GATE

ALL BRANCHES

GENERAL APTITUDE

Quantitative Aptitude

Lecture No: 10

By-Amulya Ratan Sir

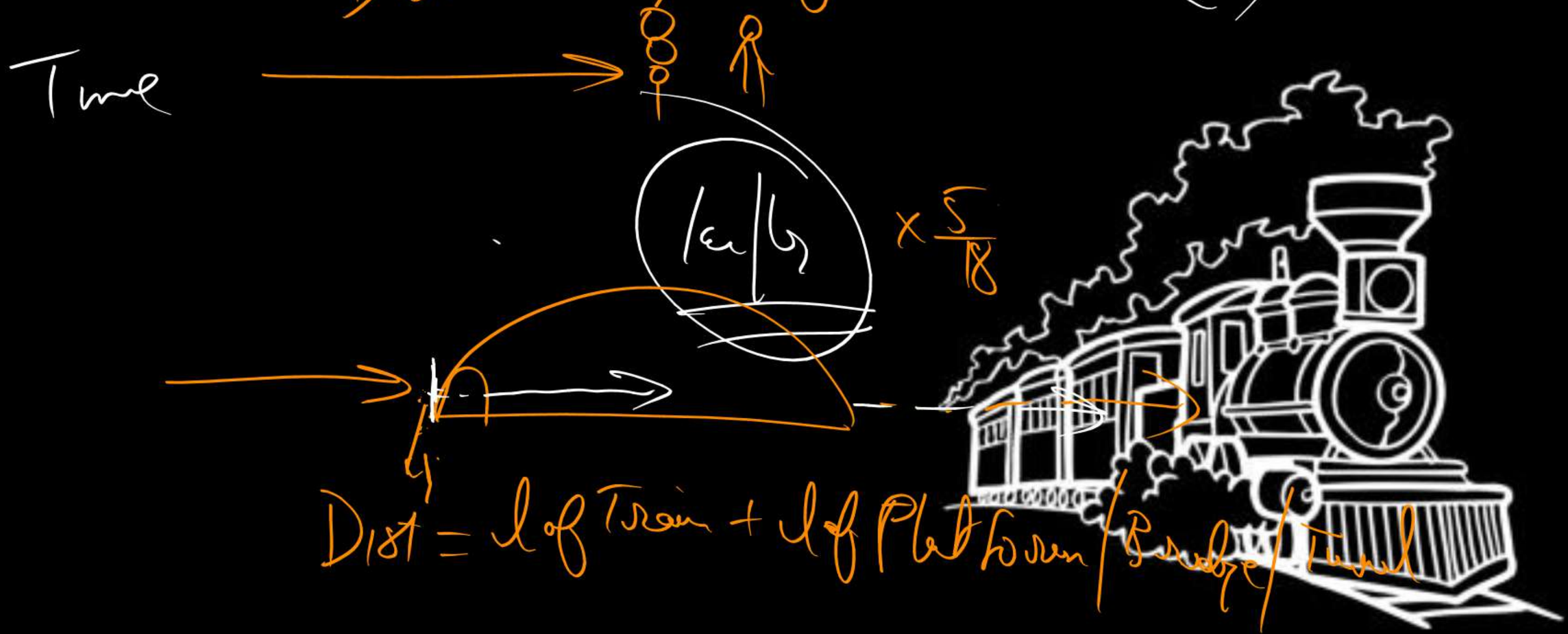
TOPICS TO BE COVERED

1. Understanding 2D figures
2. Understanding 3D figures
3. Basic Formulae and Concept
4. Questionnaire on the topic

TRAINS based questions:

Dist = length of the train (m)

Time



Trains:

more speed

$D = l_{T_1} + l_{T_2}$

When a train try to cross a signal pole or standing man completely...
D = length of the train

R.S. = (−)

R.S. = (+)

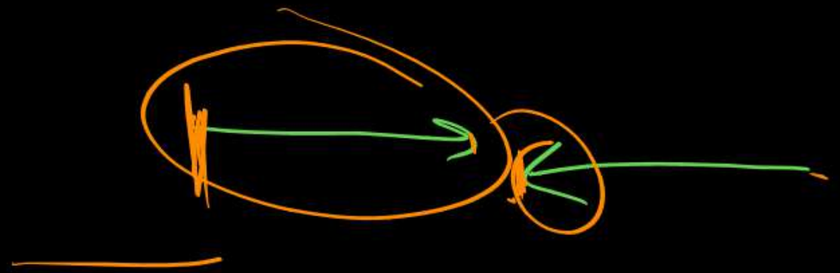
When a train try to cross a Platform or Bridge or Tunnel.....
D = length of the train + length of Platform or Bridge or Tunnel

Trains:

When a train try to cross another moving train.....

SAME DIRECTION : Speed (-)
OPPOSITE DIRECTION : Speed (+)

} Distance = Length of Train 1 + Length of Train 2



Q. If a train travelling at 40 km/hr crosses another train of length 100 meter travelling at 14 km/hr in opposite directions in 30 seconds, then find the length of the train.

Assignment

$D = l_{T_1} + 100$

$R.S = 54 \text{ km/hr} \times \frac{5}{18} \text{ (m/sec)}$

$T = 30 \text{ sec}$

$D = S \times T$

$l_{T_1} + 100 = 54 \times \frac{5}{18} \times 30$

$l_{T_1} + 100 = 3 \times 5 \times 30$

$l_{T_1} + 100 = 18 \times 25$

$l_{T_1} = 450 - 100$

$l_{T_1} = 350 \text{ m}$

Q. A train running at 52 km/hr takes 36 seconds to pass a platform. Next it takes 24 seconds to cross a man walking at the platform with 10 km/hr in the same direction. Find the length of the platform.

$l_P = 520 - 280$

$= 240\text{m}$

Train crosses platform

$D = 280 + l_P$

$S = 52 \text{ km/hr} \times \frac{5}{18} (\text{m/sec})$

$T = 36 \text{ sec}$

$280 + l_P = 52 \times \frac{5}{18} \times 36$

$280 + l_P = 520$

Train crosses a man

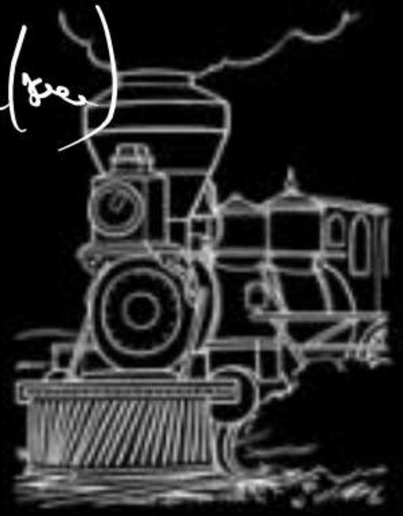
$D = l_T$

$R.S. = 42 \text{ km/hr} \times \frac{5}{18} (\text{m/sec})$

$T = 24 \text{ sec}$

$l_T = 42 \times \frac{5}{18} \times 24$

$l_T = 280\text{m}$



BOATS & STREAMS

S.Boat - S.Stream

Upstream Speed (U.S)

S.Boat + S.Stream

Downstream Speed (D.S)

$$S.Boat = \frac{D.S + U.S}{2}$$

$$S.Stream = \frac{D.S - U.S}{2}$$

Upstream & Downstream:

UPSTREAM SPEED (US)

{Speed of Boat − Speed of water}

Speed of Boat = (DS+US) / 2

DOWNSTREAM SPEED (DS)

{Speed of Boat + Speed of Water}

Speed of Water = (DS-US) / 2

Q. A man rows his boat downstream @ 18 km/hr & upstream @ 10 km/hr. Find the speed of boat in still water.

A. 12 km/hr

B. 10 km/hr

C. 14 km/hr

D. 16 km/hr

$S_{Boat} = \frac{18+10}{2}$

$= \frac{28}{2} = 14$ km/hr

Time = Dist / Speed

Q. A boat traveled from A to B and back to A from B in 5 hours. If the speed of boat in still water and the speed of stream be 7.5 kmph and 1.5 kmph, then what is the distance between A and B?

$$\frac{x}{9} + \frac{x}{6} = 5$$

A. 18 km

B. 10 km

$$\Rightarrow \frac{2x + 3x}{18} = 5$$

C. 16 km

$$\frac{5x}{18} = 5$$

$$x = 18$$

D. 5 km

$$DS - US = 2S \cdot \omega$$

$$S \cdot \omega = \frac{D \cdot S - U \cdot S}{2}$$

$$D \cdot S = S \cdot B + S \cdot \omega \quad \text{---- (i)}$$

$$U \cdot S = S \cdot B - S \cdot \omega \quad \text{---- ii}$$

$$DS + US = 2S \cdot B$$

$$\boxed{\frac{D \cdot S + U \cdot S}{2} = S \cdot B}$$

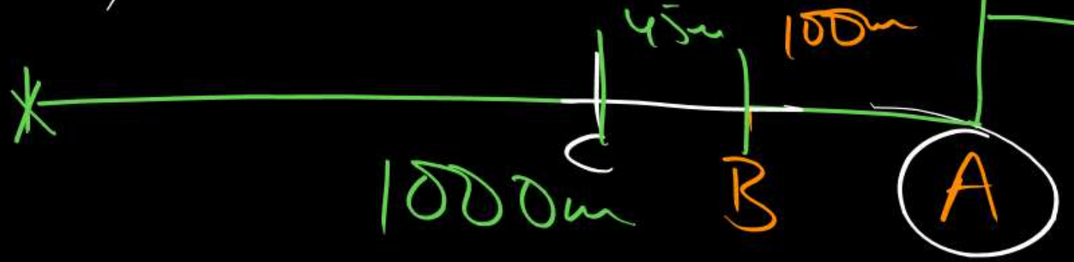
RACE

Q. In a km race A defeats B by 100 meters and B defeats C by 50 meters, then A defeats C by how many meters?

$$\frac{A}{B} = \frac{1000m}{900m}$$

$$\frac{B}{C} = \frac{1000}{950}$$

$$\frac{A}{B} \times \frac{B}{C} = \frac{1000}{900} \times \frac{1000}{950} = \frac{A}{C} = \frac{1000}{855}$$



1000-855

145m

Q. In a km race A defeats (beats) B by 200 meters and B defeats C by 100 meters, then A defeats C by how many meters?

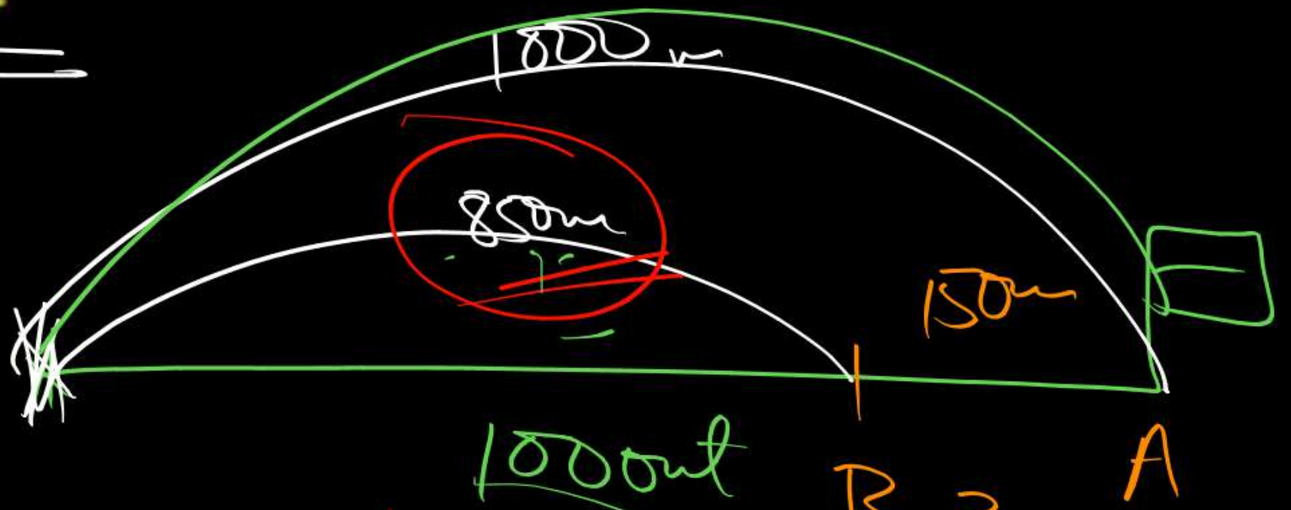
$$\frac{A}{C} = \frac{1000}{800} \times \frac{1800}{900}$$

$$\frac{A}{C} = \frac{1000}{720}$$

$1000 - 720$

$= 280$ m

Q. In a km race A defeats B by 150 meters or 3seconds. Find the speed of A.



$S_A = \frac{1000}{17}$

$= 58.82 \text{ m/sec}$

Time $= \frac{850}{50} = 17 \text{ sec}$

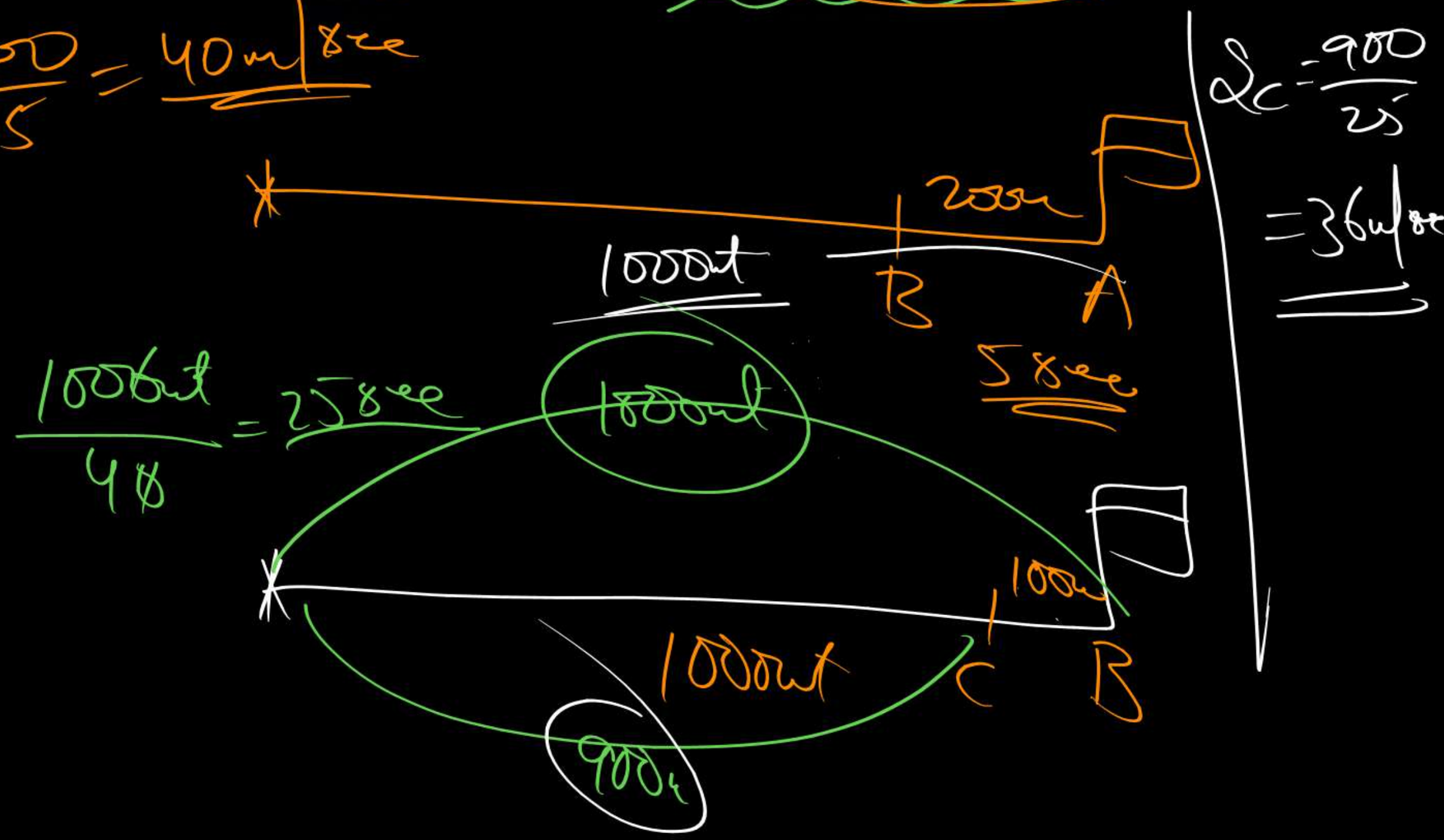
3 sec

$S_B = \frac{150}{3}$

$= 50 \text{ m/sec}$

Q. In a km race A defeats B by 200 meters or 5seconds whereas B defeats C by 100m. Find the speed of C.

$S_B = \frac{200}{5} = 40 \text{ m/sec}$



Mensuration 2D

2 Dimensional

Triangle

Quadrilateral → Square, rect, rhombus
Ilpm, trapezium etc

Triangles:

Angle

- 90° → Right angle △
- Above 90° → Obtuse angled △
- Less than 90° → Acute angle △

Side

- Equilateral
- Isosceles
- Scalene

Triangles:

Perimeter

Area

Isosceles

$P = 2a + b$

$A = \frac{b}{4}\sqrt{4a^2 - b^2}$

$\text{Area} = \frac{1}{2} \times \text{base} \times \text{height}$

3 sides

Heron's formula

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

$\text{Perm} = a + b + c$

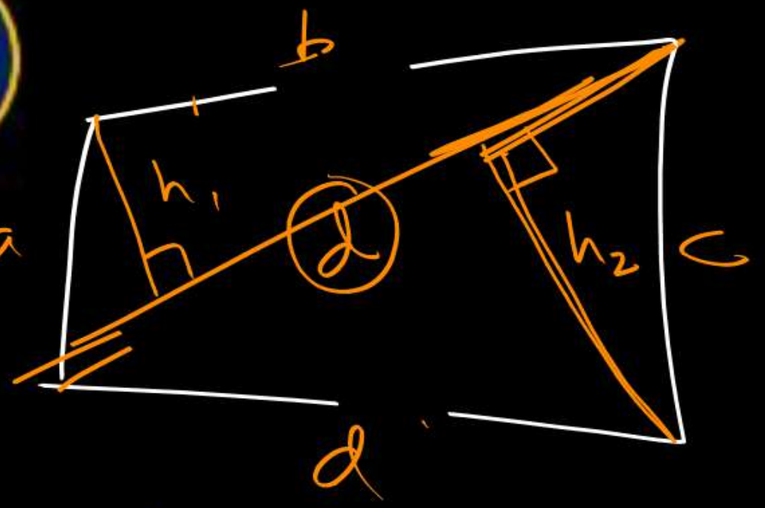
where $s = \frac{a+b+c}{2}$

Equilateral $\triangle$

$P = 3a$

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

Quadilaterals:



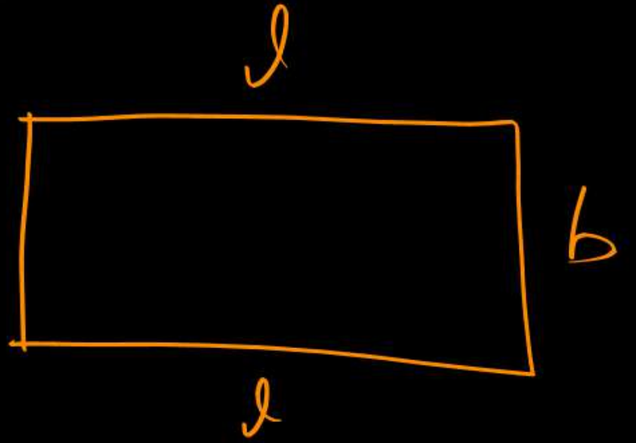
Perimeter = $a+b+c+d$

Area = $\frac{1}{2} \times d \times h_1 + \frac{1}{2} \times d \times h_2$

$= \frac{1}{2} d(h_1 + h_2)$

Rectangle & Square:

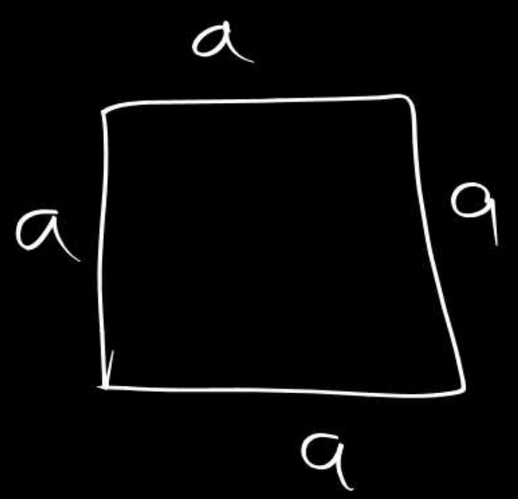
Perimeter $= 2l + 2b$
$= 2(l + b)$



Area $= l \times b$

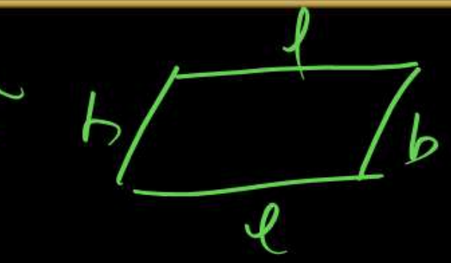
Perimeter $= 4a$

Area $= a \times a = a^2$



Rhombus, Trapezium & Parallelogram:

Parallelogram

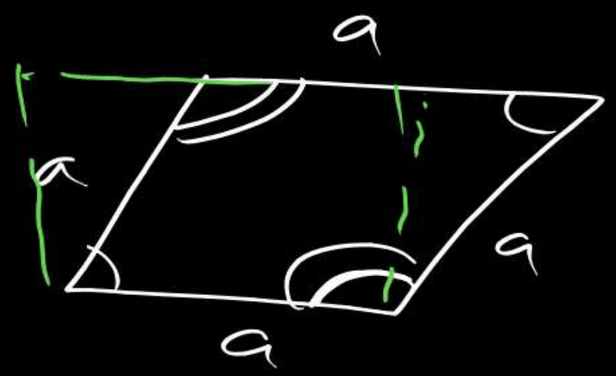


$P = 2(l+b)$

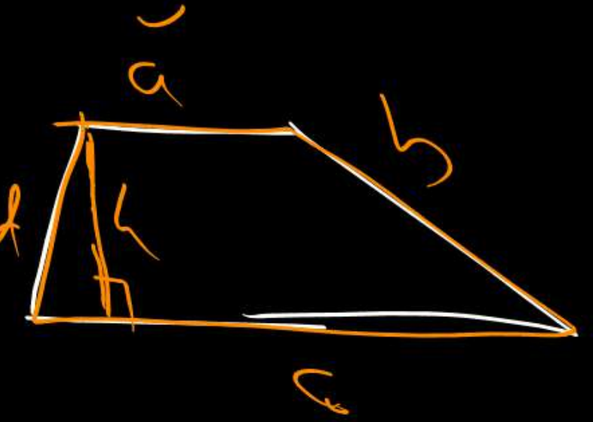
$\text{Area} = l \times b$

$P = 4a$

$\text{Area} = a^2$



$\text{Area} = \frac{1}{2}(a+c) \times h$

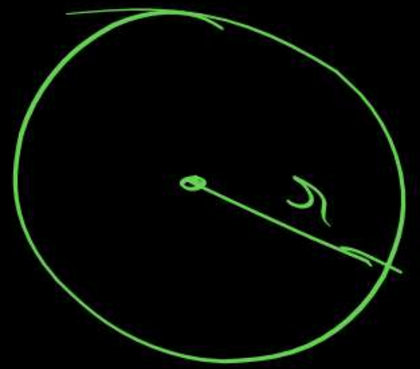


Circles & Sectors:

Circumference

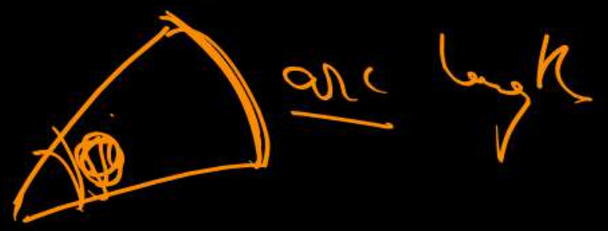
$$\text{Area} = \pi r^2$$

$$\text{Circumference} = 2\pi r$$



$$\text{Area} = \frac{\theta}{360} \times \pi r^2$$

$$\text{Length of Arc} = \frac{\theta}{360} \times 2\pi r$$



Q. What would be the area of sector of a circle whose radius is 12 cm and the length of the arc is 20 cm?

Assignment

A. 60 sq. cm

B. 240 sq. cm

C. 120 sq. cm

D. 64 sq. cm

Q. The cross-section of a canal is a trapezium in shape. If the canal is 7 m wide at the top and 9 m at the bottom and the area of cross-section is 128 sq m, find the height of the canal.

Assignment

A. 32 m

B. 8 m

C. 4 m

D. 16 m

Thank You !