15/03/2023

TIME, SPEED & DISTANCE:

→ Speed = $\frac{\text{distance}}{\text{time}}$, time = $\frac{\text{distance}}{\text{speed}}$.

* kmph → m/s
$x \times \frac{5}{18} = y$

* m/s → kmph
$x \times \frac{18}{5} = y$

1) Express in m/s.

a) 45 kmph = $\frac{\cancel{45}^{5} \times 5}{\cancel{18}_{2}}$ = 12.5 m/s.

b) 63 kmph = $\frac{\cancel{63}^{7} \times \cancel{5}}{\cancel{18}_{2}}$ = 17.5 m/s.

c) 30 kmph = $\frac{\cancel{30}^{5} \times 5}{\cancel{18}_{3}} = \frac{25}{3} = 8.3$ m/s = $8\frac{1}{3}$

2) Express in kmph.

a) 7.5 m/s = $\frac{\cancel{15}^{3}}{\cancel{2}} \times \frac{\cancel{18}^{9}}{\cancel{5}}$ = 27 kmph

b) 20 m/s = $\frac{20 \times 18}{5}$ = 72 kmph

c) 17 m/s = $\frac{17 \times 18}{5}$ = $61\frac{1}{5}$ km/hr

5) 306 (61, 30, 6, 5, 1)

3) A person crosses a 600 m long street in 5 min. What is the speed in kmph.

Speed = $\frac{\overset{10}{\cancel{600}}}{5 \times \cancel{60}}$ = 2 m/s.

$2 \times \frac{18}{5} = \frac{36}{5} = 7\frac{1}{5}$ kmph

7 + 0.2

= 7.2 kmph

* 5 × any even number = $\frac{\text{even no.}}{2} \times 10$

5 × any odd number = $\frac{\text{odd no}}{2} \times 10$

* $\frac{\text{any no.}}{5}$ = any no × 2 = any no. 2

4) The person travelling from Hyd to Warangal at the speed of 25 km/hr reaches Warangal in 3 hrs. Find the time taken by another person travelling from Warangal to Hyd at a speed 20 km/hr.

d = 25 × 3 = 75 km.

time = $\frac{75}{20} = \frac{7.5}{2} = 3.75$ hrs.

= $3\frac{3}{4}$ hrs

5) If a person walks at 14 km/hr instead of 10 km/hr he would have travelled 20 kms more. What is the actual distance travelled by him?

$$\frac{x+20}{14} = \frac{x}{10}$$

$$10x + 200 = 14x$$

$$4x = 200$$

$$x = 50\text{km}$$

6) I walk from my house to my office at a speed of 3km/hr and arrive at the office 20 mins late. But when I walked at 4km/hr; I reached the office 15 mins early. Find the distance.

$$d_1 = d_2$$

$$s_1 \times t_1 = s_2 \times t_2$$

$$3 \times (t + 20) = 4 \times (t - 15)$$

$$3t + 60 = 4t - 60$$

$$120 = t$$

$$120\text{mins} = \frac{120}{60} = 2\text{hrs}$$

$$d_1 = 3 \times 2 = 6\text{km}$$

$\frac{20}{60}$

$\frac{20}{60} = \frac{1}{3}$

$\frac{15}{60} = \frac{1}{4}$

$$3 \times \left(t + \frac{1}{3}\right) = 4 \times \left(t + \frac{1}{4}\right)$$

$$3t + 1 = 4t + 1$$

$$t = 1\text{hr}$$

$$d = 5 \times 3 =$$

$$d_1 = d_2$$

$$s_1 \times t_1 = s_2 \times t_2$$

$$3 \times \left(t + \frac{1}{3}\right) = 4 \times \left(t + \frac{1}{4}\right)$$

$$3t + 1 = 4t + 1$$

$$t = 2\text{hrs}$$

$$t_1 = t_2$$

$$\frac{d_1}{s_1} = \frac{d_2}{s_2}$$

$$3 \times \left(2 + \frac{1}{3}\right)$$

$$3 \times \frac{7}{3} = 7\text{k}$$

$$\frac{d}{3} - \frac{20}{60} = \frac{d}{4} + \frac{15}{60}$$

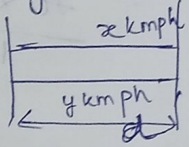
$$\frac{d}{3} - \frac{1}{3} = \frac{d}{4} + \frac{1}{4}$$

$$4(d-1) = 3(d+1)$$

$$4d - 4 = 3d + 3$$

$$d = 7\text{km}$$

⇒ A person travels from one place to another at 30kmph and returns at 120kmph. If the total time taken is 5 hrs then find the distance b/w them.



$$t_1 + t_2 = 5$$

$$\frac{d}{s_1} + \frac{d}{s_2} = 5$$

$$\frac{d}{30} + \frac{d}{120} = 5$$

$$\frac{4d + d}{120} = 5$$

$$d = 120\text{km}$$

$$d = \frac{xyT}{x+y}$$

$$= \frac{30 \times 120 \times 5}{150}$$

$$= 120\text{km}$$

12 noon
12 midnight

8) A person travels 30km at 40kmph. Another person travels 40km at 60kmph. Find their avg speed.

$t_1 = \frac{30}{40} = \frac{3}{4}$ hr

$t_2 = \frac{40}{60} = \frac{2}{3}$ hr.

$s_1 = 40$ km/hr
$s_2 = 60$ km/hr
$d_1 = 30$ km
$d_2 = 40$ km

$$\text{avg speed} = \frac{s_1 \times s_2 (d_1 + d_2)}{s_1 d_2 + s_2 d_1}$$

$$= \frac{2400(70)}{1600 + 1800} = \frac{2400(70)}{3400}$$

$$= \frac{70}{\frac{3}{4} + \frac{2}{3}}$$

$$= \frac{70 \times 12}{17} = \frac{840}{17} = 49\frac{7}{17} \text{ km/hr}$$

17) 840 (49
68
160
153
7

Sivani

9) If Rahul travels at a speed of 60kmph & returns back at 40kmph. What is avg speed?

$t_1 = \frac{d}{60}$

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

$\frac{2s_1s_2}{s_1+s_2}$

$$\text{avg} = \frac{d+d}{d\left(\frac{1}{60} + \frac{1}{40}\right)} = \frac{2 \times 60 \times 40}{100}$$

$= 48$ km/hr

10) If Vishal travels a speed of 40kmph and covers some distance in same time at a speed of 60kmph. What is his avg speed?

$t_1 = t_2 = t$

$\frac{s_1+s_2}{2}$

$$\text{avg speed} = \frac{d_1 + d_2}{t_1 + t_2}$$

$$= \frac{s_1 t + s_2 t}{2t}$$

$$= \frac{s_1 + s_2}{2} = 50 \text{kmph}$$

11) A bus covers a certain distance in 16hrs. It covers half the distance at 40kmph & the next half at 60kmph. Find the length of journey.

$t_1 + t_2 = 16$ hrs

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

$\frac{d}{2} \times (40 + 60) = 16$

$d = \frac{16 \times 2}{100} = \frac{32}{100}$

$\frac{d/2}{40}$

$\frac{d}{2}\left(\frac{60+40}{2400}\right) = 16$

$d = \frac{16 \times 4800}{100}$

$d = \frac{2S_1S_2T}{S_1+S_2}$

$= 256 \times 3 = 768$ km

12) A car left with 40 km/hr. After 5 hrs, another car started from same place at a speed of 60 kmph.

(1) Where do they meet?

$d = \frac{S_1S_2T}{S_2 - S_1}$

T = gap of time

$= \frac{40 \times 60 \times 5}{20} = 600$ km

$x \rightarrow 40$ km/hr

$t_1 = \frac{x}{40}$ $\quad t_2 = \frac{x}{60} = 5$

$x = 300$

$\frac{x}{60} = t_1 + 5$

$\frac{x}{60} - \frac{x}{40} = 5$

$x\left[\frac{40-60}{2400}\right] = 5$

$\frac{60-40}{2400} = \frac{20x}{2400} = 5$

$x = 120$

13) If the ratio of speeds of A & B is a:b; then the ratio of time taken is b:a.

29/03/2023

* CRITICAL REASONING:

1) 120 students appeared
   - 90 passed = History A
   - 65 passed = Sociology B
   - 75 passed = C

30 → only one sub

55 → 2 sub

5 → no sub

$S(A) = 90$ $\quad S(B) = 65$ $\quad S(C) = 75$

$S(A \cup B \cup C) = 30$

$S(A \cup B) + S(B \cup C) + S(C \cup A) = 55$

$S(\bar{A} \cap \bar{B} \cap \bar{C}) = 5$

$S(A \cap B \cap C) = ?$

$S(\overline{A \cup B \cup C}) =$

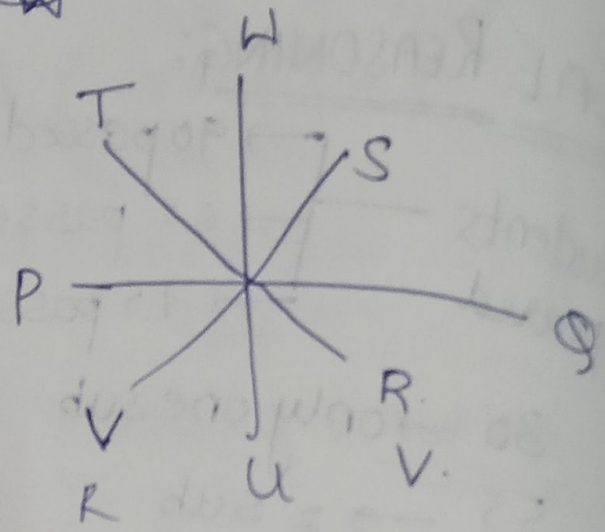
5 didn't pass

$115 = 55 + 30 + x$

$x = 30$

2)

P Q R S T U V W



3) · 150 candidates

70 → Vehicles

50 → own home.

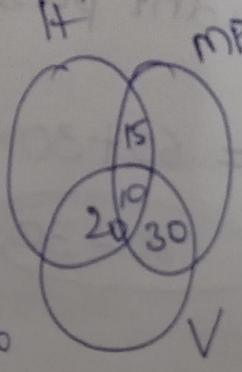
60 → mobile phone.

15 → home + mp

30 → V + mp

40 → V + h

mp + home + V = 10



150 − x

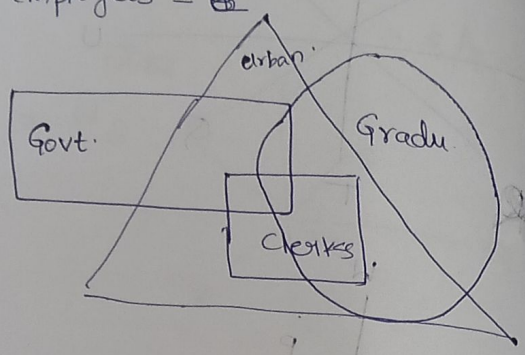
= 180 − 65 + 10

150 − x = 190 − 65

x = 215 − 190

x = 25

5) gov. employees = ⊕



→ Some gov. employees are graduates.

6) M + S = Dr + CS.

A + M = CS + P

A + P + N = P + H

N + A = P + M

P + S = H + Dr

Dr	CS	P	H	M
M	M	M	A	N
S	S	A	P	A
P	A	P	N	
		N	S	

Dr, CS, H → Shobha

Dr, CS, P → Madhu.

CS, P, H, M → Anjali.

P, H, M, not CS → Nisha

	Day	Car
A	T	E
B	F	F
C	W	Swift
D	Sat	Op
E	Sun	B
F	Th	SX4
G	S	A

Swift ✓
Alto —
Figo —
Beat —
SX4 ✓
Estillo —
Optra

F F —

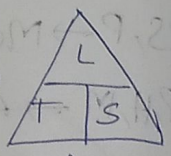
T E —

S

	Day	car
A	Tue	E
B	~~W~~	F
C	W	Swift
D	Sat	Op
E	Sun	B
F	Th	SX4
G	M	A

* 19/04/2023

1) Train crosses a pole / person / Stationary object



$$\text{time} = \frac{L_T}{S_T}$$

2) Train crosses bridge / tunnel / platform:

$$\text{time} = \frac{L_T + L_{obj}}{S_T}$$

3) Train crossing a moving person:

$$\text{time} = \frac{L_T}{\text{Relative Speed}}$$

Same direction $= \frac{L_T}{(S_T - S_p)}$

different direction: $\frac{L_T}{S_T + S_p}$

4) Train crossing a moving train:

$$\text{time} = \frac{L_1 + L_2}{R.S.}$$

Same direction $= \frac{L_1 + L_2}{|S_1 - S_2|}$

different direction $= \frac{L_1 + L_2}{S_1 + S_2}$

* Boats & streams:

Boat Speed = u kmph / person

Stream speed = v kmph / rate of flow / flow of stream.

Still water : v = 0

* Boats

Down Stream Speed = (u+v) kmph.

Up Stream Speed = (u-v) kmph.

Boats

1) u = 18 kmph v = 3 kmph.

downstream = u+v = 21 kmph.

2) u+v = 50 kmph
   u-v = 30 kmph

   2u = 80 kmph

u = 40 kmph v = 10 kmph.

3) u = 15 km/hr v = ?

$d_d = 30\text{km} = d_u$ $t = t_d + t_u = 4.3$ hrs.

$$t = \frac{d_d}{u+v} + \frac{d_u}{u-v} = 4.5$$

$$= 30\left[\frac{u-v+u+v}{u^2-v^2}\right] = 4.5$$

$\frac{24}{4^2-v^2} = \frac{4.5}{30}$

$\frac{2\times15}{(15)^2-v^2} = \frac{4.5}{30}$

$\frac{900}{4.5} = 225 - v^2$

$v^2 = 25$

$v = 5$ kmph

* Trains

1) $S_T = 132$ km/hr $L_T = 110$m

$L_p = 165$m

$S_T = 132 \times \frac{5}{18} = \frac{110}{3}$

$t = \left(\frac{165+110}{110}\right) \times 3$

$= 7.5$ sec

2) $60 \times \frac{5}{18} = \frac{50}{3} = S_T$

$t = \frac{L_T}{50} \times 3$ $\quad L_T = \frac{9 \times 50}{3} = 150$m

3) $\frac{L_T}{S_T} = 10$ $\quad \frac{L_T + 161}{S_T} = 33$

$S_T = \frac{L_T}{10}$ $\quad L_T + 161 = \frac{33 L_T}{10}$

$161 = \frac{23 L_T}{10}$

$L_T = 70$m

4) $L_1 = 250$m $\quad L_2 = 350$m

$S_1 = 30$ kmph $\quad S_2 = 36$ kmph

$t = \frac{L_1 + L_2}{|S_1 - S_2|} = \frac{600}{6} \times 3 = 360$ sec

$\frac{360}{60} = 6$ min

$|S_1 - S_2| = 6$ kmph

$= 6 \times \frac{5}{18}$ m/s

* Fiat C Fa B — — —

F. C - F A M B.

F Merc C Far B M A

C Far Fargo.

Fiat . A

Fiat . . 1 Far.

A Mar B.

10/05/2023

* LOGICAL DEDUCTIONS: / SYLLOGISMS /

STATEMENTS & CONCLUSIONS:

1000

Types of Statements / Conclusions:

Type 1: All A are B

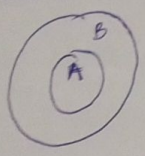
2: Some A are B

3: No A are B

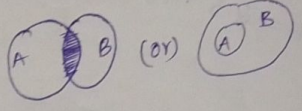
4: Some A are not B

* Diagrammatic representation:

*→ All A are B

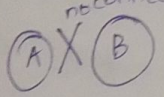


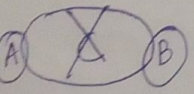
*→ Some A are B



Direct intersection

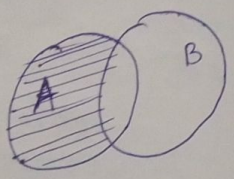
*→ No A are B (no connection)

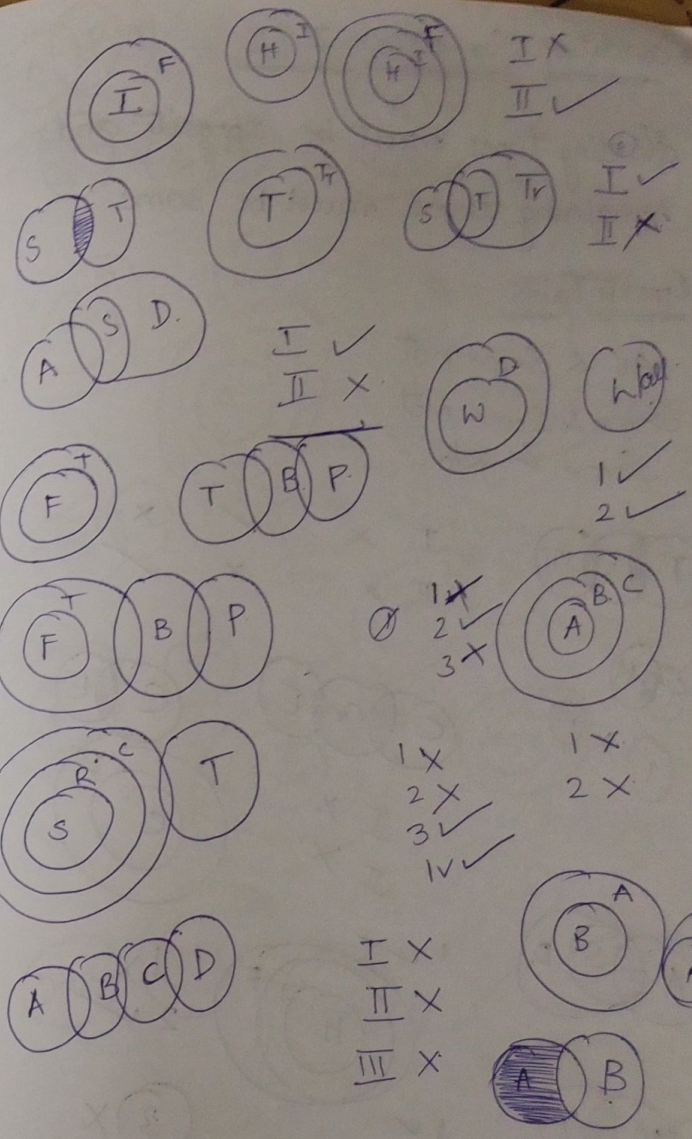




↓ no mediator also

*→ Some A are not B



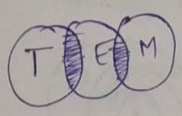


* Condition for either I / II

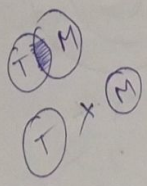
Starting types must be opposite and remaining terms must be same

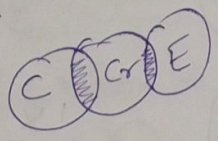
Opposite Pairs

All & Some not
Some & Some Not
Some & No.

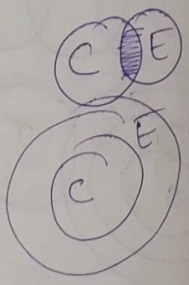


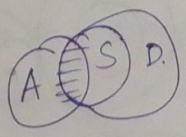
I ✓ ✗
II ✗ ✓



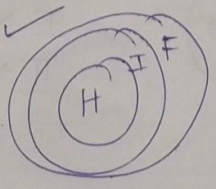


I ✗
II ✗





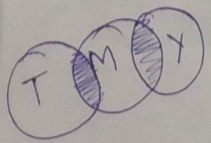
1 ✓

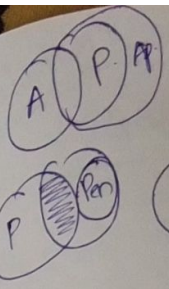


1 ✓

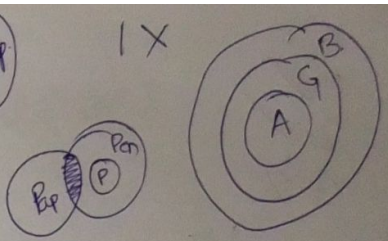
1 ✗
2 ✓

3 ✗

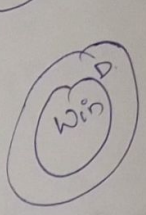


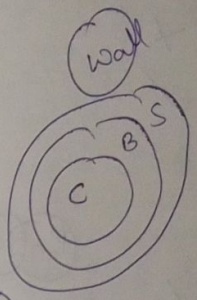


1 ✗



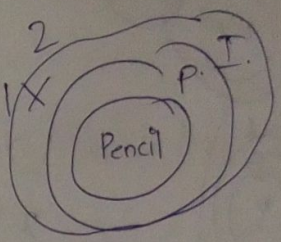
1 ✓
2



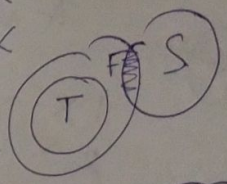


1 ✗
2
1 ✗

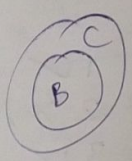
I ✓



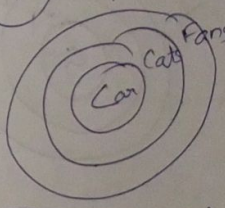
I ✗
2 ✗

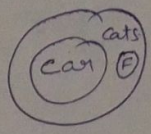


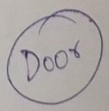
1 ✗



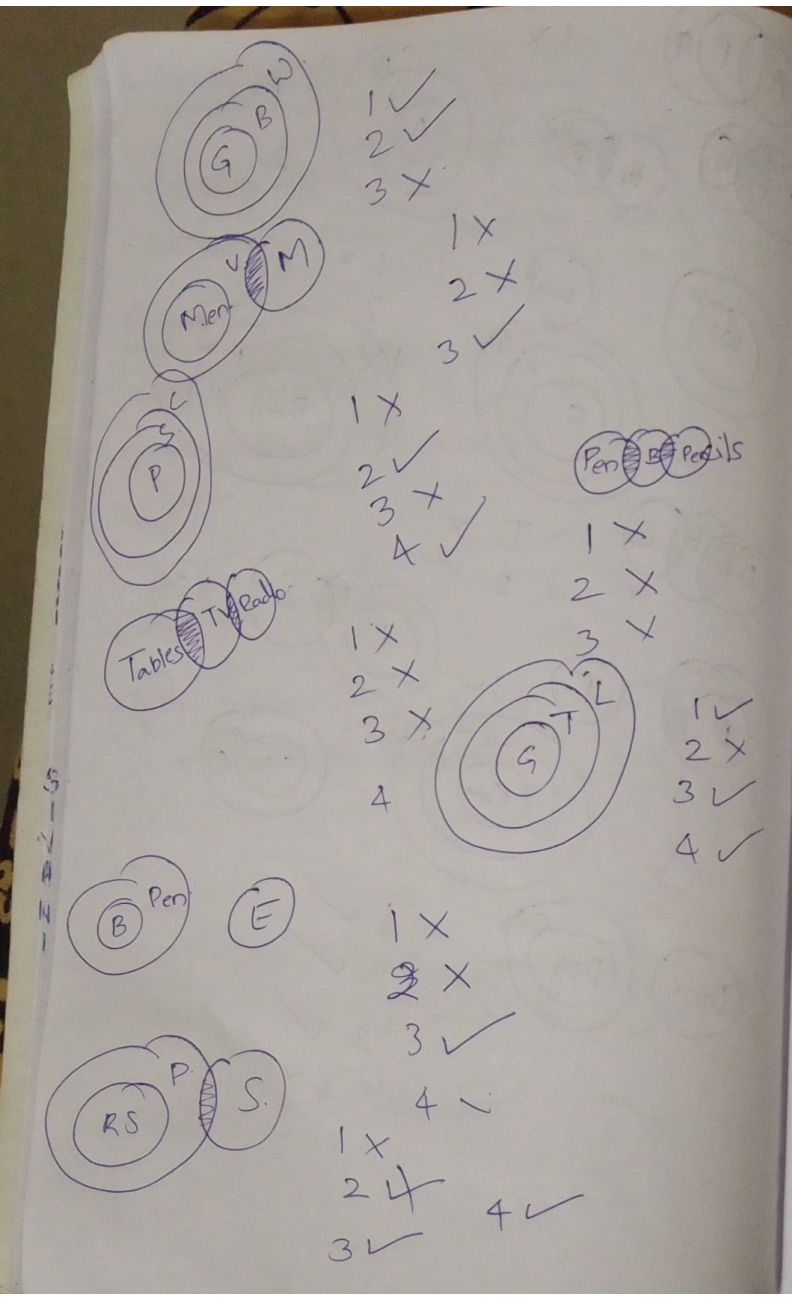
1 ✓







1 ✓
2 ✓
3 ✓
4 ✗



24/05/2023

LOGARITHMS

$\log_a 1 = 0$

$\log_a a = 1$

$\log_a 0 = \begin{cases} -\infty & a > 1 \\ +\infty & a < 1 \end{cases}$

$\log_a \frac{x}{y} = \log_a x - \log_a y$

$\log_a (xy) = \log_a x + \log_a y$

$\log_a (x^n) = n \log_a x$

$a^{\log_a x} = x$

$\log_a \sqrt{x} = \frac{1}{n} \log_a x$

$\log_a c = \frac{1}{\log_c a}$

$\log_a x = \frac{\log_c x}{\log_c a}$

$\log_{a^m} a^n = \frac{n}{m}$

$\boxed{\log_a x = m \Rightarrow x = a^m}$

1) $\log_3 a = 4 \quad 3^4 = a = 81$

2) $\log 5 \times 6 - \log 3 = \log \frac{30}{3} = \underline{1}$

3) $a = 5^3 = 125$

4) $\frac{3}{2} - \frac{2}{3} = \frac{9-4}{6} = \frac{5}{6}$

5) $x - 2 = \frac{x}{2} \qquad 2x - 4 = x \qquad x = 4$

$\log_{10}^{2} = 0.3010$

6) No. of digits 2^{64}

$\log 5 = \log(4+1)$

$\log 15 = \log \frac{30}{2}$

$= \log(3\times10) - \log 2$

$= \log 3 + 1 - \log 2$

$1 = \log_{10}^{10} = \log_{10}^{5} + \log_{10}^{2}$

$1 - \log_{10}^{2} = \log_{10}^{5}$

$\log 3 + \log 5 =$

1.0000
0.3010
0.6990

$\log 2^{64} = 64 \log_{10}^{2} = 64 \times 0.301$

$= 19.264$

↓

20 digits

no. of digits = Integral + 1

$\frac{1}{3}\log_{10}^{5^3} - 2\log_{10}^{2^2} + \log_{10}^{2^5} + \log_{10}^{1} =$

$\log_{10}^{5} - 4\log_{10}^{2} + 5\log_{10}^{2} + 0$

$\log_{10}^{5} + \log_{10}^{2} + 0 = 1$

$\log_{6^{1/2}}^{1296} = \log_{6^{1/2}}^{6^4} = \frac{4}{1} \times 2 = 8$

$\log_{3^2}^{3^3} - \log_{3^3}^{3^2} = \frac{3}{2} - \frac{2}{3} = \frac{5}{6}$

$\log_{10}^{3x+1} = 2$

$3x + 1 = 16^2$

$3x + 1 = 256$

$3x = 255$

$x = 85$

$\log_{\frac{1}{3}}^{9\cdot\sqrt{3}} = \log_{3^{-1}}^{3^{2+\frac{1}{2}}} = \frac{2+\frac{1}{2}}{-1} = \frac{-5}{2}$

$\log_{2}^{2^9} = 9$

$a = b^x;\ b = c^y;\ c = a^z$

$xyz = ?$

$7^{\log_7^8} = 8$

$\log_4 \frac{x}{5} = \log_4^{60} \Rightarrow \frac{x}{5} = 60$

$x = 300.$

$\frac{\log a + \log c}{2} = \log b$

$\log ac = b^2$

$b^2 = ac$

* MENSURATION

→ Square: $A = a^2 = \frac{d^2}{2}$ diagonal $d = \sqrt{2}a$

$P = 4a$

→ Rectangle: $A = l \times b$ $d^2 = l^2 + b^2$

$P = 2(l+b)$

→ Scalene Δ^{le} =

$A = \sqrt{S*(s-a)*(s-b)*(s-c)}$

$S = \frac{a+b+c}{2}$ $P = a+b+c$

→ Equilateral Δ^{le}:

Area $= \frac{\sqrt{3}}{4}a^2$ $P = 3*a$

$h = \frac{\sqrt{3}}{2}a$

→ Isosceles Δ^{le}:

$A = \frac{b}{4}\sqrt{4a^2 - b^2}$ a = equal side, b = base.

$P = 2a + b$

→ Right angle Δ^{le}:

$A = \frac{1}{2}bh$ $Hyp = \sqrt{b^2 + h^2}$

$P = b + h +$ hypotenuse

→ Circle: $A = \pi r^2$ $P = 2\pi r$

→ Semi-Circle: $A = \pi r^2/2$ $P = 2\pi r + 2r$

→ Sector $A = \frac{\theta}{360}\pi r^2$ length $= \left(\frac{\theta}{360}\right)2\pi r$.

$P = 2r +$ length

→ Parallelogram: $A = b \times h$

→ Rhombus: $A = \frac{1}{2} \times d_1 \times d_2$ $d_1, d_2 \rightarrow$ diagonals

$P = 4a$ $a \rightarrow$ side.

→ Trapezium: $A = \frac{1}{2}$ (sum of ||el sides) * height

→ Cube: Vol $= (\text{side})^3$ diagonal $= \sqrt{3}$ side

Surface area $= 6(\text{side})^2$

→ Cuboid: Vol $= l \times b \times h$ diagonal $= \sqrt{l^2 + b^2 + h^2}$

Surface area $= 2(lb + bh + hl)$

* What is the longest pole that can be put into a cube or cuboid? → diagonal.

→ Cylinder: $V = \pi r^2 h$

Curved SA $= 2\pi rh$

Total Surface area $= 2\pi rh(r+h)$

Cone: $V = \frac{1}{3}\pi r^2 h$

$CSA = \pi r l$

$TSA = \pi r l (r + l)$

$l = \sqrt{h^2 + r^2}$

Sphere: $V = \frac{4}{3}\pi r^3$

$S.A = 4\pi r^2$

Prism $V =$

$l = 5 + b \qquad a = 750$

$a = lb$

$750 = b(b+5)$

$= b^2 + 5b - 750$

$= b^2 + 30b - 25b - 750$

$b(b+30) - 25(b+30)$

$l = 30; \quad b = 25$

$b = 25$

750 = 75 × 10, 15 × 5 × 2

$* \sqrt{2}a = 6 \qquad A = ?$

$A = a^2 = \left(\frac{6}{\sqrt{2}}\right)^2 = \frac{36}{2} = 18$ sq. inches

$* S = \frac{a+b+c}{2} = \frac{6+8+12}{2} = 13$

$A = \sqrt{13 \times 7 \times 5 \times 1} = \sqrt{13 \times 35} = \sqrt{455}$

$= 21.33 \text{ cm}^2$

$\frac{\sqrt{3}}{4}(12)^2 = \frac{\sqrt{3}}{4} \times 144 = 36\sqrt{3} \text{ cm}^2$

$\frac{\sqrt{3}}{2} \times 12 = 6\sqrt{3}$ cm

$2(l+b) = 14 \qquad d^2 = l^2 + b^2 = 25$

$l + b = 7$

$l = 7 - b$

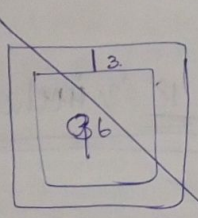
$(7-b)^2 + b^2 = 25$

$49 + b^2 - 14b + b^2 = 25$

$(l+b)^2 - 2lb = 25$

$\frac{49-25}{2} = lb$

$\frac{24}{2} = 12$ sq. units

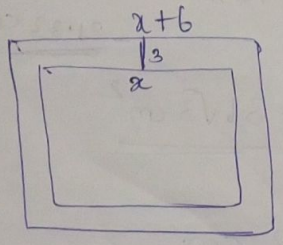
* 

$A = 96$

$a^2 = 96$

$a = \sqrt{16 \times 6} = 4\sqrt{6}$

$(4\sqrt{6} + 6)^2 =$

* 

Outer − Inner = 96

$(x+6)^2 - x^2 = 96$

$x^2 + 36 + 12x - x^2 = 96$

$12x = 60$

$x = 5$

area of room = 121

* area of 4 walls = 77 m²

$l = 7.5$ m $b = 3.5$ m

Area of 4 walls $= 2(l+b)h$

$2(11) \times h = 77$

$h = 3.5$ m

sector $= \frac{\theta}{360} \pi r^2$ $r = 14$

$= \frac{90}{360} \times \pi \times (14)^2$

$= \frac{1}{4} \times \frac{22}{7} \times 14 \times 14$

$= 154$

$\rightarrow 2\pi r = 2(l+b)$

$\pi r = 44$

$r = \frac{44}{\pi}$

$a = \pi r^2$

$= \pi \times (44)^2 \times \frac{1}{\pi} \times \frac{1}{\pi}$

$= \frac{44 \times 44}{7} \times 7$

616

44 × 14 = 176, 44 = 616

$= 63\times63 - 4\times\frac{\pi}{4}\times\left(\frac{63}{2}\right)^2$

$= (63)^2\left[1-\frac{\pi}{4}\right] = \frac{63\times63\times3}{4}$

$= (63)^2\left[1-\frac{22}{7\times4}\right]$

$= \frac{63\times63\times6}{28} = \frac{63\times27}{2}$

$\frac{\frac{1}{3}\pi r_1^2 h_1}{\pi r_2^2 h_2} = \frac{7\times9\times9\times3}{2}$

$= \frac{21\times81}{2} = 850.5$

$\frac{1}{16}\times2 = \frac{1}{8}$

$= \frac{8\times7\times6}{8\times7\times6\times10^{-6}} = 10^6 = 1000000$

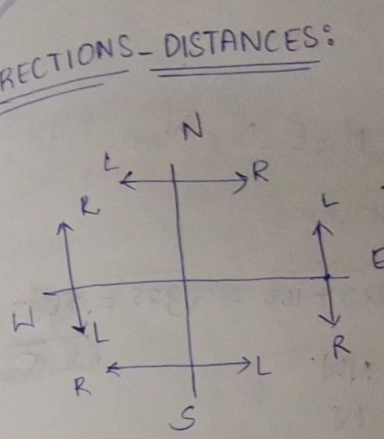
1 hectare = $10000\ m^2$

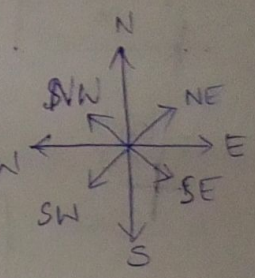
$\frac{2\times10000\ m^2}{5\times10^{-2}\ m} = \text{Vol} = 2\times10000 m^2 \times 5\times10^{-2}$

$= 10\times100\ m^3 = 1000 m^3$

30/05/202

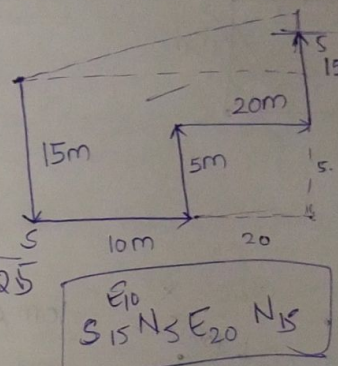
* DIRECTIONS - DISTANCES:





Right → clockwise

Left → anticlockwise



$25 + 900$

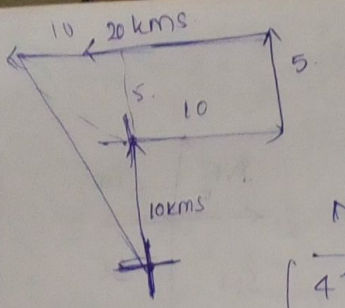
925

E_{10} S_{15} N_5 E_{20} N_{15}

Sunrise: Shadow in west

Sunset: Shadow in east

Direction	Morning	Evening
E	Back	Front
W	Front	Back
N	left	Right
S	Right	Left



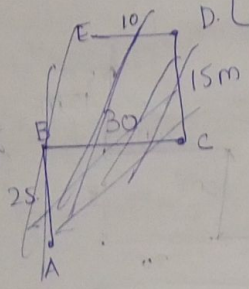
$N_{10} E_{10} N_5 W_{20} W_{10}$.

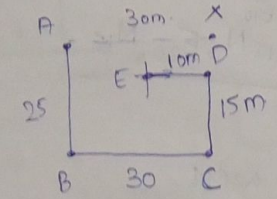
45kms

$\sqrt{225+100} = \sqrt{325} =$

NW

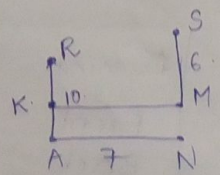
W



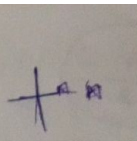


10m ~~North~~ South

NW

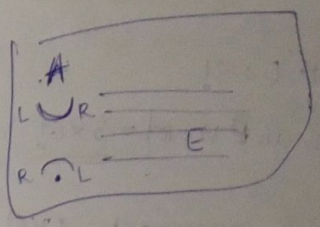


11 m



$\frac{n!}{(n-r)!} = \frac{n!}{n_1(n-r)!}$

→ Bharath and Anupama are in the park in the evng sitting back to back each other Bharath observed that her shadow is on his left side



* PERMUTATIONS & COMBINATIONS: **

↓ selection & arrangement

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

↓ only selections

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

720 x 7 = 504

$6! = 720$

$7! = 5040$

$8! = 40320$

$9! = 362880$

$10! = 3628800$

$10P_3 = 10 \times 9 \times 8$

$10P_9 = 10P_{10} = 10!$

$15C_4 = {}^{15}P_{11}$

$nC_r = nC_{n-r}$

$\frac{15!}{3!.12!} = \frac{15 \times 14 \times 13}{6}$

$\frac{15!}{9!.6!}$

$\frac{15 \times 14 \times 13 \times 12 \times 11 \times 10}{9!}$

$nC_r = nC_{n-r}$ if $r > \frac{n}{2}$

* In how many ways the letters of the word LEADING be arranged? $= 7!$

→ start with D : $6!$

→ start with vowel $= 3 \times 6!$

→ End with consonant $= 4 \times 6!$

→ Start with consonant & end with vowel.

$= 4 \times 5! \times 3 = 12 \times 5!$

→ N, D → together : $6! \times 2$

ND

ND — — — — —

$2!$ $6!$

1 2 3 4 5 6 7

$4 \times 3! \times 4! \quad 4! \times 4!$

$4P_3 \times 4! = 4C_3\, 3!\, 4!$

→ N, G → never together $= 7! - 2!\,6!$

$= 6!(7-2) = 6!(5)$

$= 5!\,6P_2$

→ No 2 vowels together $= 4! \cdot 5P_3$

| L | D | N | G |

$= 4! \times 5 \times 4 \times 3$

$= 24 \times 60$

$7! - 5! \times 3! - 6! \times 2!$

→ In how many ways the letters of the word MATHEMATICS be arranged?

M A T H E M A T I C S

1 2 3 1 2 3

$= \frac{11!}{2!\,2!\,2!}$

14/06/2023

→ 18 ⟹ 10 to 98

$\frac{110}{5} = 22$ (175)

$\frac{985}{5} = 197$

197
22
200
-21-3 175
200
24
176

~~5 3 400 to 1000~~

$= 6 \times 5 \times 4$
$= 120$

6 5 4

$= 6 \times 6 \times 6 = 216$

* 3 7 7 = ~~49 x 3 = 7~~

2
49 x3
147

* 400 to 1000

3 6 5 = 90

4 _ _ = 30
5 _ _ = 30
6 _ _ = 30
} = 90

3 7 7 → 147 + 1
= 148

1 _ _ _ = 120
6 5 4

2 _ _ _ = 120

3 _ _ _ = 60
3 5 4

30 _ _ = 20
31 _ _ = 20
32 _ _ = 20
33 _ _ _ = 20

5 _ 2 = 25
_ _ 4 = 25
_ _ 6 = 25
_ _ 0 = 30

1 _ _ _ = 120 + 120 + 120 + 120 = 480
6 5 4

2 3 _ _ = 20
5 4

2 _ _ _ = 60
3 5 4
} 560

3 _ _ _ = 480
4 6 5 4

* 5 subjects & 6 periods

AABCDE = $\frac{6!}{2!} = 360$

B/C/D/E = 360 x 5 = 1800

7)

(1) _ _ _ _ _ _ _ _ _ _ $= 8! \times 9P_2$

$= 8! \times \frac{9!}{7!}$

$= 8! \times 9P_2$

2) $21! - 2! \times 20!$

3) (i) $8! \times 5!$

(ii) $7! \times 8P_5$

(iii) $12! - 8!5!$

8) (1) $6! \times 5!$

(2) $5! \, 6P_5$

(3) $5! \, 6P_5$

(4) $= 5! \times 6P_4$

* NOTE:

→ Never together = Total − together

→ atleast one = Total − none

* CIRCULAR PERMUTATIONS:

→ If we arrange the objects in only one direction $= (n-1)!$

Ex: Round-table conference.

→ If we arrange the objects in both directions $= \frac{(n-1)!}{2}$

Ex: Preparing a garland (or) necklace.

→ Collinear points: They lie on the same line

→ Non-Collinear: They can be anywhere in the plane.

* 12 points; 4 collinear points (8)

lt. lines $= {}^4C_2 * {}^8C_2 \mid {}^4C_1 \times {}^8C_1$

$= \frac{4!}{2!2!} + \frac{8!}{2!6!} = \frac{4 \times 3}{2} + \frac{8 \times 7}{2}$

$= 6 + 28 = 34$

${}^8C_1 \times {}^4C_2 \mid {}^4C_1 \times {}^8C_2$

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

21/06/2023

* PROBABILITY

$$P(E) = n(E)/n(S)$$

*→ COINS:

1 coin ⇒ 2 chances (H/T)

2 coins ⇒ 4 chances (TT/HH/HT/TH)

3 coins ⇒ 8 chances

n coins ⇒ 2^n chances

①

(i) $\frac{1}{4}$ (ii) $\frac{1}{4}$ (iii) $\frac{1}{2}$ (iv) $\frac{1}{2}$

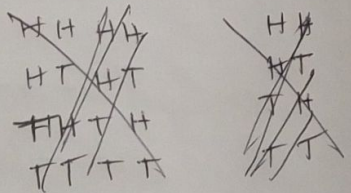
② TTT THT HTT HHT
HHH TTH HTH THH

(i) $\frac{1}{8}$ (ii) $\frac{1}{8}$ (iii) $\frac{1}{4}$ (iv) 0

(v) $\frac{7}{8}$ (vi) $\frac{4}{8} = \frac{1}{2}$

③ $\frac{4}{2^4} = \frac{4}{16} = \frac{1}{4}$

③ $\frac{{}^4C_2}{2^4} = \frac{\frac{4\times3}{2}}{2^4}$



$= \frac{6}{2^4} = \frac{6}{16} = \frac{3}{8}$

→ no. of coins(n) > 3

⇒ use nCr formula

*Events

$(A \cap B) = A \times B$

→ Independent (non-mutually exclusive)

→ Dependent (mutual exclusive) → $P(A \cap B) = 0$

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

→ $= \frac{1}{2} + \frac{1}{3} - \frac{1}{6}$

$= \frac{5}{6} - \frac{1}{6} = \frac{2}{3}$

→ $P(A \cup B) = \frac{5}{6}$

*→ Dices:

1 dice = 6 chances

2 dice = 36 chances

n dice = 6^n chances

① (i) $\frac{3}{6} = \frac{1}{2}$ (ii) $\frac{1}{2}$ (iii) $\frac{3}{6} = \frac{1}{2}$

2 4 6
2 3 5

(iv) $P(A \cup B) = \frac{1}{2} + \frac{1}{2} - \frac{1}{6} = \frac{5}{6}$

→ 2 dice

(11)(12)(13)(14)(15)(16)
(21)(22)(23)(24)(25)(26)
(31)(32)(33)(34)(35)(36)
(41)(42)(43)(44)(45)(46)
(51)(52)(53)(54)(55)(56)
(61)(62)(63)(64)(65)(66)

(1,4)
(4,1)
(2,3)
(3,2)

8
5 3
5 3
6 2
2 6
4,4

61

(i) $\frac{4}{36}$ (ii) $\frac{18}{36}$ (iii) $\frac{18}{36}$

(iv) $\frac{15}{36}$

Sum	RC
2	1
3	2
4	3
5	4
6	5
7	6
8	5
9	4
10	3
11	2
12	1

diff	RC
0	6
1	10
2	8
3	6
4	4
5	2

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

(vi) $\frac{1}{2}$, (vii) $\frac{1}{2}$

(v) $\frac{2}{36} = \frac{1}{18}$ (1,6)(6,1)

(viii) $\frac{16}{36}$

$= \frac{27}{36}$

$= \frac{9}{36}$

(ix) $N_1 \times N_2 = E$

E × E = E (9)
E × O = E (9)
O × E = E (9)
O × O = O (9)

52 cards

Spade	Diamond	Club	Heart
(13)	(13)	(13)	(13)
B	R	B	R

→ 16 face cards (4A, 4Q, 4K, 4J) (Honors) → 13

A 2 ---- 10 J Q K

4 suits ; 16 face cards 36 numbered cards

(i) $\frac{13}{52} = \frac{1}{4}$ (ii) $\frac{{}^{4}C_1 \cdot {}^{}C_1}{52} = \frac{9}{52}$

(iii) $\frac{{}^{13}C_2}{{}^{52}C_2}$

(iv) $\frac{{}^{26}C_1}{{}^{52}C_1} + \frac{{}^{4}C_1}{{}^{52}C_1} - \frac{{}^{2}C_1}{{}^{52}C_1}$

$= \frac{1}{2} + \frac{1}{13} - \frac{1}{26}$

(v) $\frac{{}^{13}C_1}{{}^{52}C_1} + \frac{{}^{13}C_1}{{}^{52}C_1} - 0 = \frac{15}{26} - \frac{1}{26} = \frac{14}{26} = \frac{7}{13}$

$= \frac{1}{4} + \frac{1}{4} = \frac{1}{2}$