



CE 181103

**1st Semester
Civil & Chemical
Engg.**

Engineering Graphics and Design

**M-1: Construction of Plain
Scale**

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Scale:

A scale is defined as the ratio of the linear dimensions of element of the object as represented in a drawing to the actual dimensions of the same element of the object itself.



Drawing ← Actual
↓ ↓

Ratio

✓	Reducing scales	1 : 2	1 : 5	1 : 10
		1 : 20	1 : 50	1 : 100
		1 : 200	1 : 500	1 : 1000
		1 : 2000	1 : 5000	1 : 10000
✓	Enlarging scales	50 : 1	20 : 1	10 : 1
		5 : 1	2 : 1	
✓	Full size scales			1 : 1

Drawing = Actual

(width in actual) 10 m \rightarrow (width in drawing) 10 cm

(Any linear element)

(width) in drawing

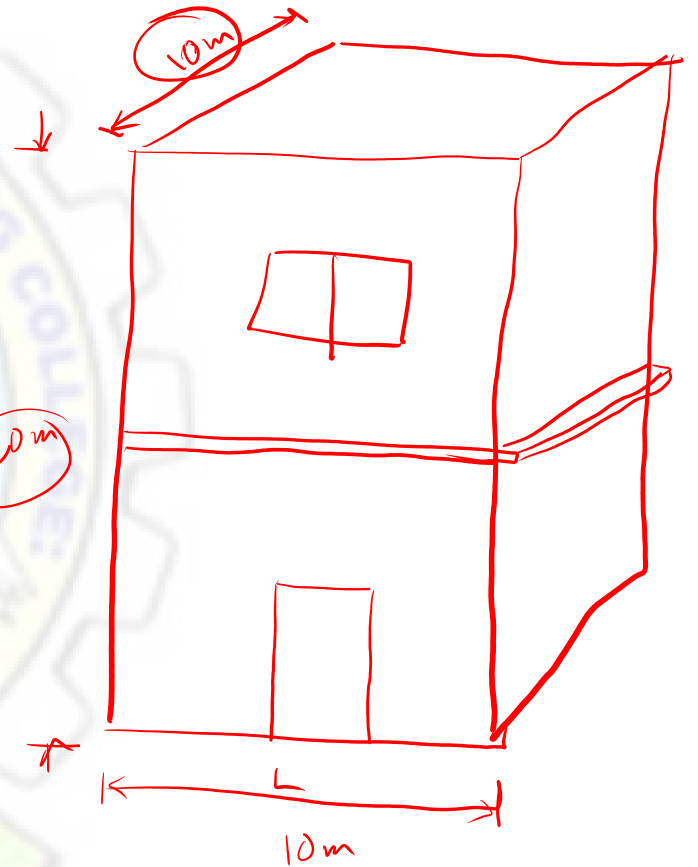
(width) in actual

$$\begin{aligned} \text{Scale} &= \frac{10\text{ cm}}{10\text{ m}} \\ &= \frac{10\text{ cm}}{1000\text{ cm}} \\ &= 1:100 \end{aligned}$$

Length \rightarrow (Scale) $1:100$

$$\text{length in drawing} = \text{Scale} \times \text{Actual length} = 10\text{ cm}$$

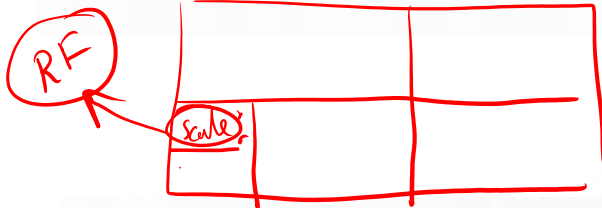
$$\text{height in drawing} = \frac{1}{100} \times 20 \times 100 = \underline{\underline{20\text{ cm}}}$$



✓ **Representative fraction:** The ratio of the length of the object represented on drawing to the actual length of the object represented is called the Representative Fraction (i.e. R.F.).

$$\text{R.F.} = \frac{\text{Length of the drawing}}{\text{Actual length of object}}$$

Scale 1:4



When an unusual scale is used, it is constructed on the drawing sheet. To construct a scale the following information is essential:

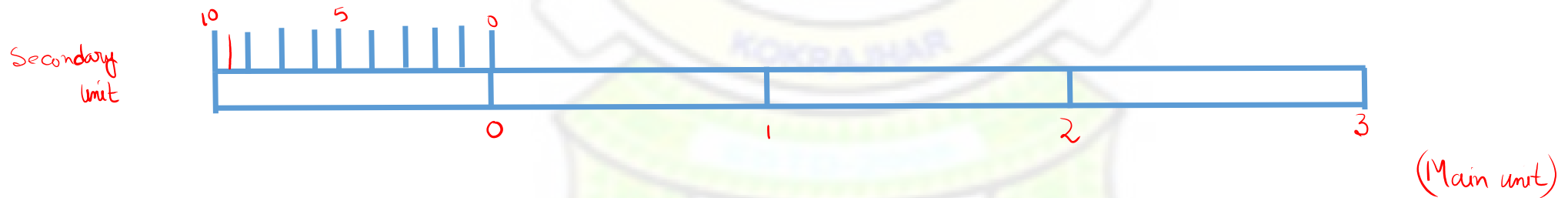
- ✓ (1) The R.F. of the scale.
- ✓ (2) The units which it must represent, for example, millimetres and centimetres, or feet and inches etc.
- ✓ (3) The maximum length which it must show.

R F
Units
max length

The scales used in practice are classified as under:

- (1) Plain scales
- (2) Diagonal scales
- (3) Comparative scales
- (4) Vernier scales
- (5) Scale of chords.

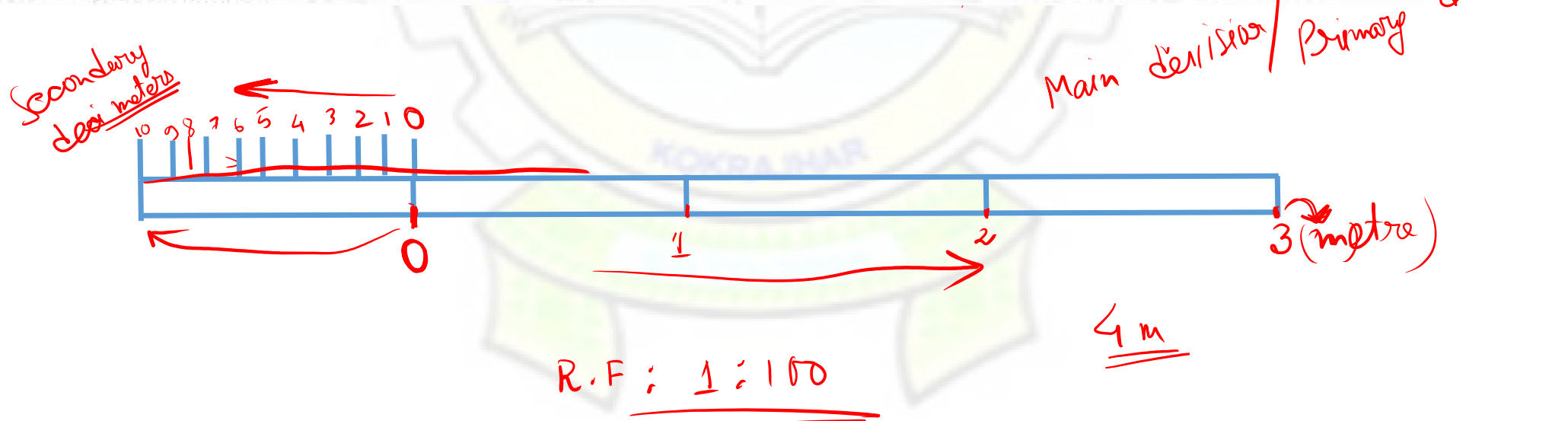
(1) Plain scales: A plain scale consists of a line divided into suitable number of equal parts or units, the first of which is sub-divided into smaller parts. Plain scales represent either two units or a unit and its sub-division.



* Thumb rules

In every scale,

- (i) The zero should be placed at the end of the first main division i.e. between the unit and its sub-divisions.
- (ii) From the zero mark, the units should be numbered to the right and its sub-divisions to the left.
- (iii) The names of the units and the sub-divisions should be stated clearly below or at the respective ends.
- (iv) The name of the scale (e.g. scale, 1 : 10) or its R.F. should be mentioned below the scale.



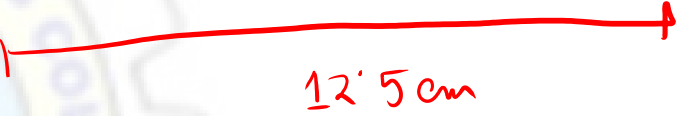
Q.1 Construct a scale of 1:4 to show cm and long enough to measure up to 5 Deci-meter.

Solⁿ

$RF = 1:4$

Units \rightarrow Deci m - 4 cm,

Max^m length = 5 deci m.



Step 1:

$$\begin{aligned} \text{Length of scale} &= R.F \times \text{max}^m \text{ length} \\ &= \frac{1}{4} \times 5 \text{ deci m} \\ &= \frac{1}{4} \times 50 \text{ cm} = 12.5 \text{ cm} \end{aligned}$$

\rightarrow Draw one line equal to the length of scale.

Q.1 Construct a scale of 1:4 to show cm and long enough to measure up to 5 Deci-meter.

Step 2: Divide the line into required number of parts (= 5)

Step 3: Provide some thickness to the scale and draw the primary division.

Step 4: Make the markings for primary divisions. (Right from the end of 1st division)

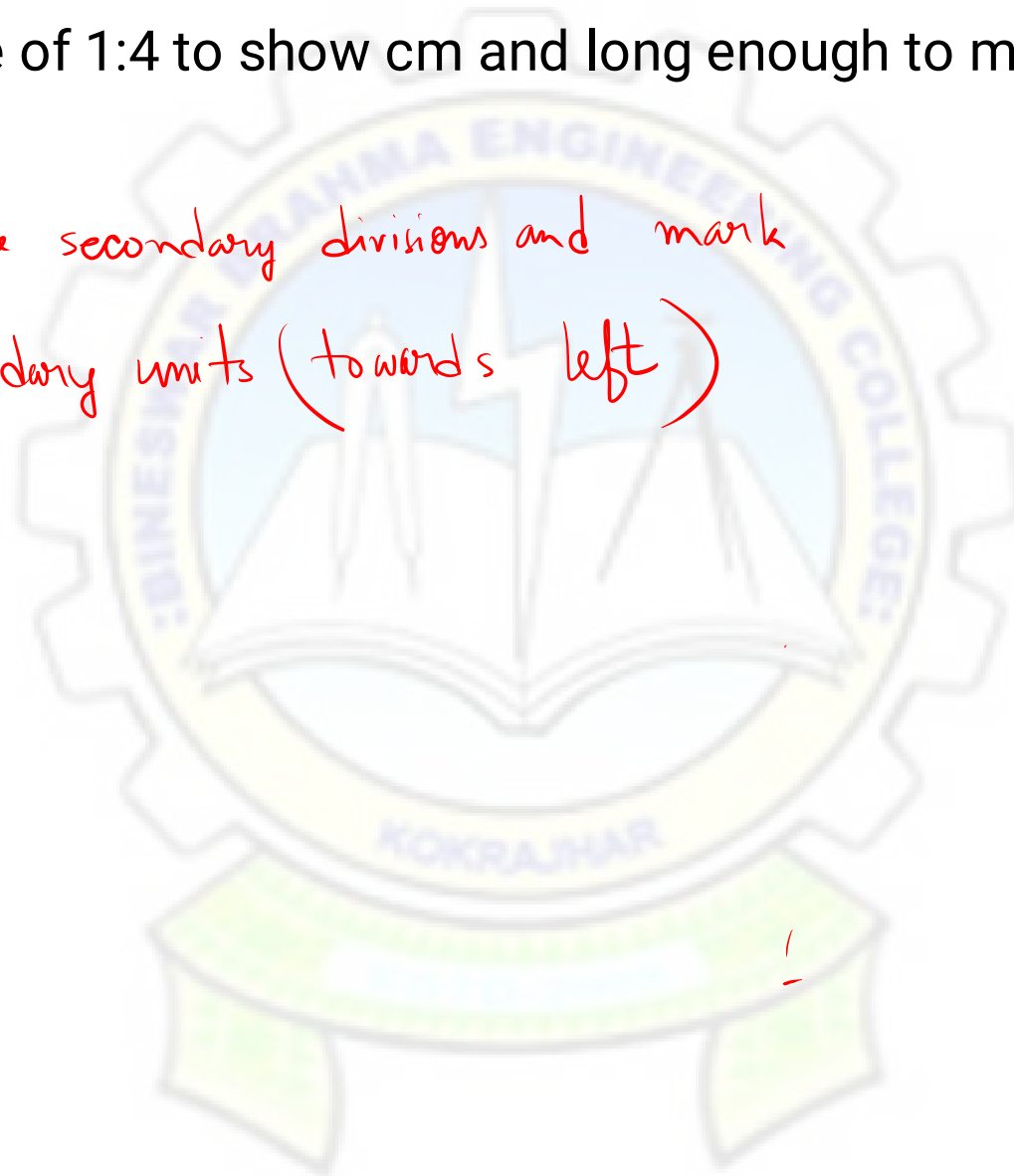
Step 5: For secondary divisions / secondary unit:

↳ On the first division, divide the division into required number of sub divisions. (= 10)

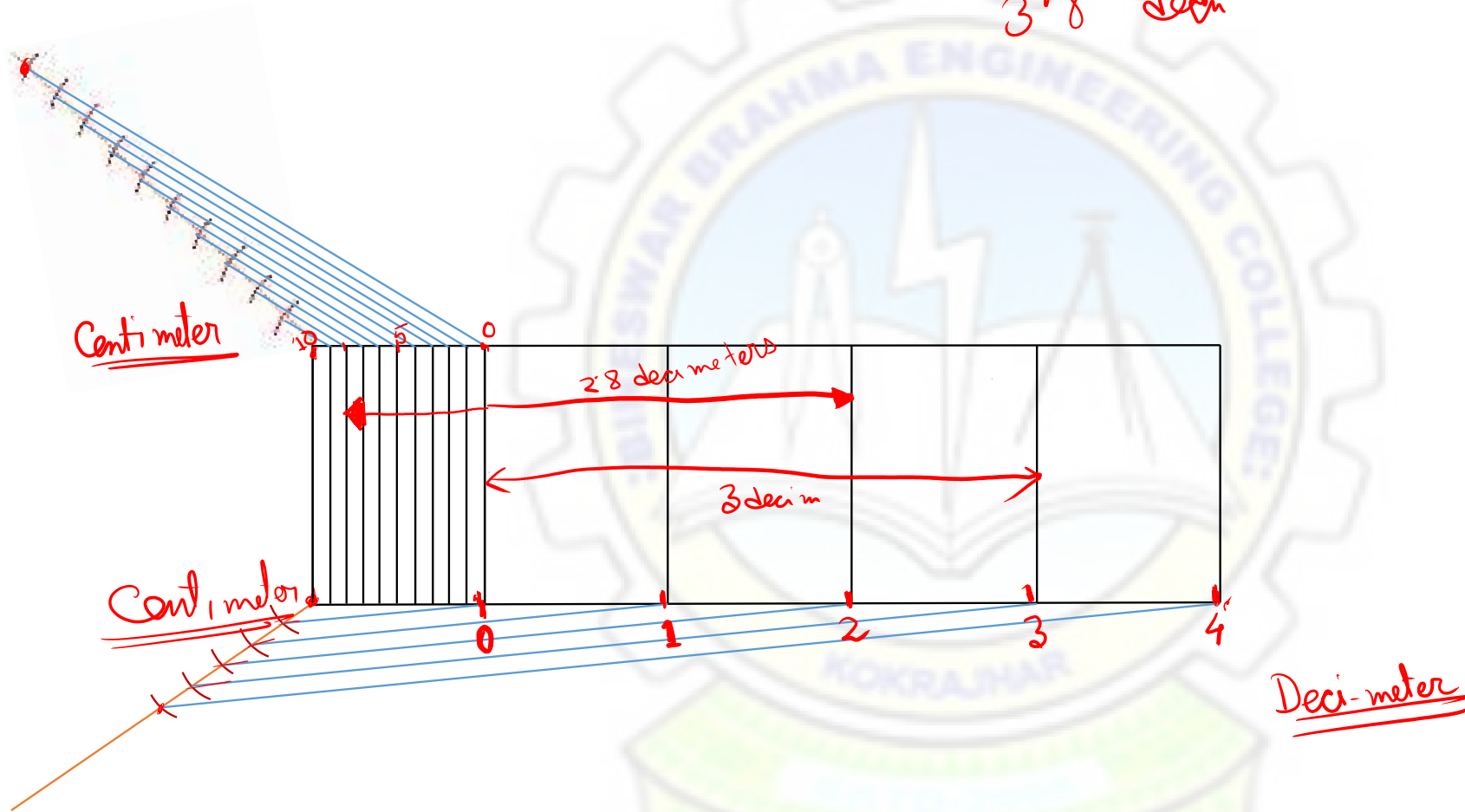
1 deci meter \Rightarrow 10 cm

Q.1 Construct a scale of 1:4 to show cm and long enough to measure up to 5 Deci-meter.

Step 6: Draw the secondary divisions and mark the secondary units (towards left)



* Show a length of ① 3 d.m & ② 2.8 decim = 2 decimeters & 8 cent.m
3.8 decm



Q.2 Construct a scale to show meter and decimeter and long enough to measure up to 6 meters. Take 1 cm of scale = 60 cm on actual. Also show measurements of 3.2 m and 5.5 m.

Soln

✓ Units = meter / decim, $1 \text{ cm} = 0.6 \text{ m}$

✓ Max^m length = 6 m

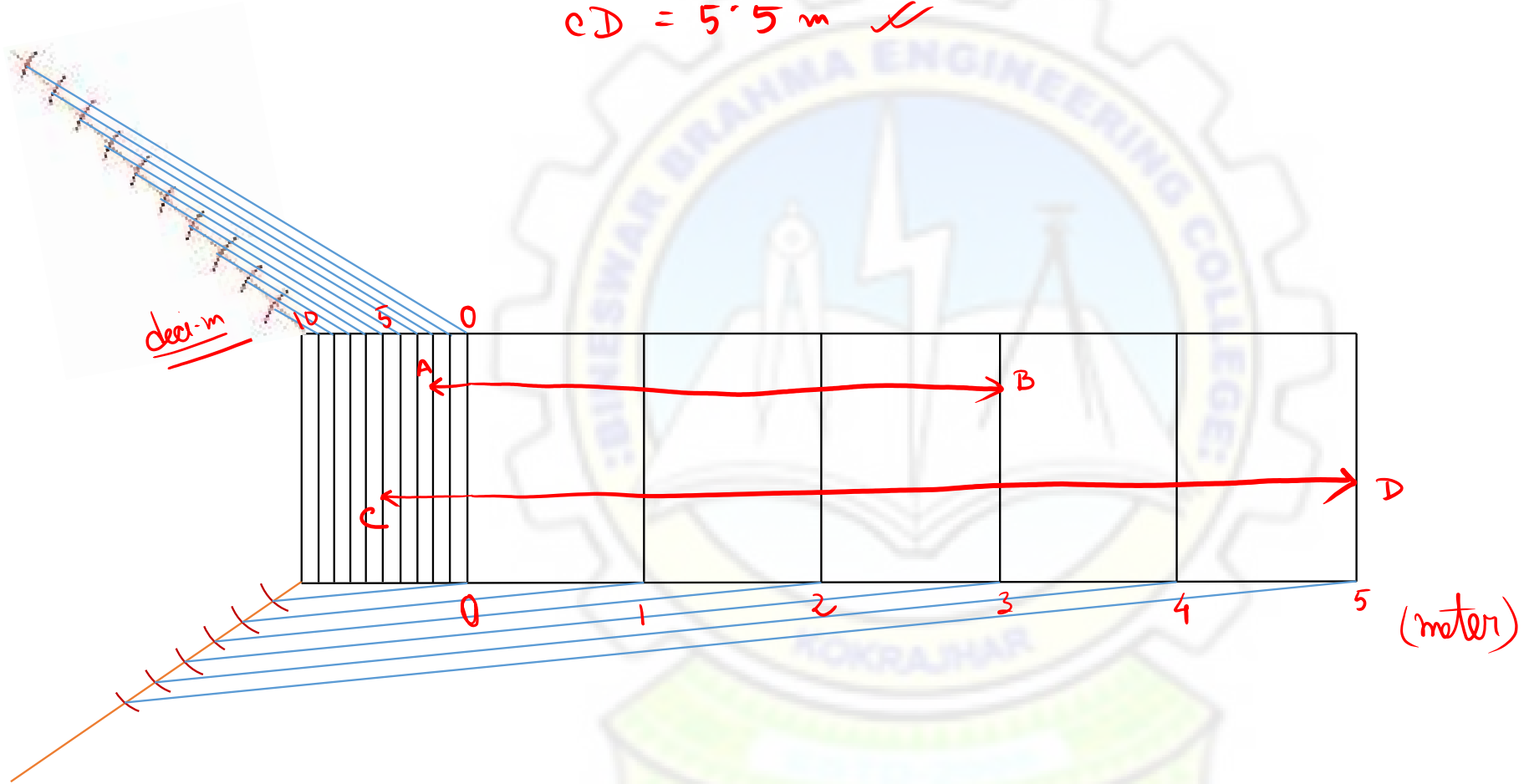
✓ ⊛ R.F. = $\frac{\text{length in drawing}}{\text{length in actual}} = \frac{1 \text{ cm}}{60 \text{ cm}} = 1:60$

① Length of scale = R.F. × Max^m length = $\frac{1}{60} \times 6 \text{ m}$
 $= \frac{1}{60} \times 600 \text{ cm} = \underline{\underline{10 \text{ cm}}}$

$$AB = 3.2 \text{ m} \checkmark$$

$$CD = 5.5 \text{ m} \checkmark$$

$$1 \text{ m} = \underline{\underline{10}} \text{ decimeter}$$



Q.2 Construct a scale to show meter and decimeter. Take 1 cm of scale = 60 cm on actual. Also show measurements of 3.2 m and 5.5 m.

50 m

Units \rightarrow meters / centimeters

$$R.F = \frac{1}{60}$$

$$\text{Max}^m \text{ Length} = \del{3} 6 \text{ m}$$

length of scale \rightarrow

F.P.S.

$$1 \text{ foot} = 12 \text{ inches}$$

$$1 \text{ yard} = 3 \text{ feet} = 36 \text{ inch}$$

$$1 \text{ burlong} = 220 \text{ yards} = 7920 \text{ inch}$$

$$1 \text{ mile} = 8 \text{ burlongs} = 63360 \text{ inch}$$

Thank you!

