# 9th CBSE Science

## 07. Motion

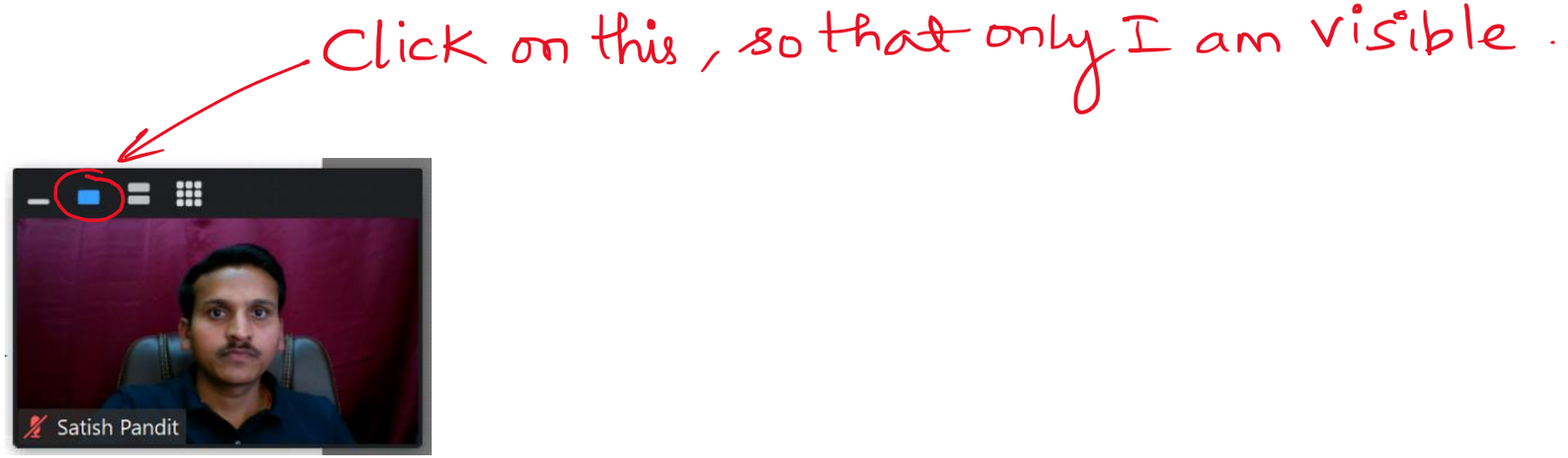
# Lecture 1

# INSTRUCTIONS FOR ATTENDING THE ONLINE CLASSES

1. Sit down on the Study Table for all the Classes at least 30 Minutes before the commencement of the Session and do SELF-STUDY.

"No amount of motivation will help someone who lacks discipline."

2. Don't write anything while the Lecture is being delivered.
3. Write the Class Notes of the previous Lecture before attending the next Lecture.
4. Kindly keep the **VIDEO SWITCHED ON**, throughout the Session.

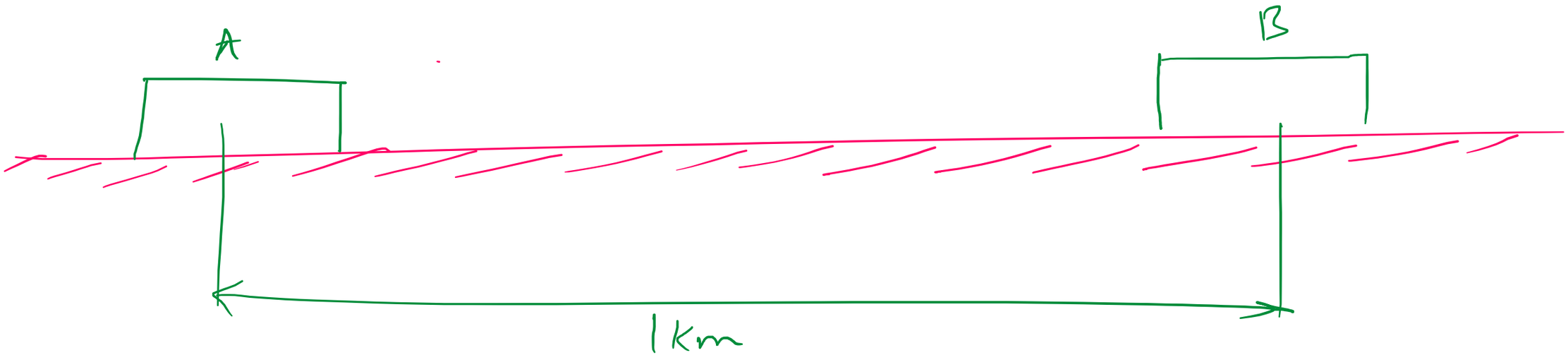



5. Get all your DOUBTS clarified even if it is very silly.

"The man who asks a question is a fool for a minute, the man who does not ask is a fool for life."

## Motion

Whenever the position of the object changes wrt time, we say that the object is in motion.




## Reference point

helps to locate an object

# Distance & Displacement

## Distance

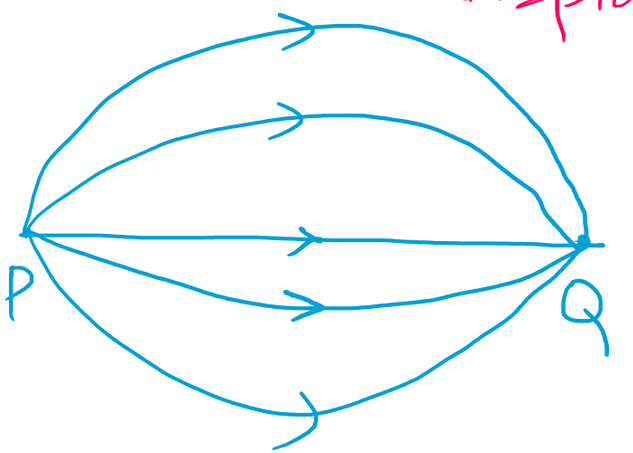
The total path length covered by an object.

Distance = AB + BC

= 5 + 3 = 8km

## Displacement

It is the shortest distance b/w the initial point & the final point.




Displacement

= 4km

$AC^2 = 16$

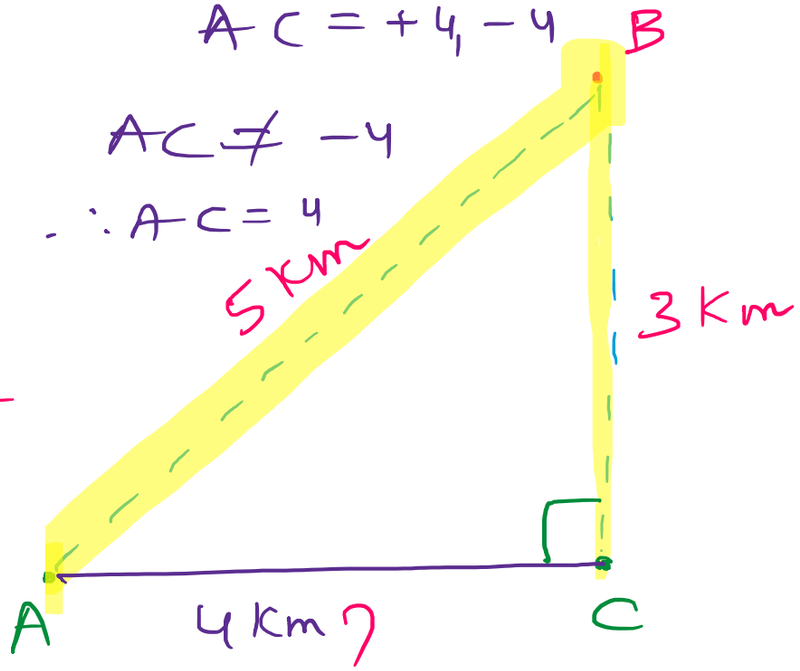
$AC = \pm\sqrt{16}$

$AC = \pm 4$

$AC = +4, -4$

$AC \neq -4$

$\therefore AC = 4$




$AB^2 = AC^2 + BC^2$

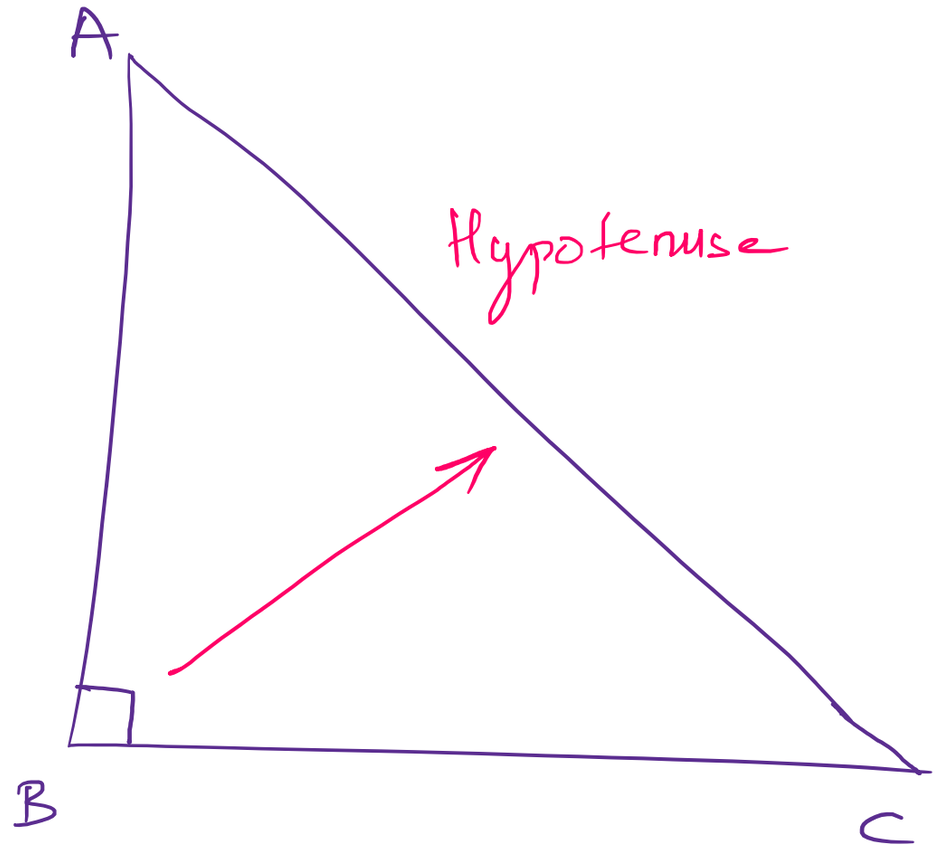
$5^2 = AC^2 + 3^2$

$25 - 9 = AC^2$

$16 = AC^2$

# Pythagoras Theorem

$$AC^2 = AB^2 + BC^2$$




$x^2 = 4$

$x = \pm\sqrt{4} = \pm 2$

$x = +2, -2$

$x = 2$

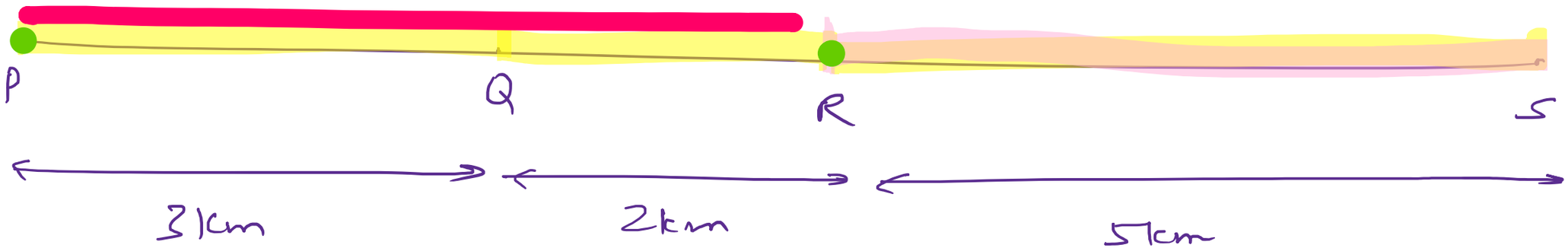
$x = -2$

P ⟶ Q ⟶ R ⟶ S ⟶ R

Distance = PQ + QR + RS + SR

= 3 + 2 + 5 + 5 = 15km

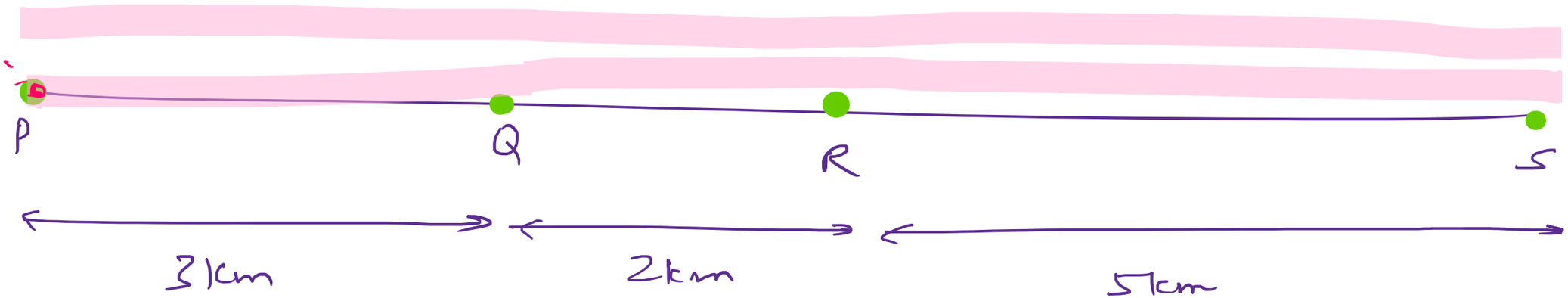
Displacement = 5km



P → Q → R → S → R → Q → P

Distance = 20 km

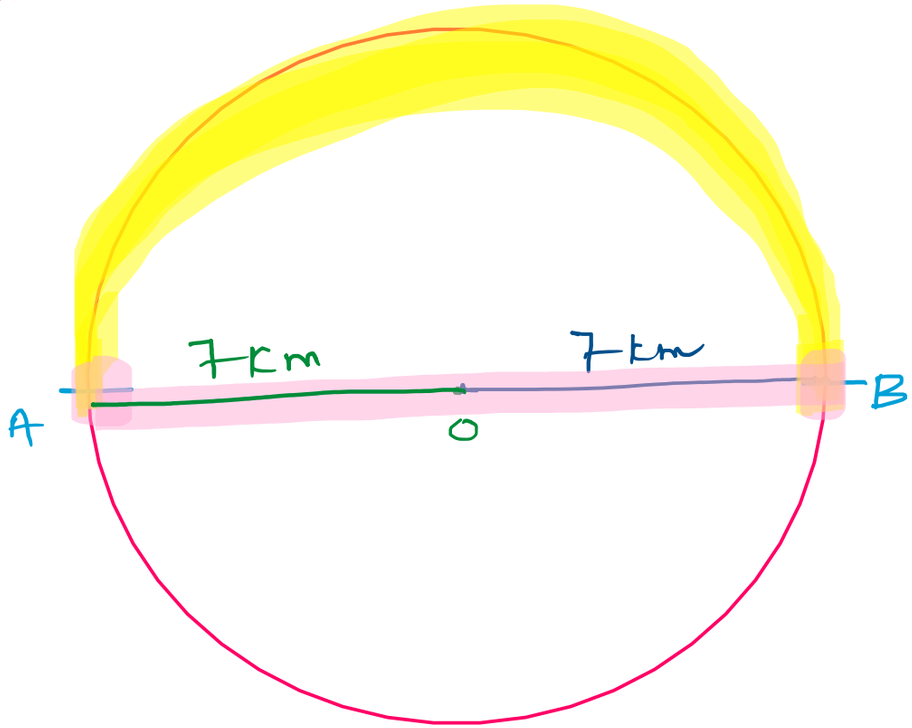
Displacement = 0



Distance = $\pi R$

$= \frac{22}{7} \times 7 = 22\,km$

Displacement = 14km

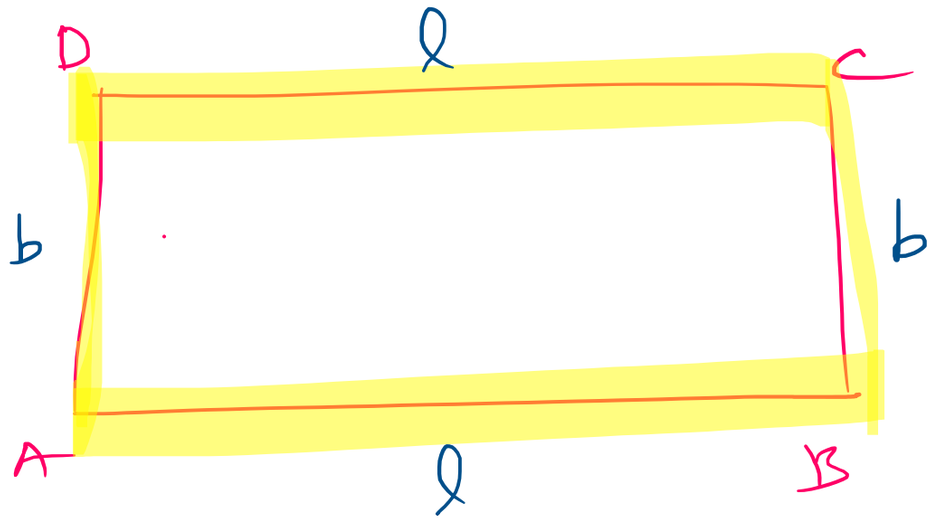


# Perimeter

Perimeter = $l + b + l + b$

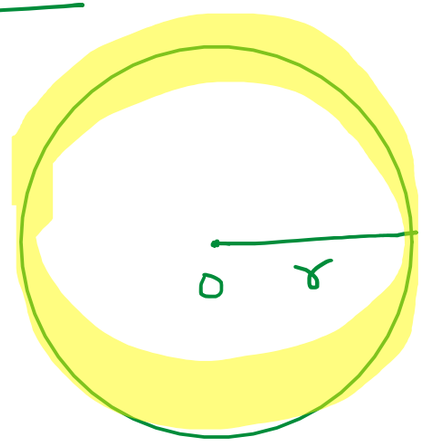
$= 2l + 2b$

Perimeter = $2(l + b)$




# Circumference

$\pi = \frac{22}{7}$




$= 2\pi r$

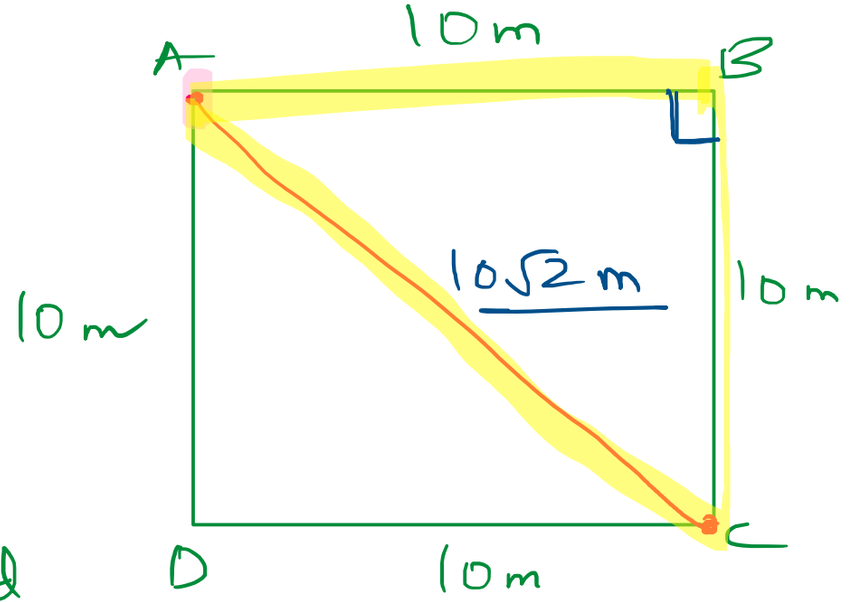
2. A farmer moves along the boundary of a square field of side 10 m in 40 s. What will be the magnitude of displacement of the farmer at the end of 2 minutes 20 seconds from his initial position?

1 min = 60 s

2 min = 120 s

120 + 20

140 s




In 40 s ⟶ 1 round

1 s ⟶ $\frac{1}{40}$ round

140 s ⟶ $\frac{7}{\cancel{140}_{2}} \times \frac{1}{\cancel{40}} = 3.5$ round

$AC^2 = AB^2 + BC^2$

$AC^2 = 10^2 + 10^2$

$AC^2 = 100 + 100$

$AC^2 = 200$

$\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$

$(ab)^m = a^m \cdot b^m$

5 pen ⟶ ₹50

1 pen ⟶ $\frac{50}{5}$

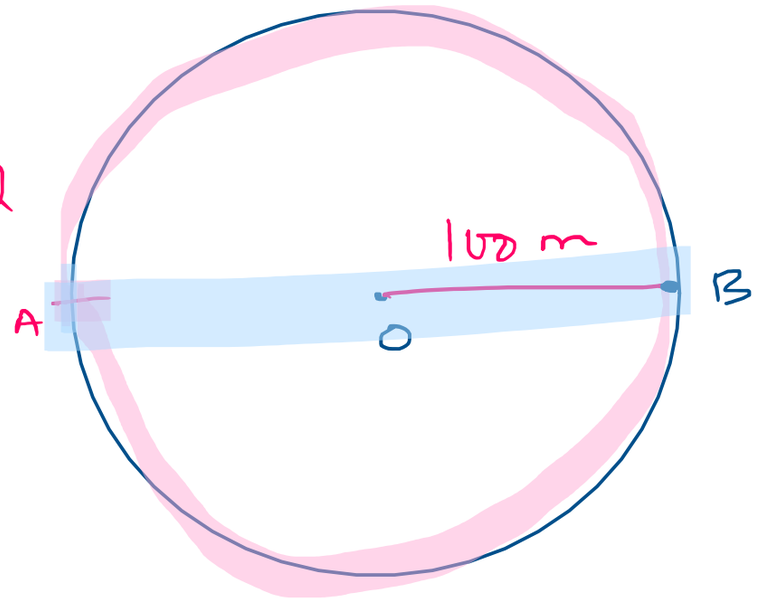
$AC = \pm\sqrt{200} = \pm\sqrt{2 \times 100} = \pm 10\sqrt{2}$ $\therefore AC = 10\sqrt{2}$ m

1. An athlete completes one round of a circular track of diameter 200 m in 40 s. What will be the distance covered and the displacement at the end of 2 minutes 20 s?

In 40 s ⟶ 1 round

1 s ⟶ $\frac{1}{40}$

140 s ⟶ $\frac{7}{\cancel{140}_{2}} \times \frac{\cancel{140}}{40} = 3.5$ round



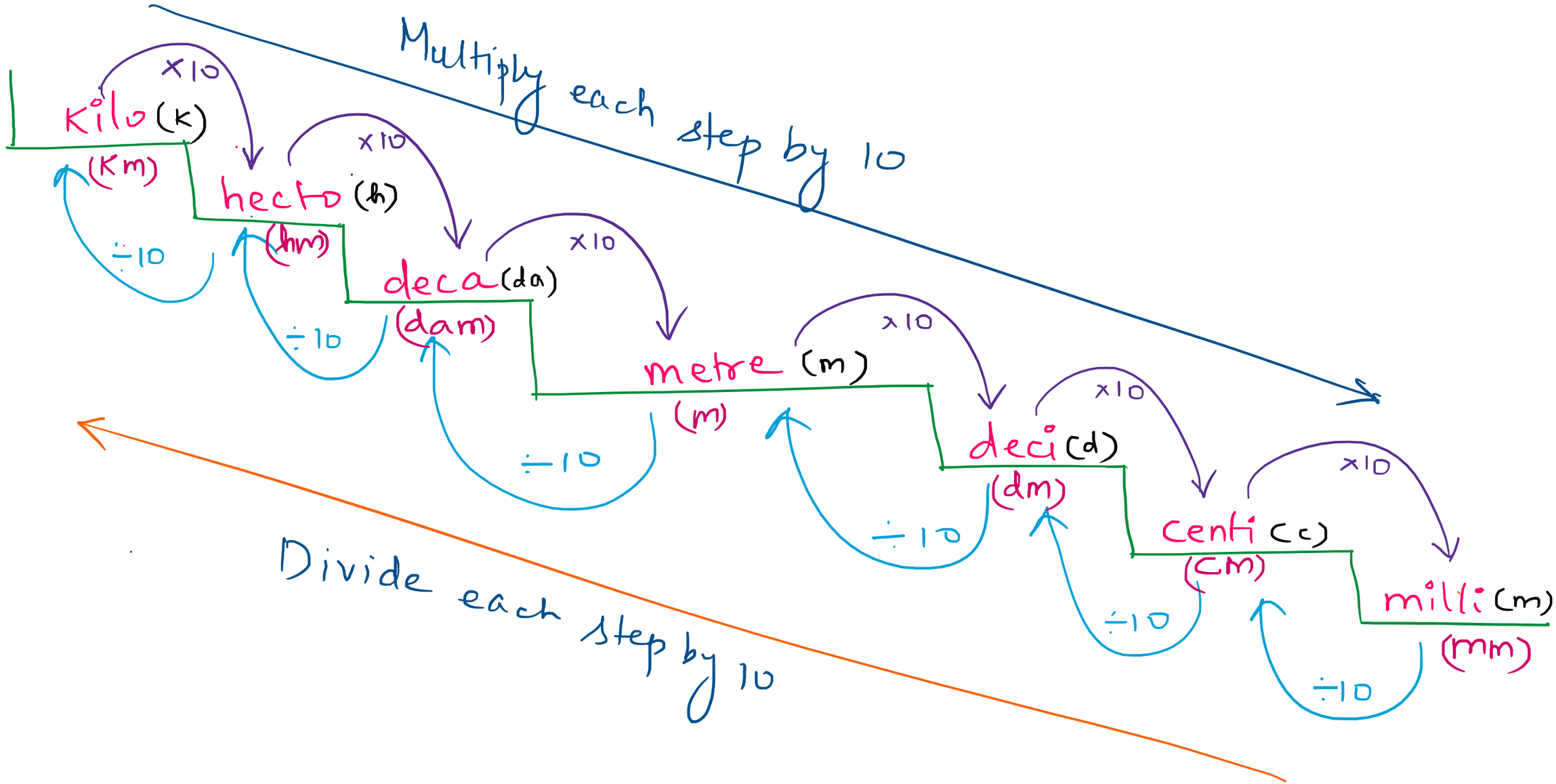

**Distance**

$= 3.5 \times 2\pi r$

$= 3.5 \times 2 \times \frac{22}{7} \times 100 = \frac{\cancel{35}^{5}}{\cancel{10}} \times \frac{2 \times 22}{\cancel{7}} \times \cancel{100}^{10} = 2200$ m

**Displacement**

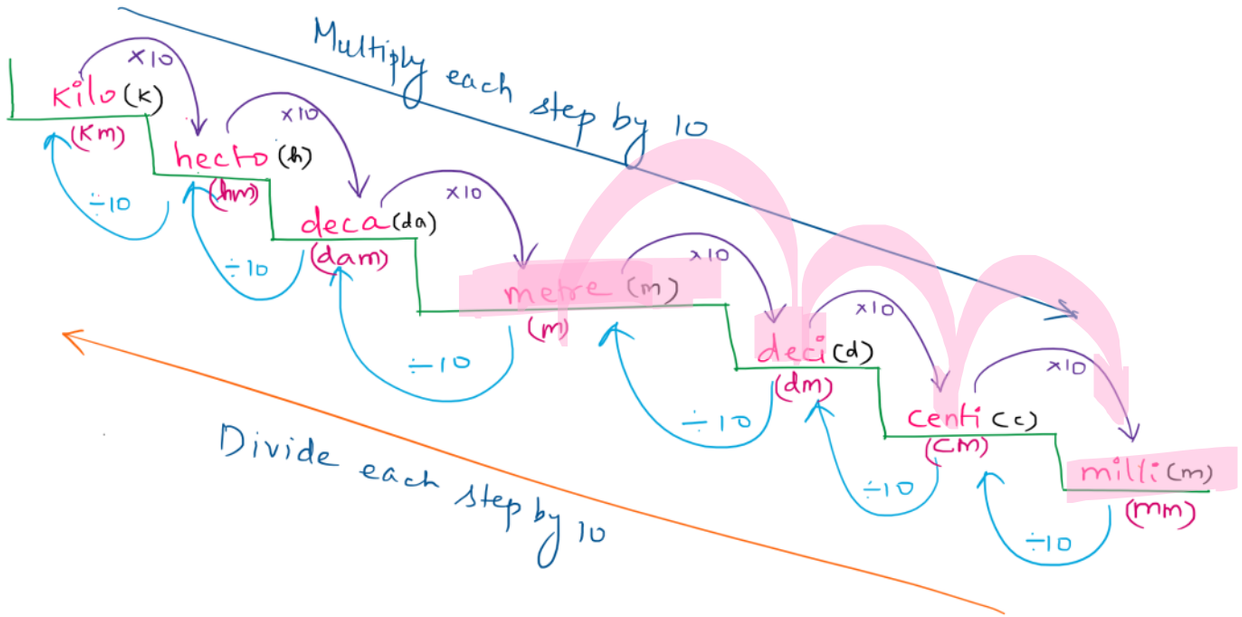
$= 200$ m


Multiply each step by 10
Kilo (k)
(Km)
hecto (h)
(hm)
deca (da)
(dam)
metre (m)
(m)
deci (d)
(dm)
centi (c)
(cm)
milli (m)
(mm)
x10
÷10
Divide each step by 10

$15\ m = 15 \times 10^3\ mm$

$= 15 \times 1000$

$15\ m = 15000\ mm$




$10 \times 10 \times 10 = 10^3$

$5\ m = 5 \times 10^2\ cm$

$5m = 5 \times 100 = 500cm$

$7\ km = 7 \times 10^6\ mm$

$14\ cm = 14 \times 10^1\ mm$

$14cm = 140mm$

$15\ hm = 15 \times 10^2\ m$

$= 15 \times 100$

$15hm = 1500m$

$10^1 \times 10^1 = 10^2 = 100$

$10 \times 10 \times 10 = 10^3 = 1000$

$10 \times 10 \times 10 \times 10 = 10^4$

$5 \div 10$

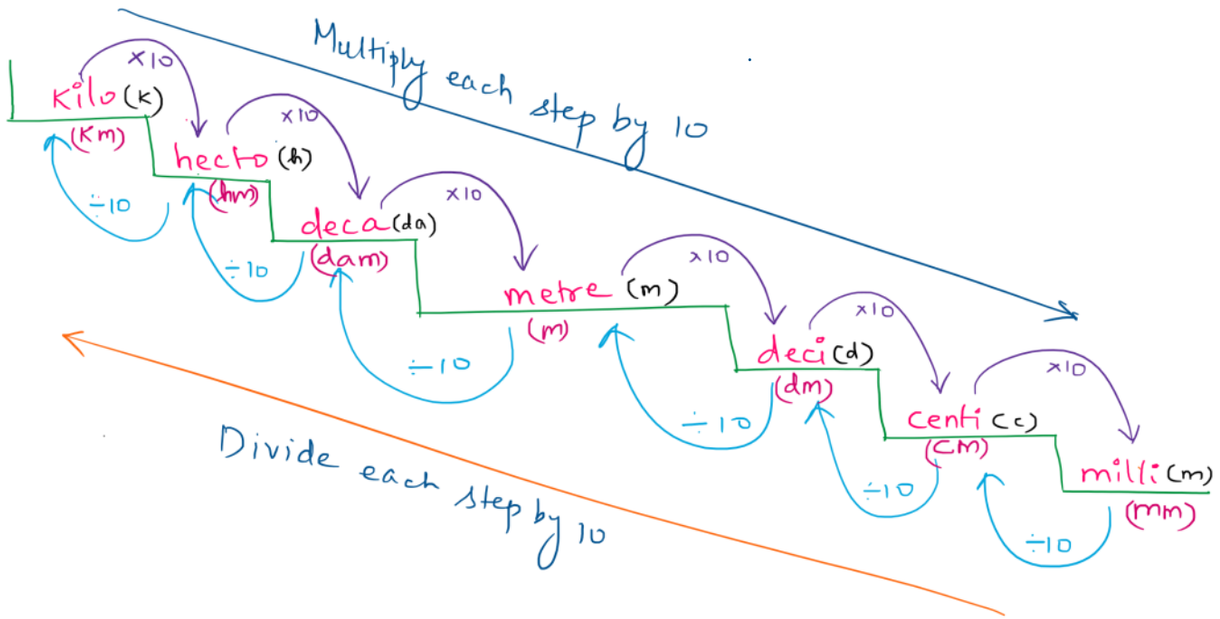
$5 \times \frac{1}{10^1} = 5 \times 10^{-1}$

$15 \div 100$

$15 \times \frac{1}{100}$

$15 \times \frac{1}{10^2}$

$15 \times 10^{-2}$

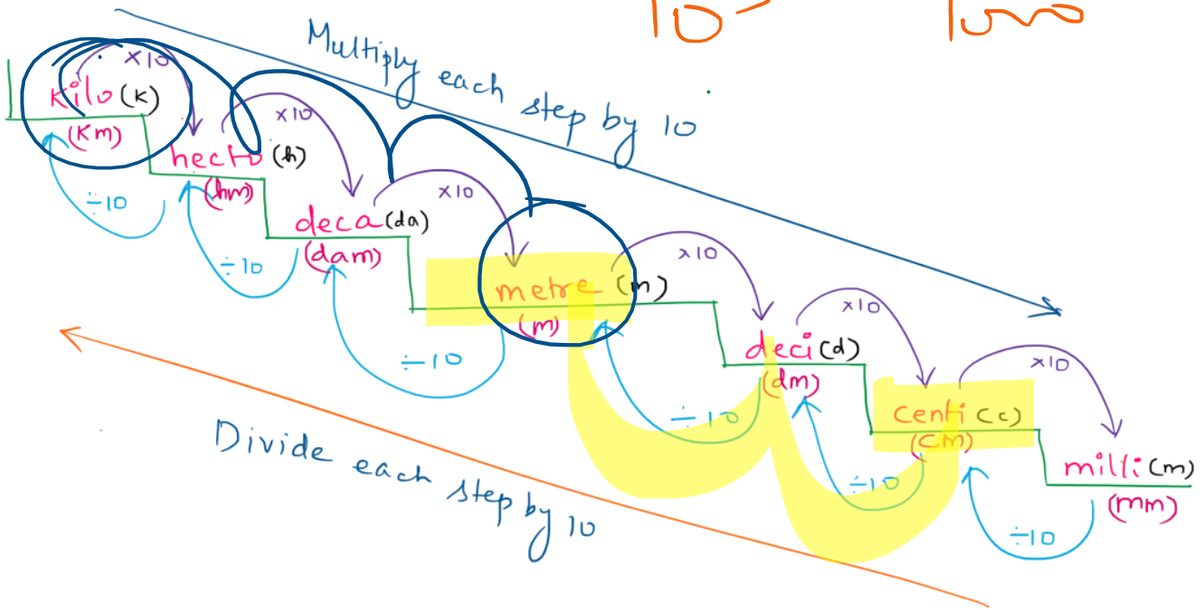



$\frac{1}{10^1} = 10^{-1}$

$\left\{ \frac{1}{a^m} = a^{-m} \right\}$

$\frac{1}{10^2} = 10^{-2}$

$$\frac{15}{10^3} = \frac{15}{1000} = \frac{0.015\ m}{15\ mm} = \frac{15 \times 10^{-3}}{} \ m$$

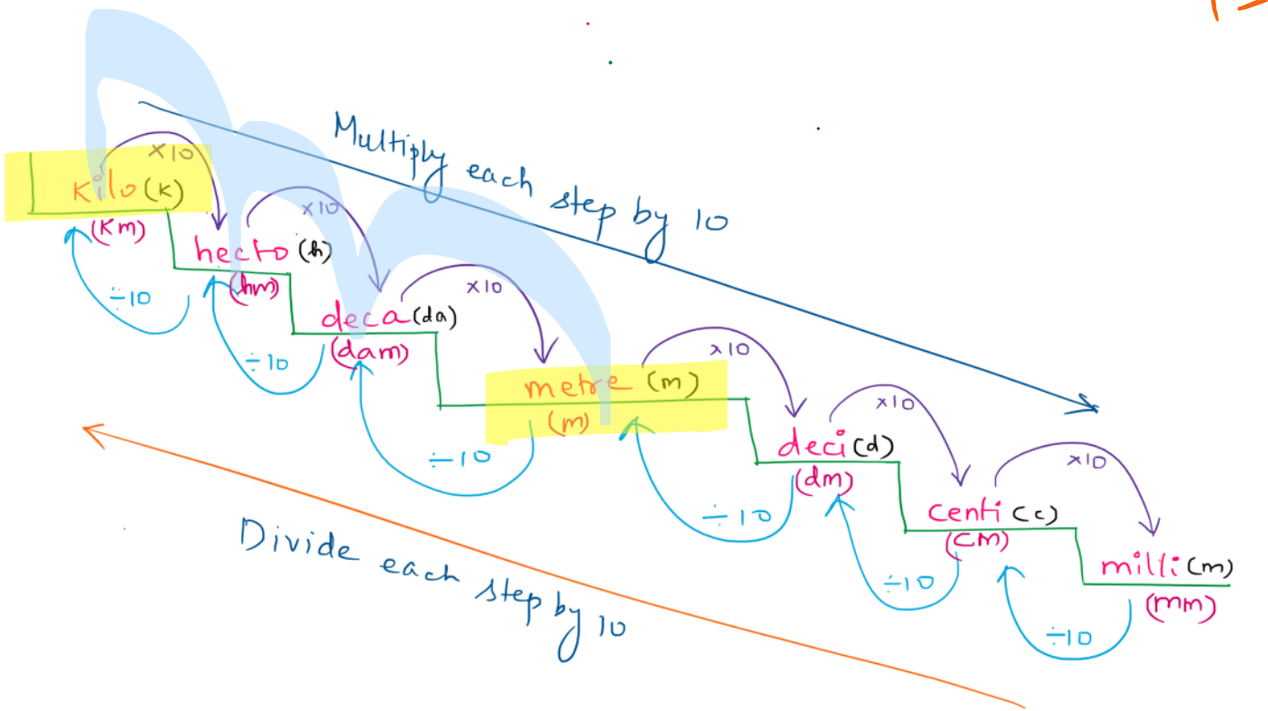



$$45\ cm = \frac{45 \times 10^{-2}}{} \ m$$

$$= \frac{45}{10^2} = \frac{45}{100}$$

$$45\ cm = 0.45\ m$$

$$\frac{1}{a^m} = a^{-m} \quad \Big| \quad a^{-m} = \frac{1}{a^m}$$




$$437m = 437 \times 10^{-3} \text{ Km}$$

$$= \frac{437}{10^3}$$

$$= \frac{437}{1000}$$

$$437m = 0.437 \text{ Km}$$

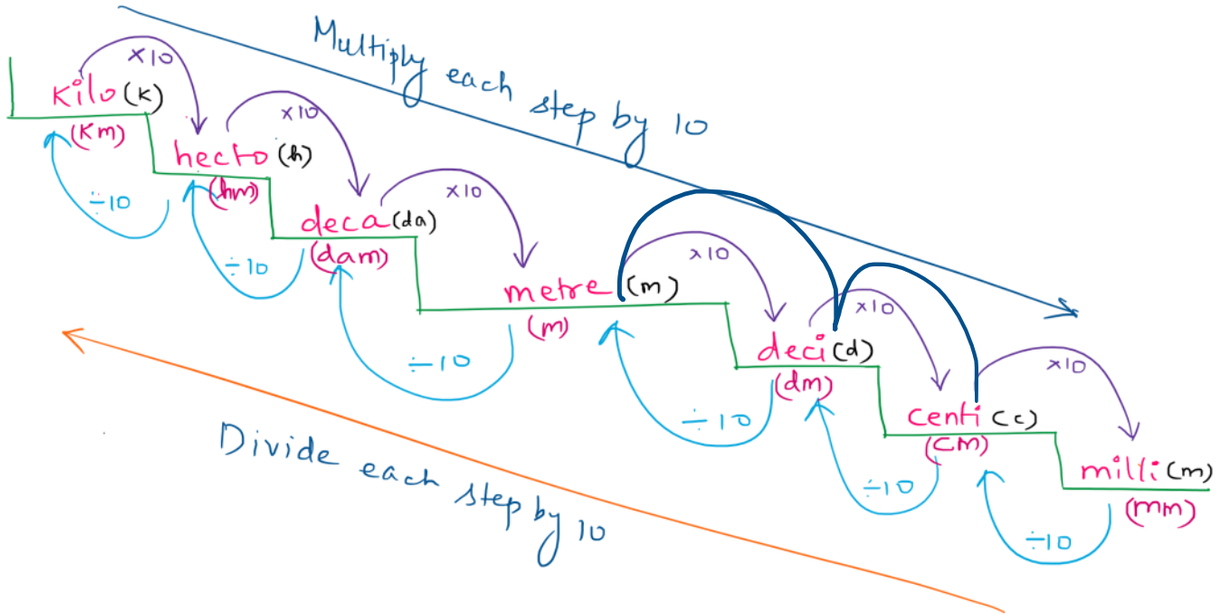
15 15.0

$\frac{15}{10} = \frac{15.0}{10} = 1.50 = 1.5$ 7.0

1.5 100.0

$\frac{437}{1000} = \frac{0.437 \times 10}{1000} = 0.437$ 157.0

$$\frac{987}{100} = \frac{987.0}{100} = 9.87$$




$$469\ cm = \frac{469 \times 10^{-2}}{} \ m$$

$$= \frac{469}{10^2}$$

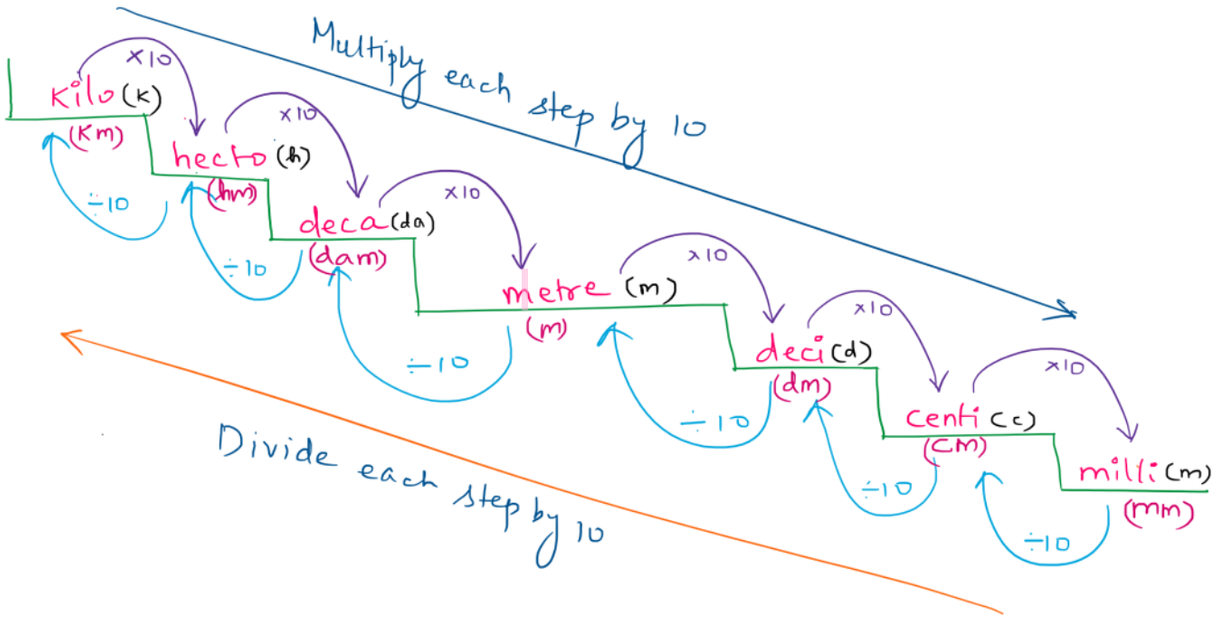
$$= \frac{469}{100}$$

$$= \frac{4690}{100}$$

$$= 4.690$$

$$= 4.69\ m$$

$(a^m)^n = a^{m \times n}$




$25\ m^2 = 25 \times (10^2)^2\ cm^2$

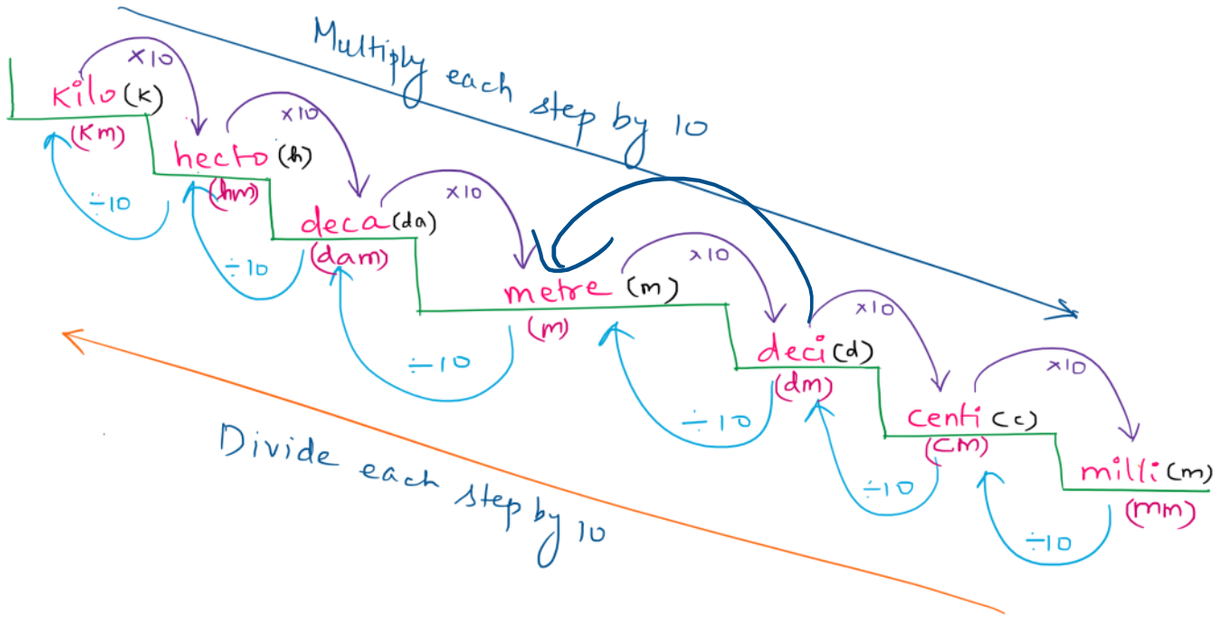
$25\ m^2 = 25 \times 10^4\ cm^2$

$49\ mm^2 = 49 \times (10^{-3})^2\ m^2$

$49\ mm^2 = 49 \times 10^{-6}\ m^2$

$487\ km^2 = 487 \times (10^3)^2\ m^2$

$= 487 \times 10^6\ m^2$




$$1287\ mm^2 = 1287 \times \left(10^{-1}\right)^2\ cm^2$$

$$= 1287 \times 10^{-2}$$

$$= \frac{1287}{10^2}$$

$$= \frac{1287}{100}$$

$$= 12.87\ cm^2$$

$$587\ dm^2 = \frac{587 \times \left(10^{-1}\right)^2}{}\ m^2$$

$$= 587 \times 10^{-2}$$

$$= \frac{587}{100} = 5.87\ m^2$$

$$\frac{0.0780}{1000}$$

$$0.078$$

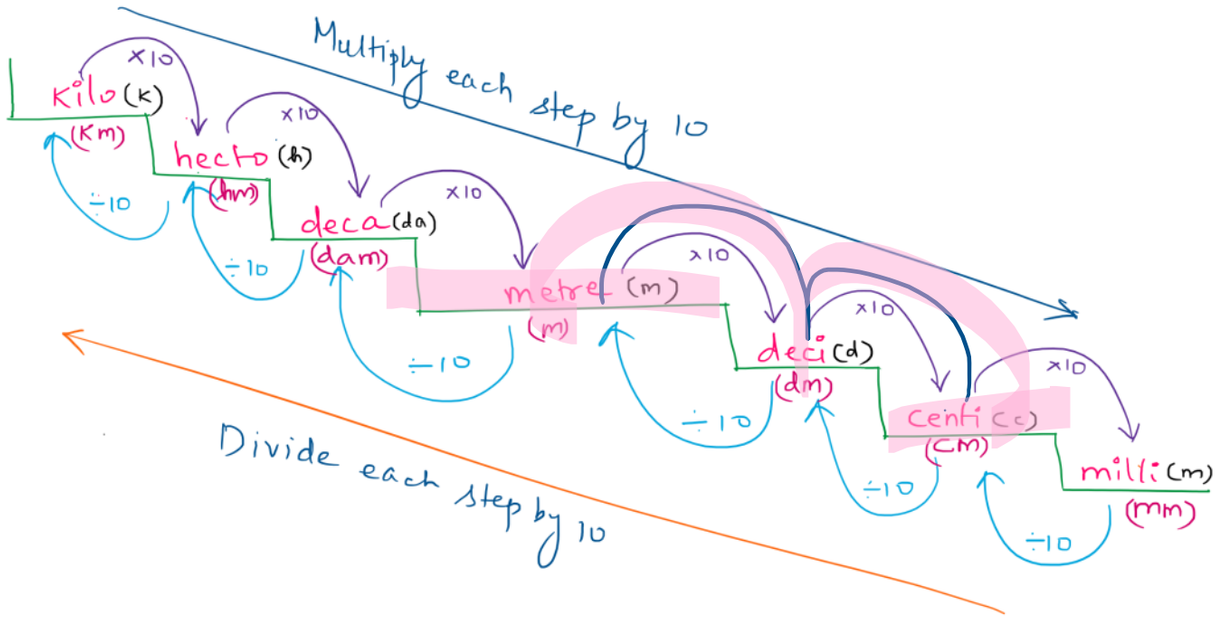
$$8972\ cm^3 = 8972 \times (10^{-2})^3\ m^3$$

$$= 8972 \times 10^{-6}$$

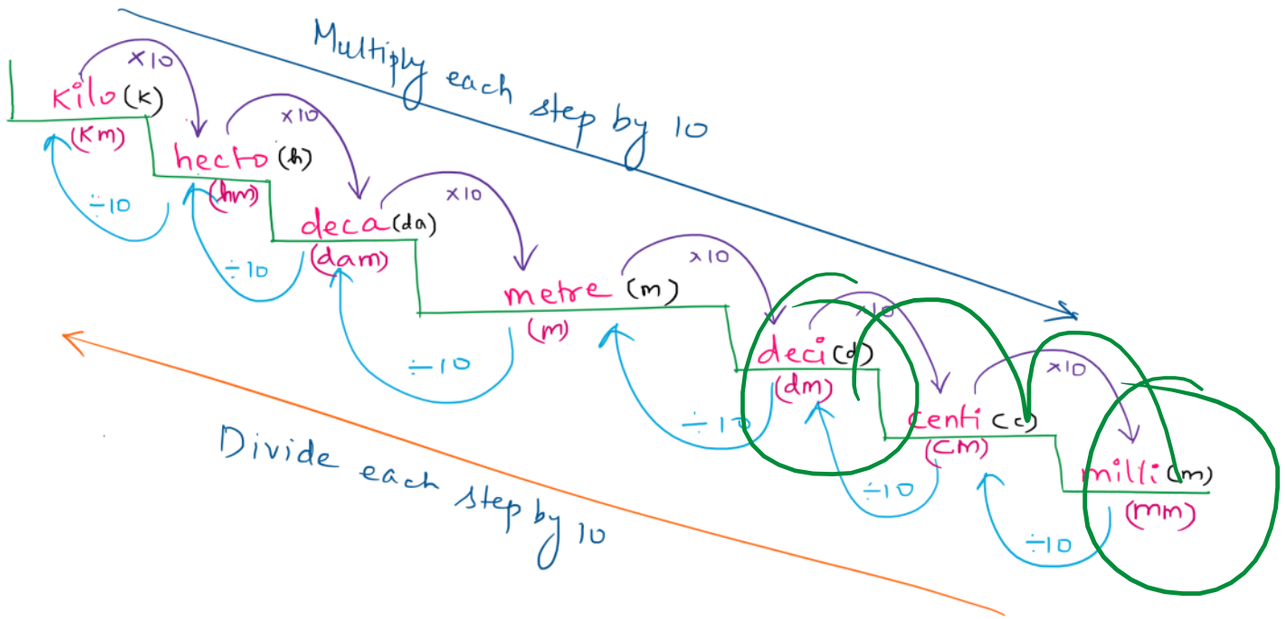
$$= \frac{8972}{10^6}$$

$$0.0008972$$

$$= 0.0008972\ m^3$$



$198754\ mm^3 = \_\_\_\_\_\ dm^3$




$198754 \times (10^{-2})^3$

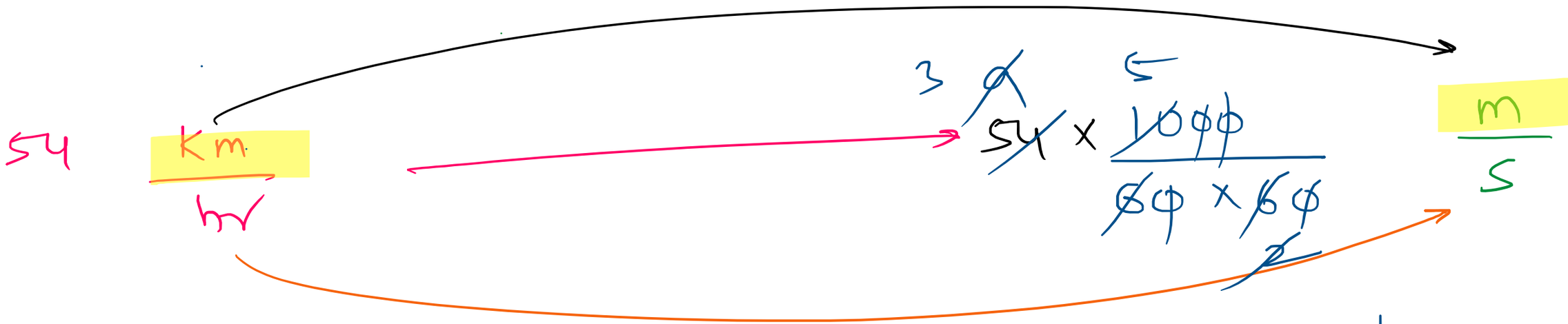
$198754 \times 10^{-6}$

$\frac{198754}{10^6}$

$\frac{0.198754 \times 0}{1000000}$

$= 0.198754$

54 km/hr → 15 m/s




15 m/s

1 pen = 10

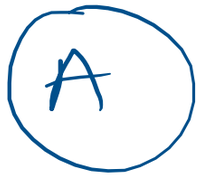
60 = 60 × 10

1 hr = 60 min

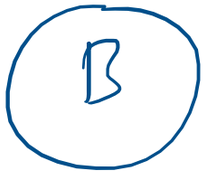
1 hr = 60 × 60 s

1 min = 60 s

60 min = 60 × 60 s




54 km/hr




15 m/s

90 km/hr ⟶ $\frac{m}{s}$

90 $\frac{km}{hr}$ ⟶ $90 \times \frac{5}{18}$ $\frac{m}{s}$

$90 \times \frac{1000}{3600} = \frac{90}{4} = \frac{45}{2}$

$25\ m/s$

$60 \times 60 = 3600$

72 km/hr ⟶ m/s

72 $\frac{km}{hr}$ ⟶ $\frac{\cancel{72}^{2}}{} \times \frac{1000}{\cancel{3600}}$ $\frac{m}{s}$

$= 20 \text{ m/s}$

1 hr = 60 min

1 hr = 3600 s

1 min = 60 s

60 min = 60 × 60 s

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

$$\text{Speed} = \frac{\text{Distance}}{\text{time}} = \left(\frac{\text{km}}{\text{hr}}\right)$$

$$\left(\frac{\text{m}}{\text{s}}\right)$$

$0.6 \text{ km/min} \longrightarrow \text{cm/s}$

$0.6 \ \frac{\text{km}}{\text{min}} \longrightarrow 0.6 \times \frac{100000}{60} \ \frac{\text{cm}}{\text{s}}$

$= \frac{6}{10} \times \frac{10000}{6}$

$= 1000 \text{ cm/s}$

$0.6$ km/min $\longrightarrow$ m/s

$0.6 \dfrac{\text{km}}{\text{min}} \longrightarrow 0.6 \times \dfrac{1000}{60} \dfrac{\text{m}}{\text{s}}$

$\dfrac{6}{10} \times \dfrac{1000}{60}$

$10$ m/s

0.6 km/min ⟶ km/hr

$1 \div \frac{1}{60} = 1 \times \frac{60}{1} = 60$

$0.6 \ \frac{km}{min} \longrightarrow 0.6 \times \frac{1}{\left(\frac{1}{60}\right)} \ \frac{km}{hr}$

$\frac{6}{10} \times 60$

1 hr = 60 min

60 min = 1 hr

1 min = $\frac{1}{60}$ hr

= 36 km/hr