* ⑧ $27!^{27!} \rightarrow 0's = 6 \times 27!$ Ans

⑦ $27!^{27} \rightarrow 6 \times 27$

$(5!) = 120$

$(5!)^2 = (120)^2 = 14400$

$5! \rightarrow 0's = 1$

$(5!)^2 \rightarrow 0's =$ ~~$(1)^2 = 1$~~ $\boxed{1 \times 2 = 2}$

eg:- $(5!)^{10} = \boxed{1 \times 10} = \boxed{(\text{no. of zeros}) \times \text{power}}$

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Que ② Find the no. of 0's at the end

① $250! \rightarrow 50+10+2 = 62$

② $150!^{150} \rightarrow (30+6+1) \times 150 = 37 \times 150 = 5550$

③ $100!^{100!} \rightarrow (20+4) \times 100! = 24 \times 100!$ Ans

③ *.

$100! \rightarrow 0's = 20+4 = 24$ Ans

$100!$ $(2^{97} \times 5^{24})$ $\rightarrow 5^{1000} \times 100! \rightarrow 0's = 5^{1000} \times 2^{97} \times 5^{24} = 97$ Ans.

$2^{1000} \times 100! \rightarrow 0's = 2^{1000} \times 2^{97} \times 5^{24} = 24$ Ans

Q. ④ $15 \times 30 \times 45 \times 60 \times 75 \times \cdots \times 1500.$

Find no. of 0's at the end.

Ans:- $= (15 \times 1) \times (15 \times 2)(15 \times 3) \times (15 \times 4) \times \cdots \times (15 \times 100)$

$= 15^{100} \times (1 \times 2 \times 3 \times \cdots \times 100)$

$= 15^{100} \times 100!$

$= 5^{100} \times 3^{100} \times 2^{97} \times 5^{24} = 5^{124} \times 2^{97}$

$\therefore$ No. of zeros $= 97$ Ans.

(*) CAT GMAT GATE

• odd + odd = even	odd − odd = even	odd × odd = odd
even + even = even	even − even = even	even × even = even
odd + even = odd	odd − even = odd	odd × even = even

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Saathi

Que. Given a and b are integers and $a + a^2b^3$ is odd then, which one of the following statement is correct?

(a) a and b are both odd — GATE-2018, IIT Guwahati

(b) a and b are both even

(c) a is even and b is odd

(d) a is odd and b even.

Ans:- [d] $a + a^2b^3 = \text{odd}$

$\text{odd} + \text{odd}^2 \cdot \text{odd}^3 = o + o = e$ ✗

$\text{even} + \text{even}^2 \cdot \text{even}^3 = e + e = e$ ✗

$\text{even} + \text{even}^2 \text{odd}^3 = \text{even} + \text{even} \times \text{odd} = \text{even} + \text{even} = e$ ✗

✓ $\text{odd} + \text{odd}^2 \cdot \text{even}^3 = \text{odd} + \text{odd} \cdot \text{even} = \text{odd} + \text{even} = o$ ✓

Que. If a and b are integers and a−b is even, which of the following must always be even?

(a) ab (b) a^2+b^2+1 (c) a^2+b+1 (d) $ab-b$

Gate-2017, IIT Roorkee (ME)

Ans: [d] $a - b = E$

		(a)	(b)	(c)	(d)
O	O	✗	✗	✗	E ✓
E	E	✓	✗	✗	E ✓

* Must — d
* Could be — a, d
* True except = False
* False except = True.

★★★

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5. Number System - IV

Date 07 / 03 / 2021

#03 Factorisation :-

- 12 = Natural No. → to write in Prime Factors → called Factorisation

✓ 1 × 12 ✓
✓ 2 × 6 ✓ → factors
✓ 3 × 4 ✓

P cube → 2×3^2

Prime Factors of $12 = 2^2 \times 3$ — Perfect square → $\times 3$

- $24 = 2^3 \times 3$ — Perfect square → 2×3
  P. cube → 3^2

- $144 = 2^4 \times 3^2$ — Perfect square → ✓
  P. cube → $2^2 \times 3$

- $200 = 2^3 \times 5^2$ — Perfect square → 2
  P. cube → 5

* Note :-

- Perfect squares: ← Power even

$4 = 2^{2}$
$9 = 3^{2}$
$100 = 2^{2} \times 5^{2}$
$N = 2^{10} \times 3^{4} \times 5^{200}$ → Perfect square
$N = 2^{3} \times 3^{4} \times 5^{7}$ → Not perfect square
$\downarrow \times (2 \times 5)$
Perfect square.

- Perfect Cubes :- Power = multiple of 3

3^3, $3^6 \times 5^3$, $2^9 \times 3^{15} \times 5^{300}$, ...

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Date ___/___/___

Saathi

Que. Find the smallest number y such that $y \times 162$ is a perfect cube?

Gate-17, IIITR, EE, CS

(a) 24 (b) 27 (c) 32 (d) 36

Ans. $162 = 2 \times 3^4$,

$y = 2^2 \times 3^2 = 36$ Ans $\boxed{d}$

* Divisibility Rule of 3:-

$N = abcd$

if DS (digit sum) $= \frac{a+b+c+d}{3}$ then $\frac{N}{3}$ ✓

eg:- (i) 123 $\rightarrow \frac{1+2+3}{3} = \frac{6}{3}$ ✓

(ii) 987120 $\rightarrow \frac{9+8+7+1+2+0}{3} = \frac{27}{3}$ ✓

↓

(i) ~~123~~ ✓ (ii) ~~987120~~ ✓

(iii) ~~1234567890987112~~ ✓

(iv) ~~97~~ 34 ~~71~~ 2 $9+4=7$, $9-7=2$

Que. If the number 715*423 is divisible by 3, the smallest whole number in place of * is _____

(a) 0 (b) 2 (c) 5 (d) 6

Gate-2018, IIT Guwahati, EC-1

Ans. $\boxed{b}$ ~~7~~ 1 ~~5~~ * ~~4~~ ~~2~~ 3 $6-(3+1) = 2$

$3+1 = 4 + 2 = 6$

* ~~1234875~~ 6 ? $\rightarrow$ No.

9

$- = 9 - 3 = 6$ Ans.

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* $\frac{\cancel{7}\,\cancel{15}\,\cancel{4}\,\cancel{23}}{9}$ $3+1=4$, $9-4=5$ Ans

*. • $\frac{15}{3}$ ✓

• $\frac{15+17}{3} = \frac{32}{3}$

$\longrightarrow \frac{\cancel{15}+\cancel{17}}{\cancel{3}} = 0+2 = 2$ Remainder

• $\frac{15+17+19+21+23}{3} = \frac{0+\cancel{2}+\cancel{1}+0+2}{3} = 2$ Ans.

• $\frac{41+43+45}{3} = \frac{\cancel{2}+\cancel{1}+0}{3} = 0$ Ans

• $\frac{15\times17}{3} = \frac{255}{3} \rightarrow$ Remainder $= 0$

$\frac{\cancel{15}\times\cancel{17}}{\cancel{3}} = 0\times2 = 0$ Ans.

• $\frac{21\times23\times27\times29}{5}$

Remainder $= \frac{1\times\cancel{3}\times\cancel{2}\times4}{5} = \frac{24}{5} = 4$ Ans.

$\downarrow$ 4 Ans

*. Test :-

1. $\frac{93\times97\times99}{5} \rightarrow$ Remainder $= \frac{\cancel{3}\times\cancel{2}\times4}{5} = 4$ Ans

2. $\frac{71\times73\times75}{7} \rightarrow$ Remainder $= \frac{1\times3\times5}{7} = 1$ Ans.

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$$\frac{91 \times 93 \times 95 \times 99}{12} \rightarrow \frac{7 \times 9 \times 11 \times 3}{12} = 3 \text{ Ans.}$$

$$\frac{91 \times 93 \times 95 \times 99}{12} \rightarrow \frac{7 \times 9 \times 11 \times 3}{12}$$

+2 +2 +4 → 11+4 = 15/12 = 3

can con (0 - 11) remainder

$$= \frac{7 \times 9 \times 11 \times 3}{12} = \frac{7 \times 9 \times 9}{12} = \frac{63}{12} = 3 \text{ Ans}$$

* $\frac{2}{3} \rightarrow$ Remainder = 2 or, −1 → negative remainder

$\frac{4}{5} \rightarrow$ 4 or, −1

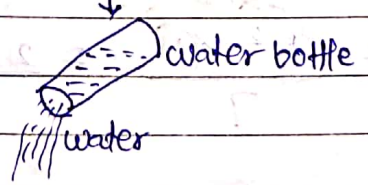
$\frac{1}{7} \rightarrow$ 1 or −6

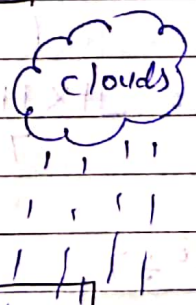
$\frac{3}{12} \rightarrow$ 3 or −9 Ans

CAT Que

$$\frac{123 \times 1234}{15} \rightarrow \frac{3 \times 4}{15} = 12 \text{ or } -3 \text{ Ans.}$$

* Continuous / Continual





बारिश का पानी

* Stationary / Stationery

Rest position.

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(कॉपी किताब का दुकान)

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Concept of Remainder

Date ___/___/___

* **Test :-**

① $\frac{7\times7}{4} \rightarrow \frac{3\times3}{4} \rightarrow$ ①

② $\frac{11\times11\times11}{7} \rightarrow \frac{\cancel{4}^{2}\times\cancel{4}\times4}{7} \rightarrow$ ① Ans

* ⊛ $\frac{7^{77}}{4} = \frac{(7^2)^{38}\times7}{4} \rightarrow$ ③ Ans.

$\frac{7^1}{4} \rightarrow$ ③

$\frac{7^2}{4} \rightarrow \frac{7\times7}{4} \rightarrow \frac{3\times3}{4} = \boxed{1}$

⋮

untill remainder = ① or, any pattern.

⊛ $\frac{11^{100}}{7} = \frac{(11^3)^{33}\times11}{7} = \frac{1\times4}{7} = 4$ Ans

$\frac{11^1}{7} \rightarrow$ ④

$\frac{11^2}{7} = \frac{11\times11}{7} = \frac{4\times4}{7} =$ ②

$\frac{11^3}{7} = \frac{11\times11\times11}{7} = \frac{(11^2)\times(11)}{7} = \frac{2\times4}{7} = \boxed{1}$

Que $11^{88} \div 7$

$= \frac{11^{88}}{7} = \frac{(11^3)^{29}\times11}{7} = 4$ Ans.

Que $\frac{7^{10}}{342} = \frac{(7^3)^3\times7}{342} = 7$ Ans

$\frac{7}{342} \rightarrow 7$ | $\frac{7^2}{342} \rightarrow 49$ | $\frac{7^3}{342} = \frac{343}{342} = 1$

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CAT Date ___/___/___

Que- $\frac{7^{84}}{342}$, Remainder = ?

$\frac{7^1}{342} = 7$ $\frac{7^2}{342} = 49$ $\frac{7^3}{343} = \boxed{1}$

$\rightarrow \frac{(7^3)^{28}}{342} = 1$ Ans

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★. Quiz-1 $\frac{10}{10}$ Rank - $\frac{2}{129}$

Saathi

Date 07/03/2023

① If P, Q, R are three consecutive integers, then which of the following is always true?

(a) P+Q+R is always even (b) P+Q+R is always odd

(c) P+2Q+R is always even (d) P+2Q+R is always odd

Ans:- $\boxed{c}$

P	Q	R		
O	E	O	O+O=E	2E=E
E	O	E	E+E=E	2O=E

$\therefore$ P+2Q+R ⟶ always even.

② By which of the following numbers must 34300 be multiplied in order to make it a perfect square?

(a) 7 (b) 5 (c) 6 (d) 14

Ans:- $\boxed{a}$ $34300 = 7^3 \times 10^2$ → 7 Ans.

③ Find the last digit of $(100008)^{12500}$.

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

Ans:- $\boxed{b}$ $(8)^{12500} = (8^4)^{-}$ ⟶ 6 Ans

④ Let $N = 10^3 + 10^4 + 10^5 + 10^6 + 10^7 + 10^8 + 10^9$. Find the sum of the digits of N?

(a) 12 (b) 9 (c) 8 (d) 7

Ans: $\boxed{d}$ N = 1111111000 ⇒ DS = 7 Ans

⑤ How many zeros are there at the end of the product $33 \times 175 \times 180 \times 12 \times 44 \times 80 \times 66$?

(a) 2 (b) 4 (c) 5 (d) 6

Ans:- $\boxed{b}$ $33 \times \underset{5^2}{175} \times \underset{5}{180} \times 12 \times 44 \times \underset{5}{80} \times 66$ ⟶ 0's = 4 Ans

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Saathi

Date __/__/____

(6) Find the last digit of 173^{99} ?

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

Ans: [b] $3^{99} \longrightarrow 3^3 \longrightarrow$ (7) Ans.

(7) Find the unit digit of $51 \times 52 \times 53 \times \cdots \times 59$.

(a) 4 (b) 3 (c) 2 (d) 0.

Ans: [d] $51 \times \cdots \times 59 \times 52 \times 55 \longrightarrow$ (0) Ans.

(8) What is the right most non-zero digit of $(13780000)^{13780000}$?

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

Ans: [d] $(13780000)^{13780000} = 1378^{137800} \times 10000^{137800}$

$\downarrow$

$8^{137800} = (8^4)^{\cdot} \longrightarrow$ (6) Ans

(9) How many factors of 1260 not end with a zero?

(a) 6 (b) 8 (c) 10 (d) 12

Ans: [d] $1260 = 2^2 \times 3^2 \times 5 \times 7$

$\downarrow -2\times5$

$2^1 \times 3^2 \times 5^0 \times 7^1$

$\therefore n = 2 \times 3 \times 1 \times 2 =$ (12) Ans.

(10) Find the last digit of the following expression ?

$15^{256} + 19^{138} + 32^{97}$

(a) 8 (b) 6 (c) 5 (d) 3

Ans: [a] $5^{256} + 9^{138} + 2^{97} = 5^{256} + 9^{\text{even}} + 2^{97}$

$\sim 5 + 1 + 2^1$

$=$ (8) Ans.

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6. Number system – V

Date 07 / 03 / 23

#.04 Last Two Digits (L2D) :-

Grade → No Que. Yet
CAT, Vizag steel, PSU

Objective

- 2^{23} → ??
- 21^{45} → ??
- 3^{2019} → ??

L2D

- UDV = 1
  - eg:- 21^{23}, 41^{99}
- UDV ≠ 1
  - UDV = 3/9/7
    - eg:- 3^{99}, 7^{2008}, 9^{75}
  - UDV = 2/4/8/6
    - eg:- 2^{25}, 4^{41}, 6^{38}, 8^{99}

* L2D : when UDV = 1 :-

(i) 21^{23} → 61 Ans.

(ii) 11^{2} → 121 Ans

(iii) 11^{3} → 1331 Ans

(iv) 21^{2} → 441 Ans.

* Test :-

(1) 31^{45} → 51 Ans

(2) 91^{87} → 31 Ans

(3) 23471 (2098) → 61 Ans.

(4) 9267581 (21341) → 01 Ans

* जितने Digits पूछे जाए उतने पर ध्यान दें।
Focus on the no. of digits what you have been asked about

eg:- 23471 (2098) $\xrightarrow{L2D}$ ≃ 71 (2098) → 61 Ans

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* $2! = 2 \cdot 1$

$3! = 3 \cdot 2 \cdot 1$ $\Rightarrow$ $\boxed{N! \geq 5! \longrightarrow UDV = 0}$

$4! = 4 \cdot 3 \cdot 2 \cdot 1$

$5! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 \longrightarrow \underline{0}$

(1) $2341^{599!} \longrightarrow 41^{599!} \longrightarrow 41^{\overline{0}} = 01$ Ans.

(2) $2341^{599!^{599}} \longrightarrow (41)^{\overline{0}^{599}} \longrightarrow 41^{\overline{0}} = 01$ Ans.

(3) $2341^{599!^{599!}} \longrightarrow 41^{599!^{599!}} \longrightarrow 41^{\overline{0}^{599!}} = 01$ Ans

* $(41)^{5!^2} = (41)^{120^2} = (41)^{14400} \longrightarrow 01$

$\hookrightarrow (41)^{(5!)^n} = (41)^{\overline{0}} \longrightarrow 01$

(*) $\boxed{\text{LSD: when UDV} = 3/9/7}$

$\rightarrow \boxed{\text{LSD: when UDV} = 3}$

$3^4 = 8$ (1)
$9^2 = 8$ (1)
$7^4 = 240$ (1)

(i) 3^{23}

$\boxed{\text{OBJ:- To make (1) at last}}$

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

$= 81^5 \times 27$

$= 01 \times 27$

$= 27$ Ans.

* Test :-

(1) 3^{29}

$= (3^4)^7 \times 3^1$

$= 81^7 \times 3$

$= 61 \times 3$

$= 83$ Ans

(2) $3^{46} \times 41^{2023}$

$= (3^4)^{11} \times 3^2 \times 41^{2023}$

$= 81^{11} \times 9 \times 41^{2023}$

$= 81 \times 9 \times 21$

$= 29 \times 21 = 09$ Ans

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Saathi

(*) → $\boxed{9}$

$9^2 = 81$

(i) $9^{23} \rightarrow (9^2)^{11} \times 9 = 81^{11} \times 9 = 81 \times 9 = 29$ Ans

* Test

(1) $9^{39} \rightarrow (9^2)^{19} \times 9 = (81)^{19} \times 9 = 21 \times 9 = 89$ Ans

(2) $9^{2001} + 41^{2001}$

$= (9^2)^{1000} \times 9 + 41^{2001}$

$= (81)^{1000} \times 9 + 41^{2001}$

$= 01 \times 9 + 41 = 9 + 41 = 50$ Ans.

→ $\boxed{\text{L2D ; UDV} = 7}$

$7^4 = 2401$

(i) 7^{23}

$= (7^4)^5 \times 7^3$

$= (01)^5 \times 43$

not useful

$= 43$ Ans.

7^{21}	7^{22}
$7^1 = 07$	$7^2 = 49$
7^{24}	7^{23}
$(7^4)^{\text{—}} = 01$	$7^3 = 43$

* Test :-

(1) $7^{555} \rightarrow 7^3 \rightarrow 43$ Ans.

(2) $7^{999!} \rightarrow (7^4)^{\text{—}} \rightarrow 01$ Ans.

(3) $31^{47} + 7^{75!} \rightarrow 11 + 01 = 12$ Ans

(4) $7^{77} + 3^{95} \rightarrow 7^1 + (3^4)^{23} \times 3^3 = 7 + 81^{23} \times 27$

$= 7 + 41 \times 27$

$= 7 + 1107$

$= 14$ Ans

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× (5) $7^{51} \times 5^{23} \rightarrow 7^3 \times 5^{23} = 43 \times 25 = \cancel{68}$ Ans. (75) Ans.

✓ (6) $7^{51} + 5^{23} \rightarrow (74)^{-} + 5^{23} = 01 + 25 = (26)$ Ans.

$5^1 = 5$

$5^2 = 25$ $\Rightarrow$ $\boxed{5^n ; n > n \Rightarrow L2D = 25}$

$5^3 = 125$

$5^4 = 625$

(*) $\boxed{L2D: \text{when } UDV = 2/4/8/6}$

$\rightarrow$ $\boxed{L2D: UDV = 2}$

#. $2^{10} = 1024$

$24^1 = 24$ $\quad$ $24^2 = 576$

$24^3 = 13824$ $\quad$ $24^4 = __76$

#. $\boxed{\begin{array}{l} 24^{odd} = __24 \\ 24^{even} = __76 \end{array}}$

(i) 2^{21}

$= (2^{10})^2 \times 2^1$

$= (24)^2 \times 2^1$

$= 24^{even} \times 2^1$

$= 76 \times 2$

$= (52)$ Ans.

* Test :-

✓ (1) $2^{42} \rightarrow (2^{10})^4 \times 2^2 \rightarrow (24)^4 \times 4 \rightarrow 76 \times 4 = (04)$ Ans.

✓ (2) $2^{33} \times 7^{33} \rightarrow (2^{10})^3 \times 2^3 \times 7^1 = 24^3 \times 8 \times 7 = 24 \times 8 \times 7$

$= 192 \times 7 = (44)$ Ans.

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→ L2D : UDV = 2/4/8 → done

$\because 4 = 2^2$, $8 = 2^3$ & $2 \rightarrow 2^{10} \rightarrow 24$

even → 76 , odd → 24.

(i) 4^{21}

$= (2^2)^{21}$

$= 2^{42}$

$= (2^{10})^4 \times 2^2 \rightarrow (24)^4 \times 4 \rightarrow 76 \times 4 = 04$ Ans.

(ii) 8^{42}

$= (2^3)^{42} = 2^{126} = (2^{10})^{12} \times 2^6 = (24)^{12} \times 32$

$= 76 \times 04$

$= 64$ Ans

→ L2D : UDV = 6

break into prime factors ??

(i) 6^{39}

$= (2 \times 3)^{39}$

$= 2^{39} \times 3^{39}$

$= (2^{10})^3 \times 2^9 \times (3^4)^9 \times 3^3$

$= (24)^3 \times 512 \times 81^9 \times 27$

$= 24 \times 12 \times 21 \times 27$

$= 88 \times 67$

$= 96$ Ans.

* 13^{23} → L2D = ?

$13^4 = 13^2 \times 13^2$

$= 169 \times 169$

$= 4761$

$13^3 = 2197$

$= (13^4)^5 \times 13^3$

$= (61)^5 \times 97$

$= 01 \times 97$

$= 97$ Ans

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(*) 17^{23}

$= (17^4)^5 \times 17^3$

$\downarrow$

$(21)^5 \times 13$

$\downarrow$

01×13

$= 13$ Ans.

$17^4 = 17^2 \times 17^2$

$= 189 \times 189$

$= 21$

$17^3 = 4913$

(*) 7^{2008} (CAT)

$\rightarrow (7^4)^{-} = 01$ Ans.

(*) 7^{2012} (Vizag steel)

$= (7^4)^{-} = 01$ Ans.

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7. Number System – VI

Date 21/03/23

Saathi

* $\boxed{12}$ = Natural No.

1×12
2×6
3×4
} Factors

① No. of Factors (n) = 6 {1, 2, 3, 4, 6, 12}

② Product of factors = 12^3 = 1728 (1×12 × 2×6 × 3×4)

③ Sum of ~~Products~~ Factors (S) = 1+2+3+4+6+12 = 28

* N = Natural No.

eg:- 12

$\underbrace{12 = 2^2 \times 3}_{\text{Process – Factorization.}}$ ⟶ Prime Factors

$$\Rightarrow \boxed{N = a^p \times b^q \times c^r \times d^s \times \cdots}$$

where,

a, b, c, --- are prime factors &

p, q, r, --- are powers

① $\boxed{\text{No. of factors} = n = (p+1)\cdot(q+1)\cdot(r+1)}$

eg:- (i) $12 = 2^2 \times 3^1$

$\therefore n = (2+1) \times (1+1) = 3 \times 2 = 6$ ✓

(ii) $24 = 2^3 \times 3^1$

$\therefore n = (3+1) \times (1+1) = 4 \times 2 = 8$

(iii) $48 = 2^4 \times 3^1$

$\therefore n = (4+1) \times (1+1) = 5 \times 2 = 10$

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Date 22/03/23

(iv) $60 = 2^2 \times 3^1 \times 5^1$

$\therefore n = (2+1) \times (1+1) \times (1+1) = 3 \times 2 \times 2 = 12$

(v) $144 = 2^4 \times 3^2$

$\therefore n = 5 \times 3 = 15$

(vi) $288 = 2^5 \times 3^2$

$\therefore n = 6 \times 3 = 18$

* • $4 = 2^2 \Rightarrow n = 3$

• $25 = 5^2 \Rightarrow n = 3$

• $100 = 2^2 \times 5^2 \Rightarrow n = 3 \times 3 = 9$

In case of perfect squares, $\boxed{n = \text{odd}}$

Que. $n = \text{odd}$, $N < 100$, How many such numbers?

(Prime Numbers) even

eg:- 2^2 3^2

$2^2 \times 3^2$

~~$2^2 \times 5^2$~~

1	16	49
4	25	64
9	36	81

~~100~~

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

1. $\boxed{n = (p+1)(q+1)(r+1)}$

* Test:-

1. $224 = 2 \times 2 \times 2 \times 2 \times 2 \times 7 = 2^5 \times 7^1 \Rightarrow n = 6 \times 2 = 12$ Ans

2. $N \longrightarrow 2^2 \times 3^4 \times 5^8 \times 11^2$. Is capital N perfect square?

$n = 3 \times 5 \times 9 \times 3 = \boxed{\text{Odd}} \Rightarrow$ Yes Ans.

(or) If (prime Nos) even $\longrightarrow$ Perfect square. Ans $\Rightarrow n = \text{odd}$

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* $\boxed{N = a^p \times b^q \times c^r}$

① $\boxed{n = (p+1)(q+1)(r+1)}$

(ii) $N = 12$

÷ 2	2, 4, 6, 12	04
÷ 3	3, 6, 12	03
÷ 4	4, 12	02
÷ 6	6, 12	02

12

1×12

2×6

3×4

$\Rightarrow 12 = 2^2 \times 3$

(i) How many factors divisible by 2.

(i) $\div 2 \Rightarrow 2^1 \times 3^1 \Rightarrow n = 2 \times 2 = 4$ → never (2, 4, 6, 12)

(ii) $\div 3 \Rightarrow 2^2 \times 3^0 \Rightarrow n = 3 \times 1 = 3$

(iii) $\div 4 \Rightarrow 2^0 \times 3^1 \Rightarrow n = 2 \times 1 = 2$

(iv) $\div 6 \Rightarrow 2^1 \times 3^0 \Rightarrow n = 2 \times 1 = 2$

* $24 = 2^3 \times 3^1$

$n = 4 \times 2 = 8$

(i) $\div 2 \Rightarrow 2^2 \times 3^1 \Rightarrow n = 3 \times 2 = 6$

(ii) $\div 3 \Rightarrow 2^3 \times 3^0 \Rightarrow n = 4 \times 1 = 4$

(iii) $\div 4 \Rightarrow 2^1 \times 3^1 \Rightarrow n = 2 \times 2 = 4$ → $(2)^2$

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* $N = 2^4 \times 3^3 \times 5^4$

$\Rightarrow n = 5 \times 4 \times 5 = 100$

(i) $\div 2 \Rightarrow 2^3 \times 3^3 \times 5^4 = 4 \times 4 \times 5 = 80$

(ii) $\div 16 \rightarrow 2^4 \Rightarrow 2^0 \times 3^3 \times 5^4 = 4 \times 5 = 20$

(iii) $\div 27 (3^3) \Rightarrow 2^4 \times 3^0 \times 5^4 = 5 \times 1 \times 5 = 25$

* Test :-

(1) $36 = 2^2 \times 3^2$

(i) $\boxed{\div 2} \Rightarrow 2^1 \times 3^2 \Rightarrow n = 2 \times 3 = 6$ → n_{even}

(ii) $\div 4 \Rightarrow 2^0 \times 3^2 \Rightarrow n = 1 \times 3 = 3$

(iii) $\div 3 \Rightarrow 2^2 \times 3^1 \Rightarrow n = 3 \times 2 = 6$

(iv) $\div 6 \Rightarrow 2^1 \times 3^1 \Rightarrow n = 2 \times 2 = 4$

(v) $\div 36 \Rightarrow 2^0 \times 3^0 \Rightarrow n = 1 \times 1 = 1$

* $80 = 2^4 \times 5$

$n = 5 \times 2 = 10$ ⟶ Total factors

$\div 2 \Rightarrow 2^3 \times 5^1 \Rightarrow n = 4 \times 2 = 8$ ⟶ no. of even factors.

* $120 = 2 \times 2 \times 2 \times 3 \times 5 = 2^3 \times 3 \times 5$

(i) $n = 4 \times 2 \times 2 = 16$

(ii) $n_{even} = \div 2 \Rightarrow 2^2 \times 3 \times 5 \Rightarrow n_{even} = 3 \times 2 \times 2 = 12$

(iii) $\div 10 \Rightarrow 2^2 \times 3 \Rightarrow n = 3 \times 2 = 6$
(2×5)

(#) $12 \quad 0$
$2^2 \times 3 \quad 2 \times 5$

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*.
- Even × Even = Even
- Even × Odd = Even
- Odd × Odd = Odd

* $12 = 2^2 \times 3^1$

$n = 3 \times 2 = 6$

$n_{even} = 2^1 \times 3^1 \Rightarrow 2 \times 2 = 4$

$n_{odd} = n - n_{even} = 6 - 4 = 2$

$n_{odd} \longrightarrow$ consider only odd no.s

$\Rightarrow n_{odd} \longrightarrow 3^1 \Rightarrow n_{odd} = (1+1) = 2$ Ans

* $N = 2^2 \times 3^4 \times 5^3$

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

$60 - 40 = 20$ Ans.

$n_{even} \Rightarrow 2^1 \times 3^4 \times 5^3 = 2 \times 5 \times 4 = 40$

$n_{odd} \Rightarrow 3^4 \times 5^3 = 5 \times 4 = 20$ Ans

* 150

$150 = 3 \times 5 \times 2 \times 5 = 2 \times 3 \times 5^2$

(i) $n = 2 \times 2 \times 3 = 12$

(ii) $n_{even} \Rightarrow 2^0 \times 3^1 \times 5^2 = 2 \times 3 = 6$

(iii) $n_{odd} \Rightarrow 3 \times 5^2 = 2 \times 3 = 6$

(iv) $\div 2 = n_{even} = 6$

(v) $\div 5 \Rightarrow 2 \times 3 \times 5 = 2 \times 2 \times 2 = 8$

(v) $\div 10 \Rightarrow 2^0 \times 3^1 \times 5^1 = 2 \times 2 = 4$

(vi) $\div 25 \Rightarrow 2 \times 3 = 2 \times 2 = 4$

(vii) $\div 50 \Rightarrow 3 = 2$

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Saathi

Que. How many factors of 12 are divisible by : 2, 3, 4, 6, 12 ?

Ans.

$12 = 2^2 \times 3$

$\div 2 \Rightarrow 2 \times 3 = 4$

$\div 3 \Rightarrow 2^2 = 3$

$\div 4 \Rightarrow 3^1 = 2$

$\div 6 \Rightarrow 2^1 = 2$

$\div 12 \Rightarrow 2^0 \times 3^0 = 1$

* $\boxed{12} \longrightarrow$ Product of factors $= 1 \times 12 \times 2 \times 6 \times 3 \times 4$

$= (12^3)$ Ans

1×12

2×6

3×4

$\Rightarrow P_n = (12)^{n/2} = 12^{6/2} = (12^3)$ Ans

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

(3) $\Rightarrow$ $\boxed{\text{Product of factors } (P_n) = (N)^{n/2}}$

Que. Find Product of factors in 24, 48, 60, 144, 288 ?

$24 = 2^3 \times 3^1 \Rightarrow n = 8 \quad \therefore P_n = (24)^4$

$48 = 2^4 \times 3^1 \Rightarrow n = 10 \quad \therefore P_n = (48)^{10/2} = (48)^5$

$60 = 2^2 \times 3^1 \times 5^1 \Rightarrow n = 12 \quad \therefore P_n = (60)^6$

$144 = 2^4 \times 3^2 \Rightarrow n = 15 \quad \therefore P_n = (144)^{15/2} \Rightarrow (12)^{2 \times \frac{15}{2}} = (12)^{15}$

$288 = 2^5 \times 3^2 \Rightarrow n = 18 \quad \therefore P_n = (288)^9$ Ans

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Que. Is $\boxed{7056}$ perfect square ?

$80^2 = 6400$ $\quad$ $4^2 = 16$

$90^2 = 8100$ $\quad$ $6^2 = 36$

7056 , $P_n = ?$

(a) 7056^{45} $\quad$ (b) 7056^{900}

(c) 84^{45} $\quad$ (d) NONE

Ans:- $7056 = (84)^2 = (2^2 \times 3 \times 7)^2 = 2^4 \times 3^2 \times 7^2$

$n = 5 \times 3 \times 3 = 45$

$\therefore P_n = (7056)^{45/2} = 84^{45}$ Ans $\boxed{c}$

*. $\boxed{12}$

1×12

2×6

3×4

$\longrightarrow$ sum of factors $= 1 + 12 + 2 + 6 + 3 + 4 = 28$

If $\boxed{N = a^p \times b^q \times c^r}$

the Sum of Product $= \dfrac{(a^{p+1}-1) \times (b^{q+1}-1) \times (c^{r+1}-1)}{(a-1)(b-1)(c-1)}$

$$\boxed{S_n = \frac{(a^{p+1}-1)(b^{q+1}-1)(c^{r+1}-1)}{(a-1)(b-1)(c-1)}}$$

eg:- $12 = 2^2 \times 3$

$\therefore S_n = \dfrac{(2^3-1)(3^2-1)}{(2-1)(3-1)} = \dfrac{7 \times 8}{1 \times 2} = 28$ Ans

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Saathi

Date ___/___/___

* $24 = 2^3 \times 3$

$S_n = \frac{(16-1)(9-1)}{1 \times 2}$

$= \frac{15 \times 8}{2} = 60$ Ans

* $60 = 2^2 \times 3 \times 5$

$S_n = \frac{7 \times 8 \times 24}{1 \times 2 \times 4} = 168$ Ans

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8. Doubt Clearing session

Saathi

Date 22/03/23

Q.① How many factors of 1260 end with a zero?

$1260 = 2^2 \times 3^2 \times 5 \times 7$

$\therefore$ 0's = $\div 10$ = $2^1 \times 3^2 \times 5^0 \times 7^1$ $\Rightarrow$ $= 2 \times 3 \times 2$
(2×5) $= 12$ Ans D

* 200

$200 = 2 \times 2^2 \times 5^2 = 2^3 \times 5^2$

(i) $\div 2 \Rightarrow 2^2 \times 5^2 = 3 \times 3 = 9$

(ii) $\div 10 \Rightarrow 2^2 \times 5^1 = 3 \times 2 = 6$

(iii) $\div 20 \Rightarrow 2^1 \times 5^1 = 2 \times 2 = 4$

*. • 1 is neither prime nor composite.

• 2, 3, 5, 7 $\rightarrow$ Prime

• 4, 6, 8, 9, 10 $\rightarrow$ Composite No

*. Co-prime No ?

↳ • Relatively Prime. No.

↓

Two nos are called Co-prime if HCF = 1

(**) Both Prime ? $\longrightarrow$ Not necessary

(i) 2, 3 $\rightarrow$ HCF = 1

(ii) 3, 4 $\rightarrow$ HCF = 1

(iii) 4, 9 $\rightarrow$ HCF = 1

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Date ___/___/___

Saathi

Que. How many nos $\boxed{N \le 10}$ which are Relatively prime to 10?

Ans:- Manually,

1 ✓	6 ✗
2 ✗	7 ✓
3 ✓	8 ✗
4 ✗	9 ✓
5 ✗	10 ✗

& 10 HCF = 1

= 4 Ans [(1,10), (3,10), (7,10), (9,10)]

Now,

10 → Break into Prime factors

$10 = 2 \times 5$

10 → $10/2 = 10 \times (1/2) = 10 \times 50\% = 5$ (2 है) ⇒ (2,4,6,8,10) means there are 5 nos until 10 which has got at least a 2.

10 → $10 \times (1 - \frac{1}{2}) = 10 \times \frac{1}{2} = 10 \times 50\% = 5$ → (1,3,5,7,9) (2 नहीं है)

10 → $10/5 = 10 \times \frac{1}{5} = 10 \times 20\% = 2$ → 5, 10

10 → $10(1 - \frac{1}{5}) = 10 \times \frac{4}{5} = 10 \times 80\% = 8$ → 1,2,3,4,6,7,8,9

* Co-prime, HCF = 1

उसके साथ 10, HCF = 1 देगा जिसके पास 2 & 5 ना हो।

$10 \times (1 - \frac{1}{2}) \times (1 - \frac{1}{5}) = 10 \times \frac{1}{2} \times \frac{4}{5} = 4$ Ans

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* **Factorization:** $\boxed{N = a^p \times b^q \times c^r}$

How many Numbers are there $\leq N$ and relatively prime to N.

$$= \boxed{N \times \left(1-\frac{1}{a}\right) \times \left(1-\frac{1}{b}\right) \times \left(1-\frac{1}{c}\right)}$$

eg:-

(i) 10 (2×5) $\Rightarrow$ $10 \times \left(1-\frac{1}{2}\right) \times \left(1-\frac{1}{5}\right) = 10 \times \frac{1}{2} \times \frac{4}{5} = 4$ Ans.

(ii) ≤ 21 & Rel. Prime. with 21

$21 = 3\times7 \Rightarrow 21 \times \left(1-\frac{1}{3}\right) \times \left(1-\frac{1}{7}\right)$

$= 21 \times \frac{2}{3} \times \frac{6}{7} = 12$ Ans

Sum $= \frac{21\times12}{2} = 126$ Ans

* **Test:-**

① 120 (How many Natural nos are there ≤ 120 & Co-prime with)

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

$= 120 \times \left(1-\frac{1}{2}\right) \times \left(1-\frac{1}{3}\right) \times \left(1-\frac{1}{5}\right)$

$= \overset{4}{\cancel{120}} \times \frac{1}{\cancel{2}} \times \frac{2}{\cancel{3}} \times \frac{4}{\cancel{5}} = 32$ Ans.

Sum $= 60\times32 = \boxed{1960}$ Ans

* **Magic-**

① How many no. ≤ 10 & Co-prime with 10?

$\Rightarrow 10 = 2\times5$

$= 10 \times \left(1-\frac{1}{2}\right) \times \left(1-\frac{1}{5}\right) = 10 \times \frac{1}{2} \times \frac{4}{5} = 4$

$\boxed{(1, 3, 7, 9)}$

& what is the sum of these?

Sum $= 1+3+7+9 = 20$

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$$* \quad \boxed{\text{Sum} = \frac{N}{2} \times \left\{ N \times \left(1-\frac{1}{a}\right) \times \left(1-\frac{1}{b}\right) \times \left(1-\frac{1}{c}\right) \right\}}$$

eg:- $\text{Sum} = \frac{10}{2} \times \left[10 \times \left(1-\frac{1}{2}\right) \times \left(1-\frac{1}{5}\right) \right]$

$= 5 \times 4$

$= 20$ Ans.

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9. **Number System – VII**

Date 22 / 03 / 23

Saathi

* $\boxed{23} = 2 \times 10^1 + 3 \times 10^0$

Place value → unit place, tense place, hundred place, --- etc.

face value

$45 = 4 \times 10^1 + 5 \times 10^0$

$\Rightarrow \boxed{xy = x \times 10^1 + y \times 10^0}$

* Original No : $xy = x \times 10^1 + y \times 10^0$

Reverse No : $yx = y \times 10^1 + x \times 10^0$

$\Rightarrow \boxed{y - x = 4}$

Given : $yx - xy = 36$ (diff b/w Reverse & original no is 36)

$\Rightarrow 10y + x - (10x + y) = 36$

$\Rightarrow 9y - 9x = 36$

$\Rightarrow (y - x) = 4$

$\Rightarrow \boxed{y - x = 4}$

Possibilities

9 – 5	59, 95
8 – 4	48, 84
7 – 3	37, 73
6 – 2	26, 62
5 – 1	15, 51
~~4 – 0~~	~~40, 04~~

* Reverse – Original no = $\boxed{63}$

$yx - xy = 63$

$\boxed{(y - x) = 7}$

9 – 2	29, 92
8 – 1	18, 81

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GATE-18 Date __/__/____

Saathi

Que. The sum of the digits of a two-digit number is 12. If the new number formed by reversing the digits is greater than the original number by 54, find the original no.

(a) 39 (b) 57 (c) 66 (d) 93

Ans.

$x + y = 12 \longrightarrow (i)$

$9(y - x) = 54$

$\Rightarrow y - x = 6 \longrightarrow (ii)$

$2y = 18 \Rightarrow y = 9$

$\therefore x = 3$

$\therefore xy = 30 + 9 = 39$ Ans $\boxed{a}$

GATE-17

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

(a) 63 (b) 72 (c) 81 (d) 90

Ans.

$x + y = 9 \longrightarrow (i)$

$10x + y - 45 = 10y + x$

$9(x - y) = 45$

$x - y = 5 \longrightarrow (ii)$

$\Rightarrow x = 7$

$y = 2$

$\therefore$ No. $= 10x + y = 72$ Ans $\boxed{b}$

G-2013, Bombay

Que. A number is as much greater than 75 as it is smaller than 117. The number is

(a) 91 (b) 93 (c) 89 (d) 96.

Ans.

$N - 75 = 117 - N$

$2N = 192$

$\therefore N = 96$ Ans $\boxed{d}$

(*) (i) $2 < 3$

$2^{1/2} \boxed{<} 3^{1/3}$

LCM(2,3) = 6, $(2^{1/2})^6 \boxed{\phantom{<}} (3^{1/3})^6 \Rightarrow 2^3 \boxed{\phantom{<}} 3^2$

(ii) $12 > 3$

$12^{1/12} \boxed{<} 3^{1/3}$

$(12^{1/12})^{12} \quad (3^{1/3})^{12}$

(iii) $4 < 6$

$4^{1/4} \boxed{>} 6^{1/6}$

LCM(4,6) = 12

$(4^{1/4})^3 \quad (6^{1/6})^2$

(iv) $6 > 2$

$6^{1/6} \boxed{<} 2^{1/2}$

$(6^{1/6})^6 \quad (2^{1/2})^6$

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* Chime → मंदिर के घंटी का आवाज (टन्न, ---)

Gate-22

(*) Bells ring → ① every 10 minute
→ ② every 12 minutes
→ ③ every 20 minutes

Starting from 6 am until 6 pm, how many times all these bells ring together?

LCM (10, 12, 20) = 60 minutes = 1 hour ⇒ 12 times Ans

* **Dipsomaniac**

शराब पागलपन

Que. Which among $2^{1/2}$, $3^{1/3}$, $4^{1/4}$, $6^{1/6}$ & $12^{1/12}$ is the largest?

(a) $2^{1/2}$ (b) $3^{1/3}$ (c) $4^{1/4}$ (d) $6^{1/6}$

b

Arrange in descending order?

2	2	3	4	6	12
2	1	3	2	3	6
3		3		3	3
					= 12

Ans:

$2^{1/2}$	$3^{1/3}$	$4^{1/4}$	$6^{1/6}$	$12^{1/12}$
2^6	3^4	4^3	6^2	12^1
64	81	64	36	12

$\therefore$ $3^{1/3} > 2^{1/2} = 4^{1/4} > 6^{1/6} > 12^{1/12}$

* **Test:-**

Que. If $x = -0.5$, then which one of the following has the smallest value?

(a) $2^{1/x}$ (b) $1/x$ (c) $\frac{1}{x^2}$ (d) $2x$

Arrange in descending order?

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Ans:-

$2^{-0.5}$	$\frac{1}{-0.5}$	$\frac{1}{(-0.5)^2}$	$2\times(-0.5)$
2^{-2}	-2	$\frac{1}{0.25}$	-1
$\frac{1}{4}$	-2	4	-1

$\therefore$ Smallest $= \frac{1}{x}$ Ans $\boxed{b}$

Descending order:- $\frac{1}{x^2} > 2^{1/x} > 2x > \frac{1}{x}$

$\boxed{\text{College Exam}}$ → Knowledge

$\boxed{\text{GATE/Any National Exam}}$ → Knowledge + $\boxed{\text{Competency}}$ ★★★

Competency → Test ★★★★★ → Analyze

- Topic wise
- Chapter wise
- Subject wise.
- Overall (Mock)

*. Decimal No:-

- $0.1234 = 1234/10000$
- $0.\overline{1234} = 1234/9999$
- $0.1\overline{234} = (1234)/9990 = (1234-1)/9990$
- $0.12\overline{34} = \left(\begin{matrix}1234\\-12\end{matrix}\right)/9900 = (1234-12)/9900$
- $0.123\overline{4} = \left(\begin{matrix}1234\\-123\end{matrix}\right)/9000 = (1234-123)/9000$

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(*) $0.44444\ldots = 0.\overline{4}$

$= 0.4 + 0.04 + 0.004 + 0.0004 + \ldots \infty$

$= \frac{4}{10} + \frac{4}{10^2} + \frac{4}{10^3} + \frac{4}{10^4} + \ldots \infty$

↳ Infinite GP

$$\boxed{S_\infty = \frac{a}{1-r}}$$

$\therefore S_\infty = \frac{4/10}{1 - 1/10} = \frac{4}{10} \times \frac{10}{9} = \frac{4}{9}$ Ans

* Test :-

PSU (1) $0.\overline{5}$ (a) $\frac{5}{10}$ (b) $\frac{1}{2}$ (c) $\frac{5}{9}$ (d) All

The simplest form is?

$0.\overline{5} = \frac{5}{9}$ Ans $\boxed{c}$

CAT (2) $D = 0.ababab\ldots$

$= 0.\overline{ab}$ (a, b are digits from (1-9).

By which the following D must be multiplied so that we get the Integral value.

(a) 99 (b) 198 (c) 297 (d) All

Ans:- $\boxed{d}$ all. $D = 0.\overline{ab} = \frac{ab}{99}$

$D \times 99 = \text{Integ.} = ab$

$\frac{ab}{99} \times 198 = 2ab$

$\frac{ab}{99} \times 297 = 3ab$

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Saathi

* Delhi AIIMS Que Methane - chemical formula

? (a) CH_4 (b) $-CH_3$ (c) $-CH_2$ (d) All the above.

Ans: $\boxed{d}$

(*) Divibility of 11 :-

$N = a\,b\,c\,d$ (d ← ℓ; b: odd, c: even, d: odd)

$\boxed{(\text{Sum})_{odd} \sim (\text{Sum})_{even} = 0/11n.}$

eg:-

- 1331 ⇒ $(1+3) \sim (1+3) = 0$ ✓
- 50017 ⇒ $(5+0+7) \sim (0+1) = 11$ ✓

* $\boxed{7/13}$

$N = a\,b\,c\,d\,e\,f\,g\,h\,i$ (i ← ℓ; abc: odd, def: even, ghi: odd)

$(\text{Sum})_{odd} \sim (\text{Sum})_{even}$

- $0/7n$ → $\div 7$ ✓
- $0/13n$ → $\div 13$ ✓

⇒ $(abc+ghi) \sim (def)$

- $0/7n$ → $\div 7$
- $0/13n$ → $\div 13$

eg:-

(i) 280140007 (odd, even, odd)

$(280+007) \sim 140$

$= 287 \sim 140$

$= 147$

- $\div 7$ ✓ → $\div 7$ ✓
- $\div 13$ ✗ → $\div 13$ ✗

(ii) 028140007 (odd, even, odd)

$(28+007) \sim 140$

$35 \sim 140$

$= 105$

$\div 7$ ✓ → $\div 7$ ✓

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★. Quiz-2 $\frac{6}{10}$ $\frac{21}{102}$ >79% People

Saathi

Date 23 / 03 / 23

★★ Q.① How many values can 'n' take, such that 2^n is exactly divisible by n^2?

(a) 2 (b) 1 (c) 0 (d) Infinite

Ans:- $\boxed{d}$ $n=1$, $2^1/1^2$ ✓

$n=2$, $2^2/2^2$ ✓

$n=4$, $2^4/4^2$ ✓

$n=8$, $2^8/8^2$ ✓

$n=16$, $2^{16}/16^2$ ✓ ------- etc.

Q.② What is the remainder when $1923^{1924^{1925}}$ is divided by 1924?

(a) 1922 (b) 1923 (c) 1 (d) 0

Ans:- $\boxed{c}$ $\frac{1923^{1924^{1925}}}{1924} = \frac{(1924-1)^{1924^{1925}}}{1924}$

$= \frac{(-1)^{1924^{1925}}}{1924} = (-1)^{\text{even}} = 1$ Ans.

Q.③ If $N = (11111111)^2$, then what is the sum of the digits of N?

(a) 54 (b) 62 (c) 64 (d) 68

Ans: $\boxed{c}$

		Digit sum	
$1^2 = 1$	$\longrightarrow$	1	$= 1^2$
$11^2 = 121$	$\longrightarrow$	4	$= 2^2$
$111^2 = 12321$	$\longrightarrow$	9	$= 3^2$
$1111^2 = 1234321$	$\longrightarrow$	16	$= 4^2$
⋮			
$(11111111)^2$	$\longrightarrow$	$8^2 =$	64 Ans.

Q.④ How many digits are required to number a book containing 200 pages?

(a) 200 (b) 600 (c) 492 (d) 372

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Saathi

Date ___/___/___

Ans: [c] 1 to 9 = 9

+ 10 to 99 = 2×90 = 180

+ 100 to 200 = 3×101 = 303

∴ Total required digits = 9+180+303 = 492 Ans

Q.5 How many multiples of 32 are perfect squares less than 10^4?

(a) 14 (b) 13 (c) 12 (d) 3

Ans: [c] The least of 32 which is perfect square = 64

64×1^2, 64×2^2, 64×3^2, ---- 64×12

($\because$ $64\times13^2 > 10^4$)

∴ Total multiple = 12 Ans

Q.6 Let D be a decimal no of the form D = 0.abcdabcdabcd--- where the digits a, b, c and d are integers lying between 0 and 9. At most three of these digits are zero. By what number should D be multiplied so that the result is a nature number?

(a) 999 (b) 9990 (c) 49995 (d) 499995

Ans. [c] $D = 0.abcdabcdabcd----$

$= 0.\overline{abcd}$

$= \frac{abcd}{9999}$

Only multiple of 9999 is 49995 = (9999×5). Ans

Que.7 Find the last two digits of $25^{63}\times63^{25}$.

(a) 85 (b) 75 (c) 55 (d) 45

Ans: [b] $25^{63}\times63^{25}$

$\downarrow 25$ $\quad \downarrow (3^{4\times6})\times3 = 81^6\times3$

$\downarrow 81\times3$ 43

$= 25\times43 =$ 75 Ans.

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Date ___/___/_____

Q.(8) How many two-digit numbers have exactly five factors?

(a) 0 (b) 1 (c) 2 (d) 3

Ans: (c) The number which has 5 factors should be in the form of (a^4).

$\therefore$ Such two digits are 2^4 & 3^4 = (16 & 81) Ans

Q.(9) & (10) $\longrightarrow$ CR/VR

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11. Verbal Reasoning - 2

Date 23 / 03 / 2023

Saathi

* ① CID (Conclusion, Inference & Deduction) (90%) ↑↑

V.R. / C.R.

④ Miscellaneous
- Paraphrase
- Deleted
- Summary
- Author's Opinion

③ Weakens
- Undermine *
- Undercut *

② Strengthen
- Bolster
- Underpin ***

* World war - II

Italy Germany Japan started

- Colony
- Colonise
- Colonial (गुलाम)

* UK / England / The Great Britain. — different

* Practice / Practise
  VX N

Advice / Advise

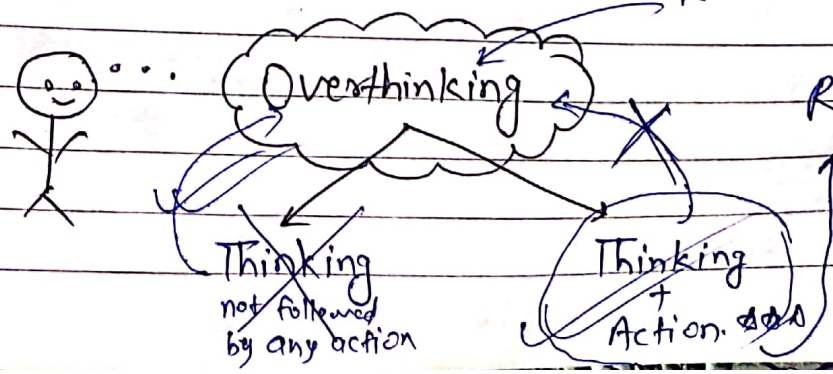
Prophecy / Prophesy
  N V → somebody who can see the future.

CV मत बनाना → X
Resume बनाना

* Dengue - डेंगी (Pronunciation)

* Prevalent - ~~Unstoppa~~ Uncontrolled.

* Not any such term exists.



Regardless of the outcome.

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They change the tone of the sentence from ⊕ to ⊖ or from ⊖ to ⊕

Saathi

* 180° words ⊕ / ⊖
⊖ / ⊕

- Though — Not withstanding
- Although
- However ☆
- But
- Yet
- Despite
- In spite of
- Not withstanding

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12. Doubt Clearing Session

Date 23/03/23

Saathi

* Remainder

- $3/2 \rightarrow 1$
- $3^2/2 \rightarrow 1$
- $3^3/2 \rightarrow 1$

$\Downarrow$

$$\boxed{\frac{(a+1)^n}{a}}$$

$\Rightarrow$ (Remainder = 1)

(*) $\frac{2}{3} \rightarrow$ Rem. = 2

$\frac{2^2}{3} \rightarrow 1$

$\frac{2^3}{3} \rightarrow 2$

$\frac{2^4}{3} \rightarrow 1$

$$\boxed{\frac{2^{odd}}{3} \rightarrow \text{Rem.} = 2}$$

$$\boxed{\frac{2^{even}}{3} \rightarrow \text{Rem} = 1}$$

$\Downarrow$

- $\frac{a^{n=odd}}{(a+1)} \rightarrow$ Rem = a
- $\frac{a^{n=even}}{(a+1)} \rightarrow$ Rem = 1

eg.- (i) $\frac{28^{29}}{27} = 1$ R

(ii) $\frac{28^{999992}}{27} = 1$

(iii) $\frac{28^{29!}}{27} = 1$

(iv) $\frac{28^{29!\,30!\,31!}}{27} = 1$

CAT (*) $\frac{7^{84}}{342} \rightarrow R = ?$

$\frac{7}{342} = 7$

$\frac{7^2}{342} = 49$

$\frac{7^3}{342} = 1$

$\therefore \frac{(7^3)^{28}}{342} = 1$ Ans

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⇒

$\frac{a^{odd}}{(a+1)} \rightarrow \boxed{R = a}$

$\frac{a^{even}}{(a+1)} \rightarrow \boxed{R = 1}$

eg:- • $\frac{26^{27}}{27} \rightarrow 26$ • $\frac{26^{26}}{27} \rightarrow 1$

⇒

$\frac{(a+1)^n}{a} \rightarrow \boxed{R = 1}$

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

$\frac{a^{odd}}{(a+1)} \rightarrow \boxed{R = a}$

$\frac{a^{even}}{(a+1)} \rightarrow \boxed{R = 1}$

* Test:-

① $\frac{38^{2023}}{37} \rightarrow 1$

② $\frac{38^{2023!}}{37} \rightarrow 1$

③ $\frac{37^{\overset{odd}{2023}}}{38} \rightarrow 37$

④ $\frac{37^{\overset{even}{2023!}}}{38} \rightarrow 1$

④ $\frac{37^{2023!}}{38} \rightarrow 1$

Q. $\frac{1923^{1924^{1925}}}{1924}$

↓

$\frac{a^{even}}{(a+1)}$

∴ R = 1 Ans

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Date __/__/__

* 1 - 9 → 9 × 1 = 9 digits
10 - 99 → 90 × 2 = 180 digits
100 - 999 → 900 × 3 = 2700 digits

Que. 12345 - - - - $\boxed{25}$ th digit = ?

$\underbrace{123456789}_{9\times1}$ $\underbrace{1011121314 \cdots 9899}_{90\times2}$ $\underbrace{100101102 \cdots 998999}_{900\times3}$

= 09 digit = 180 digit = 2700 digits

25 - 09 = 16 Digits

Let x more no from 9

∴ x × 2 = 16

⇒ x = 8 Nos. → 9 + 8 = 17 → 7 Ans.

12345678 - - - 151617 ← 25th digit

Que. 123456 - - - - - - - - - $\boxed{50^{th}}$ digit = ?

50 - 09 = 41 digits

x × 2 = 41 → 9 + 20 = 29

$x = \frac{41}{2}$ = 20 Nos / 1 digit → 30

12345 - - - - 2829 3 Ans

Que. 12345 - - - - - - $\boxed{100^{th}}$ digit = ?

100 - 09 = 91

2x = 91 9 + 45 = 54

$x = \frac{91}{2}$ = 45 / 1 → 5

12345 - - - 5354 5 Ans

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Saathi

Date ___/___/___

* 1234 - - - - - $\boxed{200^{th}}$ digit = ?

200 − 189 = 11 Digits

$x \times 3 = 11$

$x = \frac{11}{3}$ = 3 Nos of 2 Digits

1 2 3 - - 98 99 100 101 102 103 Ans

Que. How many multiples of 32 are perfect squares, less than 10^4?

(a) 14 (b) 13 (c) 12 (d) 3

Ans: $\underbrace{(2^5 \times 2)}$ $\times 1^2$, $\times 2^2$, $\times 3^2$, $\times 4^2$, $\times 5^2$, $\times 6^2$, $\times 7^2$, $\times 8^2$, $\times 9^2$, $\times 10^2$, $\times 11^2$, $\times 12^2$, ~~$\times 13^2$~~ $< 10{,}000$

12 Ans.

Que. Find the last two digits of $25^{63} \times 63^{25}$

Ans:- $25^{63} \times 63^{25}$

$\downarrow$ $\downarrow$

25 $(7 \times 9)^{25}$

$7^{25} \times 9^{25}$

25×43 $(7^4)^{-} \times 7^1 \times (9^2)^{12} \times 9^1$

$\downarrow$

49 Ans $07 \times (81)^{12} \times 9$

61×9

49

$07 \times 49 = 43$

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Saathi

Que- How many two-digit numbers have exactly five factors?

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

$\Rightarrow n = (p+1)(q+1)(r+1)$

$= 5 \quad \Rightarrow \quad p+1 = 5$

$p = 4$

$\therefore N = a^4$

$\rightarrow [10 - 99)$

$2^4 = 16$

$3^4 = 81$

$4^4 = X$

$\boxed{c}$ (2) Ans.

* Cognitive.

Cog जहाँ पर आएगा knowledge लेके आएगा।

Critical Reasoning Practice Question in PDF (2)

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NUMBERS — II

13. Permutation Combinations & Probability - 1

Saathi

Date 24 / 03 / 23

Permutation / Combination

*. $\boxed{+ / \times}$:-

- Choice → OR → + → ∪
- No choice → AND → × → ∩

1.

*. 1|2|3 :

Form a 2 digit No. such that

Rep ✓ $\underset{1/2/3}{\underline{3}} \times \underset{1/2/3}{\underline{3}} = 9$

Rep ✗ $\underset{1/2/3}{\underline{3}} \times \underset{\substack{TX \\ 1/2/3}}{\underline{2}} = 6$

* Test :

1|2|3|4|5

Rep ✓ $\underset{1-5}{\underline{5}} \times \underset{1-5}{\underline{5}} \times \underset{1-5}{\underline{5}} = 125$

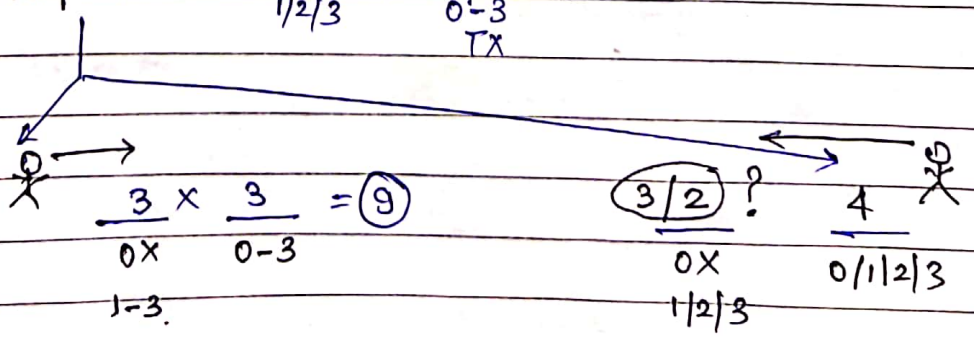
Rep ✗ $\underset{1-5}{\underline{5}} \times \underset{\substack{1-5 \\ HX}}{\underline{4}} \times \underset{\substack{1-5 \\ HX \\ TX}}{\underline{3}} = 60$

*. Test :

0/1/2/3

Rep ✓ $\underset{1/2/3}{\underline{3}} \times \underset{0-3}{\underline{4}} = 12$

* Rep ✗ $\underset{1/2/3}{\underline{3}} \times \underset{\substack{0-3 \\ TX}}{\underline{3}} = 9$



Stuck ??

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Flow — Book

Saathi

Date __/__/____

#. PFC में जहाँ पे stuck, make cases:

2	3	3	$\boxed{0}$
0X	1/2/3	1/2/3	
1/2/3	(NZ)		
UX			

= 06 + 03 = 09 Ans.

(*) Always attack the condition at first place.

eg:- 1/2/3/4 — — —

this place must alway be even.

— 2 —
↑
2/4

(*) Once you are done with the condition regardless whether repetition is allowed or not, we will always go to the 1st place.

— 2 —
↑
2/4

0/1/2/3/4

R✓ 4 × 5 × 5 = 100
0X, 1-4✓ | 0-4 | 0-4

Rx 4 × 4 × 3 = 48
0X, 1-4✓ | 0-4, HX | 0-4, HX, TX

Test:

0/1/2/3/4/5/6/7

R✓ 7 × 8 × 8 × 8 = 3584
0X, 0-7 | 0-7 | 0-7 | 0-7

Rx 7 × 7 × 6 × 5 = 1470
0X, 1-7 → X | 0-7 → X | 0-7 → X | 0-7 → X

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Date ___/___/_____

Saathi

Que. How many four digit numbers can be formed with the 10 digits 0, 1, 2, --- 9 if no number can start with 0 and if repetitions are not allowed?

– Gate 2015 : IIT Kanpur (CE-2)

Ans:-

$$\underset{\substack{0\times \\ 1-9}}{\underline{9}} \times \underset{0-9}{\underline{9}} \times \underset{0-9}{\underline{8}} \times \underset{0-9}{\underline{7}} = 81\times 8\times 7 = 648\times 7$$

$$= 4536 \text{ Ans.}$$

(2)

* 1–5 → Number odd

R✓ $\underset{1-5}{\underline{5}} \times \underset{1-5}{\underline{5}} \times \underset{1/3/5}{\underline{3}} = 75$

Rx $\underset{\substack{1-5 \\ U\times}}{\underline{4}} \times \underset{\substack{1-5 \\ U\times \\ H\times}}{\underline{3}} \times \underset{1/3/5}{\underline{3}} = 36$

* Test : 0–9

(1) Numbers must be odd.

R✗ $\underset{\substack{0\times \\ U\times}}{\underline{8}} \times \underset{\substack{U\times \\ H\times}}{\underline{8}} \times \underset{1/3/5/7/9}{\underline{5}} = 320$

R✓ $\underset{\substack{0\times \\ 1-9}}{\underline{9}} \times \underline{10} \times \underset{1/3/5/7/9}{\underline{5}} = 450$

(2) All digits must be odd 1–9

R✓ $\underset{1/3/5/7/9}{\underline{5}} \times \underline{5} \times \underline{5} = 125$

Rx $\underset{1/3/5/7/9}{\underline{5}} \times \underset{\substack{1/3/5/7/9 \\ H\times}}{\underline{4}} \times \underset{\substack{1/3/5/7/9 \\ H\times \\ T\times}}{\underline{3}} = 60$

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* Test:-

0 – 9

(i) $\underset{2/3/5/7}{\underline{4}} \times \underset{H\times}{\underline{3}} \times \underset{\substack{H\times \\ T\times}}{\underline{2}} = 24$

Every digit must Prime & Distinct

(ii) $\underset{1/3/5/7/9}{\underline{5}} \times \underset{H\times}{\underline{4}} \times \underset{\substack{H\times \\ T\times}}{\underline{3}} = 60$

every digit odd & distinct

\# We become what we CONSUME. \#.

\# We receive what we are ready for. \#.

* Test:-

(1) 1|2|3|4|5|6

Number even

R✓ $\underset{1-6}{\underline{6}} \times \underset{2/4/6}{\underline{3}} = 18$

R✗ $\underset{\substack{0\times \\ 1-5}}{\underline{5}} \times \underset{0/2/4}{\underline{3}} = 15$??

R✗ $\underset{\substack{1-6 \\ U\times}}{\underline{5}} \times \underset{2/4/6}{\underline{3}} = 15$

(2) 0/1/2/3/4/5

$\boxed{R\times}$ ** ___ ___

Make cases

$\underset{1-5}{\underline{5}} \times \underset{(Z)}{\underline{\boxed{0}}} = 5$

+

$\underset{\substack{0\times \\ 1-5 \\ U\times}}{\underline{4}} \times \underset{\substack{(NZ) \\ 2/4}}{\underline{2}}$ 8

$\boxed{= 13}$

Special practice Paper - 3

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14. P & C and Probability - 2

Date 24 / 03 / 23

* 1/2/3/4/5 Number ÷ 2

R ✓ $\frac{5}{1-5} \times \frac{5}{1-5} \times \frac{2}{2/4} = 50$

R ✗ $\frac{4}{1-5\ UX} \times \frac{3}{1-5\ UX\ HX} \times \frac{2}{2/4} = 24$

* 1/2/3/4/5 $\boxed{\div 5}$

R ✓ $\frac{5}{1-5} \times \frac{5}{1-5} \times \frac{1}{5\ \text{Fixed}} = 25$

R ✗ $\frac{4}{1-5\ UX} \times \frac{3}{1-5\ UX\ HX} \times \frac{1}{5\ \text{Fixed}} = 12$

* Test:-
1-9 __ __ __

1 ÷2 R ✓ $\frac{9}{1-9} \times \frac{9}{1-9} \times \frac{4}{2/4/6/8} = 324$

R ✗ $\frac{8}{1-9\ UX} \times \frac{7}{1-9\ UX\ HX} \times \frac{4}{2/4/6/8} = 224$

2 ÷5 R ✓ $\frac{9}{1-9} \times \frac{9}{1-9} \times \frac{1}{5} = 81$

R ✗ $\frac{8}{1-9\ UX} \times \frac{7}{1-9\ UX\ HX} \times \frac{1}{5} = 56$

* 0/1/2/3/4 $\boxed{\div 2}$?

__ __ __

4 = even

0/2/4

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Saathi

Trap:- 4/3 ★★★ 3 if 0 ✓ if 2/4

0X 0/2/4

1-4

0/1/2/3/4 ÷2

R✗ 4 × [0] = 4

1/2/3/4 Z +

3 × 2 = 6

0X NZ 2/4 10

1-4

U=NZ✗

Test

*✓ 0/1/2/3/4/5/6 [÷2]

R✓ 6 × 7 × [0] = 42

0-6 0X 0-6 Z +

5 × 3 = 126

0X U✗ NZ 2/4/6 168 Ans

R✗ 6 × 5 × [0] = 30

0-6 0X 0-6 0X U✗ Z +

5 × 5 × 3 = 75

0-6 0X U✗ 0-6 U✗ H✗ NZ 2/4/6 105 Ans

★R✓ 6 × 7 × 4 = 168 Ans.

1-6 0-7 0/2/4/6

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SD Date 25 / 03 / 31

* 0 – 9 $\boxed{\div 2}$

R✓ $\underset{\substack{0\times \\ 1-9}}{\underline{9}} \times \underset{0-9}{\underline{10}} \times \underset{0-9}{\underline{10}} \quad \underset{0/2/4/6/8}{\underline{5}} = 4500$ Ans

Rx $\underset{\substack{0\times \\ 1-9}}{\underline{9}} \times \underset{\substack{0-9 \\ U\times \\ T\times}}{\underline{8}} \times \underset{\substack{0-9 \\ U\times \\ T\times \\ H\times}}{\underline{7}} \quad \underset{0}{\underline{\boxed{1}}} = 504$

+

$\underset{\substack{0-9 \\ 0\times \\ U\times}}{\underline{8}} \times \underset{\substack{0-9 \\ U\times \\ T\times}}{\underline{8}} \times \underset{\substack{0-9 \\ U\times \\ T\times \\ H\times}}{\underline{7}} \times \underset{2/4/6/8}{\underline{4}} = 1792$

2296 Ans.

(3)

* 1|2|3|4 There must be exactly one (4).

$\underset{\substack{4\times \\ 1-2}}{\underline{3}} \times \underline{\boxed{4}}$ fixed $= 3\times 1 = 3$ {14, 24, 34}

+

fixed $\underline{\boxed{4}} \times \underset{\substack{4\times \\ 1-3}}{\underline{3}} = 1\times 3 = 3$ {41, 42, 43}

6 Ans.

* 1|2|3|4|5 exactly one (5).

$\underset{\substack{1-4 \\ 5\times}}{\underline{4}} \times \underset{\substack{1-4 \\ 5\times}}{\underline{4}} \times \underline{\boxed{5}} = 16$ $\boxed{\Rightarrow 16\times 3 = 48}$

+

$\underset{1-4}{\underline{4}} \times \underline{\boxed{5}} \times \underset{1-4}{\underline{4}} = 16$

+

$\underline{\boxed{5}} \times \underset{1-4}{\underline{4}} \times \underset{1-4}{\underline{4}} = 16$

48 Ans.

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* Test:-

* ① Using the digits 1-9 how many 3 digits no.s can be formed such that it must have exactly one ⑤.

$\underset{5X}{\underset{1-9}{\cancel{9}}} \times \underset{5X}{\underset{1-9}{\cancel{9}}} \times \boxed{5} = \cancel{81}\ 64$ (8, 8)

$+$

$\underset{5X}{\underset{1-9}{\cancel{9}}} \times \boxed{5} \times \underset{1-9\,5X}{\cancel{9}} = \cancel{81}\ 64$ (8)

$+$

$\underset{5X}{\underset{1-9}{\cancel{9}}} \times \boxed{5} \times \underset{1-9\,5X}{\cancel{9}} = \cancel{81}\ 64$ (8)

$\cancel{243}$ Ans

$81 \times 3 = 243$ Ans

192

* ② 0-9 exactly one ⑤ — — —

Gate-2012

$\underset{1-9\,0\times 5X}{\cancel{9}} \times \underset{0-9\,5X}{\cancel{10}} \times \boxed{5} = \cancel{90}\ 72$ (8, 9)

$+$ $+$

$\underset{1-9\,0\times 5X}{\cancel{9}} \times \boxed{5} \times \underset{0-9\,5X}{\cancel{10}}\ 9 = \cancel{90}\ 7.2$ (8)

$+$ $+$

$\boxed{5} \times \underset{0-9\,5X}{\cancel{10}} \times \underset{0-9\,5X}{\cancel{10}}\ 9 = \cancel{100}\ 81$ (9)

$\cancel{280}$ Ans.

225 Ans.

* 1/2/3/4/5 exactly two ⑤:

$\underset{5X}{4} \times ⑤ \times ⑤ = 4$

$+$

$⑤ \times \underset{5X}{4} \times ⑤ = 4$

$+$

$⑤ \times ⑤ \times \underset{5X}{4} = 4$

12 Ans

* 1/2/3/4/5 All three 5

⑤ ⑤ ⑤ $= 1 \times 1 \times 1 = 1$ Ans

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* exactly one (5) + exactly two (5) + all three (5)

$= 48 + 12 + 1$

$= 61$

→ **At least one (5)**

⇓

Que. 1/2/3/4/5 . If we want to have three digit nos that have at least one (5)?

exactly one (5) → (48)

exactly two (5) → (12)

All three (5) → (1)

Que. ~~उसे~~

(OR)

Total − Not required (नहीं चाहिए)

$$\text{Total} = \underset{1-5}{\underline{5}} \times \underset{1-5}{\underline{5}} \times \underset{1-5}{\underline{5}} = 125$$

$$\text{नहीं चाहिए} = \underset{\substack{5\times \\ 1-4}}{\underline{4}} \times \underset{\substack{5\times \\ 1-4}}{\underline{4}} \times \underset{\substack{5\times \\ 1-4}}{\underline{4}} = 64$$

At least one (5) = 61 Ans.

Que. 1−9 3 digit no., at least one (5)

Ans:- Total − Not required.

$$\underset{1-9}{\underline{9}} \times \underset{1-9}{\underline{9}} \times \underset{1-9}{\underline{9}} - \underset{\substack{5\times \\ 1-9}}{\underline{8}} \times \underset{\substack{5\times \\ 1-9}}{\underline{8}} \times \underset{\substack{5\times \\ 1-9}}{\underline{8}}$$

$= 729 - 512 = 217$ Ans

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Saathi

1-9

(1) exactly one 7.

because there is no zero (0).

$\underset{7\times}{\underline{8}} \times \underset{7\times}{\underline{8}} \times \boxed{7} = 8\times8\times1 = 64) \times 3 = 192$

(2) at least one 7.

Total − Not required

$\underset{1-9}{\underline{9}} \times \underset{1-9}{\underline{9}} \times \underset{1-9}{\underline{9}} - \underset{7\times}{\underline{8}} \times \underset{7\times}{\underline{8}} \times \underset{7\times}{\underline{8}} = 729 - 512 = 217$ Ans

0-9 3 digit no

(1) exactly one 7.

$\underset{\cancel{7}0\times}{\underline{8}} \times \underset{7\times}{\underline{9}} \times \boxed{7} = 72$

+

$\underset{\cancel{7}\,0\times}{\underline{8}} \times \boxed{7} \times \underset{7\times}{\underline{9}} = 72$

+

$\boxed{7} \quad \underset{7\times}{\underline{9}} \times \underset{7\times}{\underline{9}} = 81$

225 Ans

(2) At least one 7.

Total − Not required

$\underset{0\times}{\underline{9}} \times \underset{0-9}{\underline{10}} \times \underset{0-9}{\underline{10}} - \underset{\substack{0\times \\ 7\times}}{\underline{8}} \times \underset{7\times}{\underline{9}} \times \underset{7\times}{\underline{9}}$

$= 900 - 648$

$= 252$ Ans.

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15. P/C & Probability - III

Date 25 / 03 / 2023

Saathi

* Pristine – बेदाग – absolutely clean
– Immaculate
– Impeccable

(4) (Inequality)

* 1|2|3|4 2 Digit No.

(1) R ✓ ___ > ___

(2) R ✗ ___ > ___

(1) R ✓

21, 31, 41 — 3 / 2|3|4 > (1) fixed Minm = 3×1 = 3 +

32, 42 — 2 / 3|4 > (2) fixed = 2×1 = 2 +

41 — 1 / 4 > (3) Max = 1×1 = 1

6 Ans

(2) R ✗

3 / 2|3|4 > (1) Min = 3 +

2 / 3|4 > (2) = 2 +

1 / 4 > (3) Max = 1

6 Ans

* 1|2|3|4

___ ≥ ___

4 / 1-4 ≥ (1) Min² = 4 +

3 / 2|3|4 ≥ (2) = 3 +

2 / 3|4 ≥ (3) = 2 +

1 / 4 ≥ (4) = 1

10 Ans

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Saathi

Test :-

* ① 1-9 R✓ ___ > ___

$\frac{8}{2-9} > \boxed{1}$

$\frac{7}{3-9} > \boxed{2}$

$\frac{6}{4-9} > \boxed{3}$

⋮

$\frac{1}{9} > \boxed{8}$

$= 8+7+6+5+4+3+2+1$

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

$= 36$ Ans

② 0-9 R✓ ___ > ___

$\frac{9}{1-9} > \boxed{0}$

$\frac{8}{2-9} > \boxed{1}$

⋮

$\frac{1}{9} > \boxed{8}$

$= 1+2+3+ --- +9$

$= \frac{9 \times 10}{2}$

$= 45$ Ans.

* 1|2|3|4|5

R✓

~~$5 \times 5 > ①$~~

~~$5 \times 5 > ②$~~

~~$5 \times 5 > ③$~~

~~$5 \times 5 > ④$~~

$= 25 + 25 + 25 + 25$

$= 100$

$\frac{5}{1-5} \times \frac{4}{2-5} > ①$ $= 5 \times 4 \times 1 = 20$

$\frac{5}{1-5} \times \frac{3}{3-5} > ②$ $= 5 \times 3 \times 1 = 15$

$\frac{5}{1-5} \times \frac{2}{4/5} > ③$ $= 5 \times 2 \times 1 = 10$

$\frac{5}{1-5} \times \frac{1}{5} > ④$ $= 5 \times 1 \times 1 = 5$

50 Ans

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* 1|2|3|4|5 ___ ___ > ___ RX

$\underset{\substack{1-5\\ UX\ TX}}{3} \times \underset{2-5}{4} > \underset{1}{__} = 12$

$\underset{\substack{1-5\\ U=2X\\ TX}}{3} \times \underset{3-5}{3} > \underset{2}{__} = 9$

$\underset{\substack{1-5\\ UX\ TX}}{3} \times \underset{4-5}{2} > \underset{3}{__} = 6$

$\underset{\substack{1-5\\ UX\ TX}}{3} \times \underset{5}{1} > \underset{4}{__} = 3$

30 Ans.

* Test:-

① 1-9 ___ ___ > ___ . R ✓

$\underset{1-9}{9} \times \underset{2-9}{8} > \underset{1}{__} = 81$

$\underset{1-9}{9} \times \underset{3-9}{7} > \underset{2}{__} = 63$

⋮

$\underset{1-9}{9} \times \underset{9}{1} > \underset{8}{__} = 9$

$= 9[1+2+\cdots+8]$

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

$= 9 \times 36$

$= 324$ Ans

** ✗ ② 0-9 RX ___ ___ > ___ .

$\underset{\substack{0-9\\ 1X\\ TX}}{8} \times \underset{1-9}{9} > \underset{0}{__}$

$\underset{\substack{1-9\\ TX}}{7} \times \underset{2-9}{8} > \underset{1}{__}$

$\underset{\substack{1-9\\ TX}}{7} \times \underset{3-9}{7} > \underset{2}{__}$

⋮

$\underset{\substack{1-9\\ TX}}{7} \times \underset{9}{1} > \underset{8}{__}$

$= 7 \times (1+2+\cdots+9)$

$= 7 \times \frac{9 \times 10}{2}$

$= 7 \times 45$

$= 315$ Ans

$= 8 \times 9 +$

$7 \times (8+\cdots+1)$

$= 72 + 7 \times \frac{8 \times 9}{2}$

$= 72 + 7 \times 36$

$= 72 + 252$

$= 324$ Ans

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1|2|3|4 R ✓ ___ > ___ > 1

Min	3	2	1
Max	5	4	3

Wrong Approach:-

$$\frac{3}{3-5} > \frac{3}{2-4} > \frac{1}{}$$

✓

✗

eg: 3 4 1 ✗

4 4 1 ✗

Long Approach:-

★ 3rd Approach ★

$$\frac{3}{3-5} > \frac{2}{} > \frac{1}{}$$

$$\frac{2}{4-5} > \frac{3}{} >$$

$$\frac{1}{5} > \frac{4}{} >$$

321
421
521
431
531
541

$$\frac{2}{4-5} > \frac{3}{} > \frac{2}{}$$

$$\frac{1}{5} > \frac{4}{} > \frac{}{}$$

$$\frac{1}{5} > \frac{4}{} > \frac{3}{}$$

★ whenever see double inequality, attack from middle. ★

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3rd approach:-

Min.	3	2	1
Max.	5	4	3

$\frac{3}{3/4/5} > \frac{2}{} > \frac{1}{1} = 3\times1$

$+$

$\frac{2}{4/5} > \frac{3}{} > \frac{2}{1/2} = 2\times2$

$+$

$\frac{1}{5} > \frac{4}{} > \frac{3}{1/2/3} = 1\times3$

10 Ans.

* Test:-

1-9 ___ > ___ > ___ R

$\frac{7}{3-9} > \frac{2}{} > \frac{1}{}$ $\quad$ $\frac{8}{6-9} > \frac{5}{} > \frac{4}{1-4}$

$\frac{6}{4-9} > \frac{3}{} > \frac{2}{1/2}$ $\quad$ $\frac{3}{7-9} > \frac{6}{} > \frac{5}{1-5}$

$\frac{5}{5-9} > \frac{4}{} > \frac{3}{1-3}$ $\quad$ $\frac{2}{8/9} > \frac{7}{} > \frac{6}{1-6}$

$\frac{1}{9} > \frac{8}{} > \frac{7}{1-7}$

$= 2\times(7+6\times2+5\times3) + 4\times4$

$= 2\times(7+12+15) + 16$

$= 2\times34 + 16$

$= 68 + 16$

$= 84$ Ans.

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0-9 ____ > ____ > ____

$___ > \underset{___}{0} > \frac{1}{1}$ ✗

$\frac{8}{2-9} > \underset{___}{1} > \frac{1}{0-0}$ $\quad \frac{1}{9} > \underset{___}{8} > \frac{8}{0-7}$

$\frac{7}{3-9} > \underset{___}{2} > \frac{2}{0,1}$ $\quad \frac{2}{8-9} > \underset{___}{7} > \frac{7}{0,1-6}$

$\frac{6}{4-9} > \underset{___}{3} > \frac{3}{0/1/2}$ $\quad \frac{3}{7-9} > \underset{___}{6} > \frac{6}{0/1-5}$

$\frac{5}{5-9} > \underset{___}{4} > \frac{4}{0/1-3}$ $\quad \frac{4}{6-9} > \underset{___}{5} > \frac{5}{0/1-4}$

$= 2 \times [8\times1 + 7\times2 + 6\times3 + 5\times4]$

$= 2 \times (8 + 14 + 18 + 20)$

$= 2 \times 60$

$= 120$ Ans.

Practice Set - 04
P/C

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Quiz - 3 $\frac{5}{10}$ $\frac{35}{83}$

Date 26/03/23

Saathi

① How many numbers lying between 600 and 700 can be formed with the digits 0-9, where 7 occurs at exactly one of the positions (Repitition is not allowed)?

(a) 18 (b) 63 (c) 16 (d) 54

Ans:

$\overset{1}{\underline{6}} \times \underset{\substack{0-9 \\ 7\times}}{\underline{9}} \; \underline{\boxed{7}} = 1 \times 9 = 9$

+

$\underline{6} \times \underline{\boxed{7}} \times \underset{\substack{0-9 \\ 7\times}}{\underline{9}} = 1 \times 1 \times 9 = 9$

18 Ans: $\boxed{a}$

② How many five digit numbers contain exactly one 3?

(a) 29889 (b) 30889 (c) 25890 (d) 31889

Ans:

$\underset{\substack{0\times \\ 3\times}}{\underline{8}} \times \underset{\substack{3\times \\ 0-9}}{\underline{9}} \times \underset{\substack{3\times \\ 0-9}}{\underline{9}} \times \underset{\substack{3\times \\ 0-9}}{\underline{9}} \; \underline{\boxed{3}} \Big) \times 4$

$\underline{\boxed{3}} \; \underset{\substack{3\times \\ 0-9}}{\underline{9}} \times \underset{\substack{3\times \\ 0-9}}{\underline{9}} \times \underset{\substack{3\times \\ 0-9}}{\underline{9}} \times \underset{\substack{3\times \\ 0-9}}{\underline{9}}$

$= 4 \times 8 \times 9 \times 9 \times 9 + 9 \times 9 \times 9 \times 9$

$= 9^3 (32 + 9)$

$= 729 \times 41 = 29889$ Ans $\boxed{a}$

③ How many four-letter words can be formed if the first and the last letters are vowels (if repition is not allowed)

(a) 8400 (b) 10500 (c) 16900 (d) 17200

Ans:-

$\underset{\text{a/e/i/o/u}}{\underline{5}} \times \underset{a-z}{\underline{26}} \times \underset{a-z}{\underline{26}} \; \underset{\text{a/e/i/o/u}}{\underline{5}} = 25 \times 676 = 16900$ Ans $\boxed{c}$

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④ How many five-digit numbers can be formed that are the same when the order of their digits is reversed?

(a) 8500 (b) 8100 (c) 2700 (d) 900

Ans: $\underset{0\times}{\underline{9}} \times \underset{0-9}{\underline{10}} \times \underset{0\times}{\underline{9}} = 9\times10\times10\times9$

$= 900$ Ans. $\boxed{d}$

⑤ How many 4-digit numbers can be formed by using the digits 0, 2, 3, 5 and 8 (without repetition), such that each number is not divisible by 4?

(a) 32 (b) 68 (c) 30 (d) 66

Ans:- Total - Not required

Total = $\underset{0\times\ 2/3/5/8}{\underline{4}} \times \underset{0/2/3/5/8}{\underline{4}} \times \underline{3} \times \underline{2} = 96$

$\div 4 = \underset{0\times}{\underline{2}} \times \underline{3}$ $\boxed{_\ _}$ → 08/20/80

08
20
28
32
52
80

$= 6\times3 + 4\times3$

$18+12$

$= 30$

$\cancel{2} \times \cancel{2}$ $\boxed{_\ _}$ → 28/32/52

$\therefore 96 - 30 = 66$ Ans $\boxed{d}$

⑥ How many 4-digit numbers divisible by 6 can be formed from the digits 1, 2, 3, 4, 5 and 6 without repetion?

(a) 48 (b) 42 (c) 60 (d) 54

Ans:

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Q(7) How many natural numbers greater than 7,00,000 can be formed by using the digits 0,3,5,6,7,8 if repetition is not allowed?

(a) 720 (b) 1024 (c) 7280 (d) 240

Ans:- $\underset{7/8}{2} \times 5 \times 4 \times 3 \times 2 \times 1 = 2 \times 120 = 240$ Ans (1)

Q(8) A number when divided by 779 gives 47 as remainder. On dividing the same number by 19, what would be the remainder?

(a) 0 (b) 3 (c) 9 (d) 10

Ans: $N = 779x + 47$

$\therefore \frac{N}{19} = \frac{779x + 47}{19} = 9$ Ans (c)

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16. **Doubt Clearing session**

Date 26/03/23

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Quiz-III

(1)

6	9	7	= 1×9×1 = 9
7X	7X 0-9		+
6	7	9	= 1×9×1 = 9
7X		7X 0-9	18 Ans

(2)

8	9	9	9	3	= 8×9×9×9×1
3X 1-9	3X 0-9	3X 0-9	3X 0-9		+
8	9	9	3	9	= 8×9×9×1×9
3X 0X 1-9	3X 0-9	3X 0-9		3X 0-9	+
8	9	3	9	9	= 8×9×1×9×9
3X 0X 1-9	3X 0-9		3X 0-9	3X 0-9	+
8	3	9	9	9	= 8×1×9×9×9
3X 0X 1-9		3X 0-9	3X 0-9	3X 0-9	+
3	9	9	9	9	= 1×9×9×9×9
	3X 0-9	3X 0-9	3X 0-9	3X 0-9	= 29889

(3) 5 × 26 × 26 × 5 = 16900 Ans.

A|E|I|O|U A-Z A-Z A|E|I|O|U

(4) **Palindromes**

1001 (उलटा-सीधा एक समान)

2112

MADAM

9	10	10	1	1	= 9×10×10×1×1
0-9 0X	0-9	0-9	same.	same digit.	= 900
1	2	3	2	1	Ans

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(5) Total − (÷4) = ÷ Not by (4)

Total = $\underset{\substack{0X \\ 2/3/5/8}}{\underline{4}} \times \underset{\substack{0/2/3/5/8 \\ ThX}}{\underline{4}} \times \underset{\substack{ThX \\ HX}}{\underline{3}} \times \underset{\substack{ThX \\ HX \\ TX}}{\underline{2}} = 96$

$\boxed{÷4}$ → last 2 digits ÷ 4 ✓

_ _ $\boxed{_\ _}$

08, 80 } (1)
20

28, 32, 52 } (2)

(1) zero

$\underset{0X}{\underline{3}} \times \underset{\substack{0X \\ 2}}{\underline{2X}}$ $\boxed{_\ _}$

08 / 80
20

2, 3, 5, 8] U/T 3, 5, 8]
X U/T-NZX
Th-NZ X

= 3 × 2 × 3
= 18

(2) Non-zero (NZ)

$\underset{0X}{\underline{2}} \times \underset{\substack{0 \\ 2 \\ 3 \\ 5 \\ 8}}{\underline{2}}$ $\boxed{_\ _}$

0X, 0X, TX] 2, 3, 5, 8] 2NZX, 1NZX

28
32
52

= 2 × 2 × 3
= 12

∴ 18 + 12 = 30

∴ 96 − 30 = 66 Ans.

Best Que. of the Quiz ★★★

(6) Tough

_ _ _ _ $\boxed{÷6}$ 1–6

RX ÷2 & ÷3

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Minimum digit sum = 1+2+3+4 = 10
(1234)

Maximum No → 6543 (6+5+4+3 = 18)

⇒ $\boxed{1234 \le N \le 6543}$

÷3 ⇒ $\frac{DS}{3}$ ✓

$10 \le \underset{\boxed{D.S.}}{N} \le 18$

DS
12
15
18

12 → 1|2|3|6 , 1|2|4|5
15 → 2|3|4|6 , 1|3|5|6
18 → 3|4|5|6

$\boxed{\div 2}$ → $\frac{\text{unit digit}}{2}$ ✓

__ __ __ __

Now 1|2|3|6 → (3×2×1×2) = 12
+
1|2|4|5 → 3×2×1 2 = 12
+
2|3|4|6 → 3×2×1×3 = 18
+
1|3|5|6 → 3×2×1×1 = 6
+
3|4|5|6 → 3×2×1×2 = 12

60 Ans

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(7) $\underset{\uparrow \atop 7/8}{2} \underbrace{5 \times 4 \times 3 \times 2 \times 1}_{5!} = 2 \times 120 = 240$ Ans

$$\boxed{\begin{array}{l} 1M = 10^6 \\ 1B = 10^9 \end{array}}$$

*. 3) 10 (3 → Quotient
-9
(1) → Remainder
→ Divisor / Factors
→ Dividend

$$\boxed{\text{Dividend} = \text{Divisor} \times \text{Quotient} + R}$$

$10 = 3 \times 3 + 1$

(8) $D = d \times Q + R$

$D = 779 \times Q + 47$

Now, $\frac{D}{19} = \frac{779 \times Q + 47}{19} =$

$= \frac{779 \times Q}{19} + \frac{47}{19} = \cancel{\frac{41Q}{19}} + \cancel{\frac{19 \times 2 + 9}{19}}$ (9)

$= 41Q/(0) + 2/(9)$

$= 0 + 9$

$= (9)$ Ans.

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* IPR - Intellectual Property Rights
  Patents, Copyright, Trademarks

* Exorbitant → spelling correction - Usury (extreme high price)

* इस्लाम → Usury (अत्यधिक high rate of interest)
  (ब्याज हराम है।)

* Credibility - विश्वसनियता

* To offset - Nullify करना

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17. P&C and Probability - IV

Date 26/03/23

P/C

$0! = 1! = 1$

*	Combination	Permutation
	1.) Meaning:- • Selection	1.) • Selection followed by Arrangment. (selection + Arrangement)
	eg:- A/B/C	eg:- A/B/C
$^3C_0$ ←	0 selected — 1 way	0 arrange — 1 $= {}^3P_0 = {}^3C_0 \times 0!$
$^3C_1$ ←	1 selected – A or B or C – 3	1 arrange – A or B or C – 3 $= {}^3C_1 \times 1!$
$^3C_2$ ←	2 selected – AB or BC or CA – 3	2 arrange – AB or BC or CA / BA CB AC – 6 $= {}^3C_2 \times 2!$
$^3C_3$ ←	3 selected – ABC – 1	3 arrange – ABC ACB or BAC BCA or CAB CBA – 6 $= {}^3C_3 \times 3!$
	3.) Formula:-	3.)
	• $\boxed{{}^nC_r = \frac{n!}{r!(n-r)!}}$	• $\boxed{{}^nP_r = \frac{n!}{(n-r)!}}$
	$0 \le r \le n$	$\Rightarrow \boxed{{}^nP_r = {}^nC_r \times r!}$
	n different things से r को select करना	
	# ${}^5C_2 = \frac{5!}{2!(5-2)!}$	* ${}^{20}C_{18} = {}^{20}C_2 = \frac{20 \times 19}{1 \times 2} = 190$
	$= \frac{5 \times 4}{2 \times 1} = 10$	* ${}^{10}C_9 = {}^{10}C_1 = 10$
	• ${}^{10}C_3 = \frac{10 \times 9 \times 8}{1 \times 2 \times 3} = 120$	* ${}^{100}C_{97}$ $= {}^{100}C_3 = \frac{100 \times \cancel{99}^{33} \times \cancel{98}^{48}}{1 \times \cancel{2} \times \cancel{3}}$
	• ${}^{50}C_{48} = {}^{50}C_2 = \frac{50 \times 49}{1 \times 2}$	$= 33 \times 48 \times 100$
	$\boxed{{}^nC_r = {}^nC_{n-r}}$	
	Complimentary combination	
	• ${}^{10}C_8 = {}^{10}C_{10-8} = {}^{10}C_2$	

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* $^2C_0 = 1$ $\boxed{^2C_1 = 2}$ $^2C_2 = 1$ when n = even ($r = n/2$)

↳ max m

* $^3C_0 = 1$ $\boxed{^3C_1 = 3 \quad ^3C_2 = 3}$ $^3C_3 = 1$ when n = odd

↳ max

⇓

* When n = even, $(^nC_r)_{max}$ at $r = \frac{n}{2}$

* when n = odd, $(^nC_r)_{max}$ at $r = \frac{n-1}{2}$, $r = \frac{n+1}{2}$

(*) $(^nC_r)_{max}$

n = EVEN → $r = \frac{n}{2}$

n = ODD → $r = \frac{n-1}{2}$, $\frac{n+1}{2}$

Que For $n = 11$, $(^nC_r)_{max} = ?$ IITJE

$^nC_r\ max = {}^nC_{\frac{n-1}{2}} = {}^{11}C_5 = {}^{11}C_6 = {}^{11}C_5$ or $^{11}C_6$

Que For $n = 21$, $(^nC_r)_{max} = ?$

$^nC_r\ max$, $r = \frac{21-1}{2} = 10 \Rightarrow {}^{21}C_{10}$ or $^{21}C_{11}$

$\frac{21+1}{2} = 11$

Ans

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* $^nC_r \longleftrightarrow {}^nP_r = {}^nC_r \times r!$

$^3C_0 \Rightarrow \boxed{^nC_0 = 1}$	$^3P_0 = {}^3C_0 \times 0! = 1 \times 1 = 1$
$^3C_1 \Rightarrow \boxed{^nC_1 = n}$	$^3P_1 = {}^3C_1 \times 1! = 3 \times 1 = 3$
$^3C_3 \Rightarrow \boxed{^nC_n = 1}$	$\boxed{^3P_3 = {}^3C_3 \times 3! = 1 \times 6 = 6}$ **

** $\boxed{^nP_n = {}^nC_n \times n! = n!}$

eg:- • $^5P_5 = 5!$
• $^{10}P_{10} = 10!$

* n अलग-अलग चीज़ का arrangement $= n!$.

Que Using the digits 1/2/3/4, how many four-digit nos can be formed?

$4 \times 3 \times 2 \times 1 = 4!$ Ans $(= {}^4C_4 \times 4!)$

* D/E/L/H/I → 5 letter words, how many?

$5!$ Ans $= ({}^5C_5 \times 4!)$

→ When we use P/C, there is an inherent assumption that repitition is not allowed.

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* 1|2|3   1|2|2   1|1|1

123, 132, 213, 231, 312, 321 — 3!

122, 212, 221 — $\frac{3!}{2!}$ → (2 digits repeated)

111 — $\frac{3!}{3!}$ ← (3 digits repeated)

↓

n different things arrangement = n!

* Test :-

For 5 digit nos

① 1|2|3|4|5 = 5! = 120

② 1|1|2|3|4 = 5!/2! = 60

③ 1|1|2|2|3 = 5!/2!2! = 30

④ 1|1|2|2|2 = 5!/2!3! = 10

⑤ 1|1|1|1|1 = 5!/5! = 1

* Test :- (using all alphabets how many - -)

① D|E|L|H|I = 5! = 120

② AGAIN = 5!/2! = 60

③ SUCCESS = 7!/3!2! = 420

④ MATHEMATICS = 11!/2!2!2!

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* DELHI

How many five letter words can be formed using the letters of the word DELHI.

① No condition → $n! = 5! = 120$ Ans

② D must occupied the 1st place $= 1! \times 4! = 24$ Ans

D _ _ _ _

$1! \times 4!$ E|L|H|I

③ E must occupied the 1st place & H - last place.

E _ _ _ H $= 1! \times 3! \times 1! = 06$ Ans

D|L|I

④ D & E are always together.

DE / L / H / I $= 4! \times (2!) = 48$ Ans

1 2 3 4

⑤ DEL must be together.

DEL H I $= 3! \times (3!) = 36$ Ans

⑥ D & E are never together.

Total − Not required

$= 5! - (4! \times 2!) = 120 - 48 = 72$ Ans.

⑦ D, E & L are never together.

$= 5! - (3! \times 3!) = 120 - 36 = 84$ Ans.

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⑧ How many 3 lettered words can be formed using the letters of word DELHI.

(i) No condition $\underline{5} \times \underline{4} \times \underline{3} = 60 = {}^5C_3 \times 3!$

(ii) It must have 2 vowels

_ _ _ (E & I) $\left[({}^2C_2) \times {}^3C_1 \right] \times 3! = 1 \times 3 \times 6$
$= 18$

(iii) It must have 2 consonants
[D, L, H]

$\left[({}^3C_2) \times {}^2C_1 \right] \times 3! = 3 \times 2 \times 6 = 36$ Ans

(iv) At least 2 consonants

$({}^3C_2 \times {}^2C_1) \times 3! + {}^3C_3 \times 3!$ Ans

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18. P&C and Probability - V

Date 27 / 03 / 23

*

B_1 B_2 B_3 G_1 G_2

form 5 member Committee

① No Condition → (i) $5C_3$

(ii) $5C_3 \times 3!$ → if arrangement

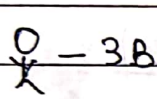
② 2B & 1G

exactly / at least / at most

↓

if ~~the~~ nothing is said, exactly

→ $3C_2 \times 2C_1$

*  – 3B , – 2G : 3 people team

③ at least 1B. (कम से कम 1B)

$3C_1 \times 2C_2 + 3C_2 \times 2C_1 + 3C_3 \times 2C_0$

(B) (G) (B) (G) (B) (G)

④ At most 2 Boys : (ज्यादा से ज्यादा 2 B)

$3C_2 \times 2C_1 + 3C_1 \times 2C_2 + 3C_0 \times 2C_3$

(B) (G) (B) (G) (B)

↓ Not possible.

*. Team formation → C ✓ P ✗

① No Condition.

② Exactly

③ At least

④ At most

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$(8+4) \leftarrow {}^{12}C_5$

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* Test:-

5 members Committee, 8 officials, 4 Non-official.

(a) 3 O, 2 NO $\longrightarrow {}^{8}C_3 \times {}^{4}C_2$

(b) At least 2 N-O $\rightarrow {}^{4}C_2 \times {}^{8}C_3 + {}^{4}C_3 \times {}^{8}C_2 + {}^{4}C_4 \times {}^{8}C_1$

(c) At most 2 Off $\rightarrow ({}^{8}C_2 \times {}^{4}C_3 + {}^{8}C_1 \times {}^{4}C_4) + {}^{8}C_0 \times \cancel{{}^{4}C_5}$

(d) A particular official member is always included.

$\rightarrow ({}^{1}C_1) \times {}^{11}C_4$

(e) A particular non-off member is never Included – ${}^{11}C_5$

Ans

* Sam, Vivek, 3B, Rani, Rag, $2C_1$

① 3 people team = ${}^{5}C_3$

② A particular person (Vivek) be always there.

$({}^{1}C_1) \times {}^{4}C_2$

③ Rani must be there $\rightarrow {}^{1}C_1 \times {}^{4}C_2$

④ Rag. must be there $\rightarrow {}^{1}C_1 \times {}^{4}C_2$

⑤ A particular person (Sam) must be rejected,

~~Sam~~ Now, 2 B, 2 G = 4 there. 4 ③ team

$\therefore {}^{4}C_3$ Ans

⑥ Rani not selected $\longrightarrow {}^{4}C_3$ Ans

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Que. A three-member committee has to be formed a group of 9 people. How many such distinct committees can be formed

(a) 27 (b) 72 (c) 81 (d) 84

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Ans. $^9C_3 = \frac{9 \times 8 \times 7}{1 \times 2 \times 3} = 84$ Ans. [d]

* 8M/10W (Total = 18 people) → select 11 → $^{18}C_{11}$

(i) Select 6M/5W → $^8C_6 \times {}^{10}C_5$

Mr. A said that if select Mss. B then don't select me

Mss. B	Mr A	
✓	✓	✗
✓	✗	
✗	✓	
✗	✗	

$(^1C_1 \times {}^9C_4)$ ← ✓ ✗ → $^7C_6$ (AX)

W=5 M=6

$(^9C_5)$ ← ✗ ✓ → $(^1C_1 \times {}^7C_5)$

$^9C_5$ ✗ ✗ → $^7C_6$

(I) $(^1C_1 \times {}^9C_4) \times {}^7C_6$

+

(II) $(^9C_5) \times (^1C_1 \times {}^7C_5)$

+

(III) $^9C_5 \times {}^7C_6$

OR

Total − नहीं चाहिए

$(^8C_6 \times {}^{10}C_5) - [\underbrace{(^1C_1 \times {}^9C_4)}_{(Mss\ B)} \times \underbrace{(^1C_1 \times {}^7C_5)}_{Mr\ A}]$

Que. Out of 8 men and 10 women a committee consisting of 6 men and 5 women is to be formed. How many such committees can be formed when one particular man A refuses to be a member of the committee in which his boss B's wife is there?

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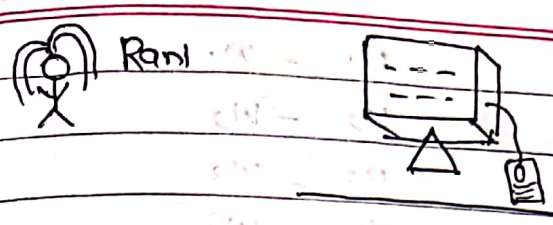
*. 

Password → Bondi 700

Bond 700 ×
Bondi 070 ×
007 ×
} arrangement

* In case of Password, arrangement matters

eg:- (a-e), (1-4) $\left[\frac{5}{a-e} \times \frac{4}{1-4}\right] \times 2!$

arrangement

*. ___ ___ ___ a-d / A-E / 0-6

$(4 \times 5 \times 7) \times 3!$ → Total possible passwords.

(पासवर्ड के case में Arrangement matter करता है)

*. ___ ___ ___ ___ a/b/c, A-F, 0-5, α/β/γ

$(3 \times 6 \times 6 \times 3) \times 4!$

Que An e-mail password must contain three characters. The password has to contain one numeral from 0 to 9, one upper and one lower case character from the English alphabet. How many distinct passwords are possible?

(a) 6760 (b) 13520 (c) 40560 (d) 105456

GATE-2018, IIT Guwahati, EE

Ans. $(10 \times 26 \times 26) \times 3! = 676 \times 10 \times 6$

0-9 A-Z a-Z $= 40560$ Ans. [c]

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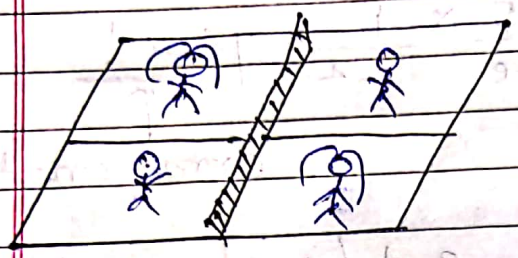
Date ___/___/___

Que. 7 married Couples

$H_1 - W_1$
$H_2 - W_2$
$H_3 - W_3$
$H_4 - W_4$
$H_5 - W_5$
$H_6 - W_6$
$H_7 - W_7$

There is lawn Tennis match going on. (~~Mens~~ Mixed double)



In how many ways the match can be played such that in one set, same-husband-wife pair cannot exist. (in opposite teams).

Ans.- $^7C_2 \times (^5C_2 \times 2!)$

(Husband) (wife)

(eg.- H_1, H_4 then W_1, W_4 ✗) (let W_2, W_7)

H_1W_2 vs H_4W_7
or
H_1W_7 vs H_4W_2

P&C
Practice Paper 5

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19. P&C and Probability - VI

Date 27/03/23

Saathi

Ram Shyam Rani Sudha

- Arrangement of n distinct objects = n!

① No condition → $n \to n!$

$\therefore 4 \to 4! = 24$

② The 2 boys must sit alternatively.

Manually,

① _ _ _ _ 1/3 Boys

OR

② _ _ _ _ 2/4 - Boys.

$(2!) \times (2!) = 04$

2 Boys 2 Girls → Rani, Sudha.

+

$(2!) \times (2!) = 04$

2 Boys 2 Girls → Rani, Sudha

$= 04 + 04$

$= 08$ Ans.

Another Method,

Ram|Shyam → 2 Boys

↓ 2 cases

1/3, 2/4 → $(^2C_1 \times 2!) \times 2! = 8$ Ans

Boys arrang, 2 Girls

③ ~~The two boys and the two girls~~ No two boys must sit together.

Manually,

_ _ _ _ _ _ _ _ _ _ _ _

$(2!) \times 2! + (2!) \times 2! + (2!) \times 2! = 12$

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OR

1/3
2/4
1/4
3 Cases

$(3C_1 \times 2!) \times 2! = 12$ Ans

Boys Girls → Rani, sudha

* Ram Shyam Rani Ragini

① No 2 boys must sit together.

$\underset{(B)}{\underline{X}}$ $\underset{(G1)}{\underline{Rani}}$ $\underset{}{\underline{X}}$ $\underset{(G2)}{\underline{Ragini}}$ $\underline{X}$

Psuedo Gap

Although we have 2 places for 2 boys but it seems as if we have 3 places for 2 boys.

$\underset{(G)}{(2!)} \times \underset{\text{Boys}}{(3C_2 \times 2!)} = 12$ Ans

*. 5 Girls & 3 Boys.

① No 2 boys must sit together.

$\underline{X}\ G_1\ \underline{X}\ G_2\ \underline{X}\ G_3\ \underline{X}\ G_4\ \underline{X}\ G_5\ \underline{X}$

$\underset{(\text{Girls})}{5!} \times \underset{\text{Boys}}{(6C_3 \times 3!)} =$

② 200 Girls, 50 Boys, Total no. of ways so that no 2 boys must seat together.

$= (200!) \times [(200C_{50}) \times 50!]$

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Saathi

* Test :-

15 G, 5 Boys. Total no. of ways – no 2 boys must sit together.

$$= \underbrace{15!}_{G} \times \underbrace{(16C_5 \times 5!)}_{B} \quad \text{Ans}$$

(i) No condition — $20!$ Ans.

* ABCDEIXYZ. ⟶ vowels – A, E, I

(i) No condition — $9!$

(ii) All the vowels are together.

AEI BCDXYZ $= 7! \times 3!$ Ans.

(iii) All the consonants must be together.

AEI BCDXYZ $= 4! \times (6!)$ Ans

(iv) All the vowels are never together.

= Total – All vowels are together

$= 9! - 7! \times 3!$ Ans.

(v) No 2 vowels are together.

x B x C x D x x x Y x Z x

$$= \underbrace{6!}_{\text{Cons.}} \times \underbrace{(7C_3 \times 3!)}_{\text{vowel}} \quad \text{Ans.}$$

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Saathi

Que. How many different words can be formed from the letters of the word GANESHPURI when:

(a) All the letters are taken:

$10!$

(b) No 2 vowels are together.

A E I U G N S H P R

$= 6! \times (^7C_4 \times 4!)$ Ans.

(c) all the vowels are never together

= Total − Not required

$= 10! - 7! \times 4!$ Ans.

AEIU GNSHPR

$7! \times (4!)$

*. MAGIC :: Linear Permutation/Arrangement (LP)

(i) — — — — ..... — (21 students)

$n \longrightarrow \boxed{n!}$

$\therefore 21!$

(ii) — — — — ..... — (15 students)

— — ..... — (6 students)

* $= (^{21}C_{15} \times 15!) \times (^6C_6 \times 6!)$

OR

$(^{21}C_6 \times 6!) \times (^{15}C_{15} \times 15!)$

=

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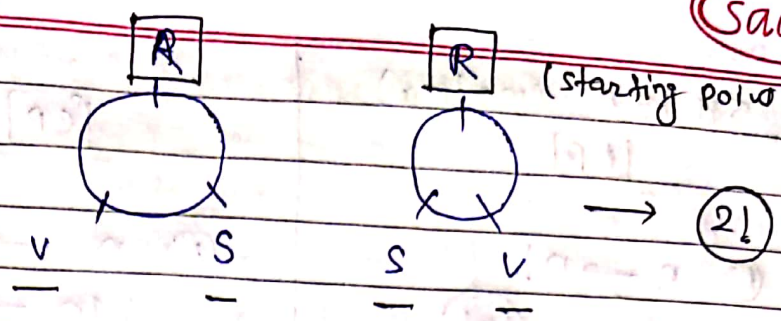
Date ___/___/___

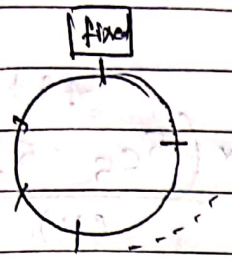
Saathi

* Rani
Vivek
Shreya



(starting point)

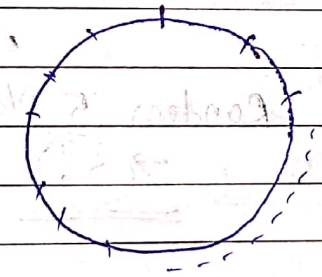
$\longrightarrow$ 21!

* 

$$\boxed{n \longrightarrow (n-1)!}$$

$$\boxed{\begin{array}{l} n \xrightarrow{\text{Linear}} n! \\ n \xrightarrow{\text{circular}} (n-1)! \end{array}}$$

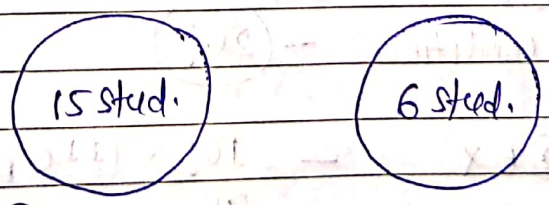
(iii) 21 students

(a) 

$n \longrightarrow (n-1)!$

$21 \longrightarrow 20!$ Ans

(b)



\# $(^{21}C_{15} \times 14!) \times (^{6}C_{6} \times 5!)$

Selection (Combination) $\longrightarrow$ Linear/circular से कोई फर्क नहीं पड़ता

Linear/circular only in Arrangement (Permutation).

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* 5H / 5E (medium)

LP

① $n \rightarrow n!$

$\therefore 10 \rightarrow 10!$

② No 2 Hindi medium student ~~can~~ must seat together.

$\underbrace{5!}_{(E)} \times \underbrace{(^6C_5 \times 5!)}_{(H)}$

LP

x E1 x E2 x E3 x E4 x E5 x

= = = = =

Linear Arrang.

Not Linear Arrang.

CP

① $n \rightarrow (n-1)!$

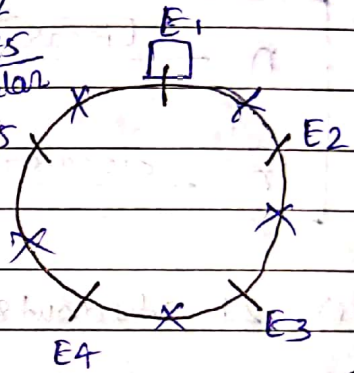
$\therefore 10 \rightarrow 9!$ Ans.

②

$\underbrace{4!}_{(E)} \times \underbrace{(^5C_5 \times 5!)}_{(H)}$ AAA

$E_1 - E_5$ circular

CP



Random 5 Places

$\rightarrow 5!$

Test

Que- 10 H / 10 E

LP → No condition — $20!$

→ No ② E X — $\underbrace{10!}_{(H)} \times \underbrace{(^{11}C_{10} \times 10!)}_{(E)}$

CP → No condition — $(20-1)! = 19!$

→ No ② H X — $\underbrace{9!}_{E} \times \underbrace{(^{10}C_{10} \times 10!)}_{(H)}$.

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20. **Doubt Clearing session**

Date 28/03/23

Saathi

* Classroom — Teacher came - Gave 1 Que - True/False.

Que. 1
✓
×

↓

2 students

Q.1	Q.2.
✓	✓
✓	×
×	✓
×	×

↓

4 students

Q1	Q2	Q3
✓	✓	✓
✓	✓	×
✓	×	✓
×	✓	✓
✓	×	×
×	✓	×
×	×	✓
×	×	×

↓

8 students

Considering all students answered and all answered different.
How many total no. of students?

* Wherever you have exactly 2 options as:
present/absent, true/false, married/happy, 1/0, ----

↓

$\boxed{\text{Binary Logic}}$ (or $\boxed{\text{Binomial Theorem}}$) is valid

In reasoning — same — In Math

$\boxed{2c_0 + 2c_1 + 2c_2}$ $\boxed{3c_0 + 3c_1 + 3c_2 + 3c_3}$ $\boxed{\cancel{4c_0 + 4c_1 + 4c_2 + 4c_3} + 4c_4}$

$= 2^2 = 4$ (Q1, Q2)

$= 2^3 = 8$

$$\boxed{{}^nc_0 + {}^nc_1 + {}^nc_2 + {}^nc_3 + \cdots + {}^nc_n = 2^n}$$

Binomial Theorem

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Date ___/___/___

Question-Paper wala Questions

There are 3 Ques.

* | 1 | 2 | 3 |

In how many ways can you attempt the que such that,

① No condition:- $^3C_0 + {}^3C_1 + {}^3C_2 + {}^3C_3$

or

no. of questions $2^3 = 8$ Ans

② At least one question must be attempted: (≥ 1)

$^3C_1 + {}^3C_2 + {}^3C_3$

(or,)

Total − Not required.

$= 2^3 - {}^3C_0$

$= 8 - 1 = 07$ Ans.

③ At least 2 Que must be attempted: (≥ 2)

$= {}^3C_2 + {}^3C_3$

or,

$2^3 - ({}^3C_0 + {}^3C_1)$

④ At most 2 Que (≤ 2)

$= {}^3C_0 + {}^3C_1 + {}^3C_2$

or,

$2^3 - {}^3C_3$

*

A	Que. 1, 2, 3
B	Que. 1, 2

① The no. of ways can you attemp the que such that

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Saathi

① No condition :-

$$\underbrace{(^3C_0 + {}^3C_1 + {}^3C_2 + {}^3C_3)}_{(A)} \times \underbrace{(^2C_0 + {}^2C_1 + {}^2C_2)}_{(B)}$$

OR,

$$\underbrace{2^3}_{(A)} \times \underbrace{2^2}_{(B)} = 2^5 = 32 \quad \text{Ans.}$$

② At least 1 Q from A and no condition for B:-

$$(2^3 - {}^3C_0) \times 2^2 = 7 \times 4 = 28 \quad \text{Ans}$$

③ At least 2 Q from A and at least 1 Que from B:

$$[2^3 - ({}^3C_0 + {}^3C_1)] \times [2^2 - {}^2C_0]$$
$$= (8-4) \times (4-1) = 4 \times 3 = 12 \quad \text{Ans}$$

④ At most 1 Q from A and at least 1 Que from B:-

$$({}^3C_0 + {}^3C_1) \times ({}^2C_1 + {}^2C_2)$$
$$= (1+3) \times (2+1) = 4 \times 3 = 12 \quad \text{Ans.}$$

Test

*

A	1, 2, 3, 4
B	1, 2, 3
C	1, 2

① No condition

$$2^4 \times 2^3 \times 2^2 = 16 \times 8 \times 4 = 512 \quad \text{Ans}$$

② $A \geq 1$, $B\times$, $C\times$ ← No condition

$$({}^2C_4 - {}^4C_0) \times 2^3 \times 2^2$$
$$= 15 \times 8 \times 4 = 480 \quad \text{Ans}$$

③ $A \geq 2$, $B \geq 1$, $C\times$

$$(2^4 - {}^4C_0 - {}^4C_1) \times (2^3 - {}^3C_0) \times 2^2$$
$$= 11 \times 7 \times 4 = 308 \quad \text{Ans.}$$

④ $A \leq 3$, $B \leq 2$, $C \geq 1$

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Date ___/___/___

④ $A \le 3$, $B \le 2$, $C \ge 1$

$(4c_0 + 4c_1 + 4c_2 + 4c_3) \times$ - - -

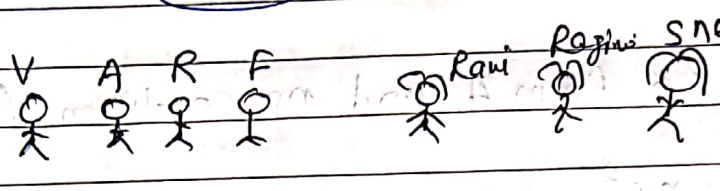
or

$(2^4 - 4c_4) \times (2^3 - 3c_3) \times (2^2 - 2c_0)$

$= 15 \times 7 \times 3$

$= 315$ Ans

*



We are about to make sub-groups such that

① No condition: $\underset{(B)}{2^4} \times \underset{(G)}{2^3} = 128$ Ans

② $B \ge 1$, $G \ge 2$:

$(2^4 - 4c_0) \times (2^3 - (3c_0 + 3c_1))$ Ans

$= 15 \times 4 = 60$

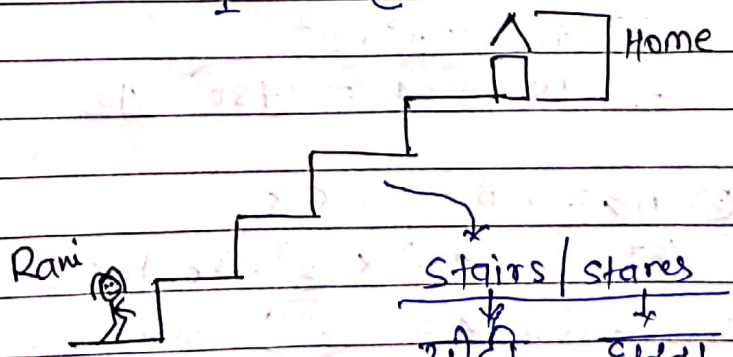
Que- There are 3 Indians and 3 Chinese in a group of 6 people. How many subgroups of this group can we choose so that every subgroup has at least one Indian?

(a) 56 (b) 52 (c) 48 (d) 44

GATE-2017: IIT Roorkee,

Ans- $\underbrace{(2^3 - 3c_0)}_{I} \times \underbrace{2^3}_{C} = 7 \times 8 = 56$ Ans $\boxed{a}$

*.



Stairs / stares (2018, IIT R)

सीढ़ी घुसना

fair/fare - 2020

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James clear ← Atomic Habit → Book **

Date __/__/__

Saathi

* Stairs / Stares
  सीढ़ी / घूरना

* Fair / Fare
  उचित / भाड़ा (₹)

घोड़ा

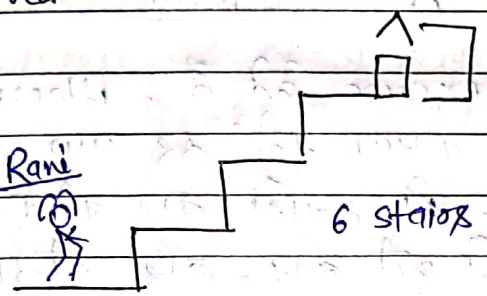
* Tire / Tyre
  (टायर) / गाड़ी का टायर

  levels
  3rd - tire
  2nd - tire

* Beside / Besides
  बगल में / के अलावा

- Tired

Oct = 2023 *



Rani ~~will~~ will take either 1 single step or she will take 2 steps. The how many ways she can reach her home?

Ans:-

D (2 step)	S (1)		ways.	
3	0	→ DDD	3!/3! = 1	+
2	2	→ DDSS	4!/2!2! = 6	+
1	4	→ DSSSS	5!/4! = 5	+
0	6	→ SSSSSS	6!/6! = 1	
			13 Ans	

Que. ** → instead 6Hrs study in 1 single go
1 Hr, 30 min, 15 min, --- then ↑↑↑ → ↑↑↑ → ↑↑↑...

* It is not just the work.
  It is the repetition of the work that is important.

* I might not be talented.
  I am obsessed.

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Ref – (R.S. Agrawal) Book if Required

Date ___/___/___

Saathi

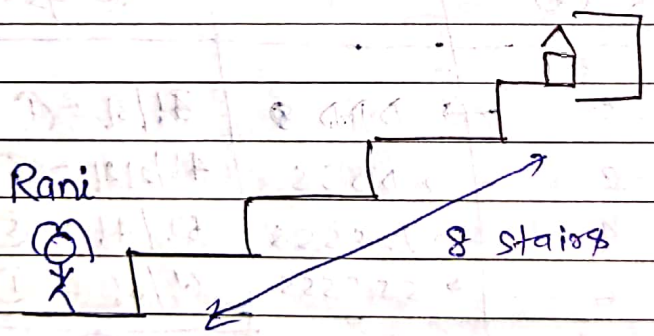
7 Days

* Make your goals very very very subtle / short.
* At the time you go for sleep, when would you wake up, what you will study, where will you study, ... etc all things, do command to mind.
* Whenever you miss, never miss that twice.

* Never Complain, Never Explain

* जब किसी को excuse देते हैं, illness, poverty, family, .. etc के कारण नहीं कर पाए; सामने वाले को 1 बार खुद को हजारों बार बोल देते हो & किसी झूठ को भी बार-बार बोला जाए तो दिमाग उसे process करना बंद कर देता है कि झूठ है या सच ---।

Que-



either one step or two step.

Ans:

D	S		
4	0	DDDD	4!/4! = 1
3	2	DDDSS	5!/3!2! = 10
2	4	DDSSSS	6!/2!4! = 15
1	6	DSSSSSS	7!/6! = 7
0	8	SSSSSS	8!/8! = 1

34 Ans.

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Quiz-4 $\frac{8}{10}$ $\frac{34}{75}$ >55%

Date 28 / 03 / 23

Saathi

Q.① A cricket team has to select a captain and a vice-captain from 12 of its players. In how many ways can this be done?

(a) 126 (b) 125 (c) 132 (d) 180

Ans. $^{12}C_1 \times {}^{11}C_1 = 12 \times 11 = 132$ Ans [c]

Q.② In how many ways can a group of 6 men and 4 women can be made out of a total of 9 men and 6 women?

(a) 720 (b) 640 (c) 1280 (d) 1260

Ans $^{9}C_6 \times {}^{6}C_4 = {}^{9}C_3 \times {}^{6}C_2$

$= \frac{9 \times 8 \times 7}{1 \times 2 \times 3} \times \frac{6 \times 5}{1 \times 2}$

$= 84 \times 15 = 1260$ Ans [d]

Q.③ In how many ways can the letters of the word VOWEL can be arranged so that all the consonants occupy odd places, vowels on even places?

(a) 6 (b) 16 (c) 8 (d) 12

$({}^{3}C_3 \times 3!) \times ({}^{2}C_2 \times 2!)$

Ans. O D O D O

odd even odd even odd

Vowels – O, E

Consonants – V, W, L

⇒ Cons. = 3 ⟶ 3!

⇒ Vowels = 2 ⟶ 2!

∴ $3! \times 2! = 6 \times 2 = 12$ Ans [d]

Imp Issed Relax

Q.④ How many four-digit numbers divisible by 10 can be formed using 1, 5, 0, 6, 7 without repetition of digits?

(a) 24 (b) 36 (c) 44 (d) 64.

Ans. $\underset{1/5/6/7}{4} \times \underset{1/5/6/7}{3} \times \underset{1/5/6/7}{2} \; \boxed{0} = 24$ Ans [a]

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Date ___/___/___ Psuedo Gap

Saathi

Q.5 What is the no. of ways that 4 boys and 3 girls can be seated in a row so that boys and girls alternate?

(a) 12 (d) 72 (c) 120 (d) 144

Ans: B G B G B G B

$B \to 4 \to 4!$ $= 4! \times 3! = 24 \times 6 = 144$ Ans [d]

$G \to 3 \to 3!$ (B) (G)

Q.6 How many 3 digit even numbers can be formed using the digits 1, 2, 3, 4, 5, 6 if the digits can be repeated?

(a) 100 (b) 120 (c) 108 (d) 110

Ans: $\underset{1-6}{\underline{6}} \times \underset{1-6}{\underline{6}} \times \underset{2/4/6}{\underline{3}}$ 1/2/3/4/5/6

$= 6 \times 6 \times 3 = 108$ Ans [c]

Q.7 In how many ways can 12 Executives be seated at a round table for a meeting?

(a) 12! (b) 11! (c) 144 (d) 12

Ans: Circular $\Rightarrow n \to (n-1)!$ $\therefore 12 \to (12-1)! = 11!$ Ans [b]

Q.8 In how many different ways can the letters of the word 'FIGHT' be arranged?

(a) 110 (b) 120 (c) 105 (d) 115

Ans: F I G H T $\Rightarrow$ 5 diff letters $= 5! = 120$ Ans [b]

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21. Verbal Reasoning - III

Date 28 / 03 / 23

Saathi

Days are long but years are short.

- इस दुनिया में सब कुछ क्षणिक है। - Pain, Suffering, Happiness ... etc

* Verbal Reasoning - Critical Reasoning - Business Judgment (MBA)
  Case study - Public Administration (UPSC)
  all same.

* It → Non-living - It is table, It is pen
  → Gender is not known - when I saw the baby, it was crying
  → Temperory subject - It is raining.

* Strengthened - (f) → Bolster, Underpine.

* Al Saud → Saudi Arabia
  → family of
  Country named by this family. Al Saud

* August / august (पवित्र festival occasion)
  August → Month
  august → oscpicious occasion / august occasion.

* Generic / Specific

Zerox → Registered Company. ~~which~~ that could able to create the technology to do photo-copy

Canon → ~~Photo-Copy~~ People started saying Zerox instead photo-copy.

eg: Noodles / Maggy / ---

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22. **Verbal Reasoning - IV**

Saathi

Date 28 / 03 / 23

* Wrath - क्रोध

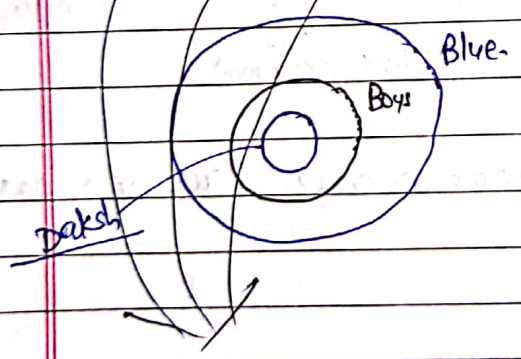
* **Syllogism**
  - 1Q in GATE
  - 3-5Q in PSU

* Reason (Premise) (P) + Conclusion (C) = Argument

Reasoning

1. **Deductive Reasoning**

(*) P1 : Boys are Blue
P2 : Daksh is a boy.
C : Daksh is blue.



They all are only variables.

→ जिसके Conclusion में कोई doubt ना हो - deductive Reasoning.

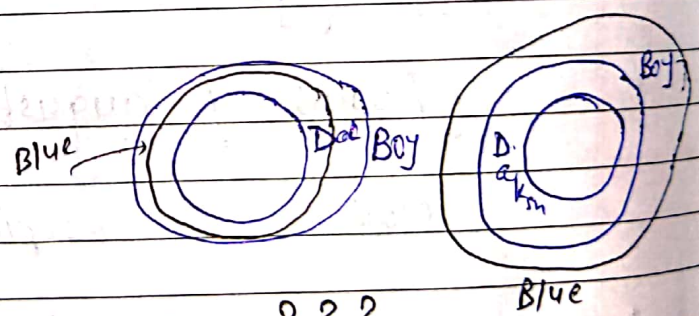
No ambiguity

LN (Logical Necessity)

Unique solution

2. **Inductive Reasoning**

⇒ P1 : Daksh is a Boy.
P2 : Daksh is blue
C :



???

→ Here, is a fix (doubt/fishy) in the conclusion.

Inductive Reasoning

LP (Logical Possibility)

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⇒ (H) ① Argument = P + C

② Deductive R. ⇒ LN → unique soln

③ Inductive R. ⇒ LP → 1↑↑ soln

* Takeaways :-

① Daksh / Boys | Blue .... → Variable ♡X

② $\boxed{LN >> LP}$ ⇒ LP

↓ Always go for LN ie unique conclusion.

③* $\boxed{LP + \text{may be} = LN}$

④ SVA (Subject - verb Agreement) → गलत भी हो, चलेगा

⑤ Don't assume anything external in a given Premice.

* $\boxed{\text{Syllogism} \Rightarrow \underline{\text{Unique Solution}}}$

↓

LN

↓

Always go for $\boxed{\text{at least}}$ wala case

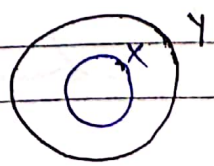
* Premise - types :-

① $\boxed{\text{All X is/are Y}}$

(X का हर एक element Y है।

(every element of X is Y).

(X के पास ऐसा कोई element ही नहीं है जो Y नहीं है)



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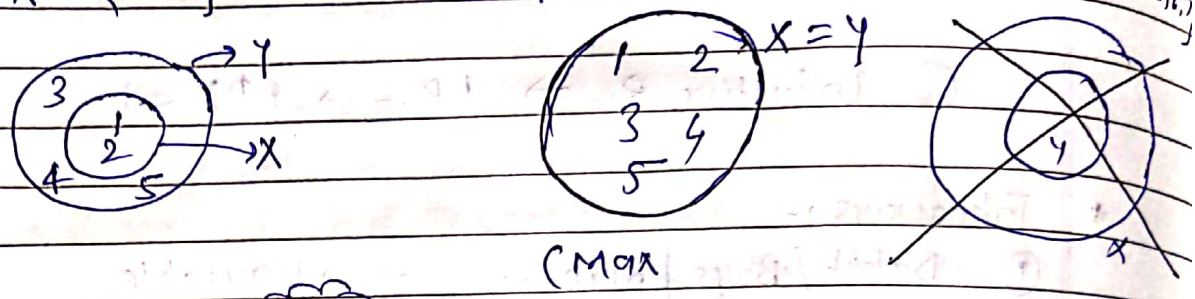
eg:- $Y = \{1, 2, 3, 4, 5\}$

$X = \{1, 2\}$ $\quad$ $X = \{1, 2, 3, 4, 5\}$ $\quad$ $X = \{1, 2, 3, 4, 5, 6, 7\}$

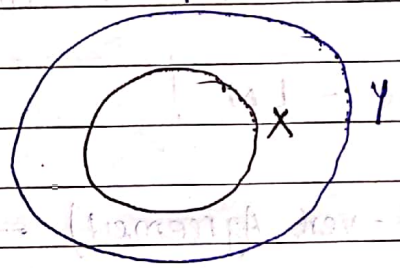


(Max

But,

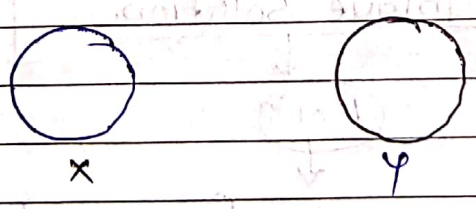
Syllogism is always unique / at least वाला case.

∴

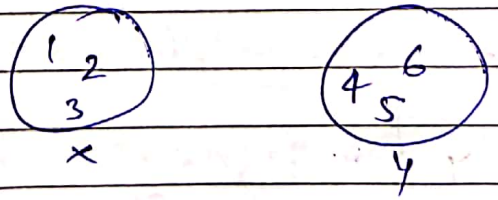


P(2) : $\boxed{\text{No X is/are Y}}$

(X and Y are disjoint sets)



eg: $X = \{1, 2, 3\}$, $Y = \{4, 5, 6\}$



(X का कोई भी element Y नहीं है)

(Not even 1 element of X is Y.)

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* **Some** (+ve word)

Countables ✓ Uncountables ✓

- I ate some mangoes.
- I ate some rice.

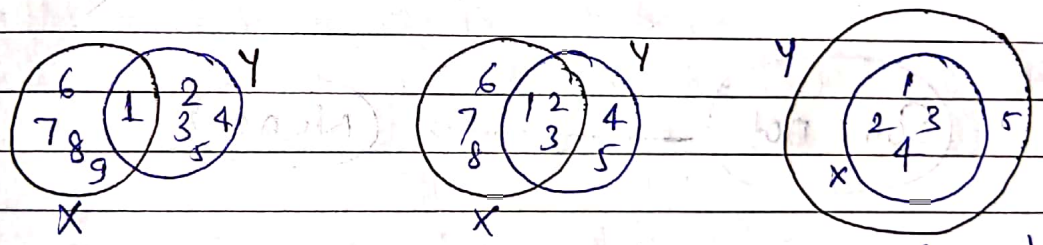
P③ : **Some x is/are y :**

At least one ①

(x के पास कम से कम एक (1) element ऐसा जरूर है जो y है)
(x has at least 1 element that is y.)

eg:- $y = \{1, 2, 3, 4, 5\}$

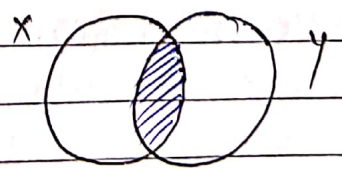
max^m → all the elements of x are y



(Max.)

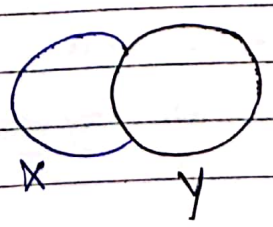
$x = \{1, 6, 7, 8, 9\}$ $x = \{1, 2, 3, 6, 7, 8\}$

∴



P④ : **Some x is/are NOT y**

(x के पास कम से कम 1 element ऐसा जरूर है जो y नहीं है)



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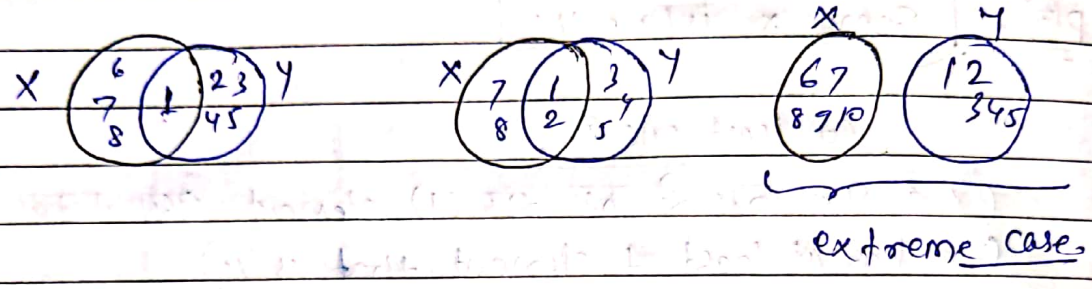
q:- $Y = \{1, 2, 3, 4, 5, \}$

$X = \{6, _, _, _, _, _\}$ AAA

$X = \{6, 1, 7, 8\}$ $X = \{6, 1, 2, 7, 8\}$ $X = \{6, 7, 8, 9, 10\}$



extreme case

(*) Some → All

Some not → None

(*) ① Syllogism ⇒ At least

② LN >> LP

③ Some → All

④ Some not → None

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23. Verbal Reasoning - V

Date 29 / 03 / 23

Saathi

* Logical Connectives *

* If the sun rises in the South then the moon rises in the North.
(i.e., In reasoning factual truthfulness is not important)

Factual Truthfulness ✗ → Logical Truthfulness ✓

* Here, we are not concerned about factual truthfulness of a statement rather what ~~about~~ we are concerned about is logical truthfulness.

* Simple statements :- (One single sentence.)
- It is raining.
- It will go to my friend's house.
- I am dead.
- I am alive.

* Compound statements :-
- Two or more simple statements combined to form a compound statements.
- Either I am dead or I am alive.
- If it is raining then I will go to my friend's house.

(*) Takeaways :-
① Logical Truthfulness ✓ , Factual Truthfulness ✗

② Simple statements - one liner
Compound statements - 2 and more simple statements.

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* Simple Statements $\xrightarrow{\text{2 or } \uparrow}$ Compound statements

with the help of

Connectors / Connectives | Logical Connectors / Logical Connectives

(1.) Either-or / or :-

- Either [I am dead] or [I am alive.]

variables

[Either p or q]

Truth Table for OR gate :-

p	q	o/p
~~0~~	~~0~~	~~0~~
0	1	1
1	0	1
1	1	1

0 - False

1 - True.

For the comp. stat to be true, at least one of the statement must be true.

(1) I am dead or

(2) I am alive or

(3) I am dead & I am alive.

* Case study :-

- Either p or q.

[p = True q = True
$\bar{p}$ = False $\bar{q}$ = False]

(1) p $\longrightarrow$ q, $\bar{q}$ } No unique Solution.

(means p is true) (From Truth Table)

(2) q $\longrightarrow$ p, $\bar{p}$ } Not unique Solution.

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③ $\bar{p} \longrightarrow q$ (unique solution).

④ $\bar{q} \longrightarrow p$ (unique solution).

* Summary :-

① Either p or q :-

- $\bar{p} \longrightarrow q$
- $\bar{q} \longrightarrow p$

$\longrightarrow$ unique Solution.

Summary / Summery. (CAT)

सार / गर्मी वाला

Que. Either shaheen cooks or salim brings the food parcel.
(a) Shaheen cooks means salim will not bring the food parcel.
(b) salim did not bring the food parcel hence shaheen cooked.
(c) shaheen is cooking hence salim has brought the food parcel.
(d) salim did not bring food parcel implies that shaheen did not cook

Ans. b. Either-OR $\Rightarrow$ $\bar{p} \longrightarrow q$, $\bar{q} \longrightarrow p$ $\Rightarrow$ we are looking for these

(a) ~~$\bar{p} \rightarrow$~~ (saheen cooks $\rightarrow p$)

(b) $\bar{q} \longrightarrow p$ ✓

(c) ~~$\bar{p} \rightarrow$~~ ✗

(d) ~~$\bar{q} \rightarrow \bar{p}$~~

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② **If - then** :-

If p then q

• जब-जब बारिश होती है तब तब मैं रेनकोट पहनता हूँ।

Whenever it rains, I wear the raincoat.
(p) (q)

① $p \longrightarrow q$ ✓

② $\bar{p} \longrightarrow q$, $\bar{q}$ } No unique Solution.

③ $\bar{q} \longrightarrow \bar{p}$ ✓

* Summary :-

If p then q.

• $p \longrightarrow q$
• $\bar{q} \longrightarrow \bar{p}$

* ③ ④

(1)(i) If p then q → (ii) q, If p

③ when p then q ⇒ $p \longrightarrow q$, $\bar{q} \longrightarrow \bar{p}$

④ whenever p then q

All are same

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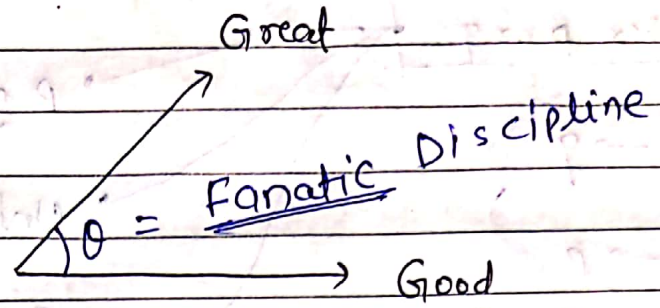
(ff)



* Good is the enemy of Great.

* - Be humble. (when you improve in your life)
  - Stay humble.
  - Keep yourself grounded.

* when you are good at something, you tell us about this.
  When you great at something, people talks about you.
  Let your success make enough noise.

* People get appleded in public for what they do in private.

* Note :-

(5) AND

$P \& Q$

AND Table.

P	Q	O/P
0	0	0
0	1	0
1	0	0
1	1	1

* Demorgan's Law :-

- $\overline{P \text{ or } Q} = \overline{P} \text{ AND } \overline{Q} = \overline{P} \cap \overline{Q}$

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* Either p or q

$\bar{p} \to q$

$\bar{q} \to p$

→ p otherwise q

→ Unless p, q

→ q, unless p

Same

* If p, then q → Only if p, then q

$p \to q$

$\bar{q} \to \bar{p}$

reverse

$q \to p$

$\bar{p} \to \bar{q}$

i.e.

Only If p then q

$p \not\to q \to p$

$\bar{q} \not\to \bar{p} \to \bar{q}$

Practice Set 6

Logical R

CR

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24. Doubt clearing session

Date 29/03/23

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MATHEMATICS $\longrightarrow \dfrac{11!}{2!\,2!\,2!}$

using the letters of the word MATHEMATICS, form 4-lettered words

M A T H E M A T I C S

Cases -

(MAT) H E I C S

① 4 letters-distinct (No rep.)

$\cancel{5C_4 \times 4!}$ $\left(8C_4 \times 4!\right)$ — HEIC, HEIM, HEMA ...

+

② 2-letters Same

MM AA TT H E I C S

$3C_1 \times 5C_2 \times \dfrac{4!}{2!}$ → HEICSAT

$3C_1 \times 7C_2 \times \dfrac{4!}{2!}$ Ans

+

③ 2-pairs repeated :

MM TT AA

$3C_2 \times \dfrac{4!}{2!\,2!}$

Que. How many word can be formed by taking 4 letters at a time out of the letters of the word MATHEMATICS?

∴ 4 letters word using the letters of MATHEMATICS

$$= \left(8C_4 \times 4!\right) + \left(3C_1 \times 7C_2 \times \frac{4!}{2!}\right) + \left(3C_2 \times \frac{4!}{2!\,2!}\right)$$

Ans.

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(*) n different flowers

Garland (Beads - मोतियों का माला). ??

LA $n \rightarrow n!$ $\boxed{n \rightarrow \frac{1}{2}(n-1)!}$

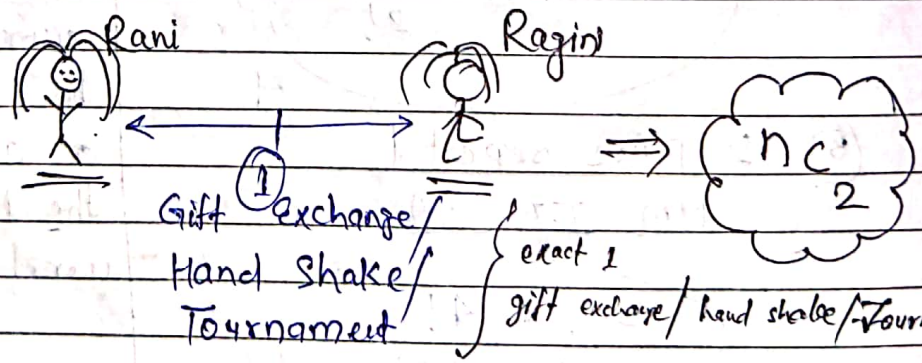
CA $n \rightarrow (n-1)!$ (because there is no left right)

* Anthropologist. ⟶ Those people who study about Human race.

* SPR - Strategic Petroleum Reserves.
(In India → Manglore, Pandoor, Vishakhapatnam)

* $\boxed{\text{This too shall pass.}}$

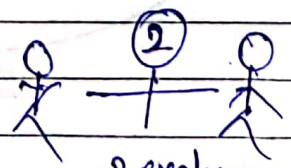
(*) Hand-shakes :-



(*) ① Gift - exchange
② Handshake
③ Journament
④ Geometry

exact one transaction

(+)



2 exchange Gift exchange

$2 \times {}^nC_2$

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25. P&C and Probability - VII

Date 29 / 03 / 23

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nC_2 :-

* If there is exactly ① transaction betn 2 people.

$$A \xrightarrow{①} B$$

* Geometry (दो Points के बीच 1 st. Line)
* Handshake (दो लोगों के बीच 1 handshake)
* Gift exchange (" " " 1 gift exch.)
* Tournaments (दो teams " 1 tournament)

$^nC_2$

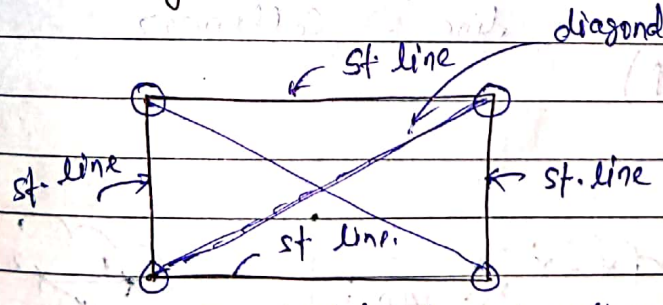
* If there is ② transactions

$$A \xleftrightarrow{②} B$$

$2 \times {}^nC_2$

* Gift Exchanges (2 gift exch. b/w 2 people)

Geometry :-



- To draw a st. line, we need minm 2 points.

quadrilateral – 4 vertices.

- $\boxed{n \text{ sides} = n \text{ vertices}}$
- $\boxed{\text{St. lines} = {}^nC_2}$
- S/L = sides + diagonals

  $^nC_2 = n + \text{diag.}$

  $\therefore \boxed{\text{Diagonals} = {}^nC_2 - n}$

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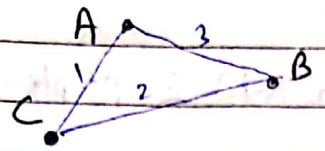
(*) 

⇒ No. of st. lines $= {}^nC_2$

$= {}^3C_2 = {}^3C_1 = 3$ Ans

(*) 5 points → • S/L $= {}^nC_2 = {}^5C_2 = \frac{5 \times 4}{1 \times 2} = 10$

• Sides $= n = 5$

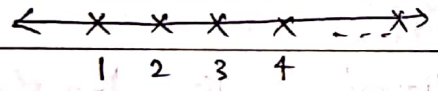
• diagonals $= {}^nC_2 - n = 10 - 5 = 5$ Ans

(*) 10 points → • SL $= {}^nC_2 = {}^{10}C_2 = \frac{10 \times 9}{1 \times 2} = 45$

• sides $= n = 10$

• diagonals $= {}^nC_2 - n = 45 - 10 = 35$ Ans

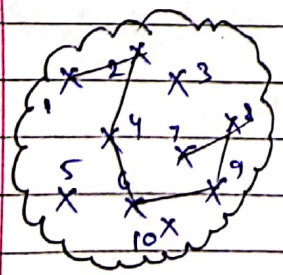
*.



• 3 or more points lies on a st. line ⇒ Collinear

Colinear (3 or ↑)

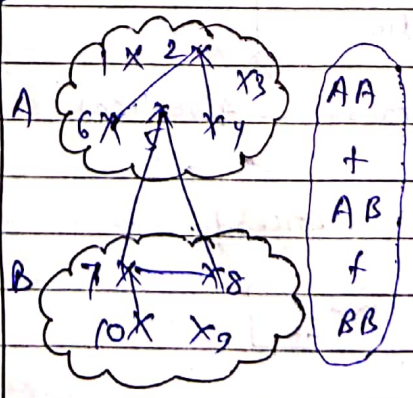
* Strait line :- ${}^nC_2$



Total no. of st lines

$= {}^{10}C_2$

$= 45$

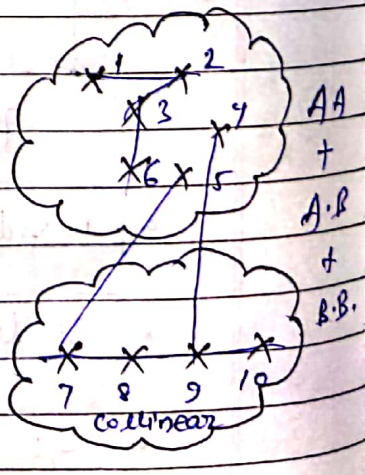


St lines :

${}^6C_2 + {}^6C_1 \times {}^4C_1 + {}^4C_2$

$= 15 + 24 + 6$

$= 45$



St lines =

${}^6C_2 + {}^6C_1 \times {}^4C_1 + 1$

$= 15 + 24 + 1$

$= 40$ Ans.

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S/L

$$\boxed{{}^{Total}C_2 - {}^{Collinear}C_2 + 1}$$

$= {}^{10}C_2 - {}^{4}C_2 + 1$

$= 45 - 6 + 1 = 40$ Ans.

$= {}^{6}C_2 + {}^{6}C_1 \times {}^{4}C_1 + 1$
$= 40$

S/L8

(1) points − 20 $= {}^{20}C_2 = \frac{20 \times 19}{1 \times 2} = 190$ Ans

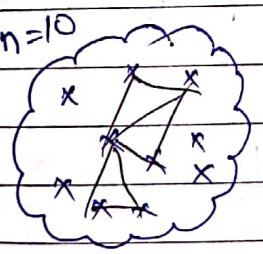
(2) Points − 20, Collinear = 5

$= {}^{20}C_2 - {}^{5}C_2 + 1$

$= 190 - \frac{5 \times 4}{2} + 1 = 190 - 10 + 1 = 181$ Ans

(*) ~~Triangles~~ Triangles :-

n = 10

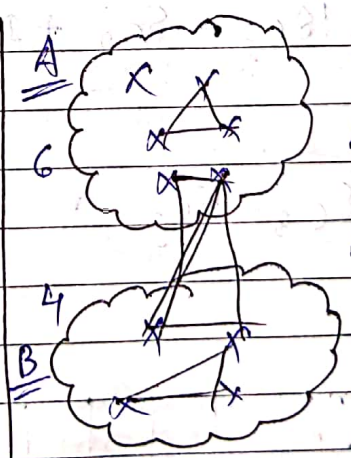


$\Delta = {}^{n}C_3$

$= {}^{10}C_3$

$= \frac{10 \times 9 \times 8}{3 \times 2 \times 1}$

$= 120$ Ans.

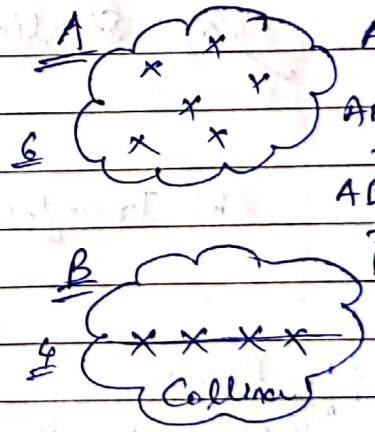


AAA + AAB + ABB + BBB

$\Delta s = {}^{6}C_3 + {}^{6}C_2 \times {}^{4}C_1 + {}^{6}C_1 \times {}^{4}C_2 + {}^{4}C_3$

$= 20 + (15 \times 4) + (6 \times 6) + 4$

$= 120$ Ans



AAA + AAB + ABB + ~~BBB~~

$\Delta s = {}^{6}C_3 + ({}^{6}C_2 \times {}^{4}C_1) + ({}^{6}C_1 \times {}^{4}C_2) + 0$

$= 20 + 60 + 36$

$= 116$ Ans

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* $\boxed{\Delta = \text{Total } C_3 - \text{Collinear } C_3}$

* 20 points, 5 points Collinear

$\Delta s = {}^{20}C_3 - {}^{5}C_3$

$= \frac{20 \times 19 \times 18}{1 \times 2 \times 3} - {}^{5}C_2 = 57 \times 20 - 10 = 1130$ Ans

Que. Out of 18 points in a plane, no three are in the same straight line except five points which are collinear. How many
(a) straight lines
(b) Triangles
can be formed by joining them.

Ans. (a) St. lines $= {}^{18}C_2 - {}^{5}C_2 + 1$ Ans

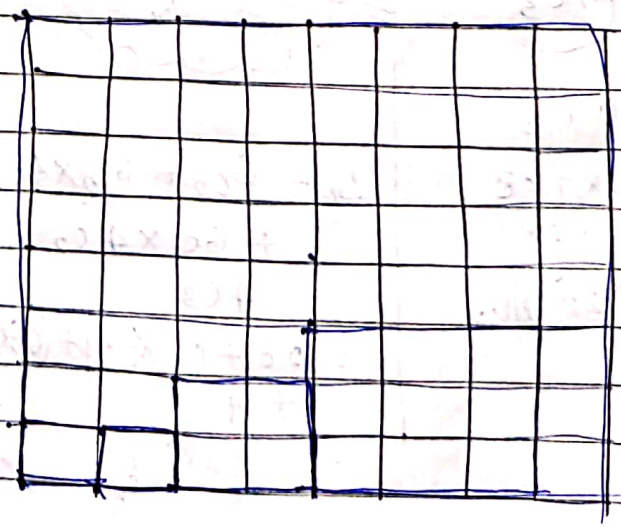
(b) Triangles $= {}^{18}C_3 - {}^{5}C_3$ Ans

* nC_2 :-

Chess-boards

Squares = ?

1^2 (8x8)
$+2^2$ (7x7)
$+3^2$ (6x6)
$+4^2$ (5x5)
$+5^2$ (4x4)
$+6^2$ (3x3)
$+7^2$ (2x2)
$+8^2$ (1x1)



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∴ No. of squares in a chess-board

$= 1^2 + 2^2 + 3^2 + 4^2 + 5^2 + 6^2 + 7^2 + 8^2$

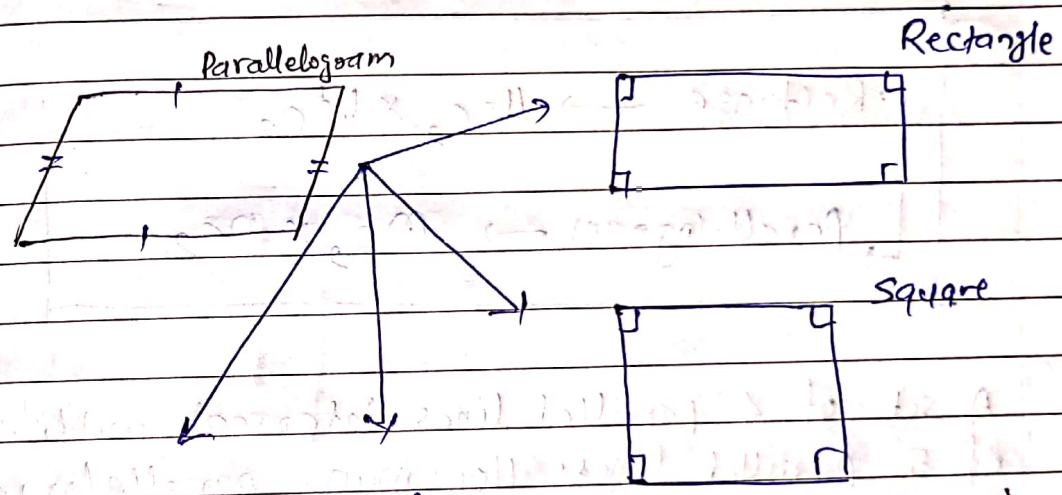
$\cancel{= \left[\frac{1}{2} n(n+1)\right]^2}$

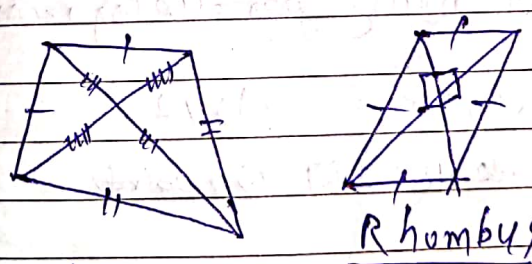
$\cancel{= \left(\frac{8 \times 9}{2}\right)^2 = 36^2 = 1296}$ ~~Ans.~~

$= \frac{1}{6} \cdot n(n+1)(2n+1)$

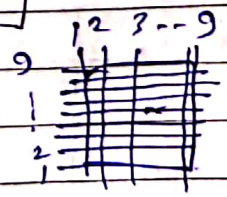
$= \frac{1}{6} \times 8 \times 9 \times 17 = 204$ Ans.

*





* $\boxed{\text{Rectange} = \text{Horizontal } C_2 \times \text{Verticle } C_2}$



In chess board, Rect $= {}^9C_2 \times {}^9C_2$

$= 36 \times 36$

$= 1296$ Ans

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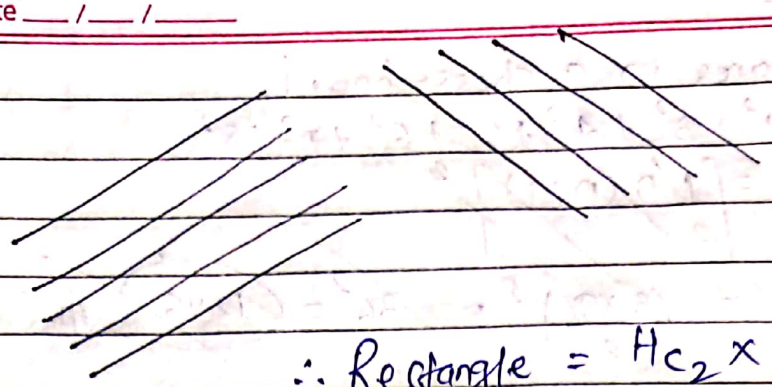
*. 

(90° ⊥ cut parallel lines) then =

$\therefore$ Rectangle $= {}^{H}C_2 \times {}^{V}C_2$

$= {}^{5}C_2 \times {}^{4}C_2$

$= 10 \times 6 = 60$ Ans

*

Rectange $\longrightarrow {}^{Hz}C_2 \times {}^{Vt}C_2$

Parallelogram $\longrightarrow {}^{m}C_2 \times {}^{n}C_2$

Que. A set of 4 parallel lines intersect with another set of 5 parallel lines. How many parallelograms are formed?

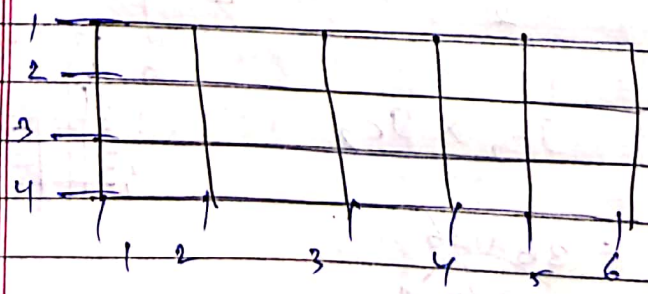
(a) 20 (b) 48 (c) 60 (d) 72

GATE-2018: IIT Guwahati

Ans:- $\square$s $= {}^{m}C_2 \times {}^{n}C_2 = {}^{4}C_2 \times {}^{5}C_2$

$= 6 \times 10$

$= 60$ Ans $\boxed{C}$

*. 

grid.

${}^{4}C_2 \times {}^{6}C_2 = 6 \times 15 = 90$ Ans

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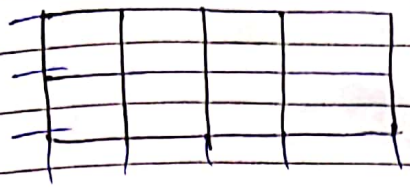
Saathi

Que. A 2X4 rectangle grid shown below, each cell is a rectangle. How many rectangles can be observed in the grid?

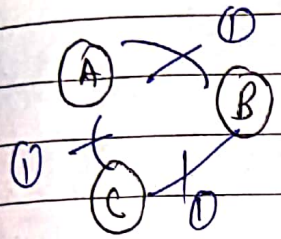


(a) 21 (b) 27

(c) 30 (d) 36

GATE-2016: IISc Banglore, EE

Ans. $^3C_2 \times {}^5C_2 = {}^3C_1 \times {}^5C_2 = 3 \times \frac{5 \times 4}{1 \times 2} = 30$ Ans $\boxed{c}$

* 

There are 3 people in a room. They shake hand with each-other. How many hand shakes? (exactly 1 handshake)

$= {}^3C_2 = {}^3C_1 = 3$ Ans.

/Tournament/Handshakes/ Gift exchange

* 5 people, exactly 1 hand shake $= {}^5C_2 = 10$

* 10 people, exactly 1 hand shake $= {}^{10}C_2 = 45$

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

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

GATE-2015: IIT Kanpur.

Ans. $^5C_2 = \frac{5 \times 4}{2} = 10$ Ans $\boxed{b}$

(#) If exactly 1 handshake b/w 2 people $\longrightarrow 1 \times {}^nC_2$

2 " $\longrightarrow 2 \times {}^nC_2$

3 " $\longrightarrow 3 \times {}^nC_2$

⋮

100 " $\longrightarrow 100 \times {}^nC_2$

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Que. In a room some people did handshakes such that exactly 1 handshake between 2 and found that total handshakes = 45. How many people were there?

Ans:- $^nC_2 = 45$

$$\frac{n(n-1)}{2 \times 1} = 45$$

$n^2 - n = 90$ $\therefore$ $n = 10$ Ans.

Que.

Total handshakes = 66.

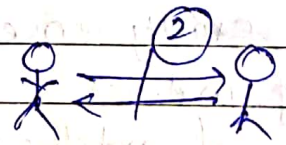
$^nC_2 = 66$

$\frac{n(n-1)}{2} = 66$ $n^2 - n = 132$ $n(n-1) = 132$

$\therefore$ $n = 12$ Ans

Que. 930 Deepawali greeting cards are exchanged amongst the students of a class. If every student sends a card to every other student then what is the number of students in the class?

Ans.



$2 \times {}^nC_2 = 930$

$n(n-1) = 930$ $\therefore$ $n = 31$ Ans.

(A) $n(n-1) = 930$

$n^2 = 930$

$n\ (30, 31)$

$\therefore$ $n = 31$

$n(n-1)(n-2)$

$\simeq n^3$

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Ques In a football championship, there were played 153 matches. Every two teams played one match with each other. The number of teams participating in the championship is :-

Ans

$\cancel{2 \times {}^nC_2 = 153}$

$\cancel{n(n-1) = 153}$

${}^nC_2 = 153$

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

$n(n-1) = 306$

$\approx n^2 = 306$

$17^2 = 289$

$18^2 = 324$

$\therefore n = 18$ Ans

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★. Quiz - 5 $\frac{10}{10}$ $\frac{1}{56}$ >98%

Saathi

Date 30/03/23

① The no of ways of arrangements of 10 person in four chairs is –
(a) 4050 (b) 5040 (c) 5020 (d) 6000

Ans. $^{10}C_4 \times 4! = \frac{10!}{4!\,6!} \times 4! = \frac{10\times9\times8\times7\times\cancel{6!}}{\cancel{6!}}$

$= 5040$ Ans (b)

② In how many ways can the letters of the word 'TRIANGLE' can be arranged?
(a) 25253 (b) 40000 (c) 40320 (d) 36558

Ans:- TRIANGLE $\rightarrow 8 \rightarrow 8! = 40320$ Ans (c)

③ How many possible two-digit numbers can be formed by using the digits 3, 5, 7 & 9 (Rep is allowed).
(a) 12 (b) 14 (c) 16 (d) 9

Ans:- $\underset{3/5/7/9}{4} \times \underset{3/5/7/9}{4} = 16$ Ans (c)

④ If $^{11}P_r = {}^{11}P_{r+1}$, then find the value of r.
(a) 8 (b) 9 (c) 10 (d) 11

Ans:- $\frac{11!}{(11-r)!} = \frac{11!}{(11-r-1)!} \Rightarrow \frac{\cancel{11!}}{(11-r)!} = \frac{\cancel{11!}}{(10-r)!}$

$\Rightarrow \frac{1}{(11-r)\cancel{(10-r)!}} = \frac{1}{\cancel{(10-r)!}}$

$\Rightarrow 11-r = 1$

$\Rightarrow r = 10$ Ans (c)

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(5) The number of parallelograms that can be formed from a set of five parallel lines intersecting another set of three parallel lines.

(a) 35 (b) 40 (c) 30 (d) 45

Ans. $5C_2 \times 3C_2 = \frac{5 \times 4}{1 \times 2} \times 3C_1 = 10 \times 3 = 30$ Ans $\boxed{c}$

(6) There are 5 boys and 4 girls and they are sitting on a circular table. In how many ways they can sit?

(a) 45630 (b) 40600 (c) 42650 (d) 40320

Ans. $9 \longrightarrow (9-1)! = 8! = 40320$ Ans.

(7) In how many different ways can the letters of the word 'CATARRH' be arranged?

(a) 5040 (b) 1260 (c) 2520 (d) 1240.

Ans. C A T A R R H $\longrightarrow \frac{7!}{2!\,2!} = \frac{5040}{4} = 1260$ $\boxed{b}$

(8) A bag contains 5 red and 4 black balls. Four balls are drawn at random. In how many ways can we draw, so that there are exactly 2 red balls?

(a) 48 (b) 24 (c) 36 (d) 60

Ans. $5C_2 \times 4C_2 = 10 \times 6 = 60$ A $\boxed{d}$

(9) How many possible ways are there in creating a 3 digit pin using the digits 1-9 when repitition is allowed?

(a) 729 (b) 512 (c) 1331 (d) 64

Ans. $\frac{9}{1-9} \times \frac{9}{1-9} \times \frac{9}{1-9} = 729$ A $\boxed{a}$

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(10) In how many ways 2 girls and 3 boys can be selected for a team among 6 girls and 8 boys!

(a) 840 (b) 720 (c) 120 (d) 1440

Ans

$^6C_2 \times {}^8C_3$

$= \frac{6\times5}{1\times2} \times \frac{8\times7\times6}{1\times2\times3} = 15\times8\times7 = 840$ ℓ (a)

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26. P&C & Probability - IX | Probability

Date ~~30/03/23~~ 01/04/23

Saathi

Number system

I. Zeros, ----

II. P&C and Probability

Probability

* B. Pascal & Coglomorov (Scientists)
  ↓
  uses a word frequently " Experiment"

Experiment

- Outcome ✓ → Deterministic Exp.
- Outcome X, Range ✓ → Random Probabilistic Exp.

Probability ↑

* Trial = कोशिश
  ↓
  Event = Outcome

$$\frac{\text{जो चाहिए (Favourable Event)} + \text{जो नहीं चाहिए (Unfavourable Event)}}{\text{सब कुछ (Sample space)}}$$

= Total no. of cases.

* $$P(E) = \frac{\text{जो चाहिए}}{\text{सब कुछ}}$$

$$= \frac{\text{Favourable Events}}{\text{Sample Space}}$$

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Saathi

*. Note : $\boxed{\text{Coin}}$ -

No. of throws.

Coins (S/S) Sample space ⇒ (faces)

- 1 ⟶ 2^1
- 2 ⟶ 2^2 (2 coins simultaneously = 1 coin twice)
- 3 ⟶ 2^3

⋮

- n ⟶ 2^n

dices (No. of throws)

* Dice S/S ⟶ (no. of faces)

- 1 ⟶ 6^1
- 2 ⟶ 6^2
- 3 ⟶ 6^3

⋮

- n ⟶ 6^n

Math
GATE-2010

Que. Thrown 2 coins. Prob. of getting 2 heads ?

S/S = 2^2 = 4

- $P(2H) = \frac{1}{4}$ Ans

$= \frac{2!/2!}{2^2} = \frac{1}{4}$

- $P(HT) = \frac{2!}{2^2} = \frac{1}{2}$

$\boxed{n \longrightarrow n!}$

HH ⟶ $2!/2!$

TT ⟶ $2!/2!$

HT ⟶ $2!$

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* 3 Coins :-

$S/S = 2^3 = 8$

- $P(HTT) = \frac{(3!/2!)}{2^3} = \frac{3}{8}$ Ans.

- $P(HHH) = \frac{(3!/3!)}{2^3} = \frac{1}{8}$ Ans

- $P(HHT) = \frac{(3!/2!)}{2^3} = \frac{3}{8}$ Ans.

* 5 Coins

$S/S = 2^5 = 32$

- $P(HHHTT) = \frac{(5!/3!2!)}{2^5} = \frac{10}{32} = \frac{5}{16}$ Ans.

* Test :-

(1) 4 Coins :

(1) $P(HHTT) = \frac{(4!/2!2!)}{2^4} = \frac{12}{16} = \frac{3}{4}$ Ans

(2) 10 Coins :-

(1) $P(HHHHHHTTTT) = \frac{(10!/6!4!)}{2^{10}}$

$= \frac{\frac{10 \times \cancel{9}^{3} \times \cancel{8} \times 7}{\cancel{4} \times \cancel{3} \times \cancel{2} \times 1}}{2^{10}} = \frac{210}{1024}$ Ans.

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Saathi

* Exactly, At least, At most :-

4 Coins : $\Rightarrow$ S/S $= 2^4 = 32$

Exactly (1) $P(HHHT) = \frac{4!/3!}{2^4} = \frac{4}{32} = \frac{1}{4}$ Ans

(2) P(At least 1 tail) =

THHH + TTHH + TTTH + TTTT

=

OR,

$1 - HHHH = 1 - \frac{4!/4!}{2^4} = 1 - \frac{1}{24} = \frac{23}{24}$

$\boxed{P(E) + P(\bar{E}) = 1}$

GATE-2009 ME

Que If three coins are thrown simultaneously.

S/S $= 2^3 = 8$

P(at least 1 head) $= 1 - P(\text{all head})$

$= 1 - P(HHH)$

$= 1 - \frac{3!/3!}{2^3}$

OR

HTT + HHT + HHH $= 1 - \frac{1}{8} = \frac{7}{8}$ Ans

* Test :-

5 coins $\Rightarrow$ S/S $= 2^5$

P(at least 4 heads) $= P(HHHHT) + P(HHHHH)$

$= \frac{5!/4!}{2^5} + \frac{5!/5!}{2^5} = \frac{6}{32} = \frac{3}{16}$ Ans

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$HHHT + HHHHH = \frac{5!}{4!} + \frac{5!}{5!} = 5+1 = 6$

$\therefore P(\text{At least one } H) = \frac{6}{2^5} = \frac{6}{32} = \frac{3}{16}$ Ans

③ At most (ज्यादा से ज्यादा) :-

* 3 coins $\Rightarrow S/S = 2^3 = 8$

P(at most 2 heads) =

$H=0 + H=1 + H=2$

TTT, HTT, HHT

$3!/3! = 1 + 3!/2! = 3 + 3!/2! = 3 \Rightarrow \frac{7}{2^3} = \frac{7}{8}$

OR

$1 - HHH = 1 - \frac{3!/3!}{2^3} = 1 - \frac{1}{8} = \frac{7}{8}$ Ans.

Gate-2010 Math

Que. 1 coin is tossed 4 times. $\Rightarrow S/S = 2^4 = 16$

P(H>T) =

HHHT + HHHH (or)

$= \frac{4!}{3!} + \frac{4!}{4!} = 4+1 = 5 \Rightarrow \frac{5}{2^4} = \frac{5}{16}$ Ans

* 3-coins $\longrightarrow S/S = 2^3 = 8$

① P(At least 1 Head) = 1 - No head = 1 - TTT = $1 - \frac{3!/3!}{2^3}$

$= 1 - \frac{1}{8} = \frac{7}{8}$ Ans

② P(At least one head & At least one tail) =

$1 - \left(\frac{HHH + TTT}{2^3}\right) = 1 - \frac{2}{8} = \frac{6}{8} = \frac{3}{4}$ Ans

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Gate-2002

Que. A fair coin is tossed four times. $\longrightarrow S/S = 2^4 = 16$

↓

unbiased

① P (At least one Tail) $= 1 - HHHH = 1 - \frac{4!/4!}{2^4} = 1 - \frac{1}{16} = \frac{15}{16}$

② P(At least one H & At least a tail)

$$1 - \left(\frac{HHHH + TTTT}{2^4}\right)$$

$$= 1 - \left(\frac{4!/4! + 4!/4!}{2^4}\right) = 1 - \frac{2}{16} = \frac{14}{16} = \frac{7}{8} \text{ Ans}$$

*. Dice S/S

1 $\longrightarrow 6^1$

2 $\longrightarrow 6^2$ (two dice or one dice twice)

3 $\longrightarrow 6^3$

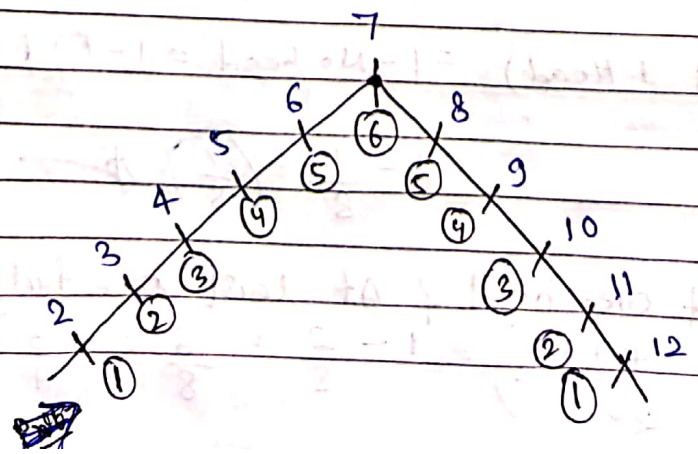
⋮

n $\longrightarrow 6^n$

* 3 dice $\longrightarrow S/S = 6^3 = 216$

① $P(6 \cdot \bar{6} \cdot \bar{6}) = \left(\frac{1}{6} \times \frac{5}{6} \times \frac{5}{6}\right) \times \frac{3!}{2!}$

*** $\boxed{\text{2-dice}}$ (sum wale Que. important)



Sum=

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① $P(\text{sum}=2) = \frac{1}{6^2}$

② $P(\text{sum}=5) = \frac{4}{6^2}$

③ $P(\text{sum} \geq 9) = P(9) + P(10) + P(11) + P(12)$

$= \frac{4}{6^2} + \frac{3}{6^2} + \frac{2}{6^2} + \frac{1}{6^2} = \frac{10}{6^2}$

④ $P(\text{sum} \leq 4) = \frac{1+2+3}{6^2} = \frac{6}{6^2} = \frac{1}{6}$

⑤ $P(\text{sum} \geq 11) = \frac{2+1}{6^2} = \frac{3}{6^2} = \frac{1}{12}$ Ans

2002 Gate Que. $P(\text{sum}=8) = \cancel{P(1)+P(2)+} \frac{5}{6^2} = \frac{5}{36}$ Ans.

* Note:- Set Theory:-

① $n(A \text{ or } B) = n(A) + n(B) - n(A \cap B)$

$\Rightarrow \boxed{P(A \text{ or } B) = P(A) + P(B) - P(A \cap B)}$

* $P(\text{Sum } 3 \text{ or sum } 4)$

$= P(\text{sum}=3) + P(\text{sum}=4) - \cancel{P(\text{sum } 3 \text{ and } 4)}$ 0

$= \frac{2+3}{6^2}$

$= \frac{5}{36}$ Ans.

* $P(\text{sum } 8 \text{ or } 9)$

$= P(s=8) + P(s=9) - \cancel{P(s=8 \cap 9)}$ 0

$= \frac{5+4}{6^2} = \frac{9}{36} = \frac{1}{4}$ Ans.

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Saathi

* $\boxed{\begin{aligned} n(\overline{A \text{ or } B}) &= n(\bar{A} \cap \bar{B}) \\ &= n(\bar{A} \text{ and } \bar{B}) \end{aligned}}$

* GATE-2005

$P(\text{sum Neither 8 nor 9}) = 1 - P(\text{sum 8 or 9})$

$= 1 - \frac{9}{36} = \frac{27}{36} = \frac{3}{4}$ A

(1) * $P(\text{sum} = \text{even})$

$= P(2) + P(S=4) + P(S=6) + P(S=8) + P(S=10) + P(S=12)$

$= \frac{1+3+5+5+3+1}{6^2}$

$= \frac{18}{36} = \frac{1}{2}$

(2) * $P(\text{sum} = \text{odd})$

$= \cancel{P(S=1)} + P(S=3) + P(S=5) + \cdots + P(S=11)$

$= \frac{2+4+6+4+2}{6^2} = \frac{18}{36} = \frac{1}{2}$

(3) * $P(\text{sum} = \text{prime No.})$

$= P(\text{sum}=2) + P(S=3) + P(S=5) + P(S=7) + P(S=11)$

$= \frac{1+2+4+6+2}{62} = \frac{15}{36} = \frac{5}{12}$ A

OR

(1) Sum = even $\Rightarrow$

$\frac{3}{2/4/6} \times \frac{3}{2/4/6} = 9$

$+$

$\frac{3}{1/3/5} \times \frac{3}{1/3/5} = 9$

18

E+E = E
O+O = O

$\Rightarrow P(S = \text{even}) = \frac{18}{36} = \frac{1}{2}$ A

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② $P(\text{sum} = \text{odd})$ $\left(\underset{\text{even}}{3 \times} \quad \underset{\text{odd}}{3}\right) \times \underset{\text{arrang}}{2!} = 18$

$\therefore P = \frac{18}{6^2} = \frac{18}{36} = \frac{1}{2}$ Ans

Que $P(\text{sum} \geq 10)$

$P(10) + P(s=11) + P(s=12)$

$= \frac{3+2+1}{6^2} = \frac{6}{36} = \frac{1}{6}$ Ans

* Test :-

7 Coins :-

① $P(5 \text{ Heads}) = \frac{(7!/5!2!)}{(2)^7} = \frac{\frac{7 \times 6}{2}}{128} = \frac{21}{128}$ Ans.

(HHHHHTT

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NAME - VIVEK KUMAR

SUBJ - APTITUDE, GATE-24 —(Part-II) (Remo)

BY - SUARABH THAKUR SIR

MOB - 7782812841

FROM - 19/02/2023 [05/03/2023)

TO — 28/05/2023

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01/04/23 **27.** **P&C and Probability - x** **Probability - 2**

*. **Test :-**

Q. 5 coins throw.

① $S/S = 2^5 = 32$

② $P(1H) \rightarrow [HTTTT] = \dfrac{5!/4!}{2^5} = \dfrac{5}{32}$

③ $P(3\text{ Head } \& \text{ 2 Tails}) \rightarrow [HHHTT] = \dfrac{5!/3!\,2!}{2^5} = \dfrac{10}{32}$

④ $P(\text{At least 4 Heads}) \rightarrow HHHHT + HHHHH \rightarrow \dfrac{5!/4! + 5!/5!}{2^5} = \dfrac{6}{32}$

⑤ $P(\text{At most 3 Tails}) \rightarrow TTTHH + TTHHH + THHHH + HHHHH$

$$= \frac{5!/3!\,2! + 5!/2!\,3! + 5!/4! + 5!/5!}{2^5}$$

$$= \frac{10+10+5+1}{32} = \frac{26}{32}$$

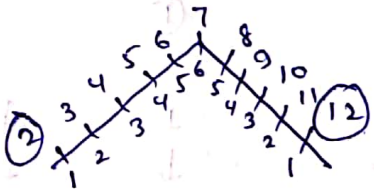
OR,

$1 - (TTTTH + TTTTT)$

$$= 1 - \left[\frac{\frac{5!}{4!}}{2^5} + \frac{5!/5!}{2^5}\right] = 1 - \frac{6}{32} = \frac{26}{32} \text{ Ans}$$

*. **Test :-**

Q. 2 Dice thrown :



① $S/S = 6^2 = 36$

② $P(\text{sum} = 7) = \dfrac{6}{6^2} = \dfrac{1}{6}$

③ $P(\text{sum} \geq 9) = \dfrac{4+3+2+1}{6^2} = \dfrac{10}{36} = \dfrac{5}{18}$

④ $P(\text{sum} \leq 10) = 1 - \dfrac{2+1}{6^2} = 1 - \dfrac{3}{36} = 1 - \dfrac{1}{12} = \dfrac{11}{12}$

$= 1 - P(\text{sum} > 10)$

⑤ $P(\text{sum } 5 \text{ or } 8) = P(\text{sum} = 5) + P(S = 8) - \cancel{P(\text{sum } 5 \cap 8)}^{\,0} = \dfrac{9}{36} = \dfrac{1}{4}$

2005 GATE ⑥ $P(\text{sum Neither 4 nor 9}) = 1 - P(\text{sum} = 4 \text{ or } 9) = 1 - \dfrac{7}{36} = \dfrac{29}{36}$

Ans

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*- 2-Dice Thrown:

$S/S = 6^2 = 36$

Min^m	Max^m
(1,1)	(6,6)
↓	↓
1	36

$\boxed{1 \le N \le 36}$

① P (perfect cubes)

1, → (1,1)

8 → ~~1×8~~, (2×4)

27 → ~~1×27~~, ~~3×9~~

$\frac{2!}{2!} = 1$

$2! = 2$

$\therefore P = \frac{1+2}{36} = \frac{3}{36} = \frac{1}{12}$ Ans.

Que. Two dice are thrown simultaneously. The probability that the product of the numbers appearing on the top faces of the dice is a perfect square is —

(a) $\frac{1}{9}$ (b) $\frac{2}{9}$ (c) $\frac{1}{3}$ (d) $\frac{4}{9}$

$S/S = 6^2 = 36$ GATE-2017 : IIT Roorkee

Ans:-

Min^m	Max^m
(1,1)	(6,6)
↓	↓
1	36

$\Rightarrow 1 \le N \le 36$

1	4 (1×4)	9	16	25	36
↓	↓	↓	↓	↓	↓
1×1	2×2	3×3	4×4	5×5	6×6
$\frac{2!}{2!} = 1$	$\frac{2!}{2!} = 1$, $2! = 2$	$\frac{2!}{2!} = 1$	$\frac{2!}{2!} = 1$	$\frac{2!}{2!} = 1$	$\frac{2!}{2!} = 1$

$\therefore P = \frac{1+(1+2)+1+1+1+1}{6^2} = \cancel{\frac{6}{36}} \times \frac{8}{36} = \frac{2}{9}$ Ans. $\boxed{b}$

1 → (1,1) → 1

4 → (2,2), (1,4) → 1 + 2

9 → (3,3) → 1

16 → (4,4) → 1

25 → (5,5), 36 → (6,6) → 1

= 8

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* $1 \le N \le 50$ → one no. selected. what is the prob. that

→ $s/s = {}^{50}C_1$

① $P(\div 2) = \dfrac{{}^{25}C_1}{{}^{50}C_1} = \dfrac{25}{50} = \dfrac{1}{2}$ Ans.

② $P(\div \bar{3}) = 1 - \dfrac{{}^{16}C_1}{{}^{50}C_1} = 1 - \dfrac{16}{50} = \dfrac{34}{50} = \dfrac{17}{25}$ Ans

① $2, 4, 6, \ldots, 50$

$n = \dfrac{l-a}{d} + 1$

$= \dfrac{50-2}{2} + 1 = 25$

OR,

$\boxed{\dfrac{50}{2} = 25}$

$\dfrac{1}{2} = 0$

25

eg:-(i) $1, 2, 3, 4, 5, 6, 7, 8, 9, 10$

$\div 2 = \dfrac{10}{2} = 5$ Ans

(ii) $5, 6, 7, 8, 9, 10$

$\div 2 = ?$

$\dfrac{10}{2} = 5$

$\dfrac{5}{2} = 2$

3 Ans

* $1 \le N \le 100$

$\div 2 = \dfrac{100}{2} = 50$

* $11 \le N \le 100$

$\div 2 =$ → $100/2 = 50$

→ $11/2 = 5$

45 Ans

* $1 \le N \le 50$

$\div 3 = \dfrac{50}{3} = 16$

$\dfrac{50}{3} = 16$

$\dfrac{1}{3} = 0$

16

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Que. GATE IIT Bom

Out of all the 2-digit integers $\boxed{\text{between}}$ 1 and 100, a 2-digit number has to be selected at random. what is the probability that the selected no. is not divisible by 7?

(a) 13/90 (b) 12/90 (c) 78/90 (d) 77/90

GATE-2013 : IIT Bombay, CSE

Ans:

10, 11, ---, 98, 99

$\div 7 =$ $\frac{99}{7} = 14$

$\frac{10}{7} = 1$

13

$\therefore P(\div \bar{7}) = 1 - P(\div 7)$

$= 1 - \frac{13c_1}{90c_1} = 1 - \frac{13}{90} = \frac{77}{90}$ Ans $\boxed{d}$

* $\boxed{\text{Between}}$ → excluding upper & lower limit

$\boxed{1 < N < 100}$

S/S = [10, 11, 12, ---, 99] = 90 [∵ 2 digits nos]

~~S/S = 98~~

*. 1/2/3

(1) $\frac{3}{1/2/3} = 3$

(2) $\frac{3}{1/2/3} \times \frac{3}{1/2/3} = 9$

R✓

(3) Rx $\frac{3}{1/2/3} \times \frac{2}{1/2/3} = 6$

×

(4) ___ > ___ = 2 + 1 = 3

$\frac{2}{2/3} > \underline{1} + \frac{1}{3} > \underline{2}$

Scanned with CamScanner

Que. P(tens place > unit place)

$= \frac{3}{9}$ Ans. → 4, 2 } (previous)

Que. 2 dice thrown:

MBA 2014

S/S = $6^2 = 36$

(i) $P\left(\underset{\text{Dice 2}}{___} > \underset{\text{Dice}}{___}\right) = \frac{15}{36} = \frac{5}{12}$ Ans

$\underset{2-6}{\underline{5}} > \underline{1}$ $= 5\times1 = 5$

$\underset{3-6}{\underline{4}} > \underline{2}$ $4\times1=4$

$\boxed{= 5+4+3+2+1 = 15}$

$\vdots$

$\underset{6}{\underline{1}} > \underline{5} = 1\times1 = 1$

* 1|2|3

(i) $\underset{1/2/3}{\underline{3}} \times \underset{1/2/3}{\underline{3}} \times \underset{1/2/3}{\underline{3}} = 27$ ← S/S

(ii) P(÷4) =

$\underset{1-3}{\underline{3}} \times \boxed{____}$ $= 3\times2 = 6$

12, 32 } 2 Cases

$\therefore P(\div4) = \frac{6}{27} = \frac{2}{9}$ Ans.

*. Test

1 – 9 , R✓ , _ _ _ , P(÷4) = ?

Ans: S/S = $\underset{1-9}{\underline{9}} \times \underset{1-9}{\underline{9}} \times \underset{1-9}{\underline{9}} = 729$

$\underset{1-9}{\underline{_}} \boxed{____}$ $= 9\times18 \Rightarrow \therefore P(\div4) = \frac{9^2\times2}{9^3}$

$= \frac{2}{9}$ Ans.

18 cases

12	44		
16	88		
24			
28	52	72	96
32	56	76	
36	64	84	
48	68	92	

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(OR)

S/S = 9^3

25 — [04, 40 / 08, 80 / 20, 60, 00] = 18

~~04~~	24	44	64	84
~~08~~	28	48	68	88
12	32	52	72	92
16	36	56	76	96
~~20~~	~~40~~	~~60~~	~~80~~	~~100~~

$\therefore \frac{9}{1-9}$ [— —] = 9 × 18 cases

$\therefore P = \frac{9 \times 18}{9^3} = \frac{2}{9}$ Ans

Que. Two dice are rolled one after another. The probability that the number on the first is smaller than the number of the second?

(a) 1/2 (b) 7/8 (c) 3/4 (d) 2/12

Ans: S/S = 6^2 = 36

$\frac{5}{1-5} < \frac{6}{}$

$\frac{4}{1-4} < \frac{5}{}$ = 5+4+3+2+1 = 15

$\frac{3}{1-3} < \frac{4}{}$

$\frac{2}{1-2} < \frac{3}{}$

$\frac{1}{1} < \frac{2}{}$

$\therefore P = \frac{15}{36} = \frac{5}{12}$ ✗

Que. MBA A five digit number is formed by the digits 1, 2, 3, 4, 5 without repetition. The probability that the number formed is divisible by 4 is —

(a) 1/5 (b) 2/4 (c) 2/3 (d) 4/5

Ans:- S/S :- $\frac{5}{1-5} \times \frac{4}{1-5} \times \frac{3}{1-5} \times \frac{2}{1-5} \times \frac{1}{1-5}$ = 120

$\therefore P = \frac{\cancel{18}\,3}{\cancel{120}\,20} = \frac{3}{20}$ ✗

$\underline{3} \times \underline{2} \times \underline{1}$ [— —] = 18

12
24
32
52
} 3 cases

Scanned with CamScanner

Que. A couple has 2 children. The probability that both children are boys if the older one is a boy is –

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

GATE-2017: IIT Roorkee

Ans.:- B $\frac{2}{B/G}$ → S/S = 2

$\therefore P(B) = \frac{1}{2}$ Ans.

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02/04/23

28. Doubt Clearing Session

Probability-3

*. PEAK:

Using each alphabets of the word PEAK if all the words that can be formed, then what would be the 10th word if all the words are arranged as per English Dictionary.

① Arrange: A E K P

② Find the Distribution:

(A) _ _ _ = 3! = 6
E|K|P

(E) _ _ _ → 3! = 6
A|K|P

(K) _ _ _ → 3! = 6
A|E|P

(P) _ _ _ → 3! = 6
A|E|K

③ (A) _ _ _
E|K|P

(E) KP, KP | (K) EP, PE | (P) EK, KE → 6

2!/3!
Magical Nos

(E) _ _ _
A|K|P

(A) KP 7, PK 8 | (K) AP 9, PA 10 | (P) AK, KA

∴ 10th word = EKPA Ans.

Scanned with CamScanner

*. IDEA , 9th word , 16th word = ?

① Total : _ _ _ _ → 4! = 24
I | D | E | A

Arrange :- A D E I →

Distribution :-

A	_ _ _ (D | E | I)	→ 3! = 6
D	_ _ _ (A | E | I)	→ 3! = 6
E	_ _ _ (A | D | I)	→ 3! = 6
I	_ _ _ (A | D | E)	→ 3! = 6

→ (A) _ _ _ (D | E | I)

(D)	(E)	(I)	
E I	D I	D E	→ 6
I E	I D	E D	

→ (D) _ _ _ (A | E | I)

(A)	(E)	(I)	
E I (7)	A I (9)	A E (11)	→ 6
I E (8)	I A (10)	E A (12)	

→ (E) _ _ _ (A | D | I)

(A)	(D)	(I)	
D I (13)	A I (15)	A D	→ 6
I D (14)	I A (16)	D A	

∴ 9th word = $\boxed{DEAI}$

16th word = $\boxed{EDIA}$

Ans.

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*. FROM

F M O R

3! = 6 6 6 6

3rd word :

F | M → OR — 1, RO — 2
O → MR — 3, RM

⇒ FOMR Ans.

* UJASH :

A H J S U

4! = 24 24 24 24 24

26th word :-

H | AJ → SU, US — 26

∴ HAJUS Ans.

50th word :-

J | AHS → H — 49, US — 50

∴ JAHUS Ans.

77th word :-

S | A → HJ → JU — 73, UJ — 74
J → HU — 75, UH — 76
U → HJ — 77th, JH

⇒ SAHUHJ Ans.

Scanned with CamScanner

* Test:-

DELHI

① 50th word ② 75th word ③ 100th

D E H I L

4! = 24 24 24 24 24

① 50th word:- (H) | DE → IL – 49, LI – 50th ⇒ HDELI

② 75th word:- (I) | DE → HL – 73, LH – 74; H → EL – 75th, LE ⇒ IDHEL

③ 100th word:- (L) | D E → HI – 97, IH – 98; H → EI – 99, IE – 100 ⇒ LDHIE

Ans.

* Necromancy – काला जादू

* Sorcery

Man जहाँ से आता है → -ve sense लाता है

* AGAIN

A A G I N

4! = 24 4!/2! = 12 12 12

50th word:- (N) | AA → GI – 49, IG – 50th = NAAIG Ans

X *. Test

CAT

OFFER ① 50th word ② 40th word

E F F O R

$\frac{4!}{2!}$ 3! 4!/2! 4!/2!

= 12 = 6 = 12 = 12

50th word :-

E F F O R

12 24 12 12

2!/3!

50th word

R | EFO — 49th
OF — 50th ⇒ REOF Ans.

40th word

O | E _ _ _ _
F/F/R

3!/2! = 3 → 37, 38, 39th

F E F R → 40th ⇒ OFEFR Ans.

* Student Dharma

① FAILURE → 50th, 100th

② SUCCESS → 50th, 100th, 150th

Scanned with CamScanner

02/04/23

29. Verbal Ability - I

VERBAL ABILITY

* **Few** (-ve)
  ↳ Countable
  (Barely any)
  - Paltry - insufficient

A few (+ve)
= some

The few
→ Not many but all that I have

* **Some**
  - Count → I ate some mangoes
  - Uncount → I ate some rice.

* **Much** - uncountable.

* **Any** (-ve)

* **Obsinate** (-ve)
  Never use a negative word to describe +ve part of personality in interview.
  - Determined ✓ Shedules ✓ Tennacious ✓ ---
  - अड़ियल, जिद्दी, भैंस बुद्धि
  Obsinacy - Group of buffalows

Que. The lecture was attended by quite _____ students, so the hall was not very _____.

(a) few, quite
(b) a few, quite
(c) few, ~~quite~~ quiet
(d) a few, ~~quite~~ quiet

IIT Madras, Gate - 2019

Ans.

+ve word
some
↓
a few
⇓
a X c X

शांत
quiet

d

⇒ ALWAYS GO FOR ELIMINATION TECH.

Scanned with CamScanner

* Quite / Quiet
Break / Brake
Advice / Advise
Fair / Fare
Stares / Stair
Heel / Heal
→ English usage (we will all)

* Man – Mal – Male → –ve

Malign (Tumour)

• +ve Benediction. (आशिर्वाद)
• –ve Malediction (श्राप)

सच (Truth)

• Veracious – जो हमेशा सच बोलते हैं
• Mendacious – जो हमेशा झूठ बोलते हैं। (→ lie)

" हमारे चारों तरफ वही लोग ईमानदार हैं
जिन्हें बेइमानी करने का मौका नहीं मिला ॥ "

• Voracious – जो बहुत ज्यादा बोलता है।
(JAB WE MET – Kareena Kapoor – Voracious)

* what is your habit?
→ I am a voracious reader. ✓
– Avid Reader.

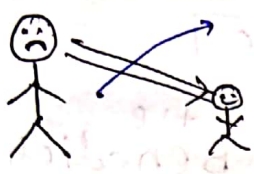
Que. IIT-Delhi 2020
His hunger for reading is insatiable. He reads indiscriminately. He is most certainly a/an ___ reader
(a) all-round (b) voracious (c) wise (d) precocious

Ans. (b)
Insatiable (इनसैशिएबल ✓ इनसैटिएबल ×) – जिसको तृप्त (satisfied) ना किया जा सके
↳ तृप्त कर देना

Brain candies – whatever you are comfortable with, you keep doing that (अपने दायरे के अंदर सीमित हो जाना

Scanned with CamScanner

- Precocious – Those people who became mature very earlier in their life
  ↓
  Ashish chanchlani
  BB ki wines – Bhuwan Bam
  Carry Minati

* 

Belittle – To humilate someone (किसी को नीचा दिखाना)

Que. Belittle

(a) Disparage (b) Begrudge
(c) Reduce (d) Applaud

IIT Delhi, GATE-2020

Ans: (a)

- Legitimate → Genuene
- Applaud → Praise
- Begrudge → बदला लेना
- Conjuring → To call upon (भूत-पिशाच को बुलाना)
- Disparage → To humilate.

Analogy Que

Partial : Impartial :: Popular : ____

(a) Dispopular (b) Impopular (c) Unpopular (d) Mispopular

IIT Delhi, GATE-2020

Ans. (c) Unpopular

- Interested →
- Disinterested → Unbaised
- Uninterested → Boring.

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* Logical Connectives :-

Or / If-then

$\overline{A \text{ or } B} = \overline{A} \text{ AND } \overline{B}$

Gate-2021

Perm. Comb. Practice set 7

Scanned with CamScanner

02/04/23

30. Verbal Ability - II

① Veer Zaara - movie : Interminable

- Interminable love of Veer & Zaara
- Unending love of Veer & Zara

→ जो कभी समाप्त / खत्म ही न हो।

② JORU KA GHULAM - Someone who is extremely fond of his wife (not for others)
↓ तरफी

↓

Uxoxious (यूक्ज़ोरियस)

③ Gamy → शादी

- Monogamy - 1 शादी
- Bigamy - 2 शादी
- Polygamy - बहुत सारे शादी

* Misogamy → when someone don't want to get married. (शादी से नफरत)
↓
hate / नफरत

* Misogyny → Hatred to Women

Misandry → Hatred to Men.

GATE Que ★★★ MBA

Censor / Censure
सेन्सर सेन्स्योर
↓
to criticize criticize

Que. Censor

(a) count (b) remove objectionable material

(c) protect from danger (d) disapprove of

Ans. (b)

Scanned with CamScanner

④ **Contra** → Contradiction

- **Incontrovertibly** – without any controversy (बिना किसी संदेश के)

⑤ **Simile** (सिमली) — **Metaphor** (मेटाफर)

Comparision

Direct Comparision → { as / like }

Indirect Comparison

eg:-

- As busy as we
- As clear as mud.
- Your presentation was as clear as mud.
- Watching the show is like watching grass grow.

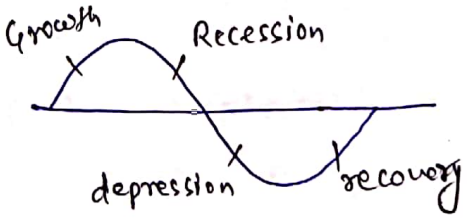
- It's raing boys/men.
- My father is light of my life.

Gate-24 ★★ ⑥ **Oxymoron** → Contradictory words

eg:- • Great Depression (+ve, −ve)

- Open secret
- Act Naturally
- Beautifully Painful

⑦



world economy

2002 Que. which sentence includes an oxymoron?

(a) On weekend we ate and drank a lot

(b) Meena corrected me by pointing out that she wanted pizza instead of burger.

(c) Media reported the attack on media-persons.

(d) He loved his aunt but found her kindness (+ve) suffocating (−ve). दम घुटनेवाला

(e) One should not compare apples and oranges.

Scanned with CamScanner

- Business is not the business of the government.
  ↳ MBA GD topic

Que. You should ___ when to say ___.

(for life)

(D) Know/no

IIT KGP, Gate-2002

* Overcommitment is the most dangerous
  &
  ~~After this~~ Underperformance after overcommitment is the most dangerous.

* Inequality * Gate-24

Special Practice Paper 8
Verbal Ability

Scanned with CamScanner

02/04/23

Quiz-6

$\frac{5}{10}$ $\frac{21}{42}$ $> 50\%$

Q.1 In a class, there are 10 boys and 10 girls. Three students are selected at random. Find the probability that out of the selected students there are 2 boys and 1 girl?

(a) $\frac{15}{38}$ (b) $\frac{13}{38}$ (c) $\frac{15}{37}$ (d) $\frac{15}{31}$

Ans: $P = \frac{{}^{10}C_2 \times {}^{10}C_1}{{}^{20}C_3} = \frac{\frac{10\times 9}{1\times 2} \times 10}{\frac{20\times 19\times 18}{1\times 2\times 3}} = \frac{15}{38}$ Ans $\boxed{a}$

Q.2 A basket contains 2 white, 3 red and 4 black balls. Two balls are drawn at random. Find the probability of not any ball being drawn is black?

(a) 10/21 (b) 5/18 (c) 9/11 (d) 7/11

Ans: $P = \frac{{}^{5}C_2 \times {}^{4}C_0}{{}^{9}C_2} = \frac{\frac{5\times 4}{1\times 2}}{\frac{9\times 8}{1\times 2}} = \frac{5}{18}$ Ans $\boxed{b}$

Q.3 An assignment is given to three men whose chances of completing it are 2/3, 3/4 and 4/5 respectively. What is the probability that the assignment will be completed?

(a) 3/4 (b) 58/60 (c) 59/60 (d) 4/5

Ans:

- $P(E) = n(E)/n(S)$
- $P(A \cap B \cap C) = P(A) \times P(B) \times P(C)$ ($A, B, C \rightarrow$ independent)

$P(A) = 2/3$ $P(B) = 3/4$ $P(C) = 4/5$

$P(\bar{A}) = 1 - \frac{2}{3} = \frac{1}{3}$, $P(\bar{B}) = 1 - \frac{3}{4} = \frac{1}{4}$, $P(\bar{C}) = 1 - \frac{4}{5} = \frac{1}{5}$

$\therefore P(\text{Completes assig}) = 1 - [P(\bar{A}) \& P(\bar{B}) \& P(\bar{C})]$

$= 1 - \left[\frac{1}{3} \times \frac{1}{4} \times \frac{1}{5}\right]$

$= 1 - \frac{1}{60} = \frac{59}{60}$ Ans $\boxed{c}$

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Q.4 Mohan needs to go to Raisen from Gwalior via Bhopal. There are 18 trains from Gwalior to Bhopal and from there he can chose either bus, car or bike to reach Raisen. Find the number of ways he can reach Raisen.

(a) 27 (b) 21 (c) 54 (d) 9

Ans:

Gwalior ⟶ Bhopal ⟶ Raisen

18 trains

Bus
Car
Bike
} 3

$= 18 \times 3$

$= 54$ Ans $\boxed{c}$

Q.5 Five dice are tossed together. What is the probability of getting different faces in all of the dice?

(a) $6!/6^6$ (b) $6!/6^5$ (c) $5!/6^5$ (d) $5!/6^6$

Ans:-

$$P = \frac{\frac{6}{1-6} \times \frac{5}{1-6} \times \frac{4}{1-6} \times 3 \times 2}{6^5} = \frac{6!}{6^5}$$ Ans $\boxed{b}$

Q.6 Weather forecast company makes a forecast of raining at 70%. The company's forecasts are only correct 60% of the time. Find the probability of it correctly forecasting rain?

(a) 21/50 (b) 23/50 (c) 26/50 (d) 29/50

Ans:- $P = \frac{70}{100} \times \frac{60}{100} = \frac{42}{100} = \frac{21}{50}$ Ans $\boxed{a}$

★ Probability of two unrelated events happening together is equal to product of individual probabilities.

Scanned with CamScanner

Q.⑦ EMBRACE is related to AFFECTION as

(a) ANXIETY is related to APATHY

(b) DISGUST is related to OMINOUS

(c) OBEISANCE is related to RESPECT

(d) LETHARGY is related to FEAR.

Ans. [c] embrace is a sign of affection.
Obeisance is a sign of respect.

Q.⑧ Spurious: _____ :: Genuine : Authentic

(a) Phony (b) Veritable (c) Bona fide (d) Dream

Ans:- [a] Phony

Spurious → false / fake ≃ phony

Genuine, Authentic → original.

⑨ ×

⑩ ×

Scanned with CamScanner

02/04/23

31. ~~Time, Speed, Distance & Work, Time-I~~

Probability-3

- Coins ✓
- Dice ✓

*. Cards (Plain Cards) (52)

→ 2 Colours →

- Red (26)
  - Heart पान ♡ (13)
  - Diamond ईंट ◇ (13)
- Black (26)
  - Spade हुकम ♠ (13)
  - Club चिड़ी ♣ (13)

→ 4 Suits →

#. • Picture Cards / Face Cards :-

J, K, Q, ~~A~~ ⇒ 3×4 = 12

#. • Honour Cards :-

J, K, Q, A (इक्का) ⇒ 4×4 = 16

Que. Draw 3-cards.

$= {}^{52}C_3$ (if nothing is mentioned).

Que. Draw 3-cards one by one or one after another or in succession

(a) With Replacement : $= {}^{52}C_1 \times {}^{52}C_1 \times {}^{52}C_1$

(b) Without Replacement : $= {}^{52}C_1 \times {}^{51}C_1 \times {}^{50}C_1$

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GATE-2007
Que.

Pack of 52 cards, 2 cards are drawn in succession with replacement.

① P(both Ace) = (a) $\frac{1}{169}$ (b) $\frac{2}{169}$ (c) $\frac{1}{13}$ (d) none

Ans: $S/S = {}^{52}C_1 \times {}^{52}C_1$ ($\because$ R ✓)

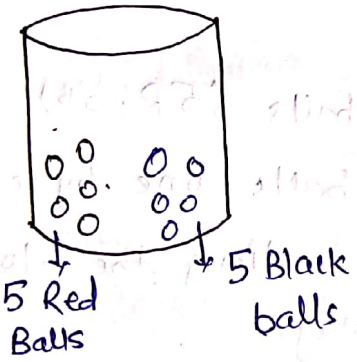
$\therefore P = \frac{{}^4C_1}{{}^{52}C_1} \times \frac{{}^4C_1}{{}^{52}C_1} = \frac{4}{52} \times \frac{4}{52} = \frac{1}{13} \times \frac{1}{13} = \frac{1}{169}$ Ans

(9)

If RX

$P = \frac{{}^4C_1}{{}^{52}C_1} \times \frac{{}^3C_1}{{}^{51}C_1} = \frac{12}{52 \times 51} = \frac{1}{13 \times 17} = \frac{1}{221}$ Ans

* Coloured Balls :- GATE-2003



Total = 5+5 = 10 balls

Pick 2 balls one after another without replacement.

Find P(both balls red).

Ans:- ① $P(R=2) = \left(\frac{{}^5C_1}{{}^{10}C_1} \times \frac{{}^4C_1}{{}^9C_1}\right) \times \frac{2!}{2!} = \frac{5 \times 4}{10 \times 9} = \frac{2}{9}$ Ans.

② $P(B=2) = \left(\frac{{}^5C_1}{{}^{10}C_1} \times \frac{{}^4C_1}{{}^9C_1}\right) \times \frac{2!}{2!} = \frac{5 \times 4}{10 \times 9} = \frac{2}{9}$ Ans.

Gate → ③ $P(R, B) = \left(\frac{{}^5C_1}{{}^{10}C_1} \times \frac{{}^5C_1}{{}^9C_1}\right) \times 2!$

- # 4 Coins — 3 head — HHHT = 4!/3!
- # 5 dice → 6 — 6.6.6.6.6 = 5!/4!
- # 6 balls → 4R, 2B → RRRRBB = 6!/4! × 2!

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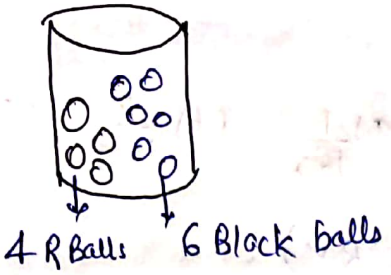
03/04/23

Que.

GATE



Total = 4 + 6 = 10 balls

P(RBB) = ?

3 balls one by one

WR

- Draw 3 balls = $10c_3$
- Draw 3 balls one by one
  - WR = $10c_1 \times 9c_1 \times 8c_1$
  - R = $10c_1 \times 10c_1 \times 10c_2$

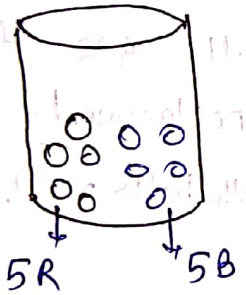
Ans:- $P(RBB) = \left[\frac{4c_1}{10c_1} \times \frac{6c_1}{9c_1} \times \frac{5c_1}{8c_1}\right] \times \frac{3!}{2!}$

$= \frac{\cancel{4} \times \cancel{6} \times 5}{10 \times \cancel{9} \times \cancel{8}} \times \cancel{8} = \frac{1}{2}$ Ans.

★★★

Que.

GATE MATH -2017



Total = 10 balls (5R, 5B)

Draw 2 balls one by one, & without noticing the colour you just threw away.

P (2nd ball is red coloured) = ?

Ans:-

(R) $\frac{5c_1}{10c_1} \times \frac{4c_1}{9c_1}$ → Red

(+) (OR)

(B) $\frac{5c_1}{10c_1} \times \frac{5c_1}{9c_1}$ → Red

$P = \frac{5 \times 4}{10 \times 9} + \frac{5 \times 5}{10 \times 9}$

$= \frac{2}{9} + \frac{5}{18}$

$= \frac{4+5}{18} = \frac{9}{18}$

$= \frac{1}{2}$ Ans

Scanned with CamScanner

2004 Que. From a pack of 52 cards, 2 cards drawn one by one without Repl.

P(both cards must be KING) = ?

Ans:- $P = \frac{4c_1}{52c_1} \times \frac{3c_1}{51c_1} = \frac{4}{52} \times \frac{3}{51} = \frac{1}{13} \times \frac{1}{17} = \frac{1}{221}$ Ans

* **Conditional Probability** :-

- $P(A/B)$ → Probability of occurence of an event A when event B already occured.

$$P(A/B) = \frac{P(A \cap B)}{P(B)} \; ; \; P(B) \neq 0$$

$$P(B/A) = \frac{P(A \cap B)}{P(A)} \; ; \; P(A) \neq 0$$

* In case of Independent event,

$\cancel{P(A/B)} = P(A)$.

$$P(A \cap B) = P(A) \times P(B)$$

* Independent Events :-

Prob. that Divyanshu will solve the que.

$\cancel{P(Div)}_D = 1/3 \Rightarrow \cancel{P(\bar{D})}_{\bar{D}} = 1 - \frac{1}{3} = \frac{2}{3}$

$\cancel{P(Nikk)}_N = 1/4 \Rightarrow \cancel{P(\bar{N})}_{\bar{N}} = 1 - \frac{1}{4} = \frac{3}{4}$

① P(only one of them solved the que)

$= D \cdot \bar{N} + \bar{D} \cdot N$ (or)

$= \frac{1}{3} \times \frac{3}{4} + \frac{2}{3} \times \frac{1}{4} = \frac{1}{4} + \frac{1}{6} = \frac{3+2}{12} = \frac{5}{12}$ Ans.

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② P(que. must be solved)

$= D \cdot \bar{N} + \bar{D} \cdot N + D \cdot N$

(or)

$1 - \bar{D} \cdot \bar{N}$

$= 1 - \frac{2}{3} \times \frac{3}{4} = 1 - \frac{1}{2} = \frac{1}{2}$ Ans.

③ P(que. not solved)

$= \bar{D} \cdot \bar{N} = \frac{2}{3} \times \frac{3}{4} = \frac{1}{2}$

G-2015
IIT Kanpur
Que.

Ram and Ramesh appeared in an interview for two vacancies in the same department. The probability of Ram's selection is 1/6 and that of Ramesh is 1/8. what is the probability that only one of them will be selected?

(a) 47/48 (b) 1/4 (c) 13/48 (d) 35/48

Ans.

$Ram = \frac{1}{6}$ $\quad \overline{Ram} = 1 - \frac{1}{6} = 5/6$

$Ramesh = \frac{1}{8}$ $\quad \overline{Ramesh} = 1 - \frac{1}{8} = \frac{7}{8}$

P(only one selected) $= Ram \cdot \overline{Ramesh} + \overline{Ram} \cdot Ramesh$

$= \frac{1}{6} \times \frac{7}{8} + \frac{5}{6} \times \frac{1}{8}$

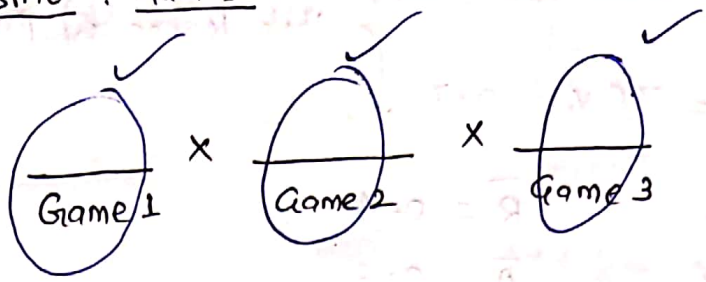
$= \frac{12}{6 \times 8} = \frac{1}{4}$ Ans $\boxed{b}$

*. Casino :-

★ किसी कार्य की असफलता सिर्फ उस कार्य की असफलता है। जरूरी नहीं कि बन्दा असफल है।
If I fail in certain ventures of my life, that doesn't mean I am a failure. It only means that I failed in those ventures.

Scanned with CamScanner

*. Casino : Games



Independent events

Que. In a Las Vegas Casino, 3 games were played.

(a) A bet on the tossing of 2 unbiased coins

(b) A bet on drawing a card from a pack of 52 cards

(c) A bet on the sum of the scores of the top face of 2 die.

Each of the above events occur at random. A 'mechanical ark' was programmed to conduct the 3 events simultaneously. What is the probability of getting at least 1 head, a picture card and a sum below 9 (in the game of dice)?

(a) 5/52 (b) 1/4 (c) 1/36 (d) 1/8.

Ans:- at least one head → HT → $2! = 2$ + $= 3$

HH → $2!/2! = 1$

$\therefore P = \frac{3}{4} = \frac{3}{2^2}$

OR

$1 - TT = 1 - \frac{2!/2!}{2^2} = 1 - \frac{1}{4} = \frac{3}{4}$

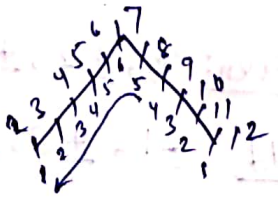
Picture cards : $P = \frac{12C_1}{52C_1}$

(J, K, Q, A)

$3 \times 4 = 9$

sum < 9 : $P = 1 - \text{sum} \geq 9$

$= 1 - \frac{4+3+2+1}{36} = 1 - \frac{10}{36} = \frac{13}{18}$



$\therefore P = \frac{2}{4} \times \frac{12}{52} \times \frac{18}{18} = \frac{1}{8}$ (d)

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*. P (Ravi) = 60% = 0.6 } thik karne of prob.

Doctors

P (Akshat) = 70% = 0.7

$R = 0.6$ $\bar{R} = 0.4$

$A = 0.7$ $\bar{A} = 0.3$

P(successful) = $R \cdot \bar{A} + \bar{R} \cdot A + R \cdot A$

$= \boxed{1 - \bar{R} \cdot \bar{A}}$

$= 1 - 0.4 \times 0.3 = 1 - 0.12 = 0.88$ Ans

Que. The probabilities of the three doctors A, B and C getting success in an operation are 0.5, 0.2 and 0.3 respectively. Find the probability that the operation is not successful?

(a) 0.78 (b) 0.64 (c) 0.56 (d) 0.28

Ans:- $A = 0.5$ $B = 0.2$ $C = 0.3$

$\bar{A} = 0.5$ $\bar{B} = 0.8$ $\bar{C} = 0.7$

~~$\bar{O} = 1 - A \cdot B \cdot C$~~

~~$= 1 - 0.030 =$~~ ~~0~~

$\therefore P(\bar{O}) = \bar{A} \cdot \bar{B} \cdot \bar{C}$

$= 0.5 \times 0.8 \times 0.7$

$= 0.28$ Ans $\boxed{d}$

Que. If 5 unbiased coins are tossed, what is the probability of getting even numbers of heads?

(a) 1/2 (b) 1/5 (c) 5/32 (d) 15/32

Ans:- Integers

$0, \pm 1, \pm 2, \ldots$

Even: $0, \pm 2, \pm 4, \ldots$

Odd: $\pm 1, \pm 3, \pm 5, \ldots$

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① $\underline{H=0}$: TTTTT $= 5!/5! = 1$

② $\underline{H=2}$: HHTTT $= 5!/2!\,3! = 10$

③ $\underline{H=4}$: HHHHT $= 5!/4! = 5$

$$\therefore P = \frac{1+10+5}{2^5} = \frac{16}{32} = 1/2 \text{ Ans.}$$ $\boxed{a}$

0 ** even

[illegible] 0 miss [illegible] [illegible] 15/32 [illegible]

Scanned with CamScanner

03/04/23

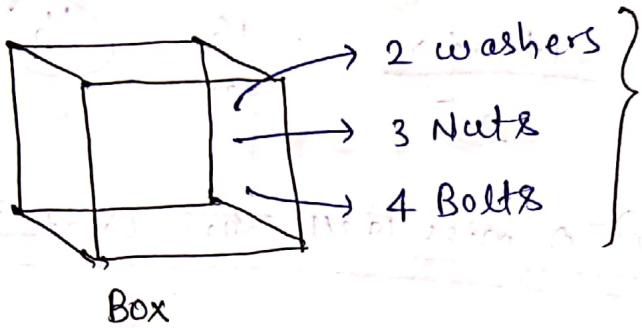
32. Doubt Clearing Session

Probability

* **Independent Event:**

$$\boxed{P(A \cap B) = P(A) \times P(B)}$$

*



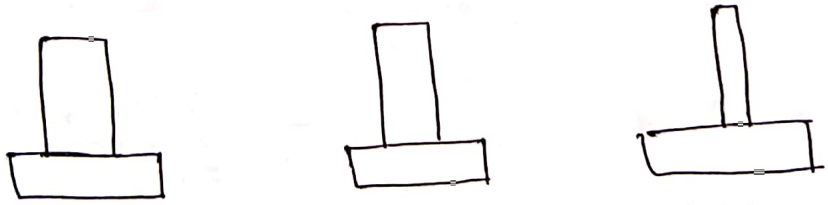
Draw items from box in succession (one by one) without Replacement.

~~① $P(2 \text{ washers}) = \frac{2C_1}{9C_1} \times \frac{1C_1}{8C_1} = \frac{2 \times 1}{9 \times 8} = \frac{1}{36}$~~

~~② $P(3 \text{ nuts}) = \frac{3C_1}{9C_1} \times$~~

$$P = \underbrace{\left(\frac{2C_1}{9C_1} \times \frac{1C_1}{8C_1}\right)}_{\text{washer} - 02} \times \underbrace{\left(\frac{3C_1}{7C_1} \times \frac{2C_1}{6C_1} \times \frac{1C_1}{5C_1}\right)}_{\text{Nuts} - 3} \times \underbrace{\left({}^4C_4 = 1\right)}_{\text{Bolts} - 4}$$

* GATE IIT-K 2015



Hemant — Rami — Vivek → Vendors

$P = 0.8$ $P = 0.7$ $P = 0.5$

(prob. of providing Highly precise components)

Que. Prob. that out of total 3 component supplied by these 3 vendors, at least one of them meets the high design specification?

Ans: $1 - \bar{H} \cdot \bar{R} \cdot \bar{V} = 1 - 0.2 \times 0.3 \times 0.5 = 1 - 0.03$

$= 1 - \cancel{0.30}$ $= 0.97$ Ans

$= \cancel{0.70}$

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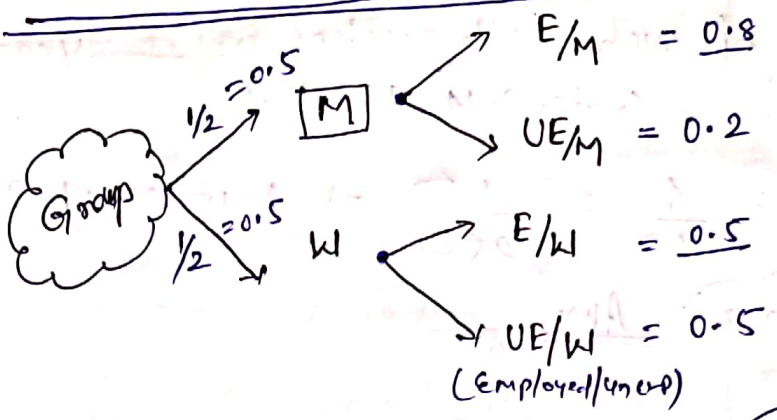
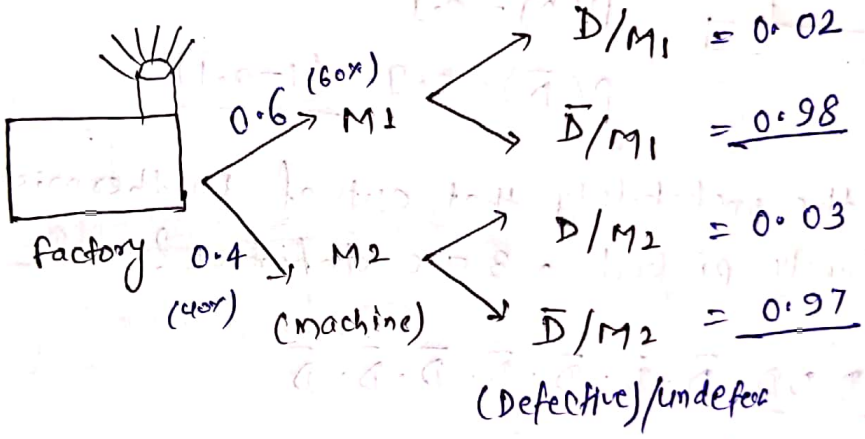
* $P(A/B) = \dfrac{P(A \cap B)}{P(B)}$; $P(B) \neq 0$

[Conditional probability]



① $P(E) = \frac{1}{2} \times 0.8 + \frac{1}{2} \times 0.5 = 0.65$ Ans.



* ① $P(D) = 0.6 \times 0.02 + 0.4 \times 0.03$

$= 0.012 + 0.012 = 0.024$ Ans.

② $P(M_2/D) = \dfrac{0.4 \times 0.03}{\text{Def.}}$

$= \dfrac{0.012}{0.6 \times 0.02 + 0.4 \times 0.03} = \dfrac{0.012}{0.024} = \dfrac{1}{2}$ Ans

* $\underset{1}{T}\ \underset{2}{T}\ \underset{3}{T}\ \underset{4}{T}\ \underset{5th}{T}$ ___ 6th $P(T) = ?$ $= \dfrac{T}{H/T} = \dfrac{1}{2} = 0.5$

$P(T) = ?$

$P(A/B) = \dfrac{P(A \cap B)}{P(B)}$; $P(B) \neq 0$

$\Rightarrow P(6^{th}\ \text{Tail (already 5T)}) = \dfrac{P(\overset{6th}{T} \cap TTTTT)}{P(TTTTT)} = \dfrac{P(\overset{6th}{T}) \times \cancel{P(TTTTT)}}{\cancel{P(TTTTT)}}$

$= P(6^{th}\ T)$

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Que. In any given year, the probability of an earthquake greater than Magnitude 6 occuring in the Garhwal Himalayas is 0.04. The average time between successive occurences of such earth quakes is ____ years.

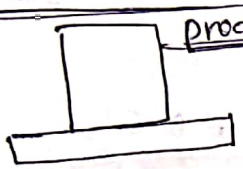
Gate-2014 : IIT KGP

Ans: $P = 0.04 = \frac{4}{100} = \frac{1}{25} \Rightarrow$ 1 in every 25 years

$\therefore$ 25 years **Ans.**

* Thermistor production unit

Math GATE-15



$P(D) = 0.1$

$\therefore P(\bar{D}) = 0.9 \quad (1-0.1)$

Find the probability that out of 10 thermistors randomly picked, 3 are defective?

Ans: $DDD \cdot \bar{D} \cdot \bar{D} \cdot \bar{D} \cdot \bar{D} \cdot \bar{D} \cdot \bar{D} \cdot \bar{D}$

$$= (0.1)^3 \times (0.9)^7 \times \frac{10!}{3! \times 7!}$$

APT. Gate — started in 2010

2008 Gate Que.

A coin is tossed 4 times.

P(exactly 3 heads)

Ans: $HHHT = \frac{4!/3!}{24} = \frac{4}{16} = \frac{1}{4}$ **Ans.**

$$P(HHHT) = \underbrace{\left(\frac{1}{2}\right)^3}_{3\text{ head}} \times \underbrace{\left(\frac{1}{2}\right)^1}_{1\text{ tail}} \times \frac{4!}{3!}$$

$$= \frac{1}{8} \times \frac{1}{2} \times 4 = \frac{1}{4} \text{ Ans.}$$

Scanned with CamScanner

Gate-18
Math

dice - 5 times rolled. $\Rightarrow S/S = 6^5$

P (1 must come at least 4 time) = ?

$$\underbrace{1\cdot1\cdot1\cdot1}\cdot\bar{1} + \underbrace{1\cdot1\cdot1\cdot1\cdot1}$$

$$= \frac{\frac{5!}{4!} + \frac{5!}{5!}}{6^5} = \frac{6}{6^5} = \frac{1}{6^4} \text{ Ans}$$

or

$$\frac{5!}{4!} \times \left[\left(\frac{1}{6}\right)^4 \times \left(\frac{5}{6}\right)\right] + \left[\left(\frac{1}{6}\right)^5\right] \times \frac{5!}{5!} = \frac{1}{6^4} \text{ Ans}$$

* $\boxed{\text{Unbiased Coin}}$: (If nothing is mentioned, always unbiased).

↓

Infinite times tossed

① P (3rd head appears at the 5th toss) = ?

$$\underbrace{\underset{1st}{__}\ \underset{2nd}{__}\ \underset{3rd}{__}\ \underset{4th}{__}}_{\boxed{\text{2 Heads}}}\ \underset{5th}{\underset{H}{__}} \leftarrow \text{3rd head}$$

$\Rightarrow$ HHTT (2H, 2T)

↓

$$\underset{2H}{\left(\frac{1}{2}\right)^2} \times \underset{2T}{\left(\frac{1}{2}\right)^2} \times \frac{4!}{2!\,2!} \times \underset{3rd\ H}{\left(\frac{1}{2}\right)}$$

$$= \frac{1}{4} \times \frac{1}{4} \times \cancel{6}^{3} \times \frac{1}{\cancel{2}} = \frac{3}{16} \text{ Ans.}$$

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Gate-2019
Q.

Coins- Infinite Times tossed.

P(4th head appears at the 10th toss)

Ans,

$$\underbrace{_\ _\ _\ _\ _\ _\ _\ _\ _}_{HHH\,TTTTTT}\ \overset{\leftarrow 4th}{\underset{\uparrow}{H}}$$

$\left(\frac{1}{2}\right)$

$$\therefore P = \left(\frac{1}{2}\right)^3 \times \left(\frac{1}{2}\right)^6 \times \frac{9!}{3!\,6!} \times \frac{1}{2} \quad \text{Ans}$$

G-2018
Q.

Fair coin tossed.

P(Head for the 3rd time in 5 tosses).

$$\underbrace{_\ _\ _\ _}_{HHTT}\ \overset{\leftarrow 3rd}{H}$$

$$= \left(\frac{1}{2}\right)^2 \times \left(\frac{1}{2}\right)^2 \times \frac{4!}{2!\,2!} \times \left(\frac{1}{2}\right) \quad \text{Ans.}$$

Que. A batch of one hundred bulbs is inspected by testing four randomly chosen bulbs. The batch is rejected if even one of the bulbs is defective. A batch typically has five defective bulbs. The probability that the current batch is accepted is—

Gate-2014 : IITK

Ans:

100 bulb → 5 D.

$$\therefore P(D) = \frac{5}{100} = 0.05$$

$$\therefore P(\bar{D}) = 1 - 0.05 = 0.95$$

$$P(A) = \bar{D}\cdot\bar{D}\cdot\bar{D}\cdot\bar{D} = (0.95)^4 \times \frac{4!}{4!} = 0.95^4 \quad \text{Ans}$$

Scanned with CamScanner

07/03/23
~~04/03/23~~

33. Time Speed Distance & Work Time - II

TSD ★★★

1.) Number System
2.) P&C and Prob.
3.) TSD

Most Imp. ★ Aptitude ★ Topics ★★★★

⊛ $\boxed{D = S \times T}$

Distance = Speed × Time

⊛ • 1 km = 1000 m

• 1 hr = 60×60 = 3600 sec

• $\boxed{1\ km/hr = \frac{1000}{60\times60} = \frac{5}{18}\ m/sec}$ → PSU

Que. A train runs at the rate of 45 km per hour. What is its speed in metres per second?

Ans:- $45\ km/hr = 45 \times \frac{5}{18} = \frac{5\times5}{2} = 12.5\ m/s$ Ans

★ • $1\ km/hr = \frac{5}{18}\ m/sec$

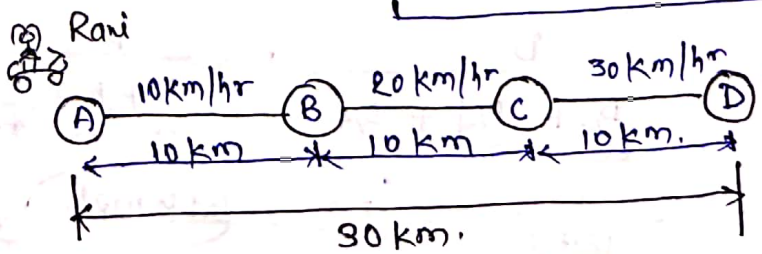
⇒ $\boxed{1\ m/sec = \frac{18}{5}\ km/hr.}$

Que. $50\ m/sec = \frac{50\times18}{5} = 180\ km/hr.$ Ans

Que. A motor car takes 50 seconds to travel 500 metres. What is speed in km per hour?

Ans:- $Speed = \frac{500\ m}{50\ s} = 10\ m/s = \frac{10\times18}{5} = 36\ km/hr$ Ans.

⊛ **Average Speed:-** $= \boxed{\frac{\text{Total Distance travelled}}{\text{Total time taken}}}$



⇒ $Avg\ speed = \frac{30}{\frac{10}{10}+\frac{10}{20}+\frac{10}{30}}$

$= \frac{30}{1+\frac{1}{2}+\frac{1}{3}} = \frac{30}{\frac{6+3+2}{6}}$

$= 30\times\frac{6}{11} = \frac{180}{11} = 16.3\ km/hr$ Ans

Scanned with CamScanner

2016

Que. A bird flying 400km covers the first 100km at the rate of 100 km/hr, the second 100 km at 200 km/hr, the third 100 km at the rate of 300 km per hour & the last 100 km at the rate of 400 km/hr. Determine the average speed of the bird?

Ans:

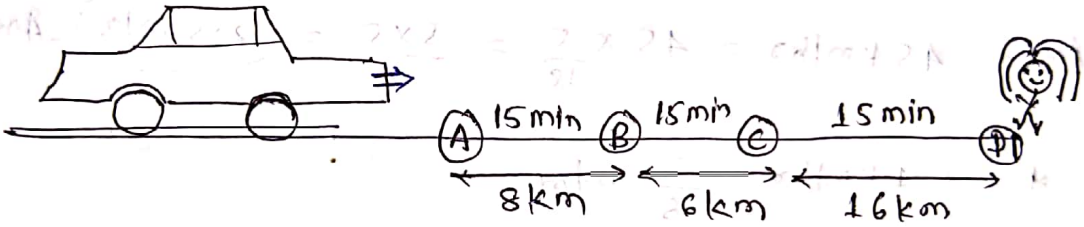
$$\text{Avg Speed} = \frac{400}{\frac{100}{100} + \frac{100}{200} + \frac{100}{300} + \frac{100}{400}}$$

$$= \frac{400}{1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4}} = \frac{400}{\frac{12+6+4+3}{12}}$$

$$= \frac{400 \times 12}{25} = 16 \times 12 = 192 \text{ km/hr}$$ Ans.

2013-Bomb

Que.



Ans.

$$\cancel{\text{Avg. Speed} = \frac{8+6+16}{\frac{8}{1/4} + \frac{6}{1/4} + \frac{16}{1/4}} = \frac{30}{4 \times 30} =}$$

$$\text{Avg. speed} = \frac{8+6+16}{(15+15+15) \times \frac{1}{60}} = \frac{30 \times 60}{45} = 40 \text{ km/hr}$$ Ans.

2013 Bombay

Que. A tourist covers half of ~~the~~ his journey by train at 60 km/hr half of the remainder by bus at 30 km/hr and rest by cycle at 10 km/hr. The avg speed is: (entire journey)

(a) 36 (b) 30 (c) 24 (d) 18

Ans.

$$\text{Avg speed} = \frac{D}{\frac{D/2}{60} + \frac{D/4}{30} + \frac{D/4}{10}} = \frac{D}{\frac{D}{120} + \frac{D}{120} + \frac{D}{40}} = \frac{D}{D\left[\frac{1}{120} + \frac{1}{120} + \frac{1}{40}\right]}$$

$$= \frac{1}{\frac{1+1+3}{120}} = \frac{120}{5} = 24 \text{ kmph}$$ Ans. $\boxed{c}$

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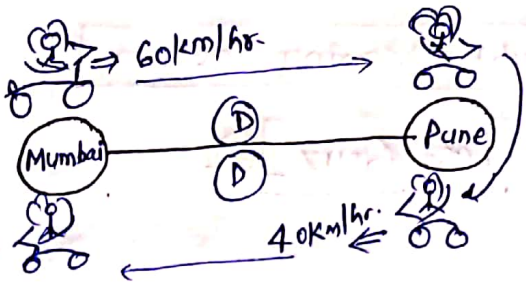
*



$\Rightarrow$ Avg speed $= \dfrac{2D}{\frac{D}{x}+\frac{D}{y}}$

$= \boxed{\dfrac{2xy}{x+y}}$

Avg speed $= \dfrac{2\times60\times40}{60+40} = 48$ km/hr Ans.

Que. If Tushar goes from Delhi to Noida at a speed of 30 kmph and comes back at a speed of 70 kmph. Then what is his average speed during the entire journey?

Ans. Avg speed $= \dfrac{2xy}{x+y} = \dfrac{2\times30\times70}{30+70} = 42$ km/hr Ans

Que. IIT Guwahati Gate-2018

City A $\xrightarrow[90\text{ km/hr}]{60\text{ km/hr}}$ City B

Avg speed $= \dfrac{2\times60\times90}{60+90} = \dfrac{2\times\overset{12}{\cancel{60}}\times\overset{3}{\cancel{90}}}{\underset{5}{\cancel{150}}} = 72$ kmph

Special Practice Paper Probability (9)

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08/04/23

34. Doubt Clearing Session

Last Quiz ⑥

① $S/S = {}^{20}C_3$

$P = \frac{{}^{10}C_2 \times {}^{10}C_1}{{}^{20}C_3} = \frac{15}{38}$ Ans.

② $S/S = {}^{9}C_2$

$P(BX) = \frac{{}^{2+3}C_2}{{}^{9}C_2} = \frac{{}^{5}C_2}{{}^{9}C_2} = \frac{5}{18}$ Ans

③ $P(\text{completed}) = 1 - \frac{2}{3} \times \frac{3}{4} \times \frac{4}{5}$

$= 1 - \left(\frac{1}{3} \times \frac{1}{4} \times \frac{1}{5}\right) = 1 - \frac{1}{60} = \frac{59}{60}$ Ans.

④ $18 \times 3 = 54$ Ans.

⑤ $S/S = 6^5$

$\underline{6} \times \underline{5} \times \underline{4} \times \underline{3} \times \underline{2} = 6!$ $\Rightarrow P = \frac{6!}{6^5}$ Ans.

Gate-2020 IIT-Delhi style ⑥

70% = 0.7

60% = 0.6 $P = 0.7 \times 0.6 = 0.42 = \frac{42}{100} = \frac{21}{50}$ Ans

⑦ Embrace – praise करना, hug करना, प्यार दिखाना, ---
– Affection

Anxiety – घबराना

Apathy – जो emotion show नहीं करता (Stoic)
eg:- स्थोनी (Balanced) (खुशी में ज्यादा खुश नहीं, दुःखी में ज्यादा दुःख नहीं)

Disgust – घटिया, बेकार

Ominous – अशुभ / बुरा होने का

नींबू-मिर्ची → लक्ष्मी का बहन – अलक्ष्मी

इनका भोजन है – नींबू, मिर्ची → दरिद्रता / Poverty / गरीबी

Requesting that please don't come in, I am bringing your food else your sister will go

किसी घर में सिर्फ एक ही रह सकती है – लक्ष्मी / अलक्ष्मी

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- Necromancy – Black magic
  – sorcery (काला जादू)

- Lethargy – आलस , खूंखार आलस
- fear – डर
- Obeisance – Respect

(8) - Spurious – false
- fid → faith ⇒ fid जहाँ पे आएगा faith को लेके आएगा।

★★★ - Bona fide / Bonafides
(Adj) (Noun)

- Ver → सच
- veritable – सच
- Phony – झूठ

(A) $\frac{366 \text{ days}}{7}$ = 52 weeks + 2 days → S/M, M/T, T/W, W/Th, Th/F, F/Sat, Sat/S } 7 Cases

(1) $P(53 \text{ sun}) = \frac{S/M \,/\, Sat/Sun}{7} = \frac{2}{7}$ Ans.

(2) $P(52 \text{ Mon}) = 1 - \frac{S/M \,/\, M/T}{7} = 1 - \frac{2}{7} = \frac{5}{7}$

(3) $P(53 \text{ sun} \,\&\, 53 \text{ Mon}) = \frac{1}{7}$ → S/M

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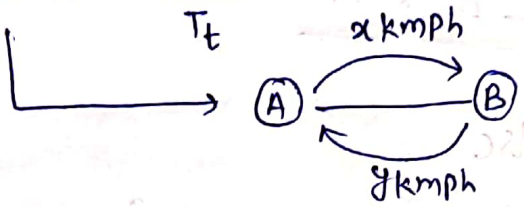
08/04/23

35. Time Speed Distance & Work Time - III

* ① $D = S \times T$

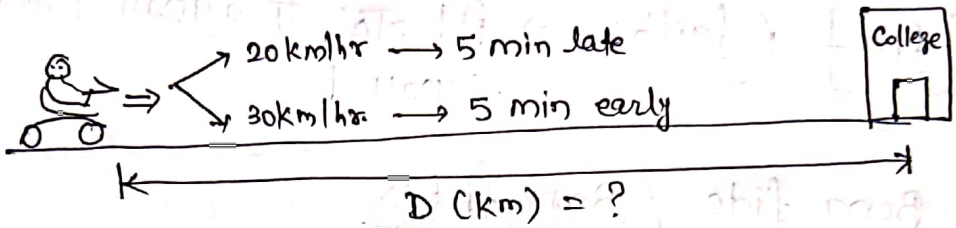
② $1\,km/hr = \frac{5}{18}\,m/s$, $1\,m/s = \frac{18}{5}\,km/hr$

③ Avg speed $= \frac{T_D}{T_t}$



$\Rightarrow$ Avg. speed $= \frac{2xy}{x+y}$ kmph

Quest.



$\boxed{D = S \times T}$

$$D = 20 \times \left(t + \frac{5}{60}\right) \longrightarrow (i)$$

$$D = 30 \times \left(t - \frac{5}{60}\right) \longrightarrow (ii)$$

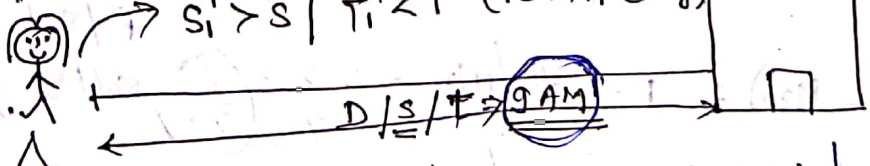
(i) & (ii), $20\left(t + \frac{5}{60}\right) = 30\left(t - \frac{5}{60}\right)$

$\Rightarrow t = 25$ min.

$D = 20 \times \left(\frac{25+5}{60}\right) = 20 \times \frac{30}{60} = 10$ km Ans

Time-difference:

Que. *



$S_1' > S \mid T_1' < T$ (15 min early) → 8:45 am

$9:00 - 8:45 = \frac{15}{60}$

$\frac{D}{S} - \frac{D}{S_1'} = \frac{15}{60}$

$S_1 < S \mid T_1 > T$ (10 min late) 9:10 am

$9:10 - 9:00 = 10$ min $= \frac{10}{60}$ hr

$\frac{D}{S_1} - \frac{D}{S} = \frac{10}{60}$

$S_2 << S \mid T_2 >> T$ (45 minute) → 9:45

$9:45 - 9:00 = 45/60$

$\Rightarrow \frac{D}{S_2} - \frac{D}{S} = \frac{45}{60}$

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Que. ①

20 km/hr → 5 min late

30 km/hr → 5 min early

College

let 9:00 am

D = ?

Ans. Time-Difference:

$$9:05 - 8:55 = \frac{10}{60}$$

$$\Rightarrow \frac{D}{20} - \frac{D}{30} = \frac{10}{60}$$

$$\Rightarrow D\left(\frac{3-2}{60}\right) = \frac{10}{60} \Rightarrow D = 10\,km$$ Ans.

* Time-difference

② Rani 5/7 th of her usual speed — 16 min late

Market

let's assume 9:00 → usually.

$$9:16 - 9:00 = \frac{16}{60}$$

$$\frac{D}{\frac{5}{7}S} - \frac{D}{S} = \frac{16}{60}$$

$$\frac{D}{S}\left[\frac{7}{5} - 1\right] = \frac{16}{60}$$

$$\Rightarrow T \times \frac{2}{5} = \frac{16}{60}$$

$$\therefore T = \frac{80}{120} \times 60 = 40\,min$$ Ans.

$D = T \times S$

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

OR

$\frac{5}{7}th \rightarrow \frac{7}{5}T$

$1 + \frac{2}{5}T$

$\frac{2T}{5} = 16$

$T = 40\,min$

Ans

③ Rani → 12/11th of her usual speed — 5 min early

Find her usual time to reach the Market ?

Let: 9:00

$$9:00 - 8:55 = \frac{5}{60}$$

$$\frac{D}{S} - \frac{D}{\frac{12}{11}S} = \frac{5}{60}$$

$$\frac{D}{S}\left[1 - \frac{11}{12}\right] = \frac{5}{60}$$

$$\Rightarrow T = \frac{5}{60} \times \frac{12}{1} = 1\,hr = 60\,min$$ Ans.

OR

$12/11 \rightarrow \frac{11}{12} = 1 - \frac{1}{12}T$

$\frac{1}{12}T = 5$

$T = 60\,min$

Ans

Scanned with CamScanner

Que. 4 A train running between two towns arrives at its destination 10 minutes late when it goes at 60 km per hour and 16 minutes late when it goes at 40 km per hour. Determine the distance between two town?

Ans:-

$\boxed{9:00\,am} \longrightarrow 9:10\,am \rightarrow 60\,km/hr$

$9:16\,am \rightarrow 40\,km/hr$

$9:16 - 9:10 = \frac{6}{60}$

$\frac{D}{40} - \frac{D}{60} = \frac{6}{60}$

$\frac{3D - 2D}{120} = \frac{6}{60}$

$\Rightarrow \boxed{D = 12\,km}$ Ans.

5

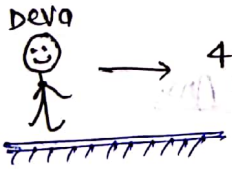
* **Time Difference:**

$\boxed{D} = S \times T$

Const $\uparrow \downarrow$

$\boxed{\longleftrightarrow}$ Const. $\downarrow \uparrow$

- Percentage में Connect करेंगे
- 5 topics इसी से बनेंगे

Deva  $\longrightarrow$ $4/3^{th}$ speed $(\uparrow) \Longrightarrow \frac{3}{4}$ time $(\downarrow)$

$\downarrow$ 12 min early

$\downarrow$ $\left(T - \frac{1}{4}T\right)$

$\frac{1}{4}T = 12\,min$

$\therefore \boxed{T = 48\,min}$ Ans.

$\longrightarrow \frac{6}{5}^{th}$ speed $\longrightarrow \frac{5}{6}t$

$= \left(1 - \frac{1}{6}T\right) \Rightarrow \frac{1}{6}T = 12$

$\Rightarrow T = 72\,min$

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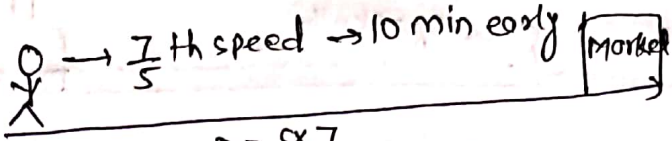
* ⑥ $\frac{7}{5}$th speed → 10 min early



$D = S \times T$

$\frac{7}{5}$th speed (↑) ⇒ $\frac{5}{7}T$ (↓)

$\left(1 - \frac{2}{7}T\right) \Rightarrow 10 = \frac{2}{7}T \Rightarrow \boxed{T = 35 \text{ min}}$ Ans.

* ⑦ $\frac{3}{5}$th speed → 10 min late.

$\frac{3}{5} \rightarrow \frac{5}{3} = 1 + \frac{2}{3}T$ $\quad \frac{2}{3}T = 10 \Rightarrow \boxed{T = 15 \text{ min}}$ Ans

Qu. ⑧ $\frac{5}{7}$th speed → 8 min late

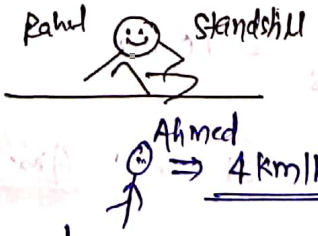
$\frac{5}{7} \Rightarrow \frac{7}{5} = 1 + \frac{2}{5}T \Rightarrow \frac{2}{5}T = 8 \Rightarrow \boxed{T = 20 \text{ min}}$ Ans.

* Relative Speed :-

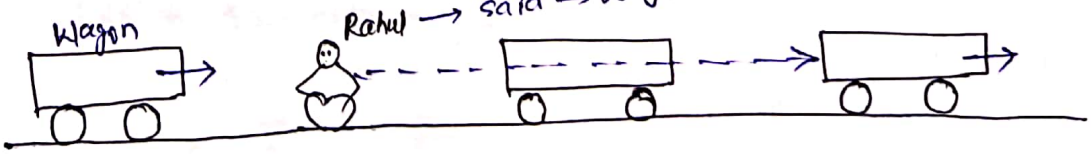
x kmph →
y km/hr →
⇓
$\boxed{(x \sim y) \text{ km/hr}}$

x km/hr → ← y km/hr
⇓
$\boxed{(x + y) \text{ km/hr}}$

*



* Rahul → said → wagon visible 100m for 4 min.



$D = S \times T$

$S_W = \frac{100/1000}{4/60} = \boxed{1.5 \text{ km/hr}}$

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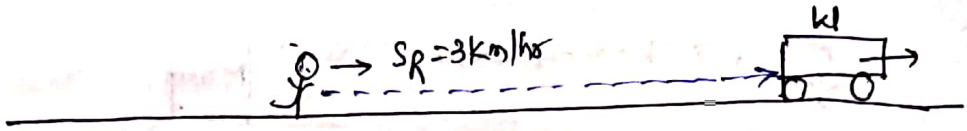
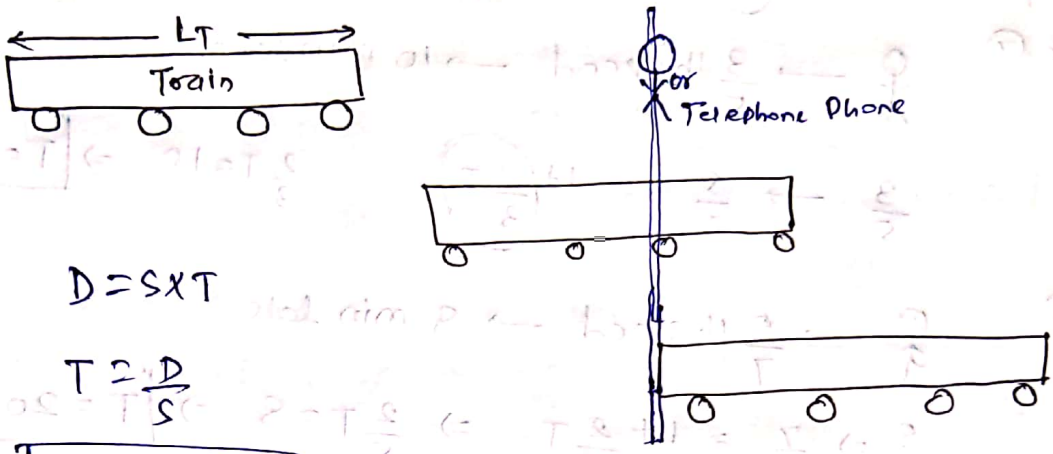


$S_{CR} = S_C \sim S_R$

$1.5 = S_C \sim 3'$

$\Rightarrow S_C = \underline{\underline{4.5 \text{ km/hr}}}$



$D = S \times T$

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

$$\boxed{T = \frac{L_T}{S_T}}$$

ESE Que. A train 140 m long, moves at the rate of 36 km/hr. How long will it take to pass a certain telegraph pole? (Height of the pole is 2 m). Useless

Ans. $L_T = 140$ m

$S_T = 36$ km/hr $= 36 \times \frac{5}{18} = 10$ m/s

$\therefore T = \frac{L_T}{S_T} = \frac{140}{10} = 14$ sec Ans.

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09/04/23

36. Verbal Ability-3

Que. 2013: Gate- IIT Bombay:

Statement: You can always give me a ring whenever you need.

Which one of the following is the best inference from the above statement?

(a) Because I have a nice caller tune.

(b) Because I have a better telephone facility

(c) Because a friend in need is a friend indeed. ✓

(d) Because you need not pay towards the telephone bills when you give me a ring.

Que. 2013: Gate- IIT Bombay

Statement: There were different streams of freedom movements in colonial India carried out by the moderates, liberals, radicals, socialists, and so on.

Which one of the following is the best inference from the above st?

(a) The emergence of nationalism in colonial India led to our independence.

(b) Nationalism in India emerged in the context of colonialism.

(c) Nationalism in India is homogeneous.

(d) Nationalism in India is heterogeneous. ✓

• Colonial - गुलाम

Que. Gate: 2013, IIT Bombay

Chance that a leap year selected at random will contain 53 Sundays is

(a) $\frac{3}{7}$ (b) $\frac{7}{2}$ (c) $\frac{7}{3}$ (d) $\frac{2}{7}$

Ans:- $\frac{366}{7}$ = 52 weeks + $\boxed{\text{2 days}}$ →

S/M
M/T
T/W
W/Th
Th/F
F/Sat
Sat/Sun

} 7

$\Rightarrow P = \frac{2}{7}$ Ans. $\boxed{d}$

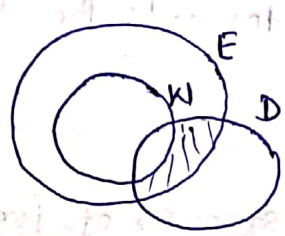
Scanned with CamScanner

Que. IIT Kharagpur, Gate-2014

All women are entrepreneurs.
Some women are doctors.

Which of the following conclusions can be logically inferred from the above sentence?

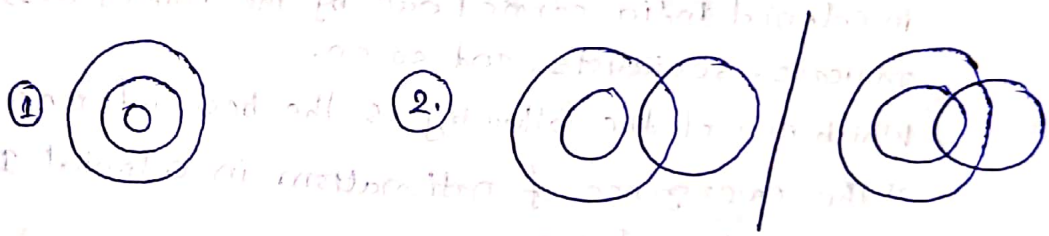
(a) All women are doctors
(b) All doctors are entrepreneurs.
(c) All entrepreneurs are women.
(d) Some entrepreneurs are doctors



d

· Syllogism is the unique /at least wala case

★.



★★★ Que. IIT Kharagpur, Gate-2014

Many ancient cultures attributed disease to supernatural causes. However, modern science has largely helped ____ such notions.

(a) impel (b) dispel (c) propel (d) repel.

Ans:- b

- Attribute – Features
- Supernatural causes – हमारे समझ के बाहर
- However – 180° word

+ ⟶ −
− ⟶ +

- Impel – (Impulse – large force for small interval of time) = F.Δt
- Propel – (Rocket, Missiles) – propulsion
- Repel – Repulse करना
- dispel

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Que. IIT KGP, 2014

Find the odd one: W, E, K, O I, Q, W, A F, N, T, X N, V, B, D

Ans.

W	E	K	O	I	Q	W	A	F	N	T	X	N	V	B	D
23	5	11	15	9	17	23	4	6	14	20	24	14	22	2	4
+8	+6	+4		+8	+6	+4		+8	+6	+4		+8	+6	+2	

Ans. [d]

Que. IIT KGP, Gate-2014

Find the odd one: QWZB BHKM WCGJ MSVX

Ans.

Q	W	Z	B	B	H	K	M	W	C	G	J	M	S	V	X
17	23	26	2	2	8	11	13	23	3	7	10	13	19	22	24
+6	+3	+2		+6	+3	+2		+6	+4	+3		+6	+3	+2	

Ans. [c]

A. • Heritage – धरोहर, विरासत
• Dialects – maxism, Local भाषाएँ (मुहावरे, लोकोक्तियाँ)...

* Cash ↑↑ → Purchasing Power ↓ → ₹ ↓ ← [r ↑] (to absorb cash) ← RBI ← Russia Ukraine war ← मंहगाई ↑

Demand ↓ → Covid-19 → RBI → r ↓ → Cash ↑

* 1 $ = ₹ 30/- (earlier)
1 $ = ₹ 100/- (now)

Appreciate Depreciate

⇒ $ ↑ → Appreciat
₹ ↓ → Depreciate

* USA → Steel → India, China, UK → Devaluate to increase export.

Que. The value of one U.S. dollar is 65 Indian Rupees today, compared to 60 las year. The Indian Rupee has ——
(a) depressed (b) depreciated (c) appreciated (d) stabilized

– Gate: 2014, IIT KGP

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Que IIT, Kharagpur, Gate-2014

In which of the following options will be expression $P<M$ be definitely true? → LN = Logical Necissity

(a) $M<R>P>S$

(b) $M>S<P<F$

(c) $Q<M<F=P$

(d) $P=A<R<M$

RRB JE | SSC JE | RRB → (5) Ques such pattern

(a) $M<R>P$

$1<3>2$
$2<3>1$
$2<3>2$

(b) ✗

(c) $M<P$ ✗

(d) $P=A<R<M \Rightarrow P<M$ (d)

Que IIT Kanpur, Gate-2015

Frogs _____

(a) croak (b) roar (c) hiss (d) patter.

Ans: (a) Frog (टरटराना) Lion (दहाड़ना) साँप बारिश की बूंदे

dance करते समय foot taping का sound.

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03/04/23

37. Verbal Reasoning - VI

Books:
Law of Human Nature
How to talk to anyone

- Curb - to control / लगाम लगाना
- Gandhian perspective - Inclusion (सबका साथ सबका विकास
- Contra - मतभेद / dispute
  Contrary, Contradiction
- Lament - दुख को बताता है।
- However - 180° word. • But → 180° word
- Anguish - गुस्सा + दुख + नाराज + ---
- Optimistic - आशावादी
- Receptive - respond करना

Que. IISc Banglore, Gate-2016

The policeman asked the victim of a theft, "what did you _____ ?

(a) loose (b) lose (c) loss (d) louse

Ans: b
- louse - जूँ
- loose - ढीला ढूज
- loss - घाटा
- lose → खोना

Que. IISc Banglore, Gate-2016

A person moving through a tuberculosis prone zone has a 50% probability of becoming infected. However, only 30% of infected people develop the disease. What percentage of people moving through a tuberculosis prone zone remains infected but does not show symptoms of disease?

(a) 15 (b) 33 (c) 35 (d) 37

Ans: $0.5 \times (1 - 0.3) = 0.5 \times 0.7 = 0.35 = 35\%$ Ans. c

* Inequality Question
- Age
- Weight
- Height

Scanned with CamScanner

Que Gate-2016: IISc Banglore

Given $(9 \text{ inches})^{\frac{1}{2}} = (0.25 \text{ yards})^{\frac{1}{2}}$. which is true?

(a) 3 inches = 0.5 yards (b) 9 inches = 1.5 yards

(c) 9 inches = 0.25 yards (d) 81 inches = 0.0625 yards

Ans. c

$(9 \text{ inches})^2 = (0.25 \text{ yards})^2$

$\Rightarrow$ ~~$3\sqrt{\text{inches}} = 0.5\sqrt{\text{yard}}$~~

$\therefore$ squaring both sides.

9 inches = 0.25 yards.

★ $\sqrt{9m^2} = 3m$

★ $\sqrt{9m} \neq 3m$

Que 2018: IIT Guwahati - Gate

"By giving him the last ____ of the cake, you will ensure lasting ____ in our house today"!

(a) peas, piece (b) piece, peace (c) Peace, piece (d) Peace, peas

↓ मटर का दाना. ↓ टुकड़ा ↓ शांति

Ans. b

Que Explicit : Implicit :: Express : ____

(a) Impress (b) Repress (c) Compress (d) Suppress

IIT Delhi, Gate-2020

Ans. d

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09/04/23

Quiz-7 $\frac{7}{10}$ $\frac{11}{27}$ 75%

Q.1 An Uber car can complete a certain distance in 21 hours, it covers one-third of the distance at 20 km/hr and rest at 50 km/hr. What is the total distance covered by the Uber car?

(a) 800km (b) 700km (c) 950 km (d) 620 km

Ans:-

$$\frac{D/3}{20} + \frac{2D/3}{50} = 21$$

$$\frac{D}{60} + \frac{D}{75} = 21 \Rightarrow \frac{5D+4D}{300} = 21$$

$$\Rightarrow D = \frac{21 \times 300}{9} = 700\text{km}.$$ Ans $\boxed{b}$

Q.2 A 360 m long train take 4.5 seconds to cross the pole. The same train takes 6 seconds to cross a car moving in the same direction. What is the speed of car in km/hr?

(a) 60 km/hr (b) 72 km/hr (c) 84 km/hr (d) 96 km/hr

Ans:-

$$S_{train} = \frac{L_T}{t} = \frac{360\text{m}}{4.5\text{s}} = 80\text{m/s}$$

Relative speed $(S_{TC}) = \frac{360}{6} = 60\text{m/s}$

$\Rightarrow S_T - S_C = \cancel{80-60}\ 60$

$\Rightarrow S_C = S_T - 60 = 80 - 60 = 20\text{m/s} = 20 \times \frac{18}{5} = 72\text{km/hr}$

Ans $\boxed{b}$

Q.3 A tractor plough along the sides of the square field of side 100 km long at a certain speed. if it increases its speed by 25%, it is able to finish the work 10 hours earlier. Find the actual speed of the tractor?

(a) 10km/hr (b) 8 km/hr (c) 20 km/hr (d) 15 km/hr.

Ans:-

let $S \longrightarrow 9:00$ AM , $S+\frac{1}{4}S \longrightarrow 11:00$ PM

$$\frac{400}{S} - \frac{400}{S+\frac{1}{4}S} = 10\text{ h}$$

$$\Rightarrow \frac{1}{S}[400 - 320] = 10 \Rightarrow S = \frac{80}{10} = 8\text{ km/hr}$$ Ans.

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Q.④ A car increases its speed each hour by 4 km/hr. If distance covered in 1 hour was 40 km then find the total distance in 10 hours by car?

(a) 550 km (b) 560 km (c) 570 km (d) 580 km

Ans:- $D = 40 + 44 + 48 + \cdots$ upto 10 terms

$\therefore D = \frac{10}{2}\left[2\times40 + (10-1)\times4\right]$

$= 5(80+36) = 5\times116 = \underline{580\text{ km}}$ Ans $\boxed{d}$

Q.⑤ A man travelled a certain distance by train at the rate of 25 km/hr and walked back at the rate of 4 km/hr. If the whole journey took 5 hours 48 minutes, the total distance covered by the man in (two ways)

(a) 25 km (b) 30 km (c) 40 km (d) 45 km

Ans:- Avg speed $= \frac{2xy}{x+y} = \frac{2\times25\times4}{25+4} = \frac{200}{29}$ km/hr.

$\frac{200}{29} = \frac{\text{Total Dist}}{\text{Total Time}}$

$\frac{200}{29} = \frac{D}{5+\frac{48}{60}} = \frac{D}{5+\frac{4}{5}} = \frac{D}{\frac{29}{5}} = \frac{5D}{29}$

$\therefore \underline{D = 40\text{ km}}$ Ans $\boxed{c}$

Q.⑥ The letter of word "LOVELY" are placed at random in a row. What is the probability that all vowels can't come together?

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

Ans:- LOVELY OE L V L Y $\rightarrow \frac{5!}{2!} \times 2! = 5!$

$\boxed{b}$

$S/S = \frac{6!}{2!} = 360$

$P = 1 - \frac{5!}{\frac{6!}{2!}} = 1 - \frac{120}{180} = 1 - \frac{2}{3} =$

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Q.7 I go to phone shop to buy apple iPhone 11 pro Max. In the shop 10 sets of apple iphone 11 pro Max in the box, out of which 3 are defectives. 5 Phones are drawn at random from the box. What is the probability that exactly 1 phone is defective?

(a) 1/12 (b) 2/12 (c) 3/12 (d) 5/12

Ans- $S/S = {}^{10}C_5$

out of 3 Def, 1 def. Phone $= {}^{3}C_1$
out of 7 N-D, Phones $= {}^{7}C_4$ $\Big\}$ (5) $\rightarrow {}^{3}C_1 \times {}^{7}C_4$

$$\therefore P = \frac{{}^{3}C_1 \times {}^{7}C_4}{{}^{10}C_5} = \frac{3 \times {}^{7}C_3}{{}^{10}C_5} = \frac{\cancel{3} \times \cancel{7} \times 6 \times 5 \times \cancel{4}}{\cancel{10} \times \cancel{9} \times \cancel{8} \times \cancel{7} \times 6 \over 1 \times \cancel{2} \times \cancel{3} \times \cancel{4} \times \cancel{5}}$$

$$= \frac{3 \times \frac{7 \times 6 \times 5}{1 \times 2 \times 3}}{\frac{10 \times 9 \times 8 \times 7 \times 6}{1 \times 2 \times 3 \times 4 \times 5}} = \frac{5}{12}$$ Ans $\boxed{d}$

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12/04/23

38. Verbal Ability - IV

Que. Gate-14, IIT, KGP

In a democracy, everybody has the freedom to disagree with the government.

(a) dissent (b) descent (c) decent (d) decadent

Ans. (a)

- Democracy → Rule of people.
  - Demos → people
  - Rule (शासन)
- dissent - disagreement
- descent - ascent / descend
- Decent - nice
  - ↳ He is a very decent guy.
- Decadent - पतन
  - Collapse
  - decline

(*) Exceptional / Exceptionable

- Exceptional → something that is beyond ordinary
- Exceptionable → Exceptionable behaviour (-ve)
  - something that cannot be the part of normal code of contact

Unexceptional
- Normal, Ordinary, Regular

Unexceptionable
- normal/valid code of conduct.

IIT KGP 2014 Que.

If 'KCLFTSB' stands for 'best of luck' and 'SHSWDG' stands for 'good wishes', which of the following indicates 'ace the exam'?

(a) MCHTX (b) MXHTC (c) XMHCT (d) XMHTC

Ans:

best of luck

B S T F L C K $\xleftrightarrow[\text{vowel}\times]{180^\circ}$ KCLFTSB

good wishes $\xleftrightarrow[\text{vowel}\times]{180^\circ}$ SHWDG

∴ ace the exam $\xleftrightarrow[\text{vowel}\times]{180^\circ}$ MXHTC Ans (b)

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Kanpur, 2015

Que. The principal presented the chief guest with a ____ as token of appreciation.

(a) momento (b) memento (c) momentum (d) moment

Ans:- (b)

- principal / Principle
  - principal → प्रधानाचार्य
  - Principle → Beliefs (सिद्धांत)
- momento X → Not any such word
- memento ✓
- Vacuum ★★
- Souvenir
- ~~Barbeque~~ / Barbecue ✓

2016 IISC Bang

Que. Despite the new medicine's ____ in treating diabetes, it is not ____ widely.

(a) effectiveness, prescribed (b) availability, used

(c) prescription, available (d) acceptance, proscribed

Ans:- (a)

- Despite — 180° word ⇒ + −
- proscribed — banned. − +

prescribed / proscribed ★★

Que.

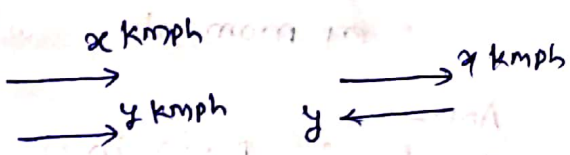
- Antagonistic - Hostile
- Cleav - विभाजन

Scanned with CamScanner

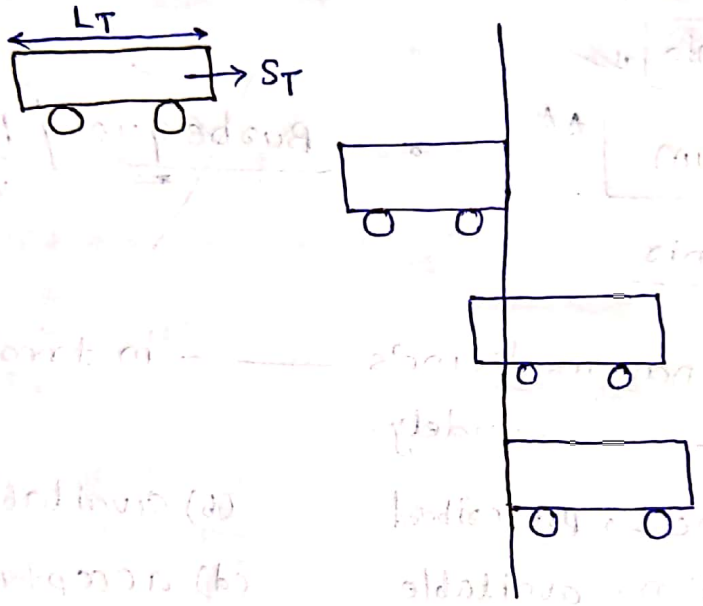
12/04/23

39. Time Speed Distance & Work Time - IV

*.
- D = ST ✓
- Avg Speed ✓
- Time Difference ✓
- Rel. Speed ✓



*. Train, 🚶 / Telegraph pole, Platform :-

① 

$\boxed{D = S \times T}$

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

$\Rightarrow T = \frac{L_T}{S_T}$

2016 IISc Bang

Que. It takes 10 s and 15 s respectively, for two trains travelling at different constant speeds to completely pass a telegraph post. The length of the first train is 120 m and that of the second train is 150 m. The magnitude of the difference in the speeds of the two train (in m/s) is :-

(a) 2.0 (b) 10.0 (c) 12.0 (d) 22.0.

Ans.

$D = S \times T$

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

$$|S_{T_1} - S_{T_2}| = \left|\frac{L_{T_1}}{T_1} - \frac{L_{T_2}}{T_2}\right| = \frac{120}{10} - \frac{150}{10}$$

$= 12 - 10$

$= 2$ m/sec Ans $\boxed{a}$

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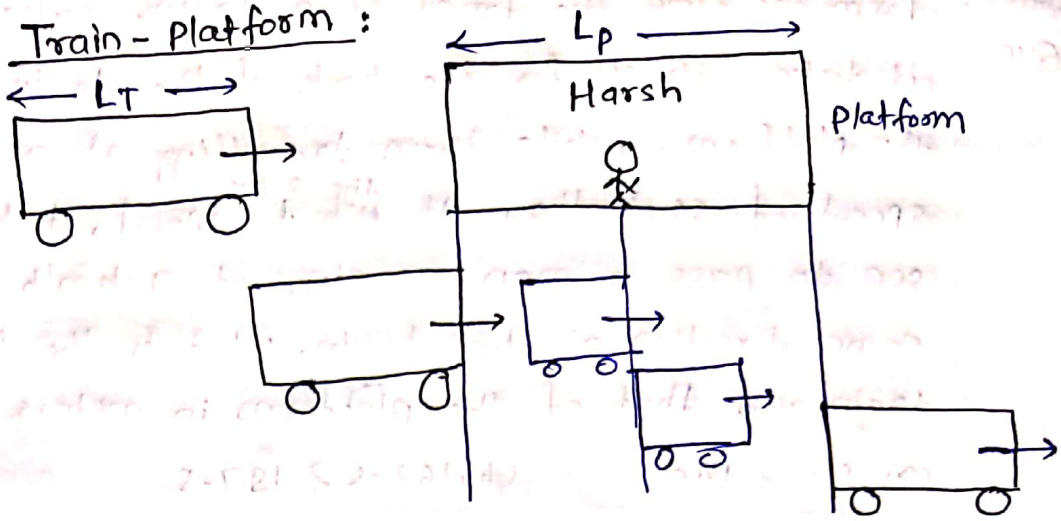
② Train - Platform :



- $D = S \times T$

- Train - Platform

$$T = \frac{D}{S} = \frac{L_T + L_P}{S_T}$$

- Train - 🚶

$$T = \frac{D}{S} = \frac{L_T}{S_T}$$

IIT KGP 2014 Que.

A train that is 280 m long, travelling at a uniform speed, crosses a platform in 60 seconds and passes a man standing on the platform in 20 seconds. what is the length of platform in metres?

Ans:-

$D = S \times T$

$L_T = S_T \times T$

$280 = S_T \times 20$

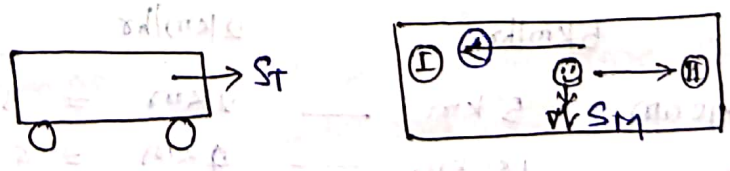
$S_T = \frac{280}{20} = 14 \, m/s$

$\frac{L_T + L_P}{T} = S_T$

$280 + L_P = 14 \times 60$

$L_P = 840 - 280 = 560 m$ Ans

③



$D = S \times T$

$$T = \frac{D}{S} = \frac{L_T}{S_T + S_M} \quad \text{(I)}$$

$$T = \frac{L_T}{(S_T \sim S_M)} \quad \text{(II)}$$

Scanned with CamScanner

2018 Guwahati

Que. From the time the front of a trains enters a platform, it takes 25 sec for the back of the train to leave the platform, while train travelling at a constant speed of 54 km/hr. At ~~what~~ the same speed, it takes 14 sec to pass a man running at 9 km/h in the same direction as the train. What is the length of the train and that of the platform in meters respectively?

(a) 210 & 140 (b) 162.5 & 187.5

(c) 245 & 130 (d) 175 & 200

Ans :-

$S_T = 54\,km/hr = 54 \times \frac{5}{18} = 15\,m/s$

$S_M = 9\,km/hr = 9 \times \frac{5}{18} = 2.5\,m/s.$

Train - Man

$\rightarrow \quad \rightarrow$

$L_T = (S_T - S_M) \times 14$

$= (54-9) \times \frac{5}{18} \times 14 = \frac{45 \times 5 \times 14}{18} = 175\,m$ Ans

Train - platform

$L_T + L_P = S_T \times 25$

$175 + L_P = 54 \times \frac{5}{18} \times 25 = 375$

$\therefore L_P = 200\,m$ Ans.

*

Rani $\rightarrow$ $\leftarrow$ Vivek

5km/hr 2km/hr. Δ

9am - 10am	5 km	—	2km	= 3 km ↑
10 - 11	10 km	—	4km	= 6 km ↑
11 - 12	15 km	—	6 km	= 9 km ↑
	50 km	? hr	20 km ←	30km ↑

$\therefore \frac{30}{3} = 10\,hr$

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$D = S \times T$

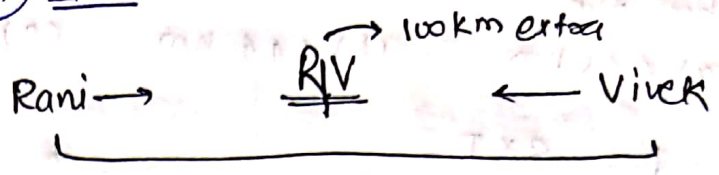
$D = (5+2) \times \frac{30}{(5-2)}$

$= 7 \times 10$

$= 70\,km$ Ans.

Rani, Vivek moves towards each-other, Rani covered 30 km additionally. (more) when they started, what was distance between them?

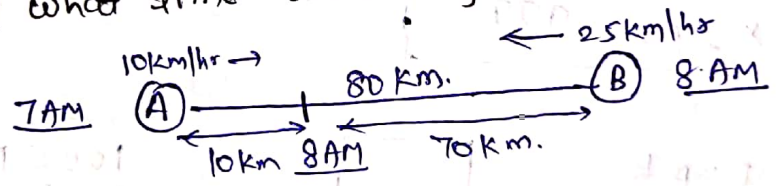
(A)



$$\boxed{\begin{aligned} D &= S \times T \\ D &= (S_R + S_V) \times \frac{100}{(S_R \sim S_V)} \end{aligned}}$$

Que. The distance between two cities A and B is 80 km. A motorcycle rider starts from A towards B at 7am at a speed of 10 km/hr. Another motorcyclist starts from B towards A at 8 am at a speed of 25 km/hr. At what time will they cross each other?

Ans:-



$D = 70\,km$

$S = 10 + 25 = 35\,km/hr$

$\therefore T = \frac{D}{S} = \frac{70}{35} = 2\,Hr.$

$\therefore$ 8 AM + 2:00 = 10:00 AM

Ans.

Que. Two trains start at the same time from two stations and proceed towards each other at the rate of 20 kmph and 25 kmph respectively. When they meet, it is found that one train has travelled 80 km more than the other. Find the distance between the two stations.

Ans:-

$D = (20+25) \times \frac{80}{(25-20)} = 45 \times \frac{80}{5} = 720\,km$

Ans

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Que. Two trains start at the same time from Aligarh and Delhi and proceed towards each other at the rate of 16 km/hr and 21 km/hr respectively. When they meet, it is found that one train has travelled 60 km more than the other. The distance between the two station is

(a) 445 km (b) 444 km (c) 440 km (d) 450 km

Ans: $\boxed{b}$

$D = S \times T$

$= (16+21) \times \frac{60}{(21-16)} = 37 \times \frac{60}{5} = 37 \times 12 = 444$ km

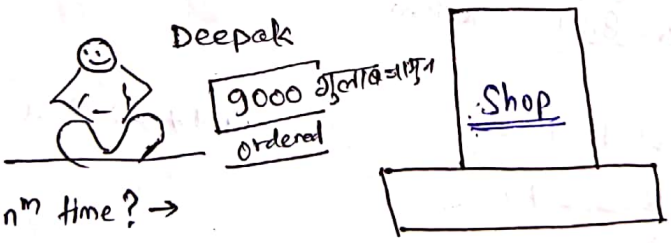
Ans.

(★)

37×3	=	111
$\times 6$	=	222
$\times 9$	=	333
$\times 12$	=	444
⋮		⋮
$\times 27$	=	999

Rem

Que.



100 GJ/min

100 GJ → 10 min

+ 5 min – cleaning

→ 15 min

Min^m time? →

$\boxed{9\text{ am}}$

Then min^m time taken untill when 9000 GJ done??

$\boxed{130/135}$?

Ans:-

9 – 9:10 + :05 ⇒ 9:15 → 1000

∴ 9 – 10 ⇒ 4000 GJ

10 – 11 ⇒ 4000 GJ

11 – 11:10 ⇒ 1000

∴ min^m 9000

(11 – 11:15) process complete

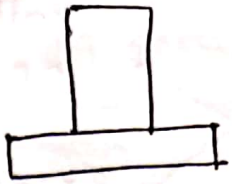
But

min^m time ⇒ 11:10

∴ 130 min Ans

* Deepak ~~Gajar~~

~~Kajoo Bati~~
Kajoo Katli
KK



75 KK → 1 min

1500 KK → 20 mins
+
10 min – cleaning
30 minutes

9:00 AM Start

9000 KK → Min^m time = ?

Ans.

9:00 – 9:30	→	1500
9:30 – 10:00	→	1500
10:00 – 10:30	→	1500
10:30 – 11:00	→	1500
11:00 – 11:30	→	1500
11:30 – 12:50	→	1500
		9000

150 + 20 = 170 min Ans

⇒

9:–10	→	3000
10 – 11	→	3000
11 – 11:50	→	3000
		9000 KK

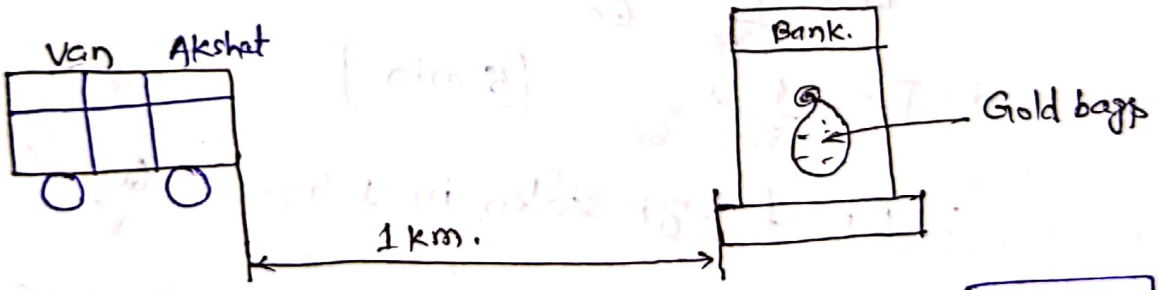
170 min Ans.

Que GJ + KK Min^m times = ?

(a) 130 min (b) 135 min (c) 180 m (d) 170m.

Ans → 170m Ans.

*



S_{Akshat} → Khali hath → 10 km/hr → $\frac{D}{} = 1$ km

→ with gold bag → $10 \times \frac{2}{3} = \frac{20}{3}$ km/hr. → $= 1$ km

$D = S \times T$

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

$t_{V \to B} = \frac{1}{10}$

$t_{B \to V} = \frac{1}{\frac{20}{3}} = \frac{3}{20}$

⇒ In 1 trip total time,

$t = t_{VB} + t_{BV}$

$= \frac{1}{10} + \frac{3}{20} = 15$ min Ans.

1 घंटे में Max^m कितने Bag चुरा सकता है?

$= \frac{60}{15} = 4$ bag Ans.

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*. **Nikhilesh**

	km/hr	D
	20	= 1 km
	$\frac{2}{3} \times 20 = \frac{40}{3}$	= 1 km

(i) $t_{VB} = \frac{1}{20}$

(ii) $t_{BV} = \frac{1}{\frac{40}{3}} = \frac{3}{40}$

(iii) $T = t_{VB} + t_{BV} = \frac{1}{20} + \frac{3}{40} = \boxed{7.5 \text{ min}}$

$\therefore$ In 1 hour, max^m bag stolen $= \frac{60}{7.5} =$ 8 bags Ans.

* **Satyam**

km/hr	D = 1 km
30	
$30 \times \frac{2}{3} = \frac{60}{3}$	

- $t_{VB} = \frac{1}{30}$
- $t_{BV} = \frac{1}{\frac{60}{3}} = \frac{3}{60}$
- $T = \frac{1}{30} + \frac{3}{60} = \boxed{5 \text{ min}}$

$\therefore$ No. of bags stolen in 1 hour $= \frac{60}{5} =$ 12 bags Ans

* Akshat + Nikhilesh + Satyam, How many max^m bags stolen

$= 4 + 8 + 12 =$ 24 bags Ans.

HW Que. In PDF

*** कुछ अलग Que Give Effort

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13/04/23

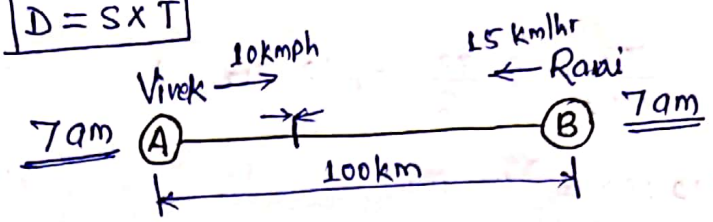
40.

Doubt clearing session

TSD

* $D = S \times T$

Relative Speed



At what time they will meet each other?

$S = 10 + 15 = 25$ km/hr

$D = S \cdot T$

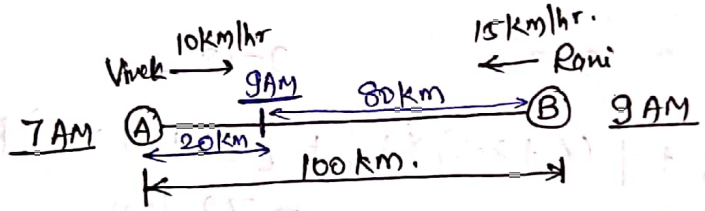
$\therefore T = \frac{D}{S} = \frac{100}{25} = 4$ Hrs

$\Rightarrow 7:00 + 4$ hrs $=$ 11 AM

Ans.

(H) $D_V = 10 \times 4 = 40$ km

$D_{Rani} = 15 \times 4 = 60$ km (100 − 40)



7 − 9 AM

$D_{Vivek} = S_D \times T$

$= 10 \times 2$

$= 20$ km.

Now, $D = 80$ km

$S = 10 + 15 = 25$ km/hr

$\therefore t = \frac{D}{S} = \frac{80}{25} = 3.2$ Hrs

$= 3$ hrs $+ 0.2$ hr

$= 3$ hr $+ 0.2 \times 60$

$= 3$ Hrs 12 min

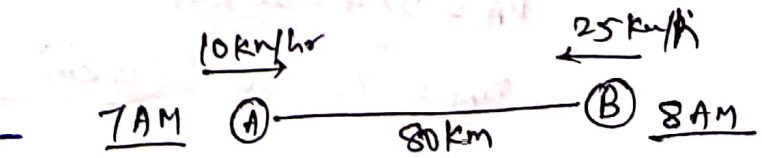
$\therefore 9 + 3:12 =$ 12:12 PM Ans

• $D_V = 20 + 3.2 \times 10 = 52$ km.

$D_R = 100 - 52 = 48$ km.

Que. on 4th back page ←

10:00 AM Ans



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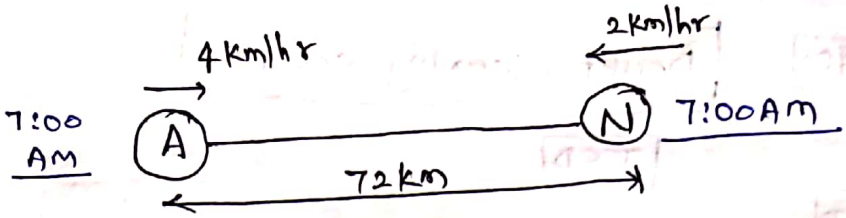
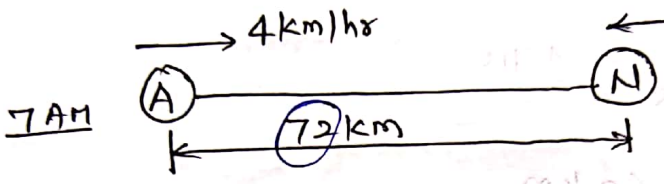


Ans. $T = \frac{D}{S} = \frac{72}{4+2} = \frac{72}{6} = 12$ Hrs

$\therefore$ 7:00 + 12:00 = 7:00 PM

$D_A = 4 \times 12 = 48$ km
$D_N = 2 \times 12 = 24$ km } Ans.

*



2 km/hr	7AM
2.5 km/hr	8AM
3 km/hr	9AM
3.5 km/hr	10AM
⋮	

Ans: $\boxed{D = S \times T}$

7–8 8–9 9–10

$[(4+2)\times 1] + [(4+2.5)\times 1] + [(4+3)\times 1] + \cdots n$ (Hours)
$= 72$ km.

$\Rightarrow 6 + 6.5 + 7 + 7.5 + 8 + \cdots + n^{th} = 72$

$\Rightarrow \boxed{S_n = \frac{n}{2}[2a + (n-1)d]}$

$\Rightarrow 72 = \frac{n}{2}[2\times 6 + (n-1)\times \frac{1}{2}]$

$\Rightarrow \boxed{n = 9 \text{ hours}}$ Ans. → in 9 hours they will meet each-other.

$D_N = ?$

$D_A = 9 \times 4 = 36$ km

$\therefore D_N = 72 - 36 = 36$ km Ans

Q↑

(a) 7h
(b) 10h
(c) 35 km from A
✓ (d) Midway b/w A & B

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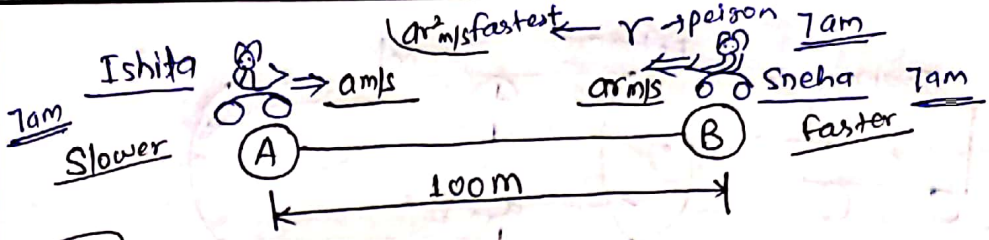

GP.

$I < S < r$

(i) I/S met at $t = \frac{50}{3}$ sec

$D = S \times T$

$\Rightarrow 100 = (a + ar) \times \frac{50}{3} \longrightarrow$ (i)

(ii) I − r $t = 10$ sec (given)

$D = S \times T$

$100 = (a + ar^2) \times 10 \longrightarrow$ (ii)

(ii) ÷ (i), $1 = \frac{(a+ar^2) \times 10}{(a+ar) \times \frac{50}{3}} = \frac{a+ar^2}{a+ar} \times \frac{\cancel{10} \times 3}{\cancel{50}}$

$\Rightarrow 3a + 3ar^2 = 5a + 5ar$

$\Rightarrow 3ar^2 - 5ar = 2a$

$\Rightarrow 3r^2 - 5r = 2$

$\Rightarrow 3r^2 - 5r - 2 = 0$

$\Rightarrow 3r^2 - 6r + r - 2 = 0 \Rightarrow 3r(r-2) + 1(r-2) = 0$

$\Rightarrow \boxed{r = 2}$

$\Rightarrow$ (i) $\longrightarrow 6 = a + 2a \Rightarrow \boxed{a = 2}$

$\therefore S_I = 2$ m/s

$S_{Sneha} = 4$ m/s $= 2 \times 2^2$

$S_{person} = 2 \times 2^2 = 8$ m/s

Ans.

Que↑ in PDF (3 Questions in Pdf) ★★★

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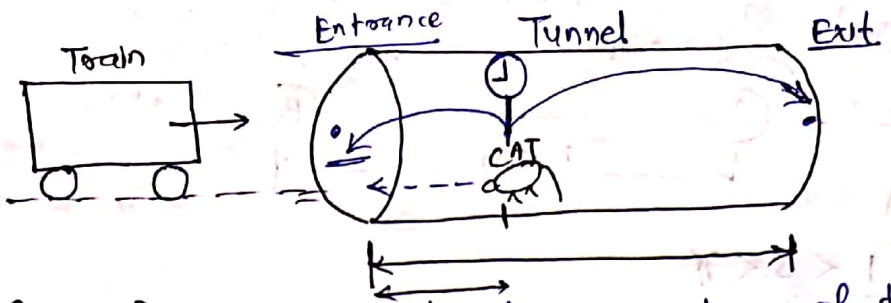
Fun *

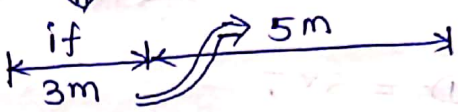


$\frac{S_T}{S_C} = ?$

3/8 from the entrance of tunnel

⇓

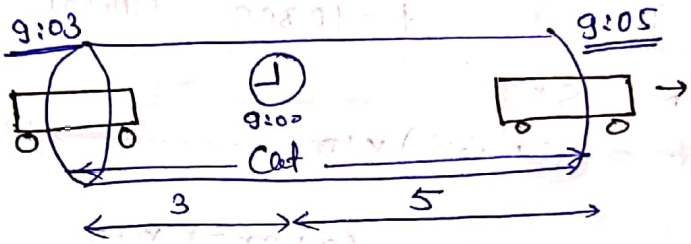
if



$\Rightarrow \frac{3}{3+5} = \frac{3}{8}$

Ans:-

let $S_{cat} = 1$ m/sec.



→ Train must be at the entrance & at the exit at 9:03 & 9:05

∴ 9:03 — 9:05

↓

2 sec, D = 8 m

$\therefore S_T = \frac{D}{T} = \frac{8}{2} = 4$ m/s.

$\therefore \boxed{\frac{S_T}{S_C} = \frac{4}{1} = 4:1}$ Ans.

OR

with the Concept of Relative Speed

Practice Paper on TSD

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16/04/23

$\frac{9}{10}$ $\frac{5}{17}$ >71%

Quiz - 08

Q.1 A man travels 40 km at speed 20 km/hr and next 60 km at 30 km/hr and there after travel 80 km at 40 km/hr. His average speed is?

Ans: Avg speed = $\frac{\text{Total distance covered}}{\text{Total time taken}}$

$$= \frac{40+60+80}{\frac{40}{20}+\frac{60}{30}+\frac{80}{40}} = \frac{180}{2+2+2} = 30 \text{ km/hr}$$ Ans

Q.2 A bus moves with a speed of 30 kmph for 12 minutes and for next 8 minutes at a speed of 45 km/hr. Find the average speed of the bus?

Ans: Avg speed = $\frac{30\times\frac{12}{60}+45\times\frac{8}{60}}{(12+8)\times\frac{1}{60}} = \frac{6+6}{\frac{1}{3}} = 36 \text{ km/hr.}$ Ans

Q.3 A train travel distance of the first 20 km in 2 hours after that 15 km in 3 hours and remaining 37 km in 4 hours then find the average speed of the train in the whole journey?

Ans: Avg speed = $\frac{20+15+37}{2+3+4} = \frac{72}{9} = 8 \text{ km/hr}$ Ans.

Q.4 An object travels 24 meters in 4 seconds and then another 15 meters in 2 seconds. What is the average speed of the object?

Ans:- Avg speed = $\frac{24+15}{4+2} = \frac{39}{6} = 6.5 \text{ m/s}$ Ans.

Q.5 A train moving at 78 km/hr crosses a tunnel in 45 sec and it crosses a man moving at 6 km/hr in the same direction in 15 seconds. Find the length of the tunnel?

Ans:- $\frac{L_{Tr}+L_{Tunnel}}{78\times\frac{5}{18}} = 45 \Rightarrow L_{Train}+L_{Tunn} = \cancel{45}^{5}\times\cancel{78}^{39}\times\frac{5}{\cancel{18}_{2}} = 975 \text{ m}$

$\frac{L_{Train}}{(78-6)\times\frac{5}{18}} = 15 \Rightarrow L_{Train} = 15\times72\times\frac{5}{18} = 300 \text{ m}$

$\therefore L_{Tunnel} = 675 \text{ m}$ Ans

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Q.⑥ The speed of a ship in still water is 5 km/hr and the speed of the stream is 2 km/hr. Rohan rows to place at a distance of 21 km and comes back to the starting point. The total time taken by him is:

Ans:-

$$t = \frac{D}{S} = \frac{21}{5-2} + \frac{21}{5+2} = \frac{21}{3} + \frac{21}{7} = 7+3 = \underline{10 \text{ hours}}$$

Ans

Q.⑦ A car has to travel 250 km in 30 hours. It covers 1/5 part of the journey in 1/6 time. What should be its speed for the remaining journey to reach on time?

Ans:-

250 km ⟶ 30 hours

↓ 1/5 — ↓ 1/6 = 200 km → 25 hours

50 km — 5 hours

$\therefore$ Speed $= \frac{200}{25} = 8$ km/hr. Ans

Q.⑧ If Manya goes to office at a speed of 40 km/hr, she reaches 5 minutes late; If she travels at the speed of 60 km/hr, she is 10 minutes early. What is the distance to office from her home?

Ans:-

Manya

9:00 — Home —— D —— Office

→ 40 km/hr ⟶ −5 min

→ 60 km/hr ⟶ +10 min

$9:05 - 8:50 = 15$ min

$\Rightarrow \frac{D}{40} - \frac{D}{60} = \frac{15}{60}$

$\Rightarrow \frac{D}{20}\left[\frac{1}{2} - \frac{1}{3}\right] = \frac{15}{60} = 5$

$\Rightarrow D\left(\frac{3-2}{6}\right) = 5$

$\Rightarrow D = \underline{30 \text{ km}}$ Ans

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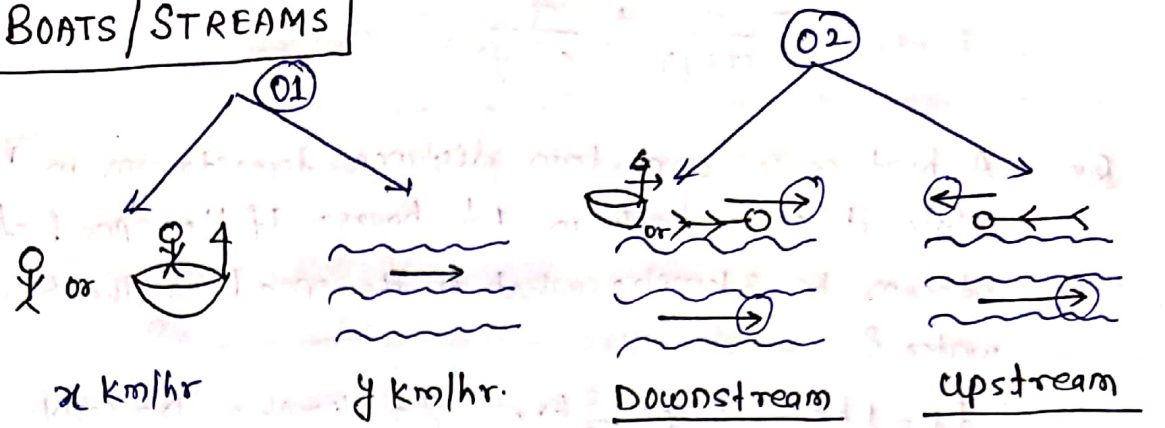
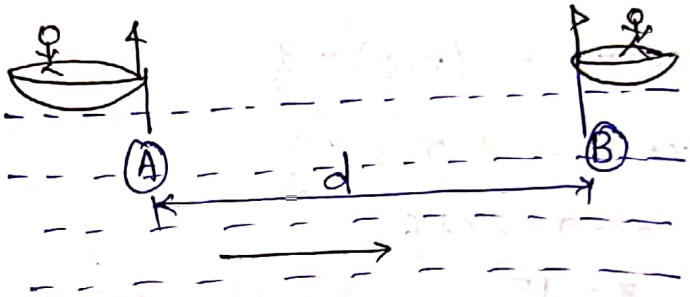
41. Time Speed Distance & Work and Time - V

* BOATS / STREAMS





$D = S \times T$

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

$T = t_{AB} + t_{BA}$
(downst.) (upstream.)

$$\Rightarrow \boxed{T = \frac{d}{(x+y)} + \frac{d}{(x-y)}}$$

Types

① $T = t_d + t_{upr.}$

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

$D = S \cdot T$
D → Const

② 45 min t_d = 45 min $t_{up.}$

$\frac{d_1}{x+y} = \frac{d_2}{x-y}$

③ $\longleftrightarrow$ d

$t_d \times 5 = t_{upr.}$

$5 \times \frac{d}{(x+y)} = \frac{d}{(x-y)}$

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18/04/23

$\Rightarrow \quad T = t_d + t_{up}$

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

Que. A boat covers a certain distance downstream in 1 hour, while it comes back in $1\frac{1}{2}$ hours. If the speed of the stream be 3 kmph, what is the speed of the boat in still water?

Ans. $t_d = 1\,hr$ $\quad t_{up} = \frac{3}{2}\,hr$, $\quad y = 3\,kmph$, $\quad D = \text{const}$, $\quad d = ?$

$$d = d$$

$$S \times T = S \times T$$

$$\Rightarrow (x+y) \times 1 = (x-y) \times \frac{3}{2}$$

$$\Rightarrow (x+3) = (x-3) \times \frac{3}{2}$$

$$\Rightarrow 3x - 9 = 2x + 6$$

$$\Rightarrow x = 15$$

$\therefore$ speed of boat in still water = 15 km/hr. Ans

Que. A motorboat whose speed is 15 km/hr in still water goes 30 km and comes back in a total of 4 hours 30 minutes. The speed of stream in (in km/hr) is ?

Ans. $x = 15\,km/hr$, $\quad y = ?$, $\quad T = 4\frac{1}{2}\,hr$, $\quad d = 30\,km$

$$T = t_d + t_{up}$$

$$4\frac{1}{2} = \frac{30}{15+y} + \frac{30}{15-y}$$

$$\frac{9}{2} = 30\left[\frac{1}{15+y} + \frac{1}{15-y}\right]$$

$$3 = 20\left[\frac{30}{225-y^2}\right]$$

$$225 - y^2 = 200$$

$$y^2 = 25$$

$$y = 5\,km/hr \quad \text{Ans}$$

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* $t_d = t_{up} \Rightarrow d_{down} \neq d_{ups}$

$$\boxed{d_{down} > d_{up}}$$

Que. The speed of a boat in still water is 10 km/hr. If it can travel 26 km downstream and 14 km upstream in the same time, the speed of stream is ?

Ans:-

$$\boxed{t_d = t_{up}}$$

$$\frac{26}{10+y} = \frac{14}{10-y} \Rightarrow \frac{13}{10+y} = \frac{7}{10-y} \Rightarrow 130-13y = 7y+70$$

$$\Rightarrow 60 = 20y$$

$$\therefore y = \frac{60}{20} = 3 \text{ km/hr.}$$ Ans

* Ambi Dexterous – जो दोनों हाथों का use at a time.
दो skilled

WHATEVER IT TAKES ***

Que. A man rows a place 48 km distant and back in 14 hours. He finds that the can row 4 km with the stream in the same time as 3 km against the stream. The rate of the stream is ?

Ans:-

- $T = t_d + t_{up}$

$$14 = \frac{48}{x+y} + \frac{48}{x-y} \longrightarrow (i)$$

- $t_d = t_{up}$

$$\frac{d_d}{x+y} = \frac{d_{up}}{x-y}$$

$$\Rightarrow \frac{4}{x+y} = \frac{3}{x-y} \longrightarrow (ii)$$

$$\Rightarrow 4(x-y) = 3(x+y) \Rightarrow 4x-4y = 3x+3y$$

$$\Rightarrow \boxed{x = 7y}$$

$$\Rightarrow 14 = \frac{48}{8y} + \frac{48}{6y} = \frac{6}{y} + \frac{8}{y}$$

$$\Rightarrow y = 1 \text{ km/hr}$$

Ans

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तुम !

When you are ready to go through failure after failure after failure after failure ..... after failure without loosing the enthuasism.

$\boxed{\text{It's very difficult!}}$

IIT KGP 2014

Que. A man can row at 8 km/hr in still water. If it takes him thrice as long to row upstream, as to row downstream, then find the stream velocity in km/hr?
≈ speed

Ans:-

$$3 \times \frac{d}{8+y} = \frac{d}{8-y}$$

$$\Rightarrow 24 - 3y = 8 + y$$

$$\Rightarrow 16 = 4y$$

$$\Rightarrow y = 4 \text{ km/hr.}$$ Ans.

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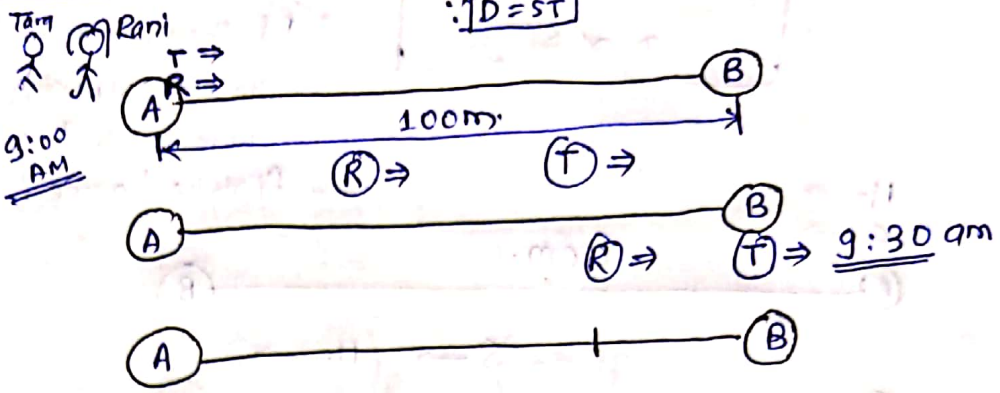
18/04/23

42. Time Speed Distance & Work-Time - VI

* Linear Races :- → Time = Constant ⇒ $D \propto S$

$\because D = ST$



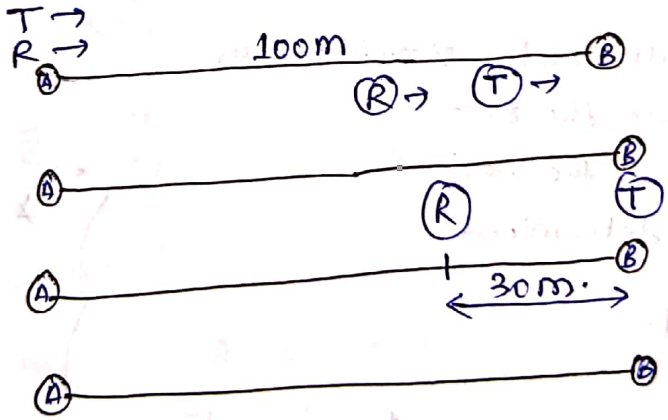
जिस time पे Tara Race finish किए, उस time पर Rani कहाँ है?

- In linear races, $T = \text{Const}$

$\Rightarrow D \propto S$

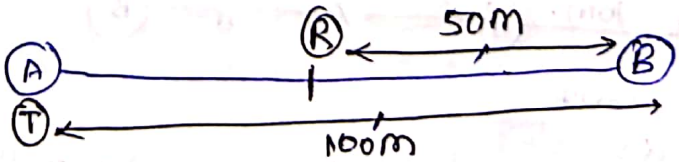
$$\Rightarrow \frac{S_T}{S_R} = \frac{D_T}{D_R}$$

Q.① *



$$\Rightarrow \frac{S_T}{S_R} = \frac{D_T}{D_R} = \frac{100}{70} = \frac{10}{7}$$

Now,



$$\frac{S_T}{S_R} = \frac{10}{7}$$

Who will win the race?

- Linear races ⇒ $T = \text{Const}$, $D \propto S$

$$\frac{D_T}{D_R} = \frac{S_T}{S_R}$$

$$D_T = \frac{S_T}{S_R} \times D_R = \frac{10}{7} \times 50 \simeq 70\,m$$

OR

$$D_R = \frac{S_R}{S_T} \times D_T = \frac{7}{10} \times 100 = 70\,m \gg 50\,m$$

∴ Rani wins now Ans

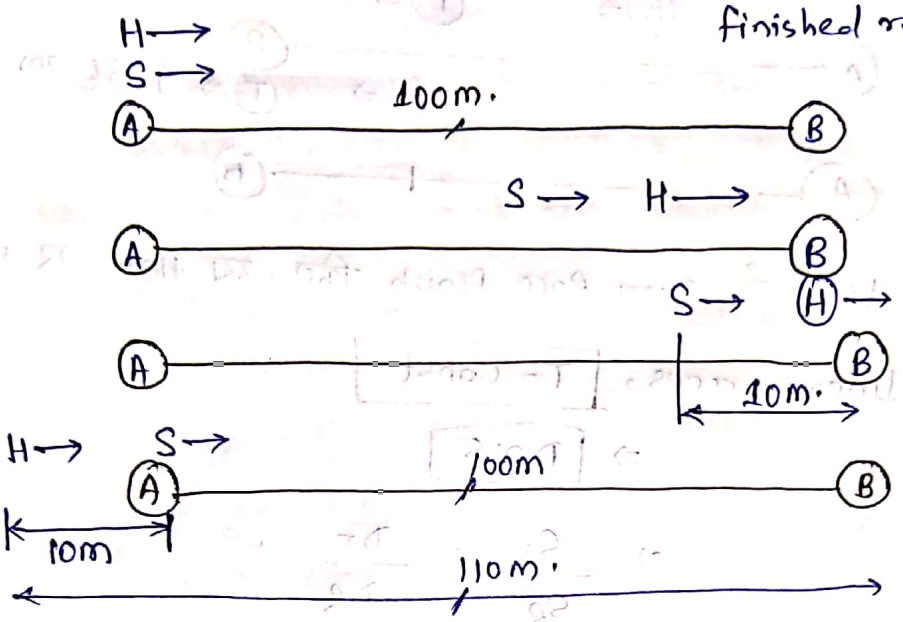
Linear Races

$T = \text{const}$

$D \propto S$

- A & B's जिस time पे A ने Race को finish किया उस time पे B कहाँ है?
- If there are 2 kids A & B who are running a race, where was B when A finished race?

* Que. Type (1)



Who will win the race?

(a) H & S will reach simultaneously

(b) H will win the race

(c) S will win the race

(d) Can't be determined?

Ans:-

$T = \text{const}$

$D \propto S$

$$\frac{S_H}{S_S} = \frac{D_H}{S_S} = \frac{100}{90} = \boxed{\frac{10}{9}}$$

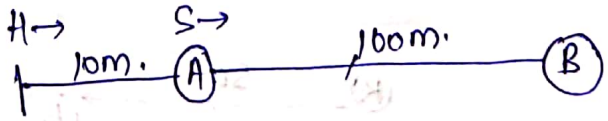
* $\frac{10}{9} = \frac{1.1}{1}$

⇒ every time S cover 1 m, H will cover 1.1 m

~~∴ 99 → 100~~

$110 + 1.1 = 111.1$

Now,



$T = \text{const}$

$D \propto S$

$$\frac{D_H}{D_S} = \frac{S_H}{S_S}$$

$$D_H = \frac{S_H}{S_S} \times D_S = \frac{10}{9} \times 100 \simeq 111.1\text{m} \; ??$$

(OR)

$$D_S = \frac{S_S}{S_H} \times D_H = \frac{9}{10} \times 110 = \boxed{99\text{m}}$$

∴ Hemat wins the race by 1 m.

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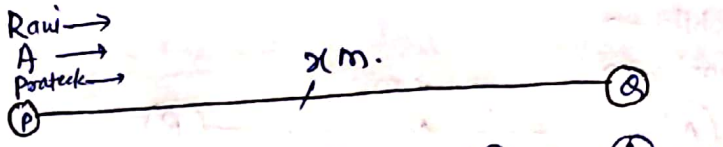
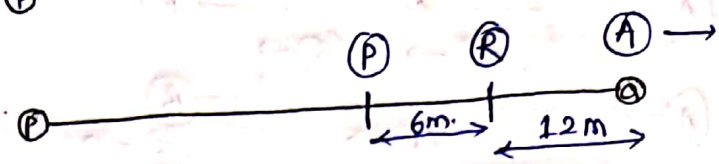
Que. Type 2

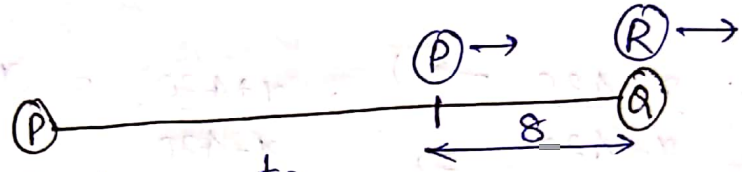




$$\frac{SA}{SR} = \frac{DA}{DR} = \frac{x}{(x-12)}$$

$$\left(\frac{D}{S}\right)_A = \left(\frac{D}{S}\right)_R = \left(\frac{D}{S}\right)_P$$

$$\Rightarrow \frac{x}{SA} = \frac{x-12}{S_R} = \frac{x-18}{S_P} \longrightarrow (i)$$



t_R t_P

$$\left(\frac{D}{S}\right)_R = \left(\frac{D}{S}\right)_P \longrightarrow (ii)$$

$$\Rightarrow \frac{x}{SR} = \frac{x-8}{S_P}$$

Track length = ?

From (i), $\frac{SR}{SP} = \frac{x-12}{x-18} \longrightarrow (iii)$

From (ii), $\frac{SR}{SP} = \frac{x}{x-8} \longrightarrow (iv)$

From (iii) & (iv)

$$\frac{x-12}{x-18} = \frac{x}{x-8}$$

$$\Rightarrow \boxed{x = 48\,m} \quad \text{Ans.}$$

$\cancel{x^2} - 18x = \cancel{x^2} - 20x + 96$

$96 = 2x$

$x = 48\,m$

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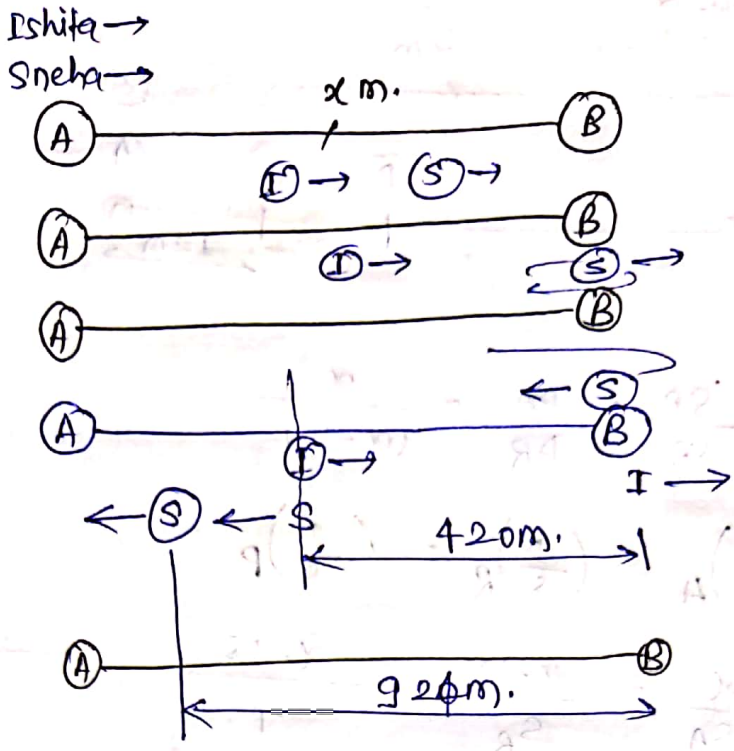
Q.③

Type



$$\frac{S_S}{S_I} = \frac{x+420}{x-420}$$

$$\frac{S_S}{S_I} = \frac{x+924}{x}$$

$$\frac{S_S}{S_I} = \frac{x+420}{x-420} \rightarrow (i)$$

$$\frac{S_S}{S_I} = \frac{x+924}{x} \rightarrow (ii)$$

$$\therefore \frac{x+420}{x-420} = \frac{x+924}{x}$$

$$\Rightarrow x^2 + 420x = x^2 + 504x - 924 \times 420$$

$$\Rightarrow x = \frac{924 \times 420}{84} = 4620\,m.$$

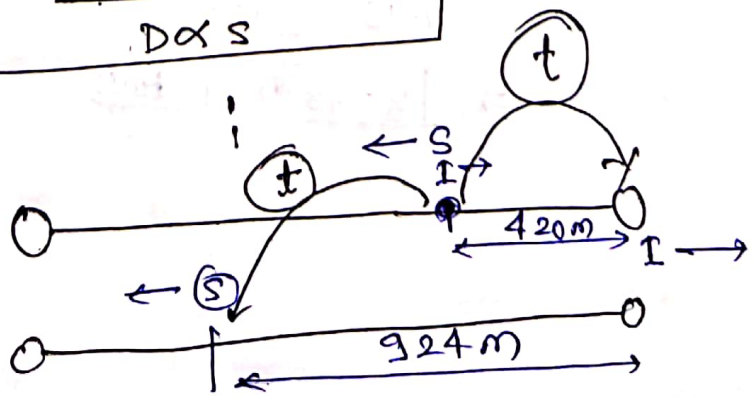
$$\cancel{\Rightarrow x = \frac{\overset{23}{\cancel{924}} \times 420}{\underset{7}{\cancel{284}}}}$$

$$\cancel{\Rightarrow x = 1366.47\ m}$$

$$\therefore \frac{S_S}{S_I} = \frac{x+420}{x-420} = \cancel{1.88}\ \frac{6}{5}$$ Ans

OR

A-finished, B ?
T = const
$D \propto S$



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$\therefore \frac{S_S}{S_I} = \frac{D_S}{D_I} = \frac{924-420}{420} = \frac{6}{5}$ Ans.

↑ Questions are in PDF

* **Linear Races:**

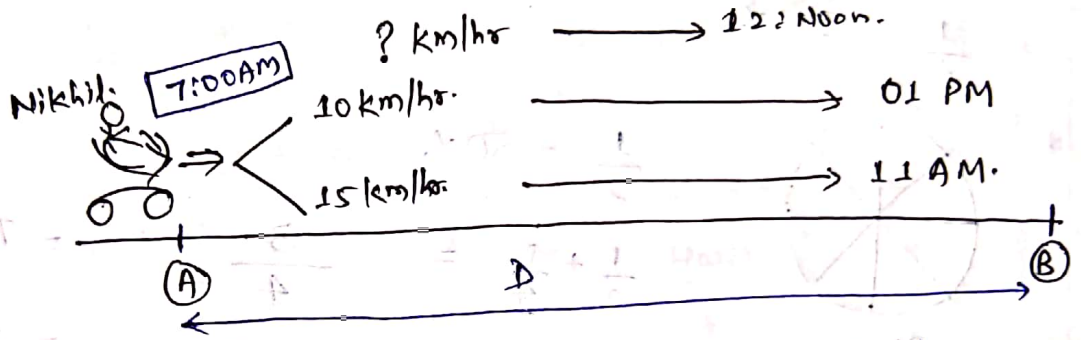
- T = Const.
- $D \propto S$

I. Who will win the Race? (IIT, 2022)

II. Track length

III. Ratio of speeds

(*) CAT



1 PM − 11 AM = 2 Hrs

$\frac{D}{10} - \frac{D}{15} = 2$

$\Rightarrow D\left[\frac{1}{10} - \frac{1}{15}\right] = 2$

$\Rightarrow \boxed{D = 60 \text{ km}}$ Ans.

$t = \frac{D}{S} = \frac{60}{10} = 6$ hr. → 1:00 PM − 6 hrs = 7:00 am starting.

$t = \frac{D}{S} = \frac{60}{15} = 4$ hr. → 11:00 AM − 4 hrs = 7:00 am starting time

★ D = 60 km

t = 12:00 − 7:00 = 5 hrs

$\therefore S = \frac{D}{t} = \frac{60}{5} = 12$ km/hr Ans

Practice paper TSD

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19/04/23

43. Time Speed Distance & Work and Time-VII

Work & Time

*. $\frac{P}{q} \times 100 \longrightarrow \%$

$\frac{1}{1} = 100\%$

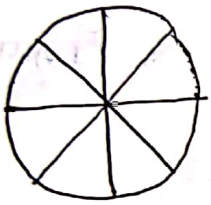
#. ☆ $\frac{1}{2} = 50\% \Rightarrow$

$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{16}$	$\frac{1}{32}$
50%	25%	12.5%	6.25%	3.125%

$\frac{1}{8} = 33.33\%$

$\frac{1}{4} = 25\%$

*



Pizza

$\frac{1}{2} = 50\%$

$\frac{1}{2} + \frac{1}{4} = \frac{3}{4} \xrightarrow{-1} = 75\%$

$\frac{1}{2} + \frac{1}{4} + \frac{1}{8} = \frac{7}{8} \xrightarrow{-1} = 87.50\%$

$\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} = \frac{15}{16} \xrightarrow{-1} = 93.75\%$

• $\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \cdots\cdots + \frac{1}{1024} = \frac{1023}{1024}$

☆. Calculation
☆. Vocab
☆. Current Affairs

for any exams.

God/god

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- $\frac{1}{5} = 20\%$
- $\frac{1}{6} = 16.67\%$
- ★ $\frac{1}{7} = 14.2857\%$
- $\frac{1}{8} = 12.5\%$
- $\frac{1}{9} = 11.11\%$
- $\frac{1}{10} = 10\%$
- $\frac{1}{11} = 9.09\%$
- $\frac{1}{12} = 8.33\%$

#.

Revolving fraction.

$\frac{1}{7} = 14.2857\%$

$\frac{2}{7} = 28.571\%$

$\frac{3}{7} = 42.8571\%$

$\frac{4}{7} = 57.1428\%$

$\frac{5}{7} = 71.4285\%$

$\frac{6}{7} = 85.7142\%$

$\frac{7}{7} = 100\%$

$\boxed{9 \leftrightarrow 11}$

$\boxed{8 \longleftrightarrow 12}$

Halves:- $\frac{1}{2}$, $\frac{1}{7}$, $\frac{1}{8}$ $(8 \leftrightarrow 12)$

$\frac{1}{2}$, $\frac{1}{7}$, $8 \leftrightarrow 12$, $9 \leftrightarrow 11$

Que. $729 \times 11.11\% + 121 \times 9.09\%$

$= 729 \times \frac{1}{9} + 121 \times \frac{1}{11}$

$= 81 + 11$

$= 92$ Ans.

$\boxed{\frac{p}{q} \longleftrightarrow \% \longleftrightarrow :}$ For fast Calculations

Q. $48 \times 12.50\%$

$= 48 \times \frac{1}{8} = 6$

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#

- $\frac{1}{13}$ = 7.7%
- $\frac{1}{14}$ = 7.14%
- $\frac{1}{15}$ = 6.67%
- $\frac{1}{16}$ = 6.25%

13 → तेरा साथ - साथ
13 7 7

Q. $60 \times 6.67\% - 48 \times 6.25\%$

$= 60 \times \frac{1}{15} - 48 \times \frac{1}{16}$

$= 4 - 3$

$= 1$ Ans.

- $\frac{1}{17}$ = 5
- $\frac{1}{18}$ = 5
- $\frac{1}{19}$ = 5
- $\frac{1}{20}$ = 5

- 88%
- 55%
- 22%
- 00%

Halfs

$\frac{1}{2}$, $\frac{1}{7}$,
8 ↔ 12,
9 ↔ 11,
13,
17/18/19/20,
22 T-20
↳ 54%

- $\frac{1}{20}$ = 5%

IPL

T-20

- $\frac{1}{21}$ = 4
- # $\frac{1}{22}$ = 4
- $\frac{1}{23}$ = 4
- $\frac{1}{24}$ = 4
- $\frac{1}{25}$ = 4%

- 74% + T-20
- 54% - 20
- 34% - 20
- 14%

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WORK & Time

1 work = 100% work

* Akshat – A piece of work – 12 days
  singular
  - a piece of information
  - an article of furniture, --etc.

12 Days → 1W

1 Day → $\frac{1}{12}$ W = 8.33% W → 91.67% w left

2 Days → $\left(\frac{1}{12}\right) \times 2$ W. = 16.67% W

5 days → $\left(\frac{1}{12}\right) \times 5$ W = 41.67% W

11 days → $\left(\frac{11}{12}\right)$ W = 91.67% W. → 8.33% left

M↑ E↑ T↑ → same/const.

Que. A can finish a piece of work by himself in 16 days. Calculate the amount of work done by him in 1 day, 13 days, 5 days?

Ans:- 16 Days → 1W

		amount of work left
∴ 1 Days	→ $\frac{1}{16}$ W = 6.25% WD	93.75%
5 days	→ $\frac{5}{16}$ W = 31.25% W done	68.75%
13 days	→ $\frac{13}{16}$ W = 81.25% W done	18.75%
15 days	→ $\frac{15}{16}$ W = 93.75% WD	6.25%

*.

	Days	One day work
Rani ⇒	25	1/25
+		
Ragini ⇒	20	1/20

Rani + Ragini = $\frac{1}{25} + \frac{1}{20} = \frac{4+5}{100} = \frac{9}{100}$ → 1 day work

∴ No. of days required = $\frac{100}{9}$ Days Ans.

= $11\frac{1}{9}$ Days Ans

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(OR)

	1 day work	
Rani → 25 days	= 4/25	= 4%
Ragini → 20 days	= 1/20	= 5%

+ = 9% WD

∴ Total time = $\frac{100\%}{9\%}$ = $11\frac{1}{9}$ days Ans.

* Note:-

	1 Day work
x days	$1/x$
+	
y days	$1/y$

$$\frac{1}{x} + \frac{1}{y} = \frac{x+y}{xy} \longrightarrow 1 \text{ Day work}$$

$$\therefore \boxed{\text{Days} = \frac{xy}{x+y}}$$

$$\therefore \text{days} = \frac{25 \times 20}{20+25} = \frac{25 \times 20}{45} = \frac{100}{9} = 11\frac{1}{9} \text{ days}$$

Ans

Que. A can do a piece of work in 12 days while B alone can do it in 15 days. In how many days can A and B working together complete it?

Ans:- (I) A → 12 → 1/12 → 8.33% (1D work) + = 15%

B → 15 → 1/15 → 6.67%

A+B :- 1 day work = $1/12 + 1/15 = \frac{5+4}{60} = \frac{9}{60}$

∴ Days = $\frac{60}{9} = \frac{20}{3}$ = $6\frac{2}{3}$ days Ans.

(II) $\frac{xy}{x+y} = \frac{12 \times 15}{12+15} = \frac{12 \times 15}{27} = \frac{60}{9} = 6\frac{2}{3}$ d Ans

(III) $\frac{100\%}{15\%}$ = $6\frac{2}{3}$ days Ans

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2019 Madras

Que. It takes two hours for a person x to mow the lawn. (घास काटना) y can mow the same lawn in four hours. How long (in minutes) will take x + y, if they work together to mow the lawn?

Ans. $\frac{xy}{x+y} = \frac{2\times4}{2+4} = \frac{8}{6}\times60 = 80$ min. Ans

Que. Sneha ⇒ 10 days → $\frac{1}{10} = 10\%$

\+ Ishita ⇒ 25 days → $\frac{1}{25} = 4\%$

10% + 4% = 14%
↳ 1 day work

~~Lucky ⇒~~

S + I ⇒ WD 5 days = 14% × 5 = 70% WD

I ✗, S ⇒ ? days remain

⇓ 100% − 70% = 30% WD left ⇒ 5 + 3 = 8 days Ans

∴ $\frac{30\%}{10\%}$ = 3 days Ans.

If S ✗, I

⇒ 100% − 70% = 30%

∴ $\frac{30\%}{4\%}$ = 7.5 days Ans.

⇒ 5 + 7.5 = 12.5 days the work lasted Ans

Que. A can do a piece of work in 25 days. B can do it in 20 days. They work to get her for 5 days and then A goes away. How many more days will B require to finish the work?

(i) B ✗ — A = ?

Ans: A → 25 days, 1 day work 1/25 = 4%

B → 20 days, 1/20 = 5%

= + 9% → 1 day work

9% × 5 = 45% WD

Remaining W = 100% − 45% = 55%

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(i) Ax, B = ?

$$\frac{55\%}{5\%} = 11 \text{ days more}$$

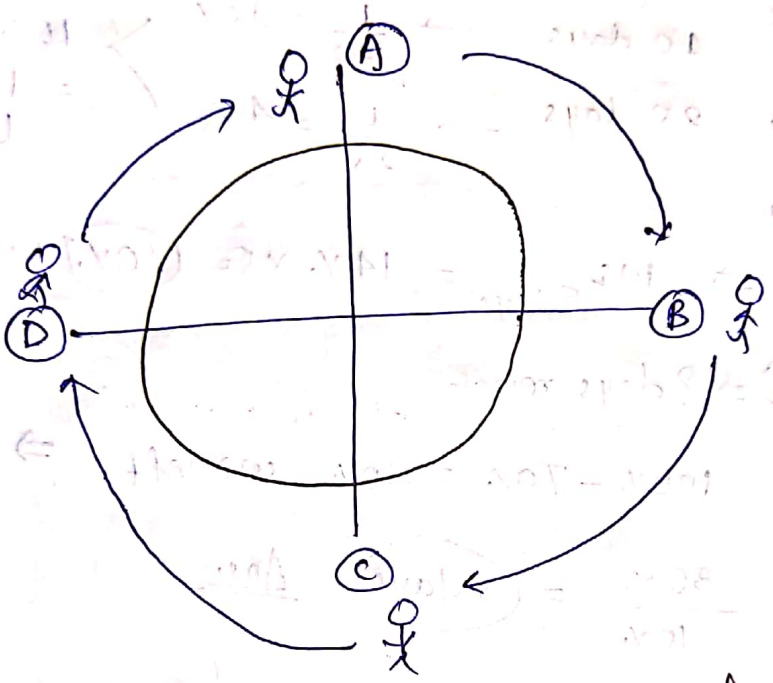
(ii) Bx, A = ?

$$\frac{55\%}{4\%} = 13.75 \text{ days}$$

Total days
= 5+11
= 16 days

Total
= 5+13.75
= 18.75 d

Challenge Que.



Avg speed =	πr	m/minute	for first 30 sec
	$\frac{\pi r}{2}$	m/min	1 min
	$\frac{\pi r}{4}$	m/min	2 min
	$\frac{\pi r}{8}$	m/min	4 min.

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

Written Que. in PDF.

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19/04/23

44. Doubt Clearing session

Quiz-8

How to become a Billionian? - Book

1.) When you start making money, always

1.) Insurance / Term Plans
2.) Gold
3.) Home

- Credit Card XX
  Use Cash ✓

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20/04/23

45. Time Speed Distance & Work and Time – VIII

Work and Time – 2

1 W = 100% W

	Days	One day work	
Tara	20	1/20 = 5%	9%
Argha	25	1/25 = 4%	

T+A ⇒ $\frac{1}{20} + \frac{1}{25}$

OR

$\frac{20 \times 25}{20+25} = 11\frac{1}{9}$ days

100% / 9% = $11\frac{1}{9}$ days

1	2	--	11
T+A	T+A		T+A
9%	9%		

	Days	One day work
Tara →	20	1/20 = 5%
Argh →	25	1/25 = 4%

(a)

1	2	3	4		22	23rd
T	A	T	A	- - - - - -		T

1 pattern

5%

1 Pattern (2-days) ⟹ 9% × 11

× 11

⇒ 22 days ⟶ 99%

∴ $22\frac{1}{5}$ Ans.

Work left = 100% − 99% = 1%

23rd → Tara → $\frac{1\%}{5\%} = \frac{1}{5}$

∴ $22\frac{1}{5}$ Ans

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(b) If Argha starts

A	T	A	T	- - - - - - - -		23rd
						A

Pattern

1 pattern $\longrightarrow$ 9% × 11

11 × 2 days

22 days = 99%

WL = 100% − 99% = 1%

23rd $\rightarrow$ A $\rightarrow$ $\frac{1\%}{4\%}$ = $\frac{1}{4}$

$\therefore$ $22\frac{1}{4}$ days

Ans.

(c) Alternately * but both

Que A can do a piece of work in 12 days while B alone can do it in 15 days. In how many days the work gets completed, if A and B work together but alternatively:

(a) A starts (b) B starts.

Ans:- 1 work = 100% W

	One day work	
A → 12 days	1/12	= 8.33%
B → 15 days	1/15	= 6.67% +
		15% / 2 days

6 × 1 pattern (2 days) $\longrightarrow$ 15% × 6

= 12 days $\longrightarrow$ 90%

WL = 10%

13th $\xrightarrow{A}$ 10% − 8.33% = 1.67%

14th $\xrightarrow{B}$ $\frac{1.67\%}{6.67\%} = \frac{1/60}{1/15} = \frac{1}{4}$

= $13\frac{1}{4}$ days

Ans.

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B starts

(b) 6 X 2 days ⟶ 15% X 6

12 days ⟶ 90%

WL = 100% − 90% = 10%

13th $\xrightarrow{B}$ 10% − 6.67% = 3.33%

WL = 3.33%

14th $\xrightarrow{A}$ $\frac{3.33\%}{8.33\%} = \frac{1/30}{1/12} = \frac{12}{30} = \frac{2}{5}$

∴ $13\frac{2}{5}$ days Ans.

*. A = 10 days B = 20 days H = 25 days

	1	2	3	4	5	6	7
1.	A+B+C	A+B+C	A+B+C	A+B+C	A+B+C	A+B+C	A+B+C
2.	A	B+C	A	B+C	A	B+C	A
3.	A	B	C	A	B	C	A
4.	A+B	A+C	A+B	A+C	A+B	A+C	A+B

Ans:- one day work

A → 10 days → 1/10 = 10%

B → 20 days → 1/20 = 5%

C → 25 days → 1/25 = 4%

} 19% work/day

(1) A+B+C ⟶ 5 X 1 day = 19% X 5 = 95%

WL = 100% − 95% = 5%

$\frac{5\%}{19\%} = \frac{5}{19}$ ∴ $5\frac{5}{19}$ days Ans.

(2) 5 X 1 pattern (2-days) ⇒ 19% X 5

10 days ⟶ 95% WD

WL = 100% − 95% = 5%

11th $\xrightarrow{A}$ $\frac{5\%}{10\%} = \frac{1}{2}$ ⇒ $10\frac{1}{2}$ days Ans

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③ $5 \times$ 1 pattern (3 days) $\longrightarrow$ $19\% \times 5$

15 days $= 95\%$ WD

WL $= 100\% - 95\% = 5\%$

16th $\xrightarrow{A}$ $\frac{5\%}{10\%} = \frac{1}{2}$

$\therefore$ $15\frac{1}{2}$ days Ans

④ 1 pattern $\longrightarrow$ $A+B+A+C = A+(A+B+C)$

$3 \times$ (2-days) $= 10+19 = 29\% \times 3$

$\Rightarrow$ 6 days $= 87\%$ WD

WL $= 100\% - 87\% = 13\%$

7th $\xrightarrow{A+B}$ $\frac{13\%}{15\%} = \frac{13}{15}$

$\therefore$ $6\frac{13}{15}$ days Ans.

HW Que

	Days
Men $\longrightarrow$	6
Women $\longrightarrow$	10
Child $\longrightarrow$	12

$\boxed{M+W+C} \longrightarrow$? days

Ans:

$M \longrightarrow 6 \longrightarrow 1/6 = 16.67\%$

$W \longrightarrow 10 \longrightarrow 1/10 = 10\%$

$C \longrightarrow 12 \longrightarrow 1/12 = 8.33\%$

$\Big\}$ 35% in 1 day

$2 \times$ 1 day $\longrightarrow 35\% \times 2$

2 days $= 70\%$ WD

WL $= 100\% - 70\% = 30\%$

3rd $\longrightarrow$ $\frac{30\%}{35\%} = \frac{30}{35} = \frac{6}{7}$

$\therefore$ $2\frac{6}{7}$ days Ans.

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IIFT/MBA

Hw Que. A man can finish a work in 6 days, a woman in 10 days and a child in 12 days. The man starts the work and works for 1/3rd of the day, then the woman works for 1/3rd of a day and finally the boy works for remaining 1/3rd of a day. This cycle is repeated till the work finishing.

	Days	
Sneha →	10	→ 1/10 = 10%
Argha →	12	→ 1/12 = 8.33%
Deva →	15	→ 1/15 = 6.67%

S+A+D → 25% in 1 day

S+A+D ⇒ 25% × 2 = 50% WD

(A+D) 15% × (2) A

(D) 20%

worked together 2 days. → 25% × 2 = 50% WD

Sneha left.

In last 3 days Deva worked alone.

↳ 6.67% × 3

$= \frac{1}{15} \times 3 = \frac{1}{5} = 20\%$

For how many days, A+D will have to work?

↓

8.33 + 6.67 = 15%

50% + 20% = 70%

WL = 100% − 70% = 30%

∴ $\frac{30\%}{15\%}$ = 2 days Ans

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*. V S

Eff 10% 40% ⇒ 50% WD

∴ 2 days Ans

Wages

₹ 1000 200 ₹ 800 ₹

V S

6X [10% $\boxed{40\%}$ after 1 day

(V) ⇒ 10 days → 1/10 = 10% → 1/10 X 6

+

(S) ⇒ 15 days → 1/15 = 6.67% → 1/15 X 6

(V) + (S) = 16.67% = 1/6 ⇒ $\boxed{\text{6 days}}$

₹ 3000/-

The amt of money must be distributed among wages based upon the amt of WD.

(V) → 3000 X 1/10 X 6 = ₹ 1800

(S) → 3000 X 1/15 X 6 = ₹ 1200

Ans

*

R → 12 days → 1/12 = 8.33%

V → 10 days → 1/10 = 10%

A → 15 days → 1/15 = 6.67%

25%

∴ 100%/25% = 4 days

₹ 48,000 → individual share = ?

R = 1/12 X 4 X 48000 = 16,000

V = 1/10 X 4 X 48,000 = 19,200

A = 1/15 X 4 X 48,000 = 4 X 3200 = 12,800

Ans

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*. Days

S → 15 → 1/15 = 6.67% → $\frac{1}{15}$ × 5 × 4.5 Lakh

I → 20 → 1/20 = 5% → $\frac{1}{20}$ × 5 × 4.5 lakh

K → ∴ 12 ← 1/12 ← = $\boxed{8.33\%}$ → $\frac{1}{12}$ × 5 × 4.5 lakh

S + I + K → $\frac{1}{5}$ = 20%

↳ $\boxed{5 \text{ days}}$

20% − (6.67 + 5)%

= 8.33%

S = 1.5 L

I = 1.125 L

K = 1.875 L

Special Practice paper TSD

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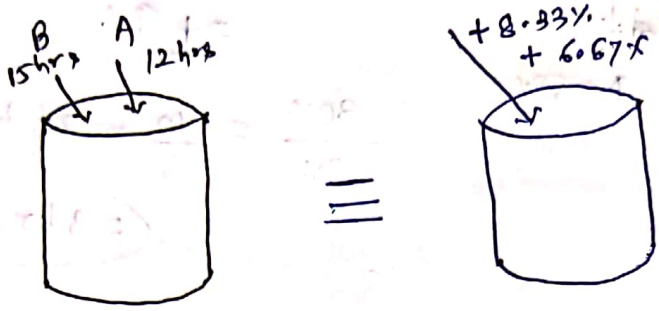
24/04/23

(46) Time speed Distance & Work and Time - IX

Work & Time

Pipes & Cisterns

(1)



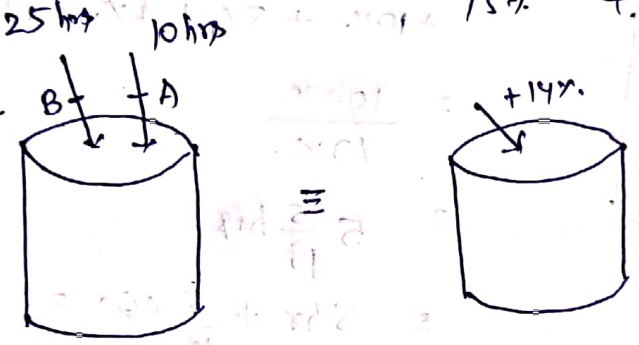
Cistern

$A \rightarrow \frac{1}{12} = 8.33\%$ (+)

$B \rightarrow \frac{1}{15} = 6.67\%$ (+)

$\frac{100\%}{15\%} = 6\frac{2}{3}$ hrs Ans.

Test



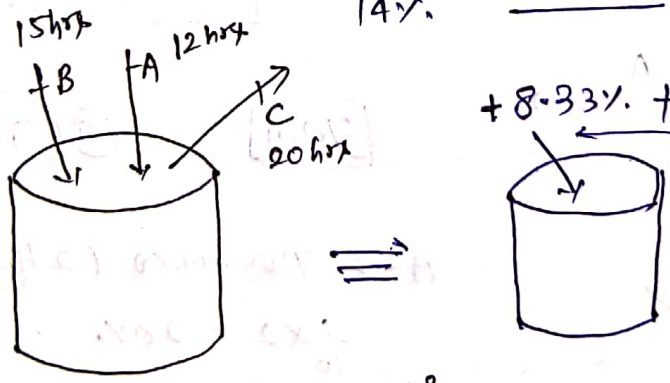
$A \rightarrow 10\text{hrs} \rightarrow \frac{1}{10} = 10\%$ (+)

$B \rightarrow 25\text{hrs} \rightarrow \frac{1}{25} = 4\%$ (+)

$+14\%$

$= \frac{100\%}{14\%} = 7\frac{1}{7}$ hrs Ans.

(2)

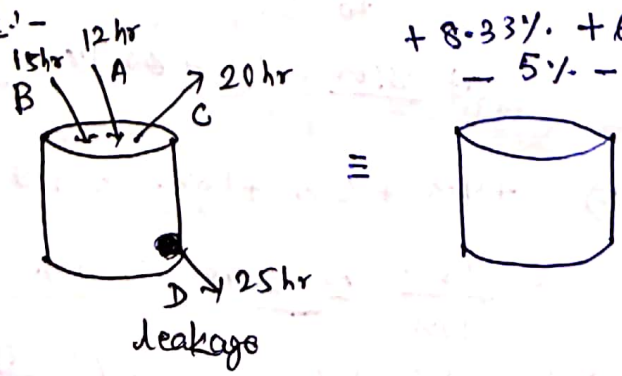


Will the cistern be filled? → Yes.

How long will it take?

$\frac{100\%}{10\%} = 10$ hrs Ans

(3) Test:-



$= (15-9)\% = +6\%$

$\frac{100\%}{6\%} = \cancel{20\text{hrs}}$ Ans.

$16\frac{2}{3}$ hrs Ans

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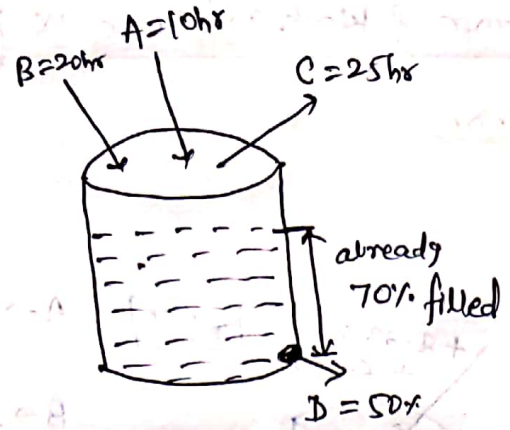
④



How long will it take to fill or empty the cistern?

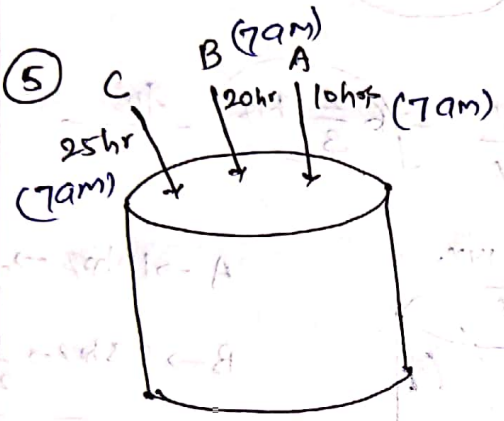
$+10\% + 5\% - 4\% - 2\%$

$= +9\%$

$\therefore \frac{30\%}{9\%} = \frac{10}{3} = 3\frac{1}{3}$ hr

$= 3$ hr 20 min Ans

⑤



(a) At what time cistern filled?

$+10\% + 5\% + 4\% = +19\%$

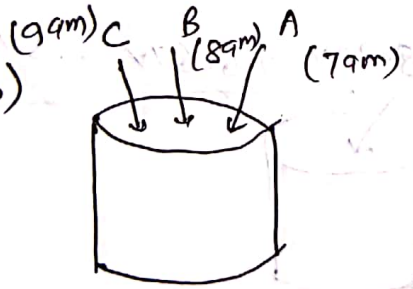
$= \frac{100\%}{19\%}$

$= 5\frac{5}{19}$ hrs

$= 5$ hr $+ \frac{5}{19} \times 60 = 5:16$

$\therefore$ 7:00 AM + 5:16 hrs = 12:16 pm Ans

(b)



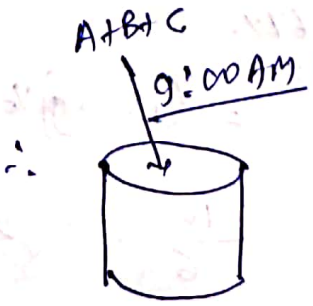
7am @ 9am

A → 7:00 – 9:00 (2 Hrs)

$\frac{1}{10} \times 2 = 20\%$

B → 8:00 – 9:00 (1 hr)

$\frac{1}{20} \times 1 = 5\%$



at 9:00, (20+5)% = 25% filled

$\Rightarrow +4\% + 5\% + 10\% = +19\%$

$\therefore \frac{75\%}{19\%} \simeq$ 3 Hrs 57 min. Ans

$\therefore$ 9:00 + 3:57 = 12:57 Ans

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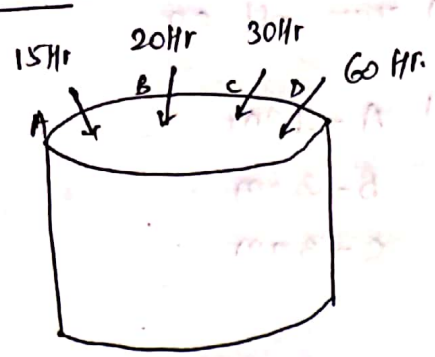
★ ★ Test:-

(7)



(a) Started all at 7:00 AM

(b) A - 7:00 AM
B - 8:00 AM
C - 9:00 AM
D - 10:00 AM.

Ans. (a) $+6.67\% + 5\% + 3.33\% + 1.67\% =$

$= 16.67\%$

$= \frac{1}{6}$

$\therefore \frac{100\%}{21\%} = \frac{100}{21} =$

$\therefore \frac{1}{1/6} = 6$ hrs

$\therefore$ 7:00 + 6 hrs = $\boxed{01 \text{ PM}}$ Ans.

(b) $\boxed{7:00 \text{ AM}} \longrightarrow \boxed{@\ 10:00 \text{ AM}}$

A: → 7-10 → $\frac{1}{15} \times 3 = 20\%$

B: → 8-10 → $\frac{1}{20} \times 2 = 10\%$

C: → 9-10 → $\frac{1}{30} \times 1 = 3.33\%$

$+$

33.33% at 10 AM

Remaining = $100\% - 33.33\% = 66.67\%$

A+B+C+D → $+6.67\% + 5\% + 3.33\% + 1.67\% = 16.67\%$

$\therefore \frac{66.67\%}{16.67\%} = \frac{2/3}{1/6} = 4$ hrs

$\therefore$ 10 AM + 4 hrs = 2 pm Ab

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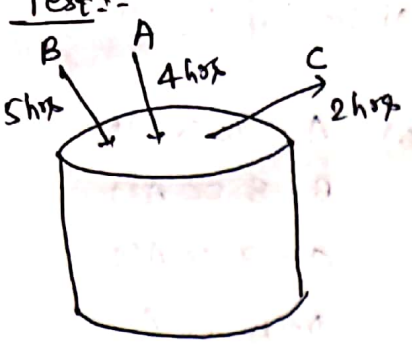
(8) Test:-



(a) 7am all on

(b) A – 1am

B – 2 am

C – 3 am

Ans:- (a) $+20\% + 25\% - 50\% = -5\%$ (Empty)

$\frac{100\%}{5\%} = 20$ Hours

$\therefore$ 7am – 20 hrs = 3am

(b) @ 3am

A: 1–3 am $\longrightarrow \frac{1}{4} \times 2 = +50\%$

B: 2–3 am $\longrightarrow \frac{1}{5} \times 1 = +20\%$

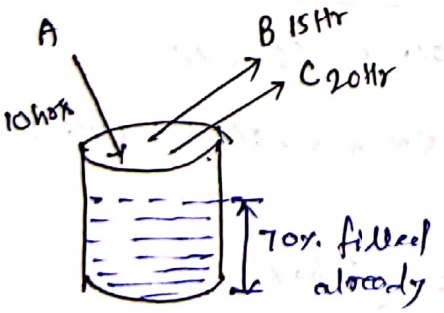
Already filled = 70%

Now, $+25\% + 20\% - 50\% = -5\%$ (Empty)

$\frac{70\%}{5\%} = 14$ hrs.

$\therefore$ 3am – 14hrs = 5pm Ans.

(9)



(a) all pipes started at 7am

$+10\% - 6.67\% - 5\%$

$= +10\% - 11.67\%$

$= -1.67\%$

↳ empty.

$\frac{70\%}{1.67\%} = \frac{\frac{7}{10}}{\frac{1}{60}} = 42$ hrs

Mon – 7:00 AM – 42 hrs

24hr 12hr 6hr

Tue 7am Tue. 7pm Wed (13) Wed

~~$\frac{30\%}{1.67\%} = \frac{\frac{3}{10}}{\frac{1}{60}} = \frac{3}{10} \times \frac{60}{1} = 18$ hrs~~

~~7:00 – 18 hrs~~

~~Wed (1AM) Ans.~~

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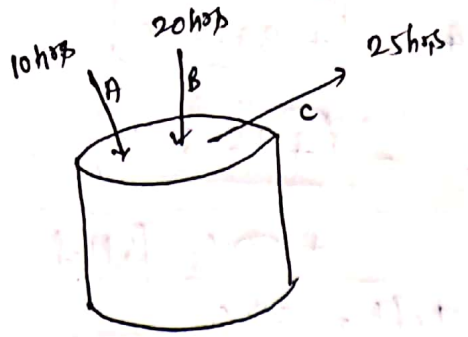
(10)



Operations

MON

① A+B 7 am → 9 am

at 9 AM → A: closed

② B+C : 9 am → 12 pm;

at 12 pm → B: closed

③ C → 12pm – 5pm

④ C+A+B → 5pm – ??

Till cistern is Completely filled or empty?

Ans :-

① $A - \frac{1}{10} \times 2 = +20\%$

$B \rightarrow \frac{1}{20} \times 2 = +10\%$

$+30\%$

② $\left.\begin{array}{l} B \rightarrow +5\% \\ C \rightarrow -4\% \end{array}\right\} +1\% \times 3$

$= +3\%$

$= +33\%$ filled

③ $C \rightarrow -4\% \times 5 = -20\%$

$WD = 33\% - 20\% = +13\%$

$WL = 100\% - 13\% = 87\%$

④ $+10\% + 5\% - 4\% = +11\%$

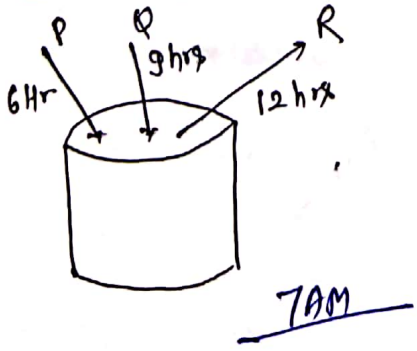
$\therefore \frac{87\%}{11\%} = 7:54$

TUE

$\therefore$ 5PM + 7:54 = 12:54 AM

Ans.

*. Test :-



Operations :-

① (P+R) → open for 4 Hrs ; P closed now

② (R+Q) → opened for 6Hrs; R closed

③ Q ✓ —— ? full cistern

Scanned with CamScanner

Q GATE 2019

① $(+16.67\% - 8.333\%) \times 4 = \boxed{+33.33\%}$

② $(-8.33\% + 11.11\%) \times 6 = \boxed{+16.67\%}$

$+50\%$ filled

Left $= 50\%$

③ $\dfrac{50\%}{11.11\%} = \dfrac{\frac{1}{2}}{\frac{1}{9}} = \dfrac{9}{2}$ hrs $= 4.5$ Hrs

$\therefore$ 7 AM + 4.5 Hrs + 4 Hr + 6 Hr

$=$ ~~11:30~~ 7:00 AM + 14.5 Hrs

$=$ 21:30 $=$ 9:30 PM Ans

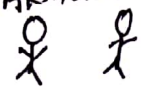
Scanned with CamScanner

25/04/23

47. ~~Percentage and DI - 1~~

Work & Time

Akshat + Harsh



$$\boxed{W = D \cdot M \cdot T \cdot E}$$ ***

$$\boxed{W = DMTE}$$

W = work done (Work)

D = no. of days

M = no. of Men / Women / Children

E = Efficiency

T = Time / Duration

(H) Ballistic Misile

- (P) Prithvi
- (A) Agni
- (T) Trishul
- (N) Naag
- (A) Akash

Engineering बड़ा है आसान है

(H) MBBS is PAINful

Maldeve Bangladesh Bhootan srilanka Pakistan Afganistan India Nepal

SAARC

$$W = DMTE$$

1. $D_1M_1 = D_2M_2$ — W, T, E } Const

$10 \times 10 = D_2 \times 20$

$\boxed{D_2 = 5 \text{ days}}$

2. $D_1M_1T_1 = D_2M_2T_2$ — W, E } ✓

$10 \times 10 \times 10 = D_2 \times 20 \times 20$

$\therefore D_2 = 2.5$ days

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1. W = DMTE

$M_1 = x$ Men $\xrightarrow{\text{if}}$ +8 Men ↑ $= x+8$, $x = ?$

$D_1 = 60$ days $\Rightarrow D_2 = 50$ days

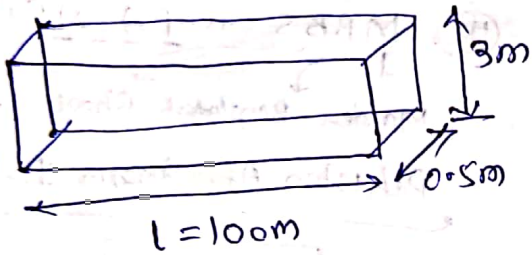
$$x \times 60 = (x+8) \times 50$$

$$6x = 5x + 40$$

$$\boxed{x = 40 \text{ men}}$$ Ans

2. W = DMTE

$\boxed{W = \text{Volume}}$ (Cylinder, Cone, wall, icre-cream...etc)



Given

$M_1 = 12$ Men

$D_1 = 25$ Days

here $W = \text{Volume} = lbh$

If $M_2 = 20M$, $D_2 = ?$, $l = 60m$, $b = 4m$, $h = 0.25m$

$$\frac{D_1 M_1}{W_2} = \frac{D_2 M_2}{W_2}$$

$$\frac{25 \times 12}{100 \times 3 \times 0.5} = \frac{D_2 \times 20}{60 \times 4 \times 0.25} \Rightarrow D_2 = 6 \text{ days}$$ Ans

IIT Guwah 2018

Que. Seven machines take 7 minutes to make 7 identical toys. At the same time rate how many ~~times~~ minutes would it take for 100 machines to make 100 toys?

Ans.

$M_1 = 7$ $M_2 = 100$

$T_1 = 7$ $T_2 = ?$

$W_1 = 7$ $W_2 = 100$

W = DMTE

$$\frac{M_1 T_1}{W_1} = \frac{M_2 T_2}{W_2}$$

$$\Rightarrow \frac{7 \times 7}{7} = \frac{100 \times T_2}{100}$$

$$\Rightarrow \boxed{T_2 = 7 \text{ min}}$$ Ans

Scanned with CamScanner

3. $W = DMTE$ $\boxed{D_1M_1 = D_2M_2}$ #

$\boxed{8M \text{ or } 10W} \longrightarrow 10$ days

$\Downarrow$ $\boxed{\text{Efficiency of } 8M = \text{Eff. of } 10W}$

$\Rightarrow 1M = \frac{10}{8}W = \frac{5}{4}W$

1M & 5W = ? days

$= 1M + 5W = 1M + 5 \times \frac{4}{5}M = 5M$

$\therefore D_1M_1 = D_2M_2$

$10 \times 8 = D_2 \times 5$

$\therefore \boxed{D_2 = 16 \text{ days}}$ Ans.

* 3M or 5W $\longrightarrow$ 12 days.

6M + 5W $\longrightarrow$? days.

$3M = 5W \Rightarrow 1M = \frac{5}{3}W$, $6M + 5W = 10 + 5 = 15W$

5W $\longrightarrow$ 12 days

15W $\longrightarrow$?

$5 \times 12 = 15 \times D_2$

$\Rightarrow D_2 = 4$ days Ans

OR $12 \times 3 = D_2 \times 9$

$D_2 = 4$ days

* $\boxed{W = DMTE}$

Pipes & Cistern

Que. If 12 pumps can raise 1218 tons of water in 11 days of 9 hours each, then how many pumps will raise 2030 tons of water in 12 days of 11 hours each?

(a) 12 (b) 15 (c) 18 (d) 14 pumps

Scanned with CamScanner

Ans.

$M_1 = 12$ $\quad$ $M_2 = ?$

$W_1 = 1218$ $\quad$ $W_2 = 2030$

$D_1 = 11$ $\quad$ $D_2 = 12$

$T_1 = 9$ $\quad$ $T_2 = 11$

$$\frac{D_1 M_1 T_1}{W_1} = \frac{D_2 M_2 T_2}{W_2}$$

$$\frac{\cancel{11} \times \cancel{12} \times 9}{1218} = \frac{\cancel{12} \times M_2 \times \cancel{11}}{2030}$$

$\boxed{M_2 = 15 \text{ Pumps}}$ Ans

1 person Eff^{n}cy

5 people learns

* $\boxed{A} \rightarrow 20$ days $\rightarrow 1/20 = 5\% \rightarrow \frac{5\%}{5} = 1\%$

2X

$\boxed{B} \rightarrow 25$ days $\rightarrow 1/25 = 4\% \rightarrow \frac{4\%}{8} = 0.5\%$

6X 8

$\boxed{N} \rightarrow 30$ days $\rightarrow 1/30 = 3.33\% \rightarrow \frac{3.33\%}{10} = 0.33\%$

5X 10

$2\% + 3\% + 1.67\% = 6.67\% = \frac{1}{15}$

$\boxed{15 \text{ days}}$

Ans

Que. is in the PDF

*. $W = DMTE$ $\quad$ $100\% \cdot W = 1W$

10 10

$W = 10 \times 10$ MD work

$= 100$ MD work

$\boxed{\text{Day 1 \& 2}}$

$W_1 = 2 \times 10$

$= 20$ MD work

left $= 80$ MD work

5 people

Day 3/4/5

$W_2 = 3 \times 5$

$= 15$ MD work

left $= 65$ MD work

W_3 :-

$(5 + x) \times 5 = 65$

$\therefore x = 8$ men

Ans.

Scanned with CamScanner

CAT *

A H D H R N → 10 ~~days~~ hours

Server work

joined 6 Engineers

S V

W = DMTE → W = 6×10 MT work. = 1W

= 60 MT work = 100% W

① W_1 = 6 × 6 = 36 MT work → work left = 24 MT work.
(M, Hr)
11am–5pm.

② W_2 = 7 × 1 = 7 MT work → WL = 24 − 7 = 17 MT work
(M, Hr)
5pm–6pm

③ W_3 = 8 × 1 = 8 MT work → WL = 9 MT work
6pm–7pm

④ W_4 = 9 × 1 = 9 MT work → Work Completed
7pm–8pm

Que in PDF

* W = DMTE

W = DMTE
D → 20 D.
M → 90

Tsunami

W = 1800 MD work = 100% work

Day 1st–5th	Day 6–10th	11th–15th	16th–20th
90 Men			W_3 = 5×60 = 300 MD work left
W_1 = 90×5 = 450 MD work	W_2 = 5×80 = 400 MD work	W_3 = 5×70 = 350 MD work	21–25th: W_4 = 5×50 = 250 MD
10 people left	10 people left	10 people left	

Total = 1750 MD work
Left = 50 MD work

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CAT

WL = 1800 MD − 1750 MD = 50 MD work.

$25^{th} - 30^{th}$ = 5 × 40 = 200 MD work.

$\frac{50}{200} = \frac{1}{4} \Rightarrow \boxed{\frac{5}{4} = 1\frac{1}{4} \text{ days}}$

✗ (a) $25\frac{1}{4}$ days ✓ (b) $26\frac{1}{4}$ day

$\therefore$ $25 + 1\frac{1}{4} = 26\frac{1}{4}$ days Ans

Que. in PDF

Scanned with CamScanner

25-04-23

48. Doubt Clearing Session

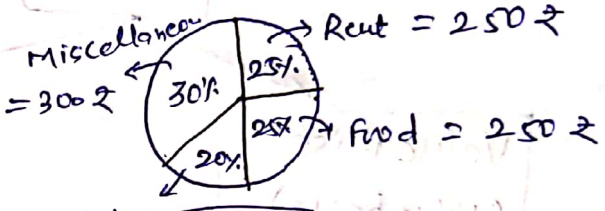
PERCENTAGE & IT'S APPLICATION (DI)

- Graph (DI)
- Profit-Loss
- CI, SI
- Mixture, Allegation, ---- etc.

DI → Data Interpretation → Other name of graph

Graph → (4)

(1) 1.) Pie chart



₹1000

Distribution

Bifercation = Break-down

⊙ 100% = 360°

100% = 360°

10% = 36°

25% = 90°

⇒ 20% = 72°

50% = 180°

90% = 324°

Que. 2017 IITR

40% of deaths on city roads may be attributed to drunken driving. The number of degrees needed to represent this as a slice of a pie chart is —

(a) 120 (b) 144 (c) 160 (d) 212

Ans:- 10% = 36°

∴ 40% = 36° × 4 = 144° Ans

Scanned with CamScanner

② Table Graph :-

CS		ET		ME		EE	
B	G	B	G	B	G	B	G
100	120	100	100	80	1	40	40
V/NV	V/NV	V/NV	V/NV	V/NV	V/NV	V/NV	V/NV

*. Graph

- Value wise (Value basis) → ₹, $, €, ₣, ---
- Volume wise (Volume Basis) → Kg, Q, T, ---

*. YoY → Year on Year
or
Year to Year

* QoQ → Quarter on Quarter
or
Quarter to Quarter

* $\frac{6}{7} = 85.7142$ $\approx 86\%$

$(\because \frac{1}{7} = 14.2857)$ ×6 ×6 = 84

*. $\boxed{\% \text{ Change} = \frac{FV - IV}{IV} \times 100\%}$

100 + 20 → 120

% Change $= \frac{120-100}{100} \times 100\% = \frac{20}{100} \times 100\% = 20\%$

Scanned with CamScanner

* $\boxed{\text{Change}}$ is a neutral word.

+20% (+30%) , +20% (−30%)

bigger bigger.

* $\boxed{\text{Profit \%} = \text{Gain \%} = \frac{SP - CP}{CP} \times 100\%}$

* $\boxed{\text{Loss \%} = \frac{CP - SP}{CP} \times 100\%}$

* $A = \{4, 5, 6, 7\}$

$B = \{8, 9, 10, 11, 12\}$

fraction = C , $C_{max} \times C_{min} = ?$

$\Rightarrow \frac{A_{max}}{B_{min}} \times \frac{A_{min}}{B_{max}} = \frac{7}{8} \times \frac{4}{12} = \frac{7}{24}$ Ans

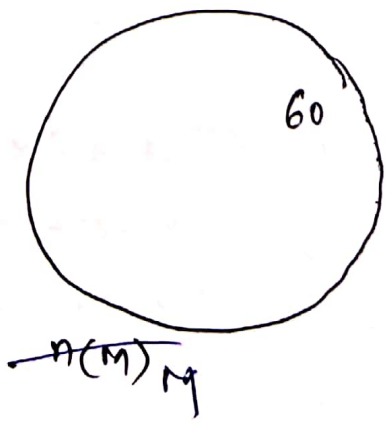
IITM 2019 Que.

Given two sets $X = \{1, 2, 3\}$ and $Y = \{2, 3, 4\}$. we construct a set Z of all possible fractions where numerators belong to X and the denominators belong to set Y. The product of elements having minimum and maximum values in the set Z is _____ ?

(a) 1/12 (b) 1/8 (c) 1/6 (d) 3/8

Ans:- $Z_{min} \times Z_{max} = \frac{X_{min}}{Y_{max}} \times \frac{X_{max}}{Y_{min}} = \frac{1}{4} \times \frac{3}{2} = \frac{3}{8}$ Ans

* 100 students = Total



$40 = \cancel{n(\bar{M})}\ \bar{M}$

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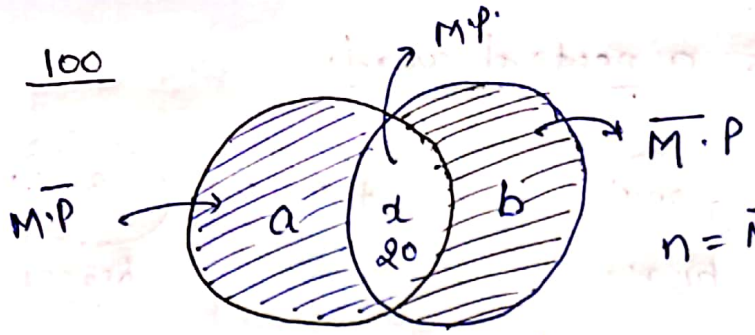
* 100



$n = \overline{M}\cdot\overline{P} = 100 - 80$
$= 20$

~~n(M)~~ ~~n(P)~~

M = 60 P = 40

$\therefore a = 60 - 20 = 40$ $b = 40 - 20 = 20$

* Quarter → $\frac{1}{4} \times 12$ Months = 3 months

Calender Year (CY)
- Q1: J - M — Q4
- Q2: Apr - June — Q1
- Q3: July - Sep — Q2
- Q4: Oct - Dec — Q3

Financial Year (FY)

31st March - Closing

27/04/23

49. Percentage & DI – II

* • YoY / QoQ
  • Valuewise (valuebasis) / Volumewise (Volume basis)
  $ ₹ € Kg / Q / T
  • Graphs → Table graph, Pie chart, Bar graph, Line graph
  • % change = $\frac{FV - IV}{IV} \times 100\%$

* Pie chart :-

In Any graph there is usually → ① Number. ② % ③ Average

* कोई चीज double हो जाए → 100% increment.

$x \longrightarrow 2x$

$\frac{2x - x}{x} \times 100\% = 100\%$

1 → 2 → 100% ↑
1 → 3 → 200% ↑
1 → 10 → 900% ↑

$\frac{10 - 1}{1} \times 100\% = 900\%$

* 10% × 20 ① = 20% × 10
  ② >
  ③ <

⇒ 37% × 74 + 74% × 37
= 2 × 37% × 74
= 2 × 74% × 37

Scanned with CamScanner

Gate-2016

Q. $(x\% \text{ of } y) + (y\% \text{ of } x)$ is equivalent to ?

IPSC Bay

$$= \frac{x}{100} \times y + \frac{y}{100} \times x = \frac{2xy}{100} = 2\% \text{ of } xy$$ Ans (a)

$$\frac{2xy}{100} \begin{cases} \frac{2}{100} xy = 2\% \text{ of } xy \\ 2\frac{x}{100} y = x\% \text{ of } 2y \\ 2x\frac{y}{100} = y\% \text{ of } 2x \end{cases}$$ Ans

* Rani $= 20 + 30 + 50 = 100$

$\downarrow 10\% \uparrow$ $\qquad$ $+10\%$

$22 + 33 + 55 = 110$

$\Rightarrow$ Overall % 10% increment = Individual % same % ↑.

* Rani

₹100 $\xrightarrow{20\%\uparrow}$ 120 $\xrightarrow{30\%\uparrow}$ 120 + 36 = ₹156/-

56% ↑

Successive % change

$$\boxed{\left(a + b + \frac{ab}{100}\right)\%}$$

$$= 20 + 30 + \frac{20 \times 30}{100} = 56\%$$

*

a%	b%	$(a+b+ab/100)\%$
10% ↑	20% ↑	$(10+20+\frac{10\times20}{100})\% = +32\% \uparrow$
10% ↑	20% ↓	$(10-20-\frac{10\times20}{100})\% = -12\% \downarrow$
10% ↓	20% ↑	$(-10+20-\frac{10\times20}{100})\% = +8\% \uparrow$
10% ↓	20% ↓	$(-10-20+\frac{10\times20}{100})\% = -28\% \downarrow$

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(OR)

*

a%	b%		
10% ↑	20% ↑	→ $1.1 \times 1.2 = 1.32$	→ +32%
10% ↑	20% ↓	→ $1.1 \times 0.8 = 0.88$	→ −12%
10% ↓	20% ↑	→ $0.9 \times 1.2 = 1.08$	→ +8%
10% ↓	20% ↓	→ $0.9 \times 0.8 = 0.72$	→ −28%

- $1 \xrightarrow{10\% \uparrow} 1 + 0.1 = 1.1$

  $1 \longrightarrow 1.32 \Rightarrow \frac{1.32 - 1}{1} \times 100 = 32\% \uparrow$

- $10\% \longrightarrow 1.1$

  10% 10% → $1.1 \times 1.1 = 1.21$ → 21% ↑

  10% 10% 10% → $1.1 \times 1.1 \times 1.1 = 1.331 = 33.1\% \uparrow$

  10% 10% 10% 10% $= (1.1)^4 = 1.4641 = 46.41\% \uparrow$

Que 20% ↑ → 1.2 ⇒ 20% ↑

20% ↑ 20% ↑ → $1.2 \times 1.2 = 1.44 \Rightarrow 44\% \uparrow$

10% ↑ 20% ↑ 50% ↑ → $1.1 \times 1.2 \times 1.5 = 1.1 \times 1.80$
$= 1.98 \Rightarrow 98\% \uparrow$

*

$C = 2\pi r$ $\boxed{C \propto r}$

$A = \pi r^2$ $\boxed{A \propto r^2}$

$r = 30\% \uparrow \Rightarrow C = 30\% \uparrow$

$A = 1.3 \times 1.3 = 1.69 = 69\% \uparrow$

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27/04/23

50. **Percentage & DI - III**

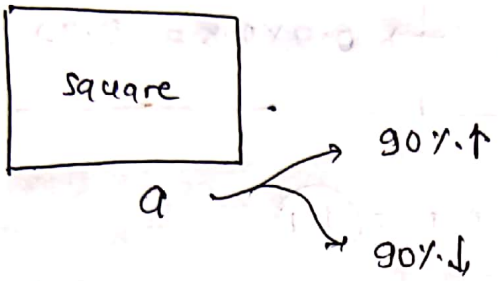
* ① 40% ↑ 40% ↑ ⇒ $\uparrow_{net} = 1.4 \times 1.4 = 1.96$ ⇒ 96% Ans

② 60% ↑ 60% ↑ 60% ↑ ⇒ $\uparrow_{net} = 1.6 \times 1.6 \times 1.6 = 4.099$

$\frac{4.096 - 1}{1} \times 100\% = 3.096 \times 100 = 309.6\% \uparrow$

Ans

*



$P \propto a$

$P = 4a$

90% ↑

90% ↓

$\frac{3.61 - 1}{1} \times 100 = 261\%$

$P \propto a^2$

$A = a^2$

$1.9 \times 1.9 = 3.61$

$= 261\%$

$(0.1)^2$

$= 0.01$

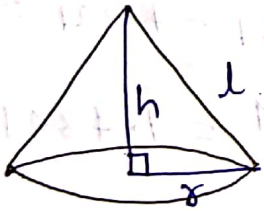
$= 99.99\% \downarrow$

$\frac{0.01 - 1}{1} \times 100\%$

$= 99.99\% \downarrow$

***

Cone



$\boxed{\text{Volume} = \frac{1}{3} \cdot \pi r^2 h}$

Volume $V \propto r^2 \cdot h$

① $r \uparrow 10\%$ $1.1 \times 1.1 \Rightarrow 1.21 \Rightarrow 21\% \uparrow$

② $r \uparrow 20\%$, $h \leftrightarrow$ $1.2 \times 1.2 \Rightarrow 1.44 \Rightarrow 44\% \uparrow$

③ $r \uparrow 10\%$, $h \uparrow 10\%$ $1.1 \times 1.1 \times 1.1 = 1.331 \Rightarrow 33.1\% \uparrow$

→ If nothing is said, height remains same.

Scanned with CamScanner

Que. The radius of a circle has increased by 20%. By what percentage does

(a) Circumference increases?

(b) The area increases?

Ans. (a) $C \propto r \Rightarrow$ 20% ↑ Ans.

(b) $A \propto r^2 \Rightarrow 1.2 \times 1.2 = 1.44 \Rightarrow$ 44% ↑ Ans.

Que. If the side of a square is increased by 25% then its area is increased by how many percent?

Ans. $A \propto a^2$

$\Rightarrow 1.25 \times 1.25 = 1.5625 \Rightarrow$ 56.25% ↑ Ans.

G-2017 Roorkee

Que. If the radius of a right circular cone is increased by 50% its volume increased by ?

Ans. $V \propto r^2 h \Rightarrow 1.5 \times 1.5 = 2.25 =$ 125% Ans (c)

$h \leftrightarrow$

• r ↑ 50% h ↑ 50% $\Rightarrow (1.5)^2 \times 1.5 = 2.25 \times 1.5$

$= 3.375 =$ 237.5% ↑ Ans.

Que. What is 20% of 30% of 40% ?

$$\left[= \frac{20 \times 30 \times 40}{100 \times 100 \times 100} = \frac{3}{125} \right] \rightarrow 2.4\%$$

$0.2 \times 0.3 \times 0.4 = 0.024 \times 100\% = 2.4\%$ Ans

CI

10% ↑ 10% ↑ 10% ↑ $\Rightarrow 1.331 \Rightarrow$ 33.1% Ans

10% ↓ 10% ↓ 10% ↓ $\Rightarrow 0.9 \times 0.9 \times 0.9 = 0.729$

$\frac{0.729 - 1}{1} \times 100\% \Rightarrow$ 27.1% ↓ Ans

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* **Discount :-**

₹ 1000

$1000 \times 0.9 \times 0.8 \times 0.5 = ₹360$

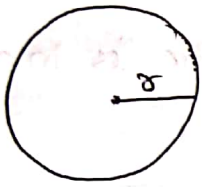
10% D 20% D 50% D

Que. A single discount equivalent to a series discount of 20%, 10% and 5% is ____ ?

Ans. $0.8 \times 0.9 \times 0.95 = 0.684$

$\frac{0.684 - 1}{1} \times 100\% = .316 \times 100\% = 31.6\%$ Ans

*



A ↑ 69% ⟶ C ↑ % ?

$\cancel{A_{new} - A = 0.69\,\pi r^2}$

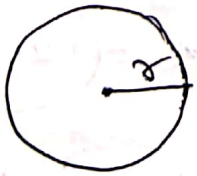
$A_{new} = 1.69 \times A$

$\pi r_{new}^2 = 1.69 \times \pi r^2$

$r_{new} = 1.3 \times r \Rightarrow r = 30\% \uparrow$

∴ C ↑ ⇒ 30% ↑ Ans.

*



$A_{new} \Rightarrow 96\% \uparrow$, C ? % ↑

$A_{new} = 1.96 \times A$

$\cancel{\pi} r_{new}^2 = 1.96 \times \cancel{\pi} r^2$

$r_{new}^2 = 1.4\, r \Rightarrow r = 40\% \uparrow$

∴ C ↑ ⇒ 40% ↑ Ans.

Scanned with CamScanner

Que. If the area of circle is increased by 21% then what is the percentage increased in the circumference of the circle?

Ans.

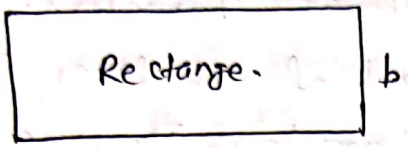
$A_{new} = 1.21\,A$

$\pi r_{new}^2 = 1.21\,\pi r^2$

$r_{new} = 1.1\,r \Rightarrow r = 10\% \uparrow$

$\therefore C \uparrow = 10\%$ Ans.

*



$\boxed{A = l \times b}$

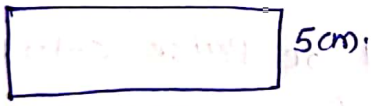
$l \rightarrow 40\% \uparrow$

$b \rightarrow 50\% \uparrow$

$\therefore A \uparrow \rightarrow 1.4 \times 1.5 = 2.10 \Rightarrow 110\%$ Ans.

Que. The length and breadth of a rectangle are 10 cm and 5 cm respectively. The length is increased by 10% and the breadth is increased by 5%. What is the new area of the rectangle?

Ans.



$A \rightarrow 1.1 \times 1.05$

$= 1.155$

$\Rightarrow 15.5\% \uparrow$

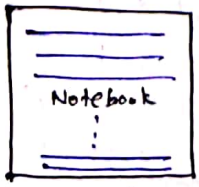
$A = 50\,cm^2 \rightarrow 50 + \frac{50 \times 15.5}{100} = 50 + 7.75$

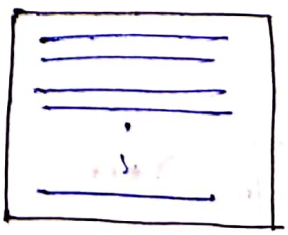
$= 57.75\,cm^2$

OR $10 \times 1.1 \times 5 \times 1.05 = 57.75\,cm^2$

*

$$\boxed{\%\ \text{Change} = \frac{FV - IV}{IV} \times 100\%}$$





x pages
20 lines/
20 char.

10 pages/ 10 lines/ 10 characters $\Rightarrow 10 \times 10 \times 10 = 1000$ characters

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$1000 = x \times 400$

$x = \frac{10}{4} = 2.5$

$\therefore$ $\boxed{x \simeq 3 \text{ pages}}$

if 2.1 pages then also 3 pages

$\therefore$ % reduction $= 10 \rightarrow 3$

$= 70\%$ Ans.

CAT

Que. A report consists of 20 sheets each of 55 lines and each such line consists of 65 characters. This report is reduced onto sheets each of 65 lines such that each line consists of 70 characters. The percentage reduction in number of sheets is closest to?

Ans: $20 \times \cancel{55}^{11} \times \cancel{65} \longrightarrow x \times \cancel{65} \times \cancel{70}\ 14$

$x = \frac{20 \times 11}{14} = \frac{110}{7} = 15.7 \simeq 16$ pages

$20 \rightarrow 16$

$\therefore$ % reduction $= 20\%$ Ans. $\boxed{a}$

HW

Que. Using only 2, 5, 10, 25 and 50 paise coins, what will be the minimum number of coins required to pay exactly 78 paise, 69 paise and Re 1.01 to three different persons?

(a) 19 (b) 20 (c) 17 (d) 18

Ans: 78 paise $\rightarrow$ 50×1, 10×2, 2×4 } 7 coins

69 paise $\rightarrow$ 50×1, 5×3, 2×2 } 6 coins

101 paise $\rightarrow$ 50×1, 25×1, 10×2, 2×3 } 7 coins

Min/Max *** very imp.

$= 20$ Ans $\boxed{b}$

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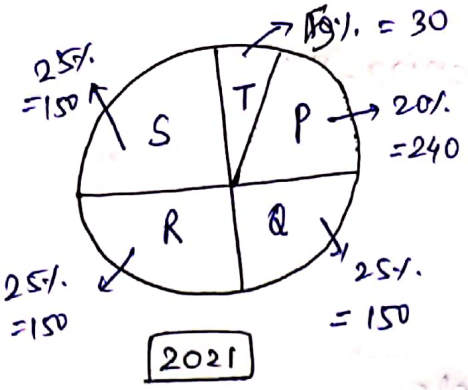
*



600 Employees

15% ↑ ⇒

600 + 90 = 690

P ↔

Q ↔

R ↔

S ↑ 40% ⇒ S = 60 → 210

∴ T → 30

↳ 80

Que. If A's income is 70% of B's. B's income is 50% of C's. If C's income is Rs. 1,00,000. what is A's income?

Ans.

C → 1,00,000

B → 50,000

A → 35,000 ✓ A1

Time & work practice papers

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01/05/23

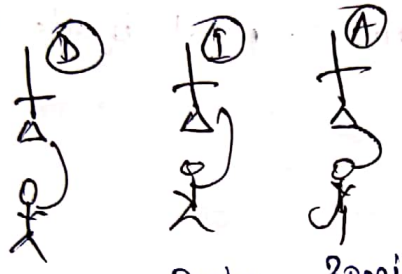
51. Verbal Reasoning - VII

* • Either / or
  • Neither / nor
  • whether / or
  • Not only / but also, ... etc.

* Ablution – मंदिर जाने के पहले हाथ - पाँव धोना (washing)
  – पवित्र करना

* Chime – मंदिर के घंटी की आवाज

*



every 10 min 5 min 30 min

→ LCM (10, 5, 30)
= 30 min.
altogether.

$\boxed{6\,PM - 8\,PM}$?

6 — 7 — 8
2 2 = 4 times

* Inquisitive → Eager.

* M $\frac{1}{7}$ → Rem 1 → 01 June – M

$\frac{8}{7}$ → 1 → M

$\frac{15}{7}$ → 1 → M

$\frac{22}{7}$ → 1 → M

$\frac{29}{7}$ → 1 → M

* • In a months, max^m no. of any days = $\boxed{5}$
  • If 31 days month, 3 such days max^m.
  eg:- In this case, M, T, W

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(*) 1/8/15/22/29 → M
2/9/16/23/30 → T
3/10/17/24/31 → W

If 30 days month

5 days wale max^m days = 2

⇒ M, T

If 28 days Month,

5 days wale max^m days ≠ 5

If 29 days, जिस day से start, उसी से खत्म

M ⟷ M

T → T, - - -

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