Apti

- 100 balls — 99 balls (ok) 10 gm each
  — 1 ball (faulty) 9 gm

  ⇒ minimum no. of weighings on a beam balance is ______ [Power of 3 will control answer]

  ⇒ Spring balance → Power of 2

CHAPTER-1 [NUMBER SYSTEM]

- $N = a^p b^q c^r$

  ⇒ no. of factors $= (p+1)(q+1)(r+1)$

  a, b, c are distinct prime no.s

  p, q, r natural no.

- $N = \cancel{2^3} \times 3^2 \times 5^3$

  even factors = Total − odd

  odd factor $= (2+1)(3+1) = 12$

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

0 2 0 2 0 2

$2 \times 2 \times 2 = 8$ perfect square

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

0 3 0 0 3

$2 \times 1 \times 2 = 4$ perfect cube

CHAPTER [FACTORIAL]

- Highest Power of a no. 'n' in N! is calculate by dividing repeatedly & adding Quotient.

ex :- 100! have how many zeros
or
100! have what highest Power of 5

$$\Rightarrow \frac{100}{5} = 20$$

$$\frac{20}{5} = 4$$

$$\overline{24}$$

- If n is not prime, break it in prime, then the no. in shortage will decide the answer

CHAPTER [BASE SYSTEM]

- <u>Ques</u> 32 + 24 = 100 find base

$$\begin{array}{r} 32 \\ 24 \\ \hline 100 \end{array} \qquad 2+4=0 \Rightarrow \text{base} = 6$$

$$1+3+2=0 \Rightarrow \text{base} = 6$$

ex :-

$$\begin{array}{r} 137 \\ 276 \\ \hline 435 \end{array} \quad \text{then,} \quad \begin{array}{r} \overset{1}{7}31 \\ 672 \\ \hline 1623 \end{array}$$

⇓

base = 8

CHAPTER [REMINDER]

- Rule - 1 ⇒ If $a = b \bmod c$
$d = e \bmod c$
$f = g \bmod c$

[∵ when a is divided by C, b is the remainder]

then, $\underline{a \times d \times f} = \underline{b \times e \times g} \bmod c$

applicable on
+, −, ×, ÷ also

$b \times e \times g < c$
or change by dividing by C

- Rule-2 ⇒ If $a = b \bmod c$
  $a^n = b^n \bmod c$

CHAPTER [Cyclicity]

-

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

	4	9
odd Power	4	9
even Power	6	1

- 0, 1, 5, 6 have no cyclicity, they appear themselves

CHAPTER [Proportions]

- $a : b :: c : d \Rightarrow \frac{a}{b} = \frac{c}{d}$

  means → b, c; Extremes → a, d

- a, b, c are in continued proportion ⇒ $a : b :: b : c$

CHAPTER [MIXTURES]

- Quantity of milk left after n operation $= \left(\frac{a-b}{a}\right)^n \times$ initial Quantity

  a = Initial quantity
  b = Quantity replaced in each operation

CHAPTER [PERCENTAGE]

- If $R = a \times b \Rightarrow \%$ in $R = x + y + \frac{xy}{100}$

  a → x% change, b → y% change

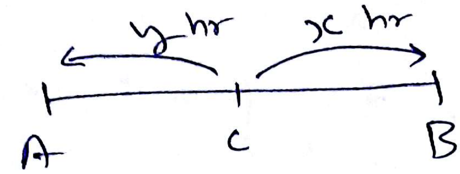
  ⇒ use −ve sign for reduction

CHAPTER [TIME, SPEED, DISTANCE]

- when N equal distances are covered with diff. speeds (x_1, x_2, x_3, x_4 ---) then

$$(\text{Speed})_{\text{average}} = \frac{N}{\frac{1}{x_1} + \frac{1}{x_2} + \frac{1}{x_3} --- \frac{1}{x_n}}$$ ⇒ Harmonic mean

- Relative speed concept



$$\frac{S_A}{S_B} = \sqrt{\frac{y}{x}}$$

⇒ A goes towards B & B comes towards A
⇒ meets at C
⇒ A takes x hrs to reach B
⇒ B takes y hrs to reach A
[After meeting at C]

- Linear races

put values in Ratio, $\frac{A}{B}$ = given, $\frac{B}{C}$ = give

then, $\frac{A}{C} = \frac{A}{B} \times \frac{B}{C} =$ ______

- Circular races

⇒ meeting @ SP for 1st time [independent of dirn]

Time taken = A = LCM (t_A, t_B)

$= \text{LCM}\left(\frac{\text{Circu}}{S_A}, \frac{\text{Circu}}{S_B}\right)$

⇒ meeting for 1st time anywhere on track

Time taken = $\frac{\text{Circum}}{\text{relative Speed}}$ = B

⇒ Total ~~#~~ diff. meeting points = $\frac{A}{B}$

CHAPTER [Calender]

odds	Day
1	mon
2	Tues
3	wed
4	Thrus
5	Fri
6	Sat
0	Sun

- Every multiple of 4 is L.Y.
- Every centurry is not L.Y
- Every 4th century is L.Y.
  ex:- 1600, 2000, 2400
- 1 normal year ⇒ 1 odd day
- 1 leap year ⇒ 2 odd day
- 100 years ⇒ 5 odd day [when observed century is not a L.Y.]
- upto 1600, 2000, 2400 ⇒ 0 odd day
- upto 1900 → 1 odd day

CHAPTER [ALGEBRA]

- If $x+y =$ const.
  then, $x \times y$ ⇒ maximum when $x = y$

  If $x+y+z =$ const
  $x \times y \times z$ ⇒ max. when $x = y = z$
- for All $x, y, z > 0$
  AM > GM > HM
- Geometric Progression

  $a, ar, ar^2 \text{ ---- } ar^{n-1}$

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

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

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

- Arithematic Progression (AP)

$a, a+d, a+2d \ldots [a+(n-1)d]$

$S_n = \frac{n}{2}[2a+(n-1)d] = \frac{n}{2}(a+l)$

- $\Sigma n = \frac{n(n+1)}{2}$ [when $T_n = n$]

$\Sigma n^2 = \frac{n(n+1)(2n+1)}{6}$ [when $T_n = n^2$]

$\Sigma n^3 = \left[\frac{n(n+1)}{2}\right]^2$ [when $T_n = n^3$]

$\Sigma \Sigma n = \frac{n(n+1)(n+2)}{6}$ [$\because$ when $T_n = \Sigma n = \frac{n(n+1)}{2}$

CHAPTER [CUBES]

Total blocks $= l \times b \times h$ [$\because$ Dipped in ink]

3s painted $= 8$

2s painted $= 4[(l-2)+(b-2)+(h-2)]$

1s painted $= 2[(l-2)(b-2)+(b-2)(h-2)+(h-2)(l-2)]$

0s painted $= (l-2)(b-2)(h-2)$

CHAPTER [Permutation & Combination]

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

- whole no. solu^n $\Rightarrow$ when '0' allocations is allowed 'n' identical ~~o~~objects distributed among 'r' people can be done in

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

- Natural no. Solun ⇒ when '0' allocation not allowed

⇒ allote the required no. to each as per question

⇒ find new 'n'

i.e $n_{ew} = n' = n - (\text{sum of all allocation})$

$$\text{ways} = {}^{n'+r-1}C_{r-1}$$

- 12 points, How many lines can be formed

⇒ $^{12}C_2$

if 5 are collinear

⇒ $^{12}C_2 - {}^5C_2 + 1$

- 12 points, ~~are~~ How many Δs

⇒ $^{12}C_3$

if 5 are collinear Points

⇒ $^{12}C_3 - {}^5C_3$

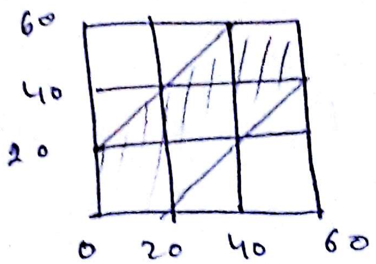
Chess board

- n × n board
- no. of squares = Σn^2
- no. of rectangles = Σn^3
- no of types of rectangle = Σn

Ques: All five digit no. are formed from 5 Single digit natural no without repitition then, sum of all those no.s = ?

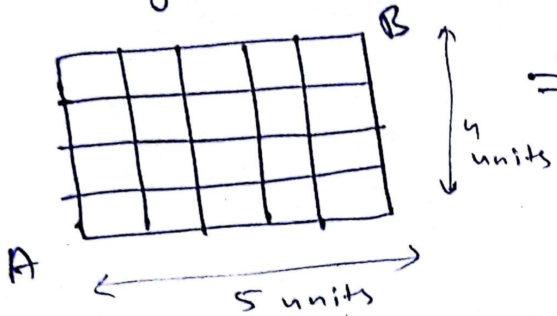
⇒ $\text{Sum} = \underbrace{(n-1)!}_{\text{no. of digits}} \times \underbrace{11111}_{\text{equal to no. of digits}} \times \underbrace{\Sigma d}_{\text{sum of digits}}$

CHAPTER (Probability)

- 

$P = \frac{5}{9}$

- no. of shortest distance from $A \to B$



$\Rightarrow \frac{(4+5)!}{4!\,5!} = \frac{9!}{4!\,5!}$

CHAPTER [BLOOD RELATIONS]

1. family hiearchy tree
2. Keep on marking gender
3. Keep on writting relation
4. $A^{+} \to$ for male
   $A^{-} \to$ for female
5. Don't judge gender by name

- Bhanja, Bhateja $\Rightarrow$ nephew
- Bhanji, Bhatiji $\Rightarrow$ niece
- Relation from mother side $\Rightarrow$ maternal
- Relation from father side $\Rightarrow$ Paternal

Clock

12 hrs $\to$ 11 coincides

12 hrs $\to$ 11 opposites

12 hrs $\to$ 22 right angles

CHAPTER [Simple interest & Compound interest]

- $SI = \frac{PRT}{100}$

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

eg:- Amount is compounded <u>half yearly</u>

$R = 10\%$ per anum $\div 2$; $T = 2$ years $\times 2$

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

- $(CI - SI)_{\text{upto 1 year}} = 0$
- $(CI - SI)_{\text{upto 2 year}} = P\left(\frac{R}{100}\right)^2$
- $(CI - SI)_{\text{upto 3 year}} = P\left(\frac{R}{100}\right)^3 + 3P\left(\frac{R}{100}\right)^2$

<u>Miscellaneous</u>

- $Ax^3 + Bx^2 + Cx + D = 0$

$\alpha + \beta + \gamma = -\frac{B}{A}$

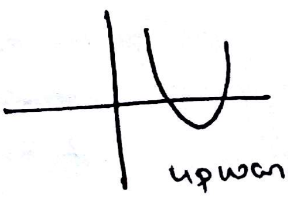
$\alpha\beta + \beta\gamma + \gamma\alpha = +\frac{C}{A}$

$\alpha\beta\gamma = -\frac{D}{A}$

+
−
+

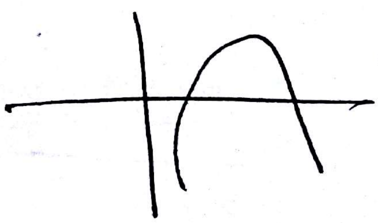
Start with −ve and move alternatively

- $y = Ax^2 + Bx + c = 0$ is a parabola



$A > 0$

upward open



downward open

$A < 0$

- $n(A \cup B \cup C) = +\left(n(A) + n(B) + n(C)\right)$
$\quad - \left(n(A \cap B) + n(B \cap C) + n(C \cap A)\right)$
$\quad + \left(n(A \cap B \cap C)\right)$

−
+