11.07.2022 80 Monday

Speed, Distance And Time Concepts

* The relation between Distance, Speed & Time is $\boxed{D \propto S * T}$
* Hence $\boxed{\frac{S_1 T_1}{D_1} = \frac{S_2 T_2}{D_2}}$ or $\boxed{\frac{D_1}{S_1 T_1} = \frac{D_2}{S_2 T_2}}$ AND

$D = S * T$ $\boxed{S = \frac{D}{T}}$ $T = \frac{D}{S}$

* To Convert Speed from Km/h to m/sec we have to multiply with $\frac{5}{18}$ and m/sec → Km/hr ⇒ multiply with $\frac{18}{5}$
* If the ratio of Speeds of A and B is a:b, then the ratio of times taken by them to cover same distance is b:a

18-07-2022 Monday

* If Speed & time both ↑ by x% & y% respectively, then the distance travelled is ↑ by $\left(x+y+\frac{xy}{100}\right)\%$
* If Speed & time both ↓ by x% & y% respectively, then the distance travelled is ↓ by $\left(x+y-\frac{xy}{100}\right)\%$
* If Speed ↑ by x% & time ↓ by y%, then the distance travelled is Changed by $\left(x-y-\frac{xy}{100}\right)\%$
  - If +ve: there is distance travelled Increases (↑)
  - If -ve: distance travelled (↓)
  - If Zero: then distance travelled doesn't Change

① If Speed ↑ by x%, then time ↓ by $\left(\frac{x}{100+x}\right)100\%$, So the distance travelled doesn't change or to cover Same distance.

② If Speed ↓ by x%, then time ↑ by $\left(\frac{x}{100-x}\right)100\%$, to cover Same distance.

* ① If time ↑ by x% then Speed ↓ by $\left(\frac{x}{100+x}\right)100\%$, to cover Same distance.

② If time ↓ by x%, then Speed ↑ by $\left(\frac{x}{100-x}\right)\times 100\%$, to cover the Same distance.

* $\boxed{\text{Average Speed} = \frac{\text{Total distance travelled}}{\text{Total Time taken}}}$

→ The ratio of total distance to that of total time taken.

* Suppose a man covers a certain distance at 'x' kmph and an equal distance at 'y' kmph. Then the average Speed during Journey is $\boxed{\frac{2xy}{x+y}}$ kmph.

(or)

If a person covers 2 equal distances with different Speeds at 'x' kmph & 'y' kmph. Then the average Speed of the Person during the whole Journey is: $\boxed{\frac{2xy}{x+y}}$ kmph

* Suppose a Man covers 'n' equal distances with different Speeds $x_1, x_2, x_3, \dots, x_n$ then, the avg Speed during Journey is $\boxed{\frac{n}{\frac{1}{x_1}+\frac{1}{x_2}+\frac{1}{x_3}+\dots+\frac{1}{x_n}}}$ kmph

Relative Speed: Comparision of Speed of one Person w.r.to another, is Called Relative Speed.

Note:

1, If 2 Persons travelled with different Speeds 'x' kmph & 'y' kmph respectively, then the relative Speed of:

(a) 1st Person w.r.to 2nd Person is $\boxed{x-y \text{ kmph}}$

(b) 2nd Person w.r.to 1st Person is $\boxed{y-x \text{ kmph}}$

2, If 2 Persons travelled with different Speeds 'x' kmph & 'y' kmph respectively in opp. direction, then the Relative Speed of:

1, 1st w.r.to 2nd Person
(or)
2, 2nd w.r.to 1st Person

$\Rightarrow \boxed{x+y \text{ kmph}}$

Points Regarding Problems based on Trains:

* If a Train Crosses a Stationary Object having Negligable length [Man, Tree or Pole or Signal Post], then it Travels a distance of Length of Train.

* If a Train Crosses a Stationary object having Some length [Bridge, platform, Tunnel or Train] then it Travels a distance of Sum of the Length of Train & the length of Object which it crosses.

* If a Train Crosses a Moving Object, then also distances are Same as above, but Speeds are Considered as Relative Speed.

Eg: ① If 2 Trains of lengths 'x' mts & 'y' mts are moving in opp. dir with Speeds 'u' m/s & 'v' m/s respectively. Then the Time taken by the Trains to Cross each other is $\boxed{\frac{x+y}{u+v} \text{ Sec}}$

② If 2 Trains of lengths 'x' mts & 'y' mts respectively are mov in same dir with speeds 'u' m/s & 'v' m/s respectively Then the time taken by the faster train to cross slower train is $\boxed{\frac{x+y}{|u-v|}\text{ sec}}$

* If 2 Trains start at the same time in opp dir from 2 stations 'A' & 'B', after Passing/Crossing each other, they complete their remaining journeys in 'a' & 'b' hrs respectively, then the ratio of their speeds is $\boxed{\sqrt{b} : \sqrt{a}}$

25.07.2022

Monday

Circular Track:

① If two Persons running on a Circular Track of length 'c' mts, with different speeds 'x' m/sec and 'y' m/sec respectively, then the first Meeting Time of two persons at any Point on the Circular Track is:

i, If they travel on opp directions is $\boxed{\frac{c}{x+y}\text{ sec}}$

ii, If they travel in same dir is $\boxed{\frac{c}{|x-y|}\text{ sec}}$

② If two persons running on a Circular Track of length 'c' mts with different speeds 'x' m/sec & 'y' m/sec respectively, then the first Meeting time of two Persons at Starting Point: $\boxed{\text{L.C.M of }\left\{\frac{c}{x}, \frac{c}{y}\right\}\text{ sec.}}$

3) Boats & Streams:

i, Down Stream:

If the boat Travels in the Same dir of water flow, then Speed of boat Increases (↑), In this case we say that Boat Travels in Downstream or with Tide

ii, Up Stream:

If a boat travels in the opp dir of water flow, then speed of boat (↓), In this case we say that Boat Travels in UpStream or Against Tide.

Note: ① If a boat Travels in Stationary Water with Speed of 'x' km/h and Speed of water is 'y' km/h

i, The Speed of boat in down stream is $\boxed{x+y \text{ km/h}}$

ii, The speed of boat in UpStream is $\boxed{x-y \text{ km/h}}$

② If a boat Travels in DownStream with a Speed of 'a' km/h & In UpStream with a Speed of 'b' km/h

Let $a = x+y$

$(+)\ b = x-y$ then $2x = a+b$, $\boxed{x = \frac{a+b}{2}}$

$2y = a-b$, $\boxed{y = \frac{a-b}{2}}$

$a = x+y$

$-b = x-y$

i, The Speed of boat in Stationary water is $\boxed{\frac{a+b}{2} \text{ kmph}}$

The Speed of water or Stream is $\boxed{\frac{a-b}{2} \text{ kmph}}$

---

1) If the Speed & Time both (↑) by 20% & 30% respectively. Then what is the % Increase in distance travelled?

Sol $D = S \times T$ ↑20% ↑30%

$D = 20+30+\frac{20 \times 30}{100}$ $\quad x+y+\frac{xy}{100}\%$

$50+6$

$\boxed{56\% \uparrow}$ Distance

ii, If Speed & Time both (↓) by 20% & 30% respectively, then distance travelled is ↓ by what %?

Sol $D = 20+30-\frac{20 \times 30}{100} = 50-6 = \boxed{44\% \downarrow}$ $\quad x+y-\frac{xy}{100}\%$

iii) If the speed (↑) by 30% & time (↓) by x%, due to that distance travelled is (↓) by 5%, Then value of x?

Sol:

$x - y - \frac{xy}{100}$

$30 - 5 - \frac{30 \times 5}{100}$ (or) $30 - x - \frac{30x}{100} = -5$

$25 - \frac{3}{2} = 25 - 1.5$

$= 24.5$

$30 - x = -5 + \frac{30x}{100}$

2) If a Person Travelled 20 km with Speed of 30 km/h & another 40 km with Speed of 90 km/h. Then what is his avg. Speed during the whole Journey of 60 km.

$\xleftarrow[20\,km]{30\,km/h} \xrightarrow[40\,km]{90\,km/h}$

Total dis $= 20 + 40$
$= 60$ km

$s = \frac{d}{t}$

$t = \frac{d}{s}$

$t_1 = \frac{20}{30}$

$t_2 = \frac{40}{90}$

Avg Speed $= \frac{\text{Total distance}}{\text{total time taken}}$

$= \frac{60\,km}{\frac{20}{30} + \frac{40}{90}}$

$= \frac{60}{\frac{60+40}{90}}$

$= \frac{60 \times 90}{100} = 54$ km/h

3 | 30, 90
10 | 10, 30
1, 3

90 × 1 = 90

3) If a Person travelled ½ of distance with speed of 30 km/h & ½ of remaining with 10 km/h & remaining at 40 k/h. Then what is Avg speed of person during whole Journey?

sol

~~x~~

~~$x/2 + \frac{x}{4} + \frac{x}{4}$~~

$\frac{(x40)}{\frac{2}{3} + 1 + \frac{1}{4}}$

$\frac{40}{\frac{8+12+3}{12}}$

$= \frac{12 \times 40}{23}$

3, 4

Let total distance = 40 km

	$x/2$	$x/4$	$20 \times 1/4$
	d_1	d_2	d_3
	20	10	10
s	30	10	40

$S = \frac{d}{t}$ = s_1 =

$t_1 = \frac{d}{s} = \frac{20}{30}$

4) If a Person travelled 3 equal distances with different speeds 20 kmph, 40 kmph & 80 km/h. Then avg speed of a Person during whole Journey is?

speeds 20 , 40 , 80

$x/3$ | $x/3$ | $x/3$

$$\text{Avg Speed} = \frac{3xyz}{xy+yz+zx} = \frac{3(20)(40)(80)}{800+3200+1600} = \frac{3(20)(40)(80)}{5600}$$

$$= \frac{240}{7} = \boxed{34.2\text{ km/h}}$$

3200
1600
800
5600

7) 160 (22
144
20
14
60

7) 240 (34.2
21
30
28
20

5, If a Person travelled with a speed of 20 km/h from his house to Office & return back in same route with a speed of 60 km/h. Then what is his avg speed during whole Journey is:

Sol: Avg speed $= \frac{2xy}{x+y} = \frac{2(20)(60)}{20+60} = \frac{2(20)(60)}{80} = \boxed{30\text{ km/h}}$

6, If a Person travelled 4 equal same dist with different speeds 10, 20, 30 & 40 km/h. Then wt is his avg speed during whole Journey is:

Sol
$$\frac{n}{\frac{1}{x_1}+\frac{1}{x_2}+\frac{1}{x_3}+\frac{1}{x_4}} = \frac{4}{\frac{1}{10}+\frac{1}{20}+\frac{1}{30}+\frac{1}{40}} = \frac{4}{\frac{24+12+8+6}{240}}$$

10 (10, 20, 30, 40
1, 2, 3, 4 240

$$= \frac{4\times 240}{50}$$

24
12
8
6
50

$$= \boxed{\frac{96}{5}\text{ km/h}}$$

01.08.2022 Monday

1)

90 km/h | 54 k/h

160 km | 160 km

$s = \frac{d}{t}$ $t = \frac{d}{s}$

Avg Speed = $\frac{\text{tot dist}}{\text{tot time}} = \frac{320}{\frac{160}{90} + \frac{160}{54}} = \frac{320}{\frac{480+800}{270}}$

$= \frac{320 \times 27}{128}$ $= \frac{320 \times 270}{1280}$

$= 2.5 \times 27 = \boxed{6.75 \text{ k/h}}$

(or)

$= \boxed{\frac{2xy}{x+y}}$

$3 | 54, 90$
$3 | 18, 30$
$2 | 6, 10$
$3, 5$

2)

train | bus | cycle

60 km/hr | 30 k/h | 10 k/h

(or) $\frac{4}{\frac{2}{60} + \frac{1}{30} + \frac{1}{10}}$

Avg Speed for 2nd half $= \frac{2xy}{x+y} \Rightarrow x = 30, y = 10$

$= \frac{2 \times 30 \times 10}{30 + 10} = \frac{2 \times 30 \times 10}{40} = \boxed{15 \text{ km/h}}$

Avg Speed for 1st half $= \frac{2xy}{x+y} = \frac{2 \times 60 \times 15}{60 + 15} = \frac{2 \times 60 \times 15}{75}$

$= \boxed{24 \text{ km/h}}$

3)

$S = 5$ km/h $= 5 \times \frac{5}{18} = \frac{25}{18}$ m/s

$t = 15$ m = bridge

$15 \times 60 = 900$ s

$s = \frac{d}{t} \Rightarrow d = s \times t$

$= \frac{25}{18} \times 900$

$\boxed{d = 1250 \text{ m}}$ → length of bridge

4)

Original time $= \frac{80}{x-4}$ (t_2) difference is 1 hour

$= \frac{80}{x}$ (t_1) Here Increased Speed = x km/h

↓ time

$\Rightarrow t_2 - t_1 = 1$

$\Rightarrow \frac{80}{x-4} - \frac{80}{x} = 1$

$\Rightarrow 80x - 80^{x} + 320 = x(x-4)$

$\cancel{80x} - \cancel{80x} + 320 = x^2 - 4x$

$x^2 - 4x - 320 = 0$

$x^2 - (-16+20)x + (-16 \times 20) = 0$

$x^2 + 16x - 20x + (-16 \times 20) = 0$

$x(x+16) - 20(x+16) = 0$

$(x+16)(x-20) = 0$ $\boxed{x = 20 \text{ km/h}}$

$-16 \quad +20$

---

5) Let time taken for they meet is 'x' hrs after 8 hrs

1 - 60
x - $60x$ kmph } 1st train

Second Train takes $(x-1)$ because 2nd train starts after 1 hour when 1st train starts.

And they covered total distance to cross each other so

$S_A t_A \quad S_B \times t_B = d$

$\Rightarrow 60x + 75(x-1) = 330$

$\Rightarrow 135x - 75 = 330$

$\Rightarrow 135x = 405 \Rightarrow x = \frac{405}{135} = 3 \text{ hrs}$

$\boxed{\text{Required Time} = 11 \text{ A.M}}$

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6) $d = s \times t$ m =

$d_1 = s_1 \times t_1$

$= 3 \times \frac{5}{18} \text{ m/s} \times 20 \times 60 \text{ sec}$

$= \frac{\cancel{15}^{5}}{\cancel{18}_{\cancel{6}\,3}} \times \cancel{1200}^{\cancel{400}\,200}$

$= 1000 \text{ m}$

$d_2 = 4 \times \frac{5}{18} \text{ m/s} \times 30 \times 60$

$= \frac{4 \times 5 \times \cancel{18} \times 100}{\cancel{18}}$

$= 2000 \text{ m}$

$= \boxed{10 \text{ Km}}$

(d)

Difference of Time $\Rightarrow \frac{x}{3} - \frac{x}{4} = \frac{20+30}{60}$

$\Rightarrow \frac{x}{3} - \frac{x}{4} = \frac{5\cancel{0}}{6\cancel{0}}$

$\Rightarrow \frac{4x - 3x}{\cancel{12}_{2}} = \frac{5}{\cancel{6}}$

$\Rightarrow \boxed{x = 10 \text{ km}}$

7) $l_1 = S_1 \times t_1$
$= 3 \times \frac{5}{18} \times 36$
$= \boxed{30\ m}$

$l_2 = S_2 \times t_2$
$= 6 \times \frac{5}{18} \times 30$
$= \boxed{50\ m}$

(8)

I: $\frac{x}{y + 3 \times \frac{5}{18}} = 36$

$\Rightarrow x = 36y + 30$

II: $\frac{x}{y + 6 \times \frac{5}{18}} = 30$

$x = 30y + 50$

III: $36y + 30 = 30y + 50$

$6y = 20$

$\boxed{y = \frac{20}{6}}$

$x = 30\left(\frac{20}{6}\right) + 50$

$\boxed{x = 150m}$

8) Relative Speed $= 5.5 - 5 = 0.5\ km/h$
same direction ($x-y$ relative speed)
Distance $= 8.5\ km$
$\Rightarrow T = \frac{D}{S} = \frac{8.5}{0.5} = \boxed{17\ hrs}$

9) Avg Speed $= \frac{2xy}{x+y} =$
Distance from village $\rightarrow$ Post office $=$ 'x' km
Total distance travelled '$2x$' km
Total time is $= 5$ hrs 48 min
$= 5 + \frac{48}{60}$ hrs $= 5 + \frac{48}{60} = \frac{29}{5}$ hrs

Avg Speed $= \frac{2x}{\frac{29}{5}} = \frac{10x}{29}$

$\frac{10x}{29} = \frac{2 \times 25 \times 4}{25 + 4}$ $\quad \frac{2xy}{x+y} \Rightarrow \begin{matrix} x = 25 \\ y = 4 \end{matrix}$

$\frac{10x}{\cancel{29}} = \frac{2 \times 25 \times 4}{\cancel{29}}$

$10x = 200$

$\boxed{x = 20\ km/h}$

12.09.2022 Monday

Race: A Race is a Contest of Speed in Running, driving, riding, Sailing, rowing etc, Over a particular distance

Race Course: Race Course is the Ground or path on which Contests are Conducted

Starting Point: Starting Point is the point, where the race Starts.

Winning Point (or) Goal: It is the point where race finishes or ends.

Dead-heat race: It is the race, If all the persons/participants Contesting the race reaches the winning point exactly at the Same time

Winner: The Person who reaches the Goal first

1, A Game Of 100 Points means that:
The Person who Scores 100 points first is The Winner

General Statements involved in Races & Games and their Mathematical Interpretation:

Let 'A' & 'B' be 2 participants in a race. Let examine Some of the General Statements & Their Mathematical Interpretations:

1, 'A' beats 'B' by 't' Seconds means that 'A' finishes the race 't' Seconds before 'B' finishes. If $t(A) = x$ sec then $t(B) = (x+t)$ sec

2, 'A' gives 'B' a Start Of 't' Seconds means that 'A' Starts the race 't' Seconds after 'B' from The Same Starting point then $t(A) = y - t$ sec

If $t(B) = y$ sec

3) 'A' Gives 'B' a Start of 'x' mts means that while 'A' Start from Starting point, 'B' Starts 'x' mts ahead from the Starting Point at the Same time (or)

To cover a race of 'y' mts, 'A' will have Cover 'y' mts, while 'B' will Cover only 'y-x' mts

4) 'A' beats 'B' by 'x' mts means that, when 'A' reach the Goal, 'B' is 'x' mts behind the Goal i.e. In a race of 'y' mts 'A' travels 'y' mts, In the Same tim 'B' travels only 'y-x' mts.

5) A Game of 100 points means that a Game in which the participant who Scores 100 pts win Game

i) In a game of 100, 'A' can give 'B', 'x' points means that while 'A' Scores 100 points, 'B' Scores only '100-x' pts to win Game

ii) In a Game of 100 points, 'A' beats 'B' by 'x' points mea that when 'A' Scores 100 points, in the same time 'B' Scores (100-x) points

iii) If 'A' is 'n' times as fast as 'B' and 'A' Gives B a Start of 'x' mts, then the length of race Course, So that 'A' and 'B' reaches the winning post at the Sametime is, $x\left(\frac{n}{n-1}\right)$ mts.

$D_1 = y$ | $D_2 = y-x$

$S_1 = nx$ | $S_2 = x$

then

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

$$\frac{y}{nx} = \frac{y-x}{x} \Rightarrow y = ny - nx$$

$$y - ny = -nx$$

$$y(1-n) = -nx$$

$$\boxed{y = \frac{nx}{n-1} \text{ mts}}$$

(v) If 'A' can run/cover 'x' mts race/distance in 't_1' sec & 'B' in 't_2' sec, where $t_1 < t_2$, then 'A' beats 'B' by a distance of $\boxed{\frac{x}{t_2}(t_2 - t_1)}$ mts.

$\boxed{D_1 = x}$ in t_1 | $\boxed{D_2 = x - y}$ in t_2 (A beats B by 'y' mts)

$S_1 = \frac{x}{t_1}$ | $S_2 = \frac{x-y}{t_2}$

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

$\frac{x}{\frac{x}{t_1}} = \frac{x-y}{\frac{x}{t_2}}$

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

$\Rightarrow \frac{x}{\frac{x}{t_1}} = \frac{x-y}{\frac{x}{t_2}}$

$\Rightarrow xt_1 = xt_2 - yt_2$

$yt_2 = x(t_2 - t_1)$

$\Rightarrow \frac{xt_1}{x} = \frac{(x-y)t_2}{x}$

$y = \frac{x}{t_2}(t_2 - t_1)$

VI)

1) 'A' runs $1\frac{2}{3}$ times as fast as B. If 'A' gives 'B' a start of 80m, how far must the winning post be so that 'A' & 'B' might reach at same time?

A) $n = 1\frac{2}{3} = \frac{5}{3}$ then $x = 80$ mts

Length of Race Course $= \left(\frac{n}{n-1}\right)x$

$= \frac{\left(\frac{5}{3}\right)}{\left(\frac{5-3}{3}\right)} 80$

$= \frac{5}{2} \times 80 = \boxed{200\text{ m}}$

2) 'A' is $2\frac{1}{3}$ times as fast as B. If A gives 'B' a start of 80m, how long should the race course be so that both of them reach at same time & Dead-heat race.

Sol:- $n = 2\frac{1}{3} = \frac{7}{3}$

$x = 80$

$= \left(\frac{n}{n-1}\right)x$

$= \frac{\frac{7}{3}}{\left(\frac{7-3}{3}\right)}(80) = \frac{7}{4} \times 80 = \boxed{140\text{m}}$

3) 'A' runs $1\frac{3}{8}$ times as fast as 'B'. If 'A' gives 'B' a start of 90m & they reach the goal at same time. The goal is at a distance of.

Sol $n = 1\frac{3}{8} = \frac{11}{8}$

$x = 90$

$\left(\frac{\frac{11}{8}}{\frac{11-8}{8}}\right) \times 90 = \frac{11}{3} \times 90 = \boxed{330\text{m}}$

4, 'A' can run 224 mts in 28 sec, & 'B' in (32) sec. By what distance 'A' beat 'B'?

Sol 'A' beats 'B' by $\frac{x}{t_2}(t_2-t_1)$ mts

$$\frac{224}{32}(32-28) = \frac{224}{32_{8}}\times 4 = \boxed{28\text{ mts}}$$

5, In 100 mts race, 'A' can give 'B' 10 mts & 'C' 28 mts. In the same race 'B' can give 'C':

Sol: ~~x=100mts~~

$A_1 = 100$ mts

$B_1 = 90$ mts

$C_1 = 72$ mts

In the same race:

$\boxed{\begin{array}{l} B_2 = 100\text{ mts} \\ C_2 = (100-x)\text{ mts} \end{array}}$ ← 'B' can give 'x' mts to C

then we know that

$$\Rightarrow \frac{C_1}{B_1} = \frac{C_2}{B_2}$$

$$\Rightarrow \frac{72}{9\cancel{0}} = \frac{100-x}{10\cancel{0}} \Rightarrow 9x = 900-720$$

$$\Rightarrow 720 = 900-9x \qquad x = \frac{180}{9}$$

$$\boxed{x = 20\text{ mts}}$$

26.09.2022 # SEQUENCE Monday

* A Sequence is a Series of Numbers or letters which maintain a common Characteristic property throughout the Series.
* Generally Sequences are also called as Progressions. They are of 3 types: 1, Arithmetic Progression [A.P]
  2, Geometric Progression [G.P]
  3, Harmonic Progression [H.P]

Arithmetic Progression [A.P]:

* The difference b/w any two Consecutive

* nth term of AP whose first term is 'a' & Common difference is 'd' then $\boxed{T_n = a+(n-1)d}$
* Sum of 'n' terms of AP is:

$$\boxed{S_n = \frac{n}{2}[2a+(n-1)d] = \frac{n}{2}[T_1+T_n]}$$

* $T_n - T_{n-1} = d$
* $T_n = S_n - S_{n-1}$
* AM. of a & b is $= \frac{a+b}{2}$
* To Insert 'n' Arithmetic Means b/w 'a' & 'b' take them as: $x_1, x_2, \dots, x_n$ where $\boxed{x_i = a+id}$. $i=1,2,3,\dots,n$
  & $\boxed{d = \frac{b-a}{n+1}}$
* $S_n = n * AM$
* The reciprocals of terms of AP are in H.P.
* To Consider 3 odd terms in AP, we have to take them as:
  $a-d, a, a+d$
* To Consider 4 terms in AP, we have to take them as:
  $a-3d, a-d, a+d, a+3d$

2) Geometric Progression [G.P]: The ratio of any two Successive terms is Same, then that Series is called Geometric Progression [G.P] and the ratio is called Common Ratio.

* The General terms of

* nth term of GP whose 1st term is 'a' & Common ratio 'r'

* is $T_n = ar^{n-1}$

* $\frac{T_n}{T_{n-1}} = r$ * Sum of 'n' terms of G.P $\boxed{S_n = \frac{a(r^n-1)}{r-1} \text{ if } (r>1)}$

$\boxed{\frac{a(1-r^n)}{1-r} \text{ if } (r<1)}$

* Sum of ∞ terms of G.P. $\boxed{S_\infty = \begin{cases} \infty & \text{If } r>1 \\ \frac{a}{1-r} & \text{If } r<1 \end{cases}}$

* GM of a & b is $\sqrt{ab}$

* GM of numbers which are in G.P = $\sqrt{T_1 * T_n}$

* The reciprocals of terms of GP are again in G.P.

* To Consider 3 terms in GP, we have to take them as

$\boxed{\frac{a}{r}, a, ar}$ r = Common Ratio.

* To Consider 4 terms in GP, we have to take them as:

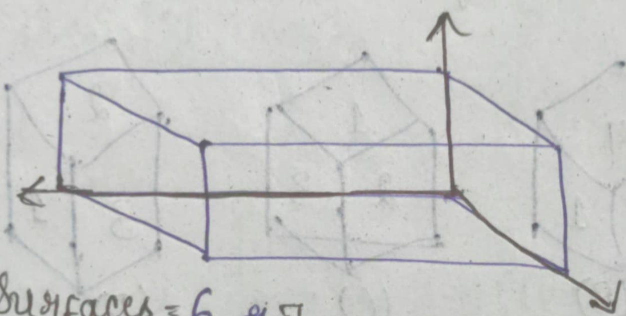
$\boxed{\frac{a}{r^3}, \frac{a}{r}, ar, ar^3}$ a = first term

r^2 = Common ratio.

Cube And Cuboid

* Volume = Base Area × Height
* Lateral Surface Area (LSA) or Curved Surface Area
  = Base Perimeter × Height
* Total Surface Area = LSA + 2(Base Area)

Cuboid.



Total Surfaces = 6 or Faces = 6 [Rectangles]

Vertices\Corners = 8

Edges = 12

* Volume = Base Area × Height = $(lb) \times h = \boxed{lbh}$ cubic units
* LSA (only sides) = Base Perimeter × height = $(2(l+b)) \times h = \boxed{2h(l+b)}$
* TSA = LSA + 2(Base Area)

$$= 2h(l+b) + 2(lb)$$

$$= 2lh + 2bh + 2lb = \boxed{2(lb+bh+hl)}$$

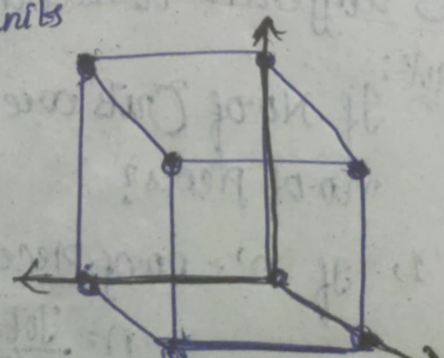
Cube: $l = b = h = s$

Volume = $\boxed{s^3}$ cu. units

LSA = $2s(s+s) = 2s(2s) = \boxed{4s^2}$ sq units

TSA = $2(s^2+s^2+s^2)$

$= \boxed{6s^2}$ sq. units



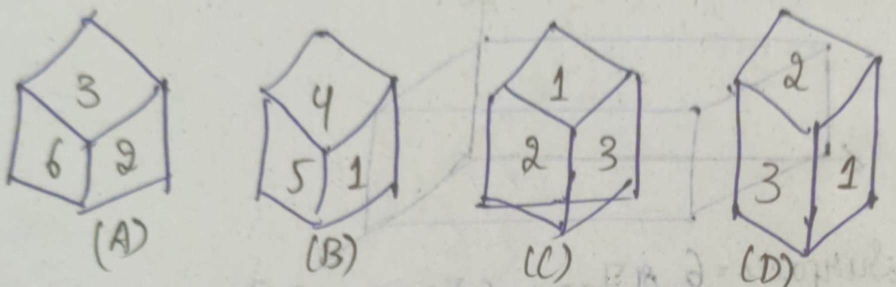
Euler's Formula

$\boxed{F+V=E+2}$

F = Surfaces
V = Vertices/Corners
E = Edges

$\boxed{F+V=E+2}$

1 ⇒ 2, 3, 4, 5 all are adjacent; so remaining is '6'. So it is Opposite Side of '1'.



If Top is '6' → then opp of '6' is 1

18.07.2022

Monday

* If you want the Max No. of Identical Pieces, then you should cut the Cube in all directions
* If you want the minimum no. of Identical Pieces, then you should cut the cube in same direction
* In Order to obtain Max no. of pieces, the Cuts Given to a large Cube must be divided as equally as possible in 3 different directions

Note:
If No. of Cuts are Given. Then How to find Max no. of pieces?

1) If 'n' = no. of pieces along each Edge.

$n = \frac{\text{Total cuts}}{(3)} + 1$ $\boxed{n = \frac{\text{Total cuts}}{3} + 1}$

→ Max no. of Identical Pieces: n^3

→ No. of Pieces with '3' faces Visible = 8

No.of Pieces with '2' faces Visible = $12(n-2)$

No.of Pieces with '1' face Visible = $6(n-2)^2$

No.of pieces with 'No' face Visible = $(n-2)^3$

25.07.2022 Monday

① Min Pieces = $n+1 = 5+1 = \boxed{6}$ n = no.of cuts

② Max Pieces = ~~$\frac{6}{3}+1 = \frac{5}{3}+1 = \frac{5+3}{3} = \frac{9}{3} = 3$ on each edge~~

~~$12 \times 3 = \boxed{36 \text{ Pieces}}$~~

6 → 2 2 2

$= (2+1)(2+1)(2+1)$

$= 3 \times 3 \times 3$

$= \boxed{27 \text{ Pieces}}$

③ 2, 3, 4

$(2+1)(3+1)(4+1) = 3 \times 4 \times 5$

$= \boxed{60}$

④ Min = 216 Pieces = $6 \times 6 \times 6 = (6-1)+(6-1)+(6-1)$

$= 5+5+5 = \boxed{15}$ → cuts   factorization

$\boxed{\cancel{\text{cuts} = 215}}$

⑤ Min = 24 Pieces = $24-1 = 23$

$\boxed{\text{Cuts} = 23}$

24 → 2, 3, 4

$2 \times 3 \times 4 = 24$

$(2+1)(3+1)(4+1) =$

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

⑥ Cuts = 10

Max Pieces = ~~$\frac{10}{3}+1$ on each edge~~

~~$= \frac{10+3}{3} = \frac{13}{3}$ 4 4~~

10 → 3 3 4 $= (3+1)(3+1)(4+1)$

$= 4 \times 4 \times 5$

$= 80$

Total Max Pieces = $\boxed{80}$

7)

~~$27^3 = 343$~~

~~$5^3 = 125$~~

~~128~~

$3 \times 3 \times 3 = 27$

↓ ↓ ↓

$(3+2)$ $(3+2)$ $(3+2)$

5 5 5 $= 5^3 = 125$

$= 125 - 27$

$= \boxed{98}$

125
27
98

5 5 5 − 125

3 3 3 = 27 125
27
152

(8). 5 5 5 = 125

$(5+1)(5+1)(5+1)$ 216 $= (5+1)^3 - (5)^3$

$= 216 - 125 = 91$.

Eg: A cube placed on Table, to cover cube how many small cubes are required?

(9) 125 → 5 5 5 $(n-2)^3 = (5-2)^3 = 3^3 = 27 \rightarrow \boxed{\text{No face}}$.

(10) ii, $6(n-2)^2 = 6(5-2)^2 = 6(3)^2 = 6\times9 = 54 \rightarrow \boxed{\text{One face}}$

(11) iii) $12(n-2) = 12(5-2) = 12\times3 = 36 \rightarrow \boxed{\text{Two faces exactly}}$

12) 216 → 6 6 6 $6\times6\times6 = 216$

$(6-2)(6-2)(6-2) = 4\times4\times4 = 64 \rightarrow$ Inside blue cubes.

13) $12(6-2) = 12(4) = 48$

14) n=4 (no need)

'3' faces Painted blue = 8 → direct formula

15) $125 = 5\times5\times5$ 3 faces visible when Painted white.

5 5 5 → 5 4 4 atleast (2) is 2 & 3

$= 5+4+4 = 13$.

$8+12(n-2)^2$

$8+12(5-2)^2$

$8+12(9)$

$8+108$

116

20.

16) No face Painted:

~~$(n-2)^3 = (5-2)^3 = (3)^3 = 27$.~~

$(5-1)(5-1)(5-1)$

$4\times4\times4 = 64$

17) $\overset{20}{216}$

6 6 6

Corners colors → YYY - 1 → 19th answer.

edges colors

faces colors

YY → 3

YG → 4

YB → 2

BG → 2

GG → 1

YYG - 2

YYB → 1

GGB → 1

$\boxed{YGB \to 2}$ → 2 cubes having all three colors.

GGY → 1

4+4=8

$8(n-2) = 8(6-2) = 8(4) = 32$

+5

37

20) $2+2 = 4\times2$

$= 8+1$

$= 9$

01.08.2022

Data Sufficiency

Monday

Format:

Directions for questions: Each Problem Consists of a Question and two Statements labelled I and II. Decide whether the data given in the Statements are Sufficient or not to answer the questions. Make an appropriate choice from (1) to (4) as follows:

1, If Statement-I is alone is Sufficient to answer the Question

2, If Statement-II alone is Sufficient to answer the question

3, If both statements I & II are required to answer the Question, but neither statement alone is Sufficient.

4, If statements I & II are not Sufficient to answer the Question and additional data are required to answer it.

(or)

Options	Statement-1	Statement-2
1	✓	X
2	X	✓
3	✓	✓
4	X	X