102001208 ENGINEERING GRAPHICS

Engineering Scales

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Outline

- Introduction
- Representative Factor (RF) or Scale Factor
- Unit Conversion - Metric
- Unit Conversion - British
- Types of Scale
- Problem Solution – Plain Scale
- **Problem Solution – Diagonal Scale**

Introduction

- Can we draw Map of India on a paper / notebook / drawing sheet / sketch book in actual dimensions ?

Introduction

- How objects having Large/Small dimensions are required to drawn ?
  - Map of Motherland INDIA
  - Ant or Corona Virus

Introduction

- We can take the scale, like example
  - 1 km actual distance
    = 1 mm on drawing
  - 0.1 mm actual distance
    = 10 cm on drawing

Introduction

- 1 km actual distance
  = 1 mm on drawing

(Dimensions are reduced on Drawing – Reducing Scale)

Introduction

- 0.1 mm actual distance
  = 10 cm on drawing

(Dimensions are increased on Drawing – Enlarging Scale)

Introduction

- When we take the scale, we are required to find out
  - How much dimensions are required to be reduced OR
  - How much dimensions are required to be increased

Introduction

- These change in dimensions are defined by a ratio known as Scale Factor or Representative Factor (RF)

Representative Factor (RF)

$$\text{Representative Factor} = \frac{\text{Dimension of Object in Drawing}}{\text{Actual Dimension of Object}}$$

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$$\frac{1}{1000}, \frac{1}{10}, \frac{1}{500}, \frac{1}{7000}\ \textit{etc.}\ \text{are Reducing Scale}$$

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Denoted also as: 1:1000, 1:10, 1:500, 1:7000 etc.

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$\frac{1000}{1}, \frac{10}{1}, \frac{500}{1}, \frac{7000}{1}$ *e*tc. are Enlarging Scale

Denoted also as : 1000 : 1, 10 : 1, 500 : 1, 7000 : 1 etc.

Representative Factor (RF)

If, $RF = \frac{1}{1}$ or 1:1 Then Scale is known as_____

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Full Size Scale,

means Drawing and Objects are of Same Size.

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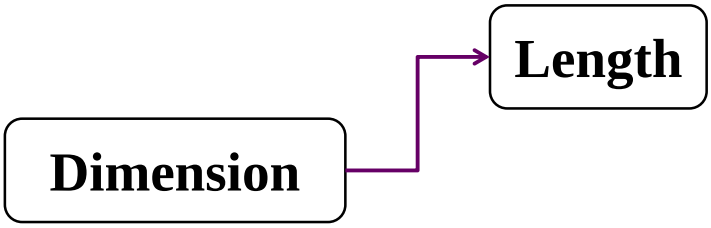

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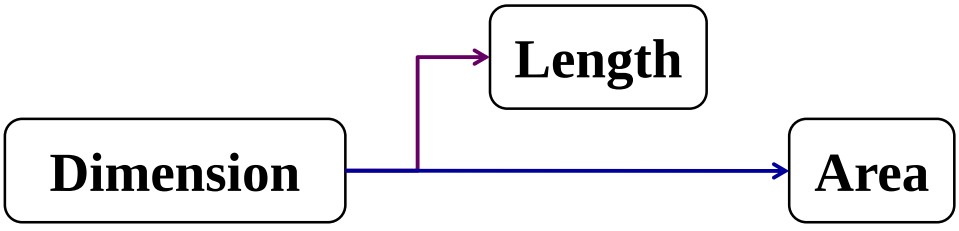

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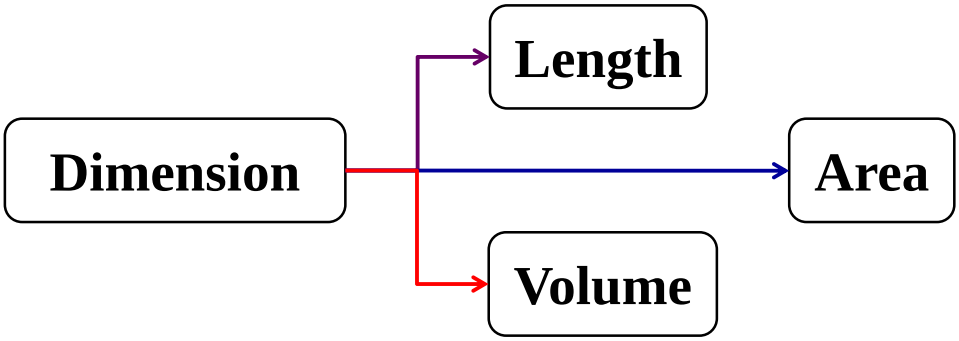

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If Dimension in Area is given

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If Dimension in Area is given

$$\text{RF} = \sqrt{\frac{\text{Area of Object in Drawing}}{\text{Actual Area of Object}}}$$

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If Dimension in Volume is given

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If Dimension in Volume is given

$$RF = \sqrt[3]{\frac{\text{Volume of Object in Drawing}}{\text{Actual Volume of Object}}}$$

Unit Conversion - METRIC

1 kilometre (km) =10 hectometres (hm)
1 hectometre (hm)=10 decametres (dam)
1 decametre (dam) =10 metres (m)
1 metre (m) = 10 decimetres (dm)
1 decimetre (dm) = 10 centimetres (cm)
1 centimetre (cm) =10 millimetres (mm)

Unit Conversion - British

1 mile	= 8 furlongs
1 furlong	= 220 yards
1 yard	= 3 feet
1 foot	= 12 inches
1 inch	= 2.54 centimetres

Types of Scales

- Plain Scale
- Diagonal Scale
- Vernier Scale
- Comparative Scale
- Scale of Cords

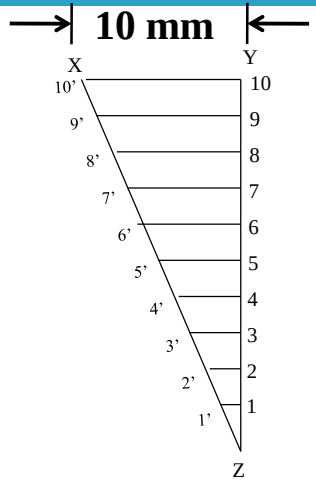
Types of Scales

- Plain Scale
  - For Dimension up to single Decimal
- Diagonal Scale
  - For Dimension up to two Decimal

Types of Scales

- Vernier Scale
  - For Dimension upto two Decimal
- Comparative Scale
  - For comparing two units
- Scale of Cords
  - For measuring/constructing angles

Diagonal Scale - Principle



What will be length of 9-9' = ?

What will be length of 4-4' = ?

Diagonal Scale - Principle

The diagonal scales give us three successive dimensions that is

a unit,

a subunit and

a subdivision of a subunit.

Diagonal Scale - Steps

$$\text{Representative Factor} = \frac{\text{Dimension of Object in Drawing}}{\text{Actual Dimension of Object}}$$

$$\text{LOS} = \text{RF} \times \text{Max. Dimensions to be Measured}$$

Diagonal Scale - Steps

- Draw a Horizontal Line Equivalent to LOS
- Divide the Horizontal Line as per Max. Dimensions to be measured
  - Very Important

Diagonal Scale - Steps

- Draw a Vertical Line of any length to represent third dimension on it.
  - ➢Very Important

Diagonal Scale

Construct a diagonal scale 1 cm = 0.5 km. showing kilometer, hectometer and decameter. Scale should be long enough to measure up to 5 kms. Indicate 3 km, 7 hm and 8 dam on the scale.

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$$LOS = RF \times \text{Max. Dimensions to be Measured}$$

$$LOS = \frac{1}{0.5*100000} \times 5\,\text{km}$$

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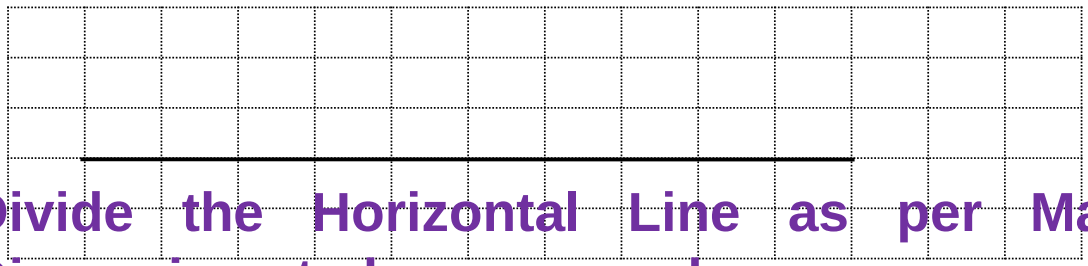

Divide the Horizontal Line as per Max. Dimensions to be measured

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10 cm line shows 5 km

So, to devide in ??? divisions

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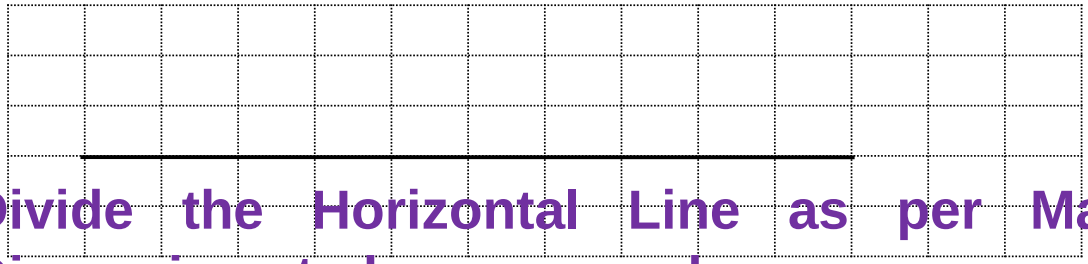

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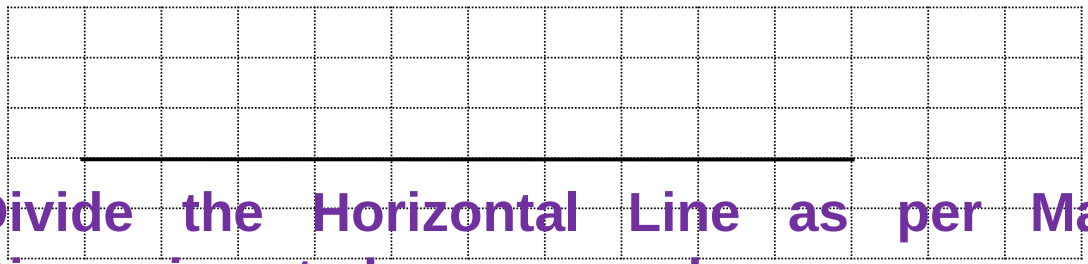

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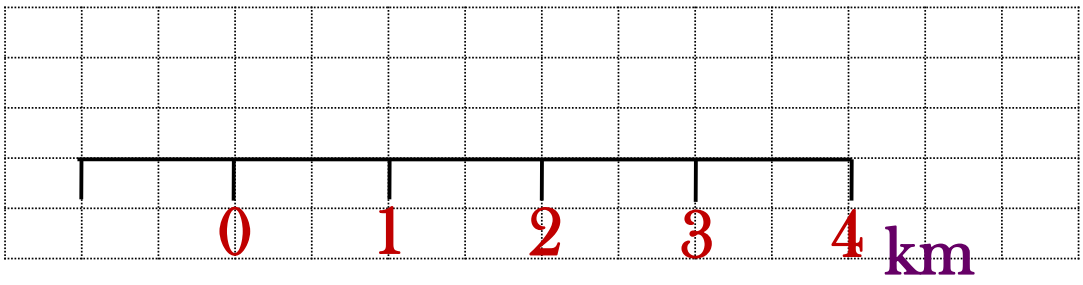

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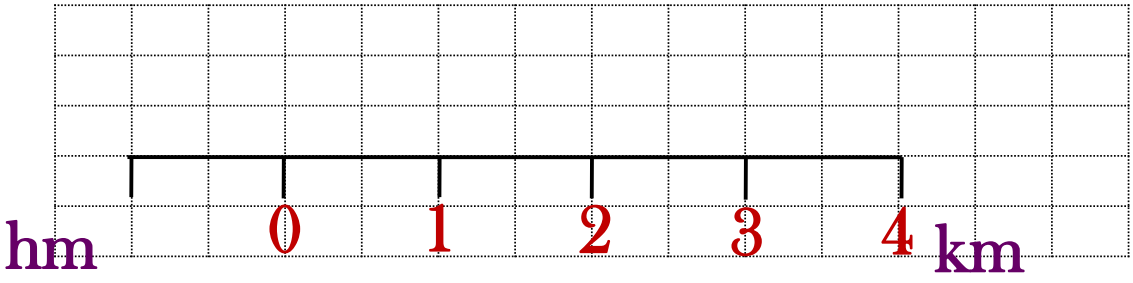

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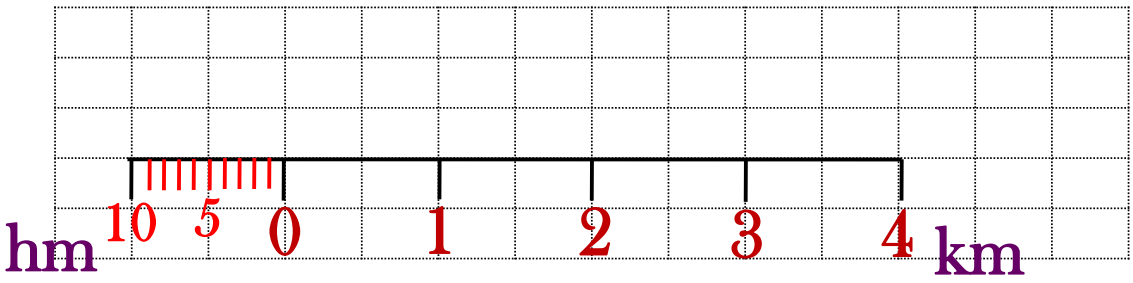

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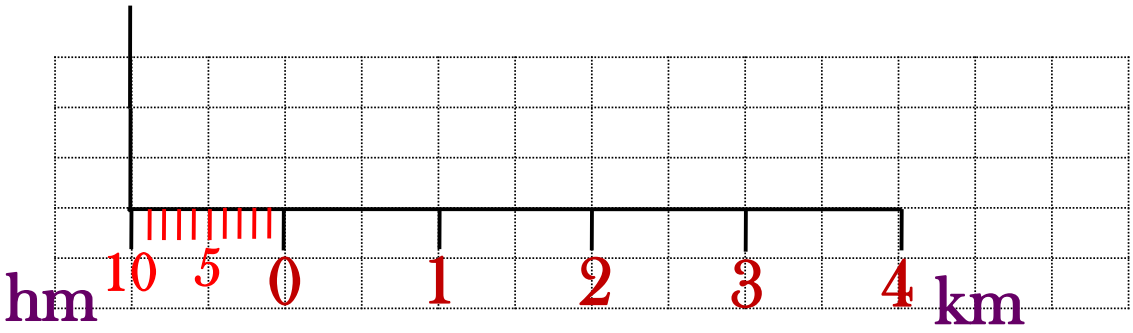

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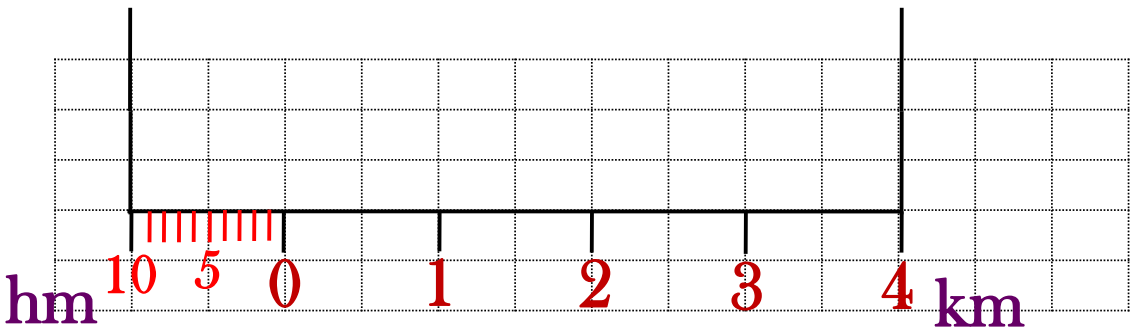

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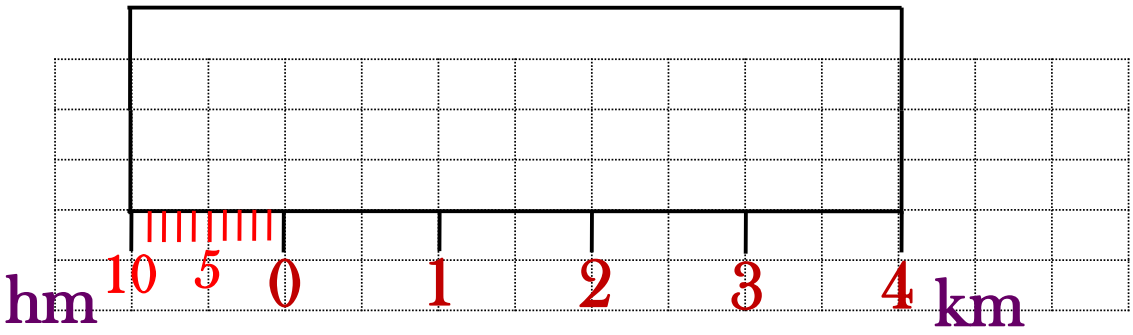

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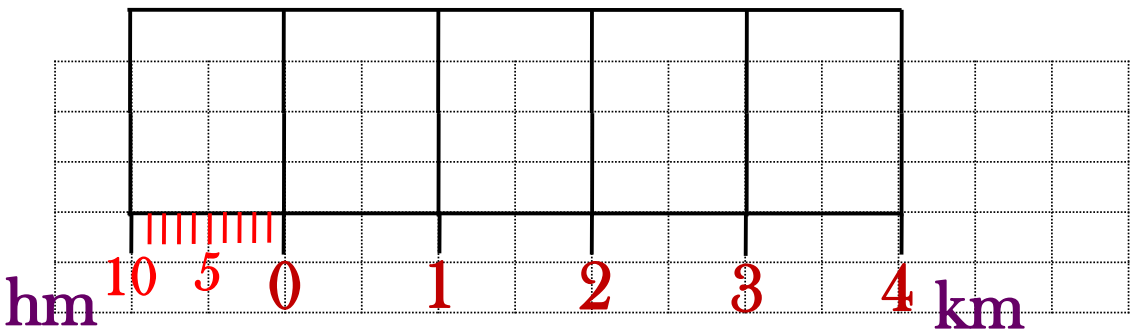

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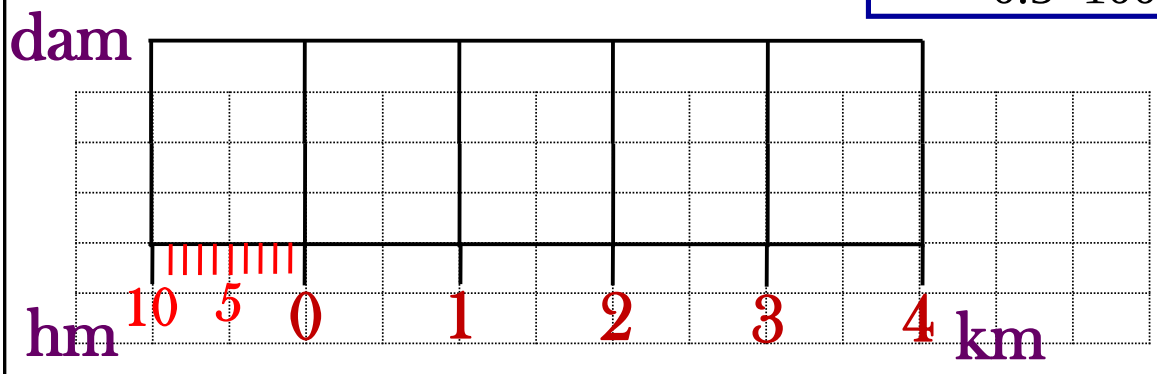

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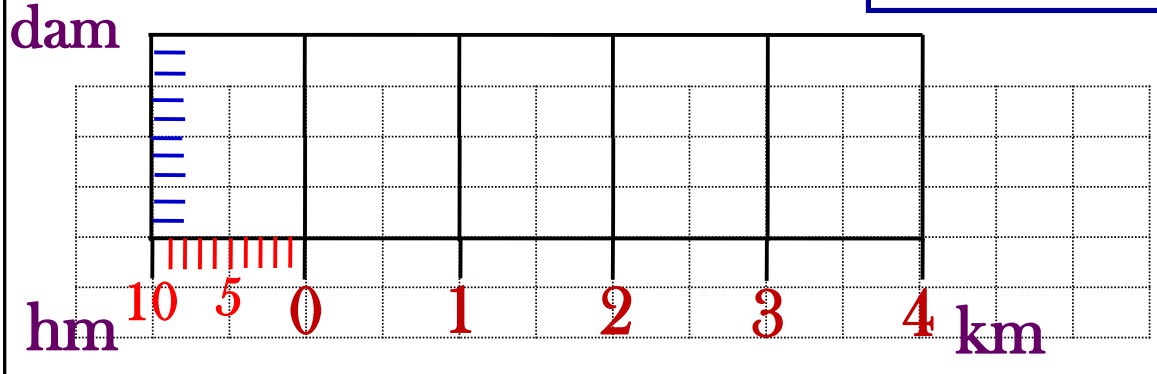

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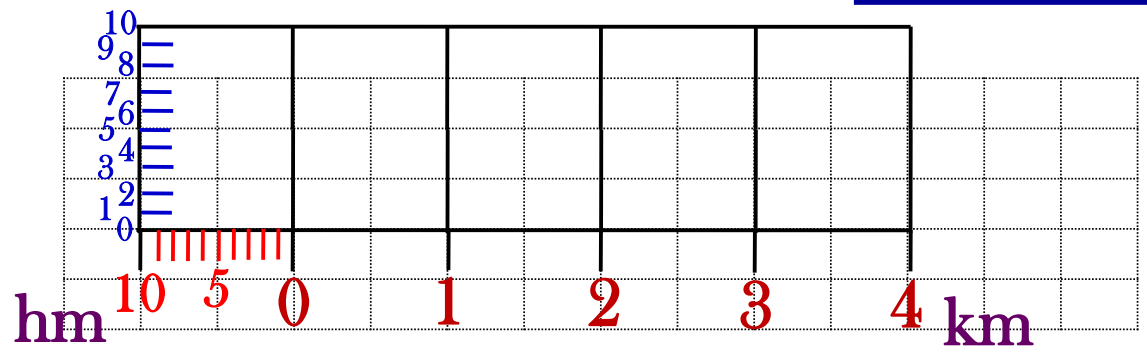

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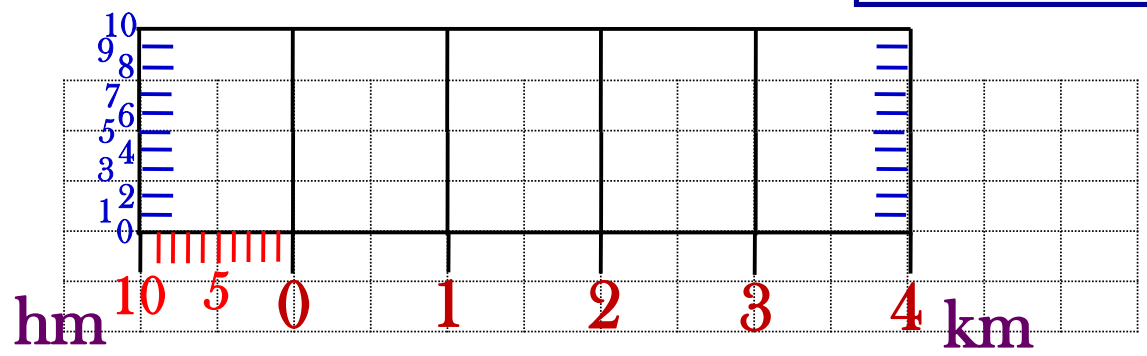

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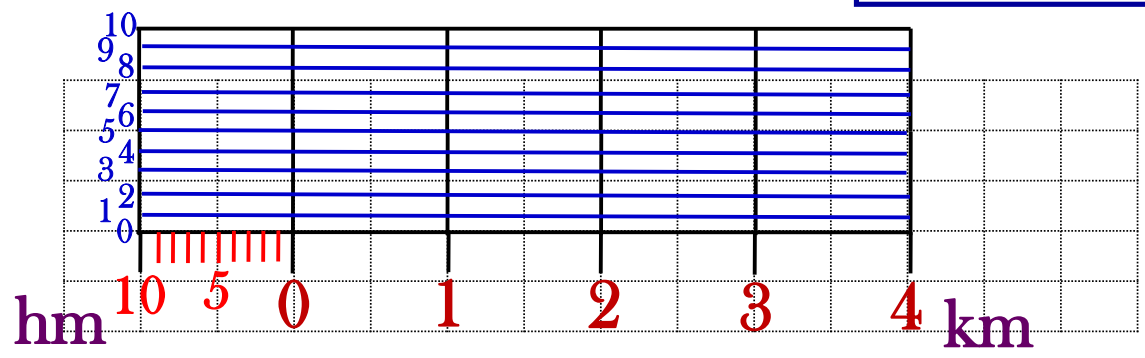

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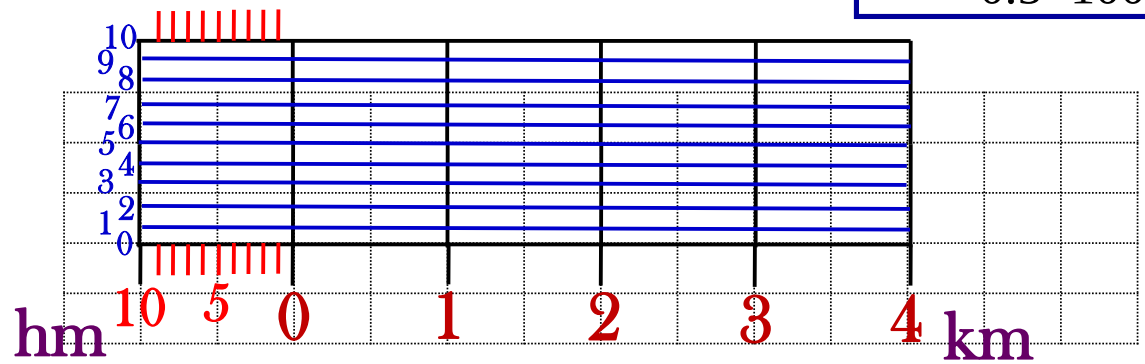

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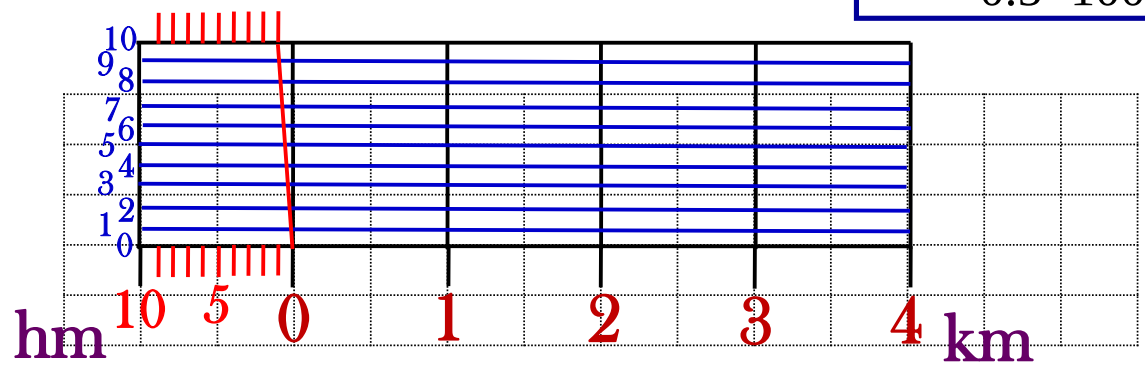

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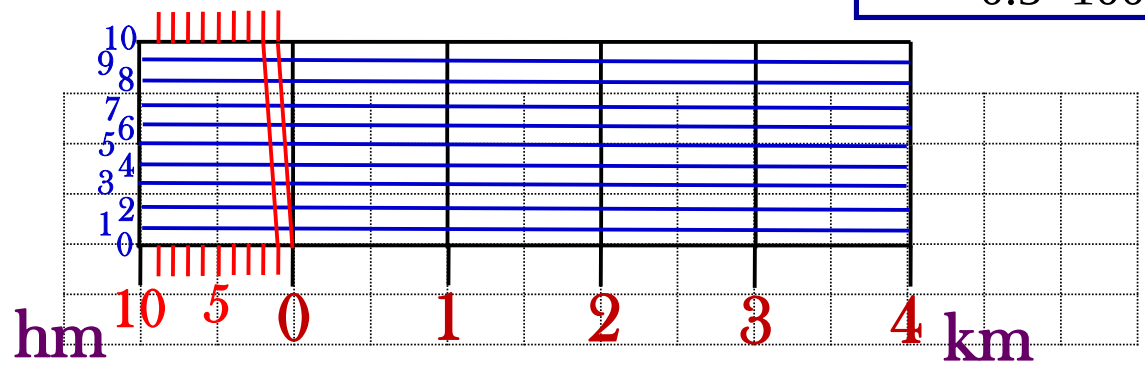

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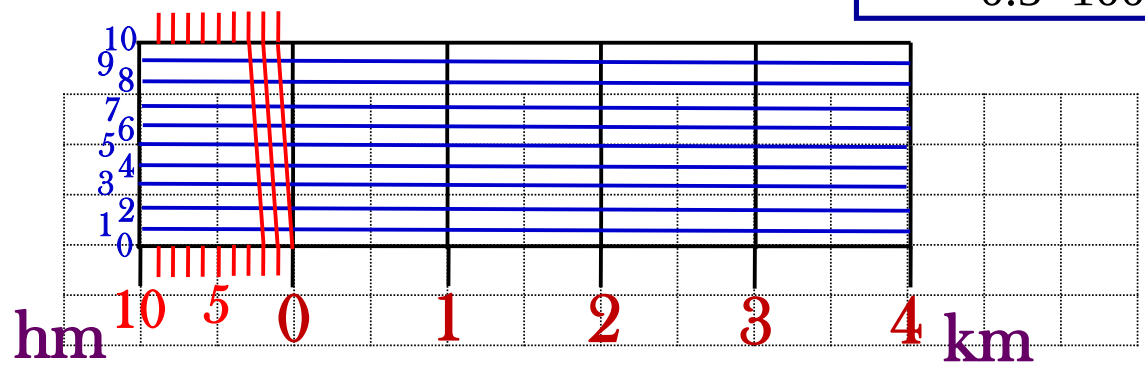

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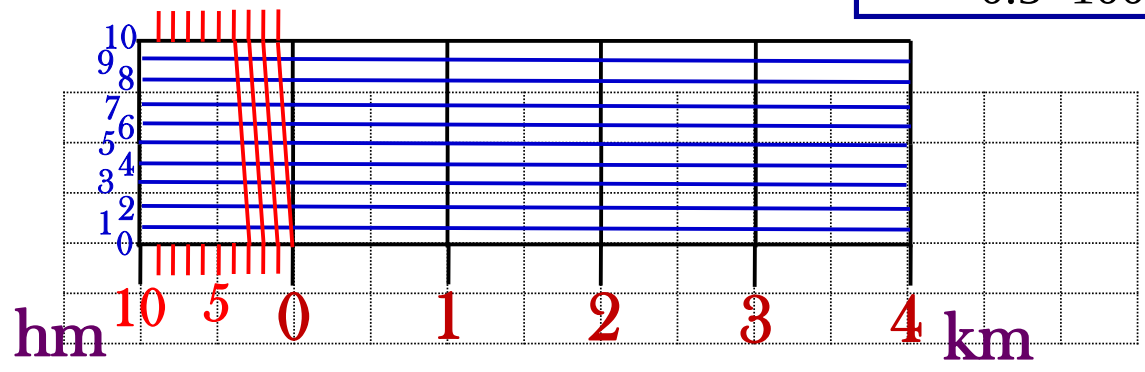

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$LOS = 10\ cm$

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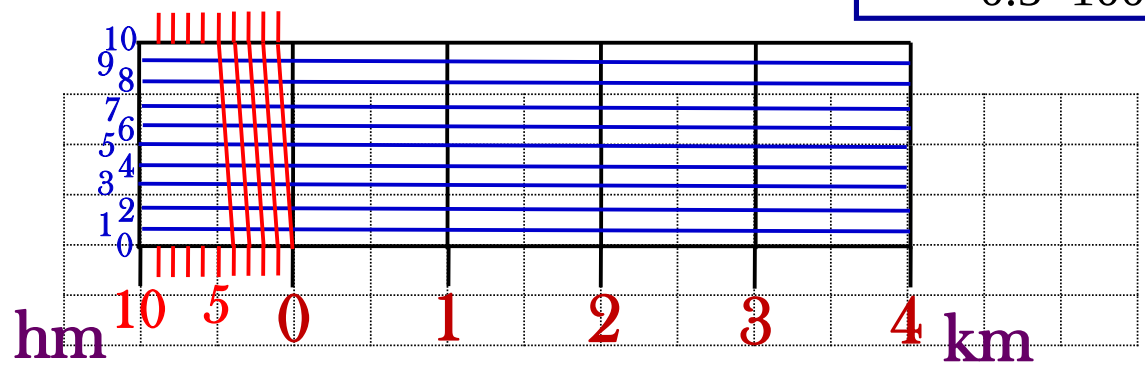

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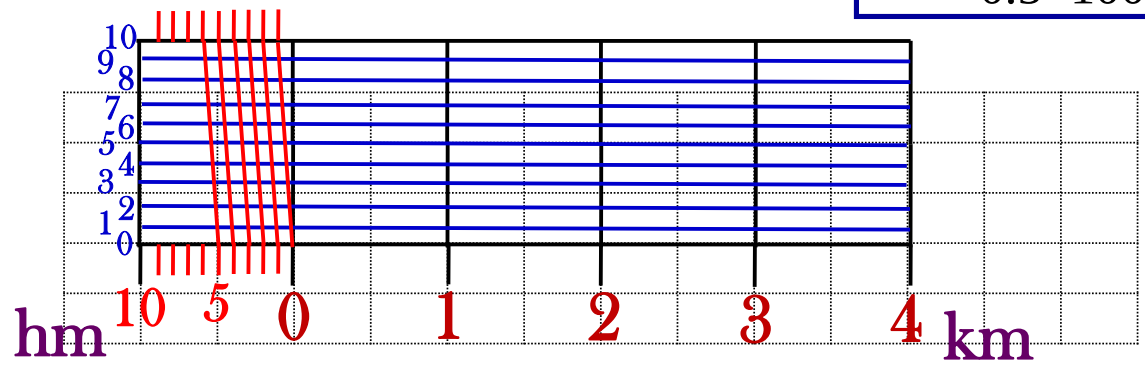

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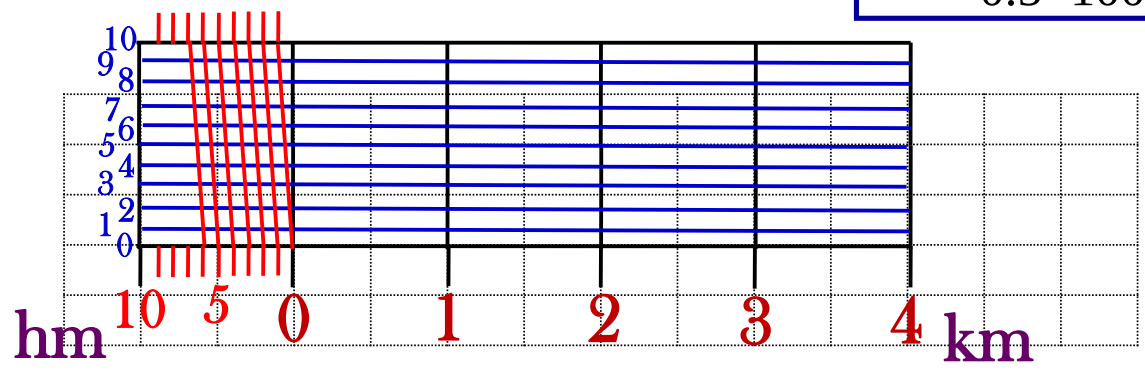

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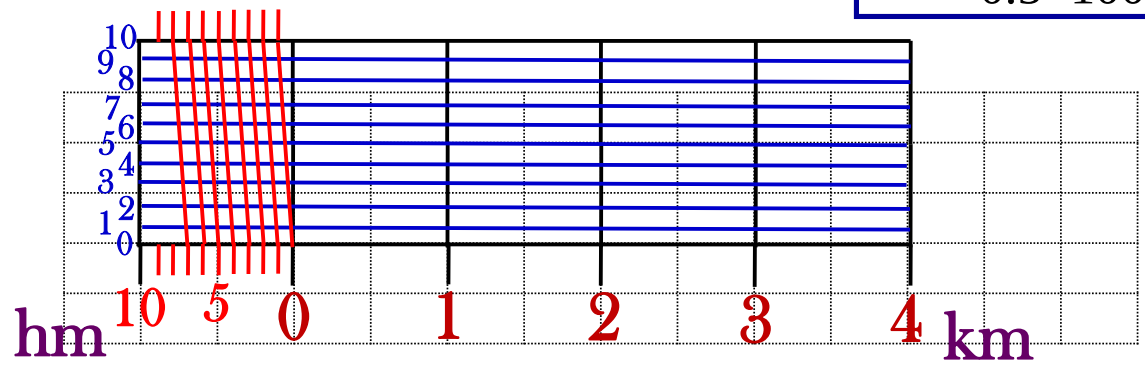

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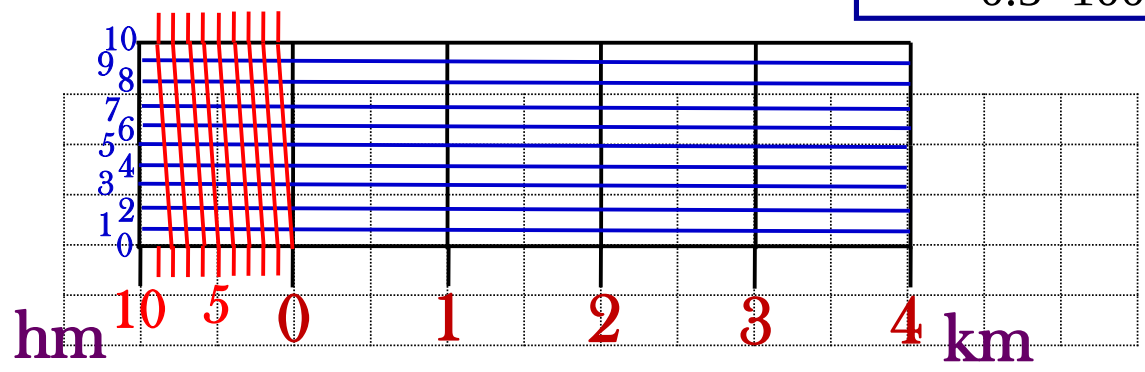

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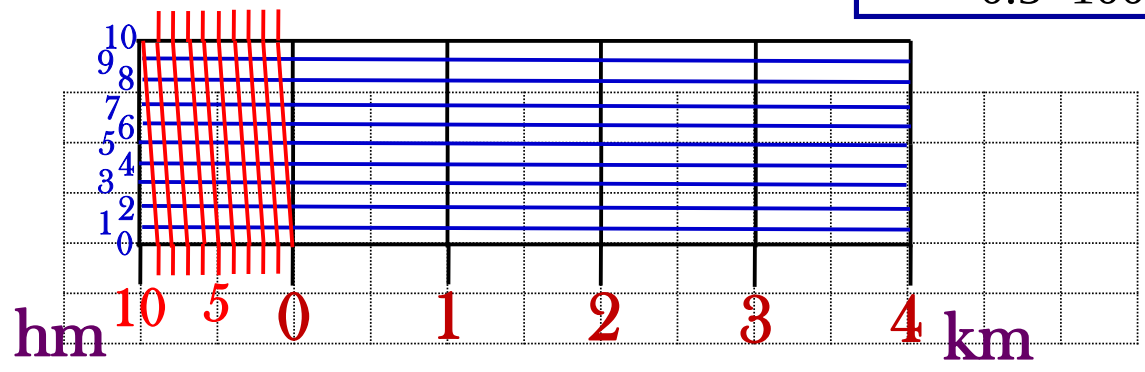

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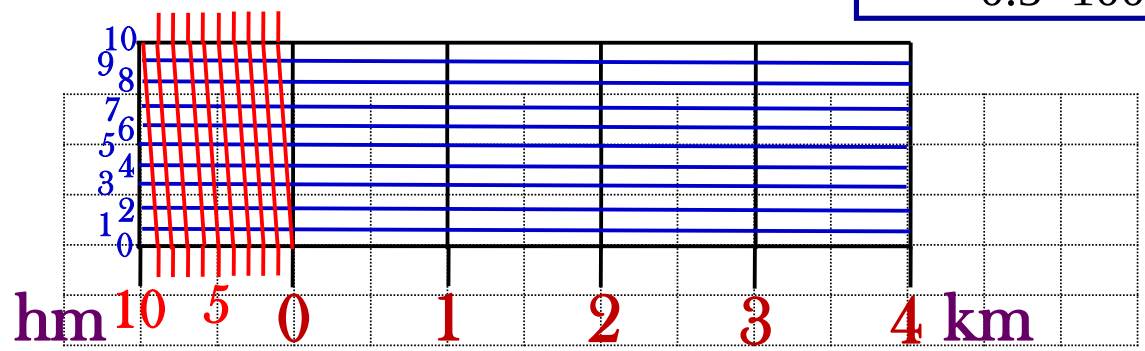

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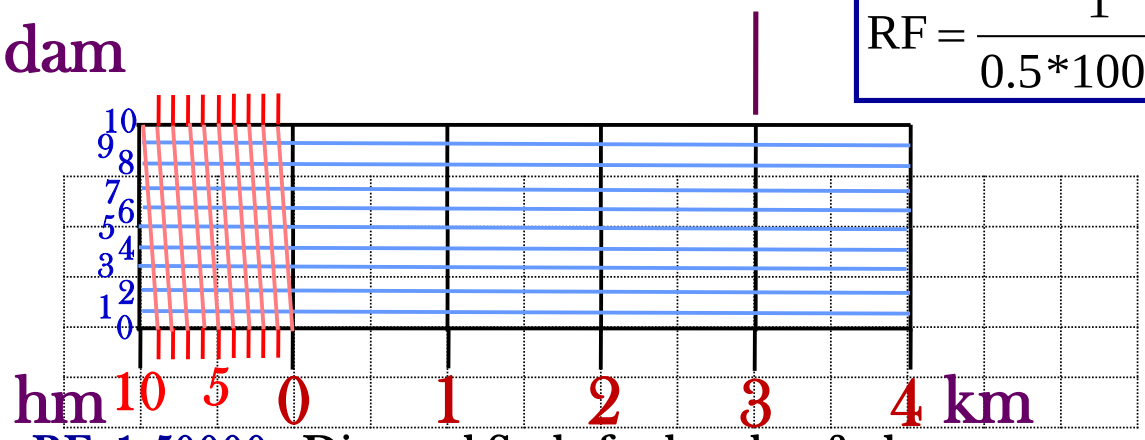

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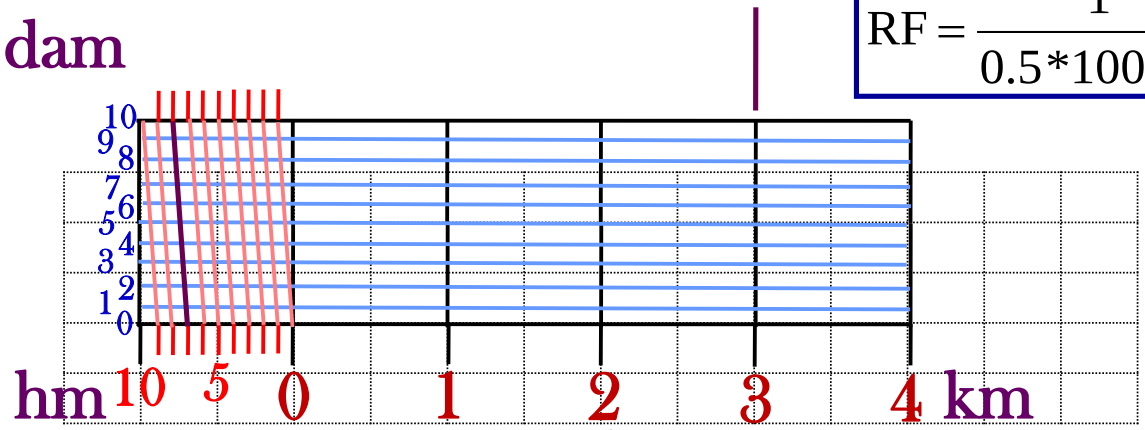

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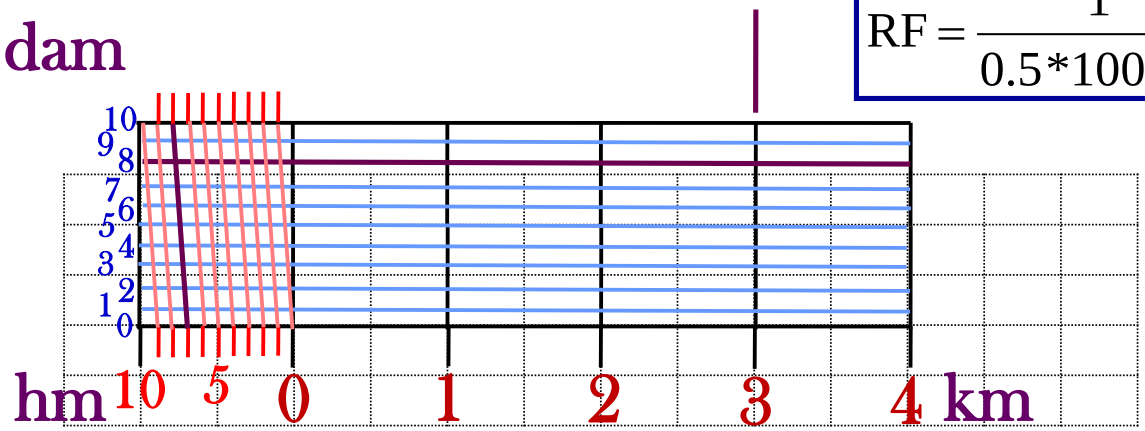

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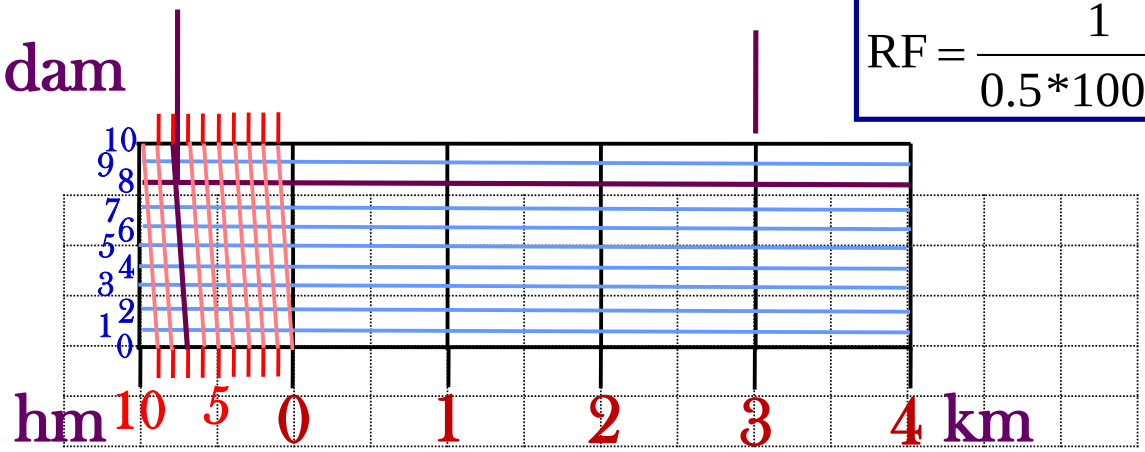

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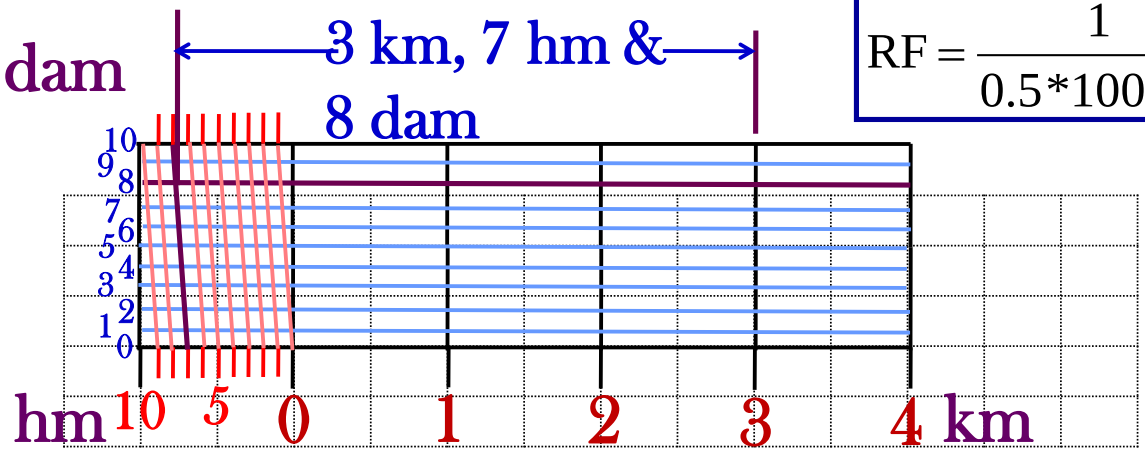

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Diagonal Scale

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$$RF = \frac{1}{36}$$

$$LOS = RF \times \text{Max. Dimensions to be Measured}$$

$$LOS = \frac{1}{36} \times 5 \text{ yards} = \frac{1}{36} \times 5 *$$

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$$LOS = \frac{1}{36} \times 5 \text{ yards} = \frac{1}{36} \times 5 * 3 * 12 \text{ inch}$$

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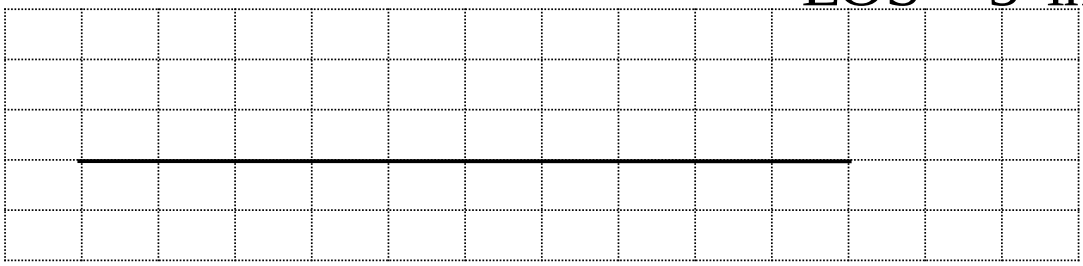

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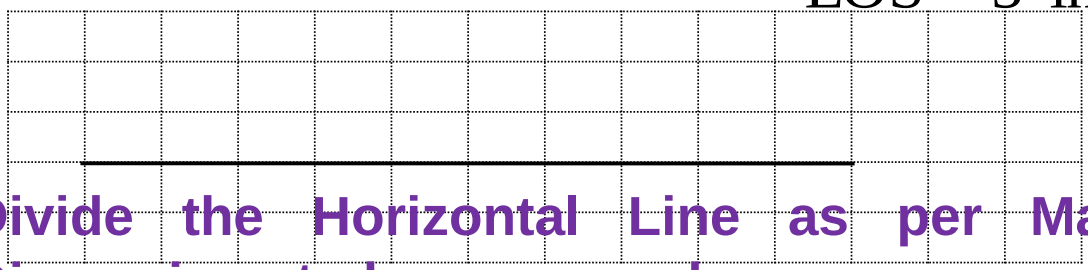

Divide the Horizontal Line as per Max. Dimensions to be measured

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5 inch line shows 5 yards

So, to devide in ??? divisions

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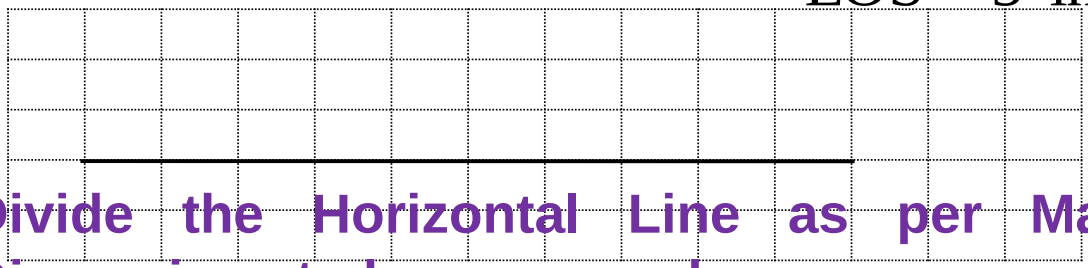

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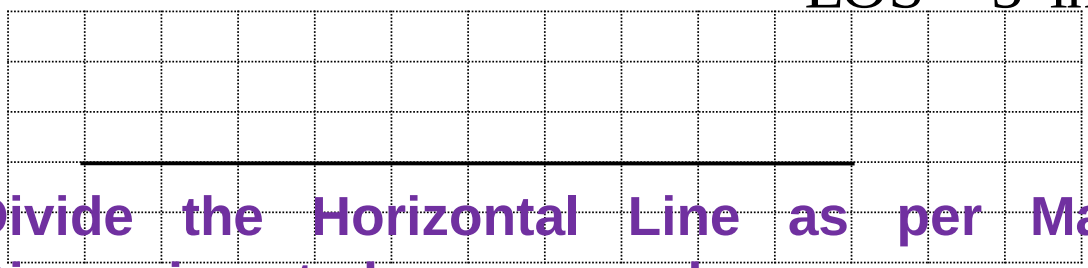

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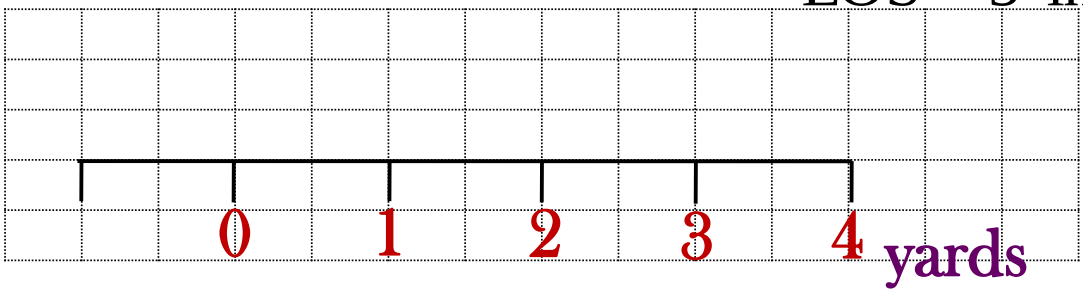

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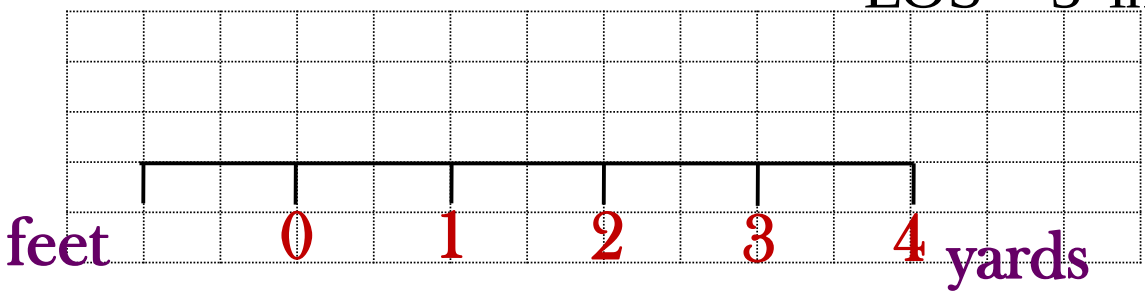

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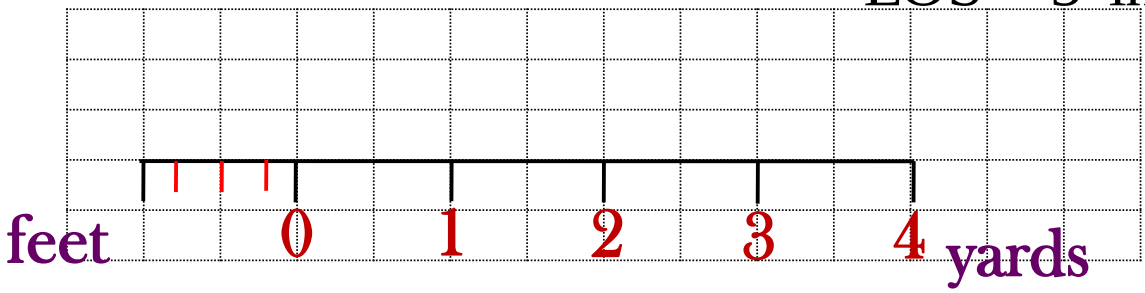

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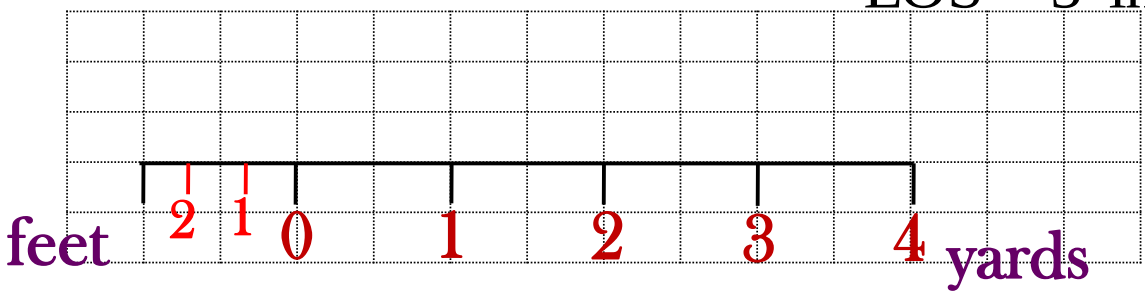

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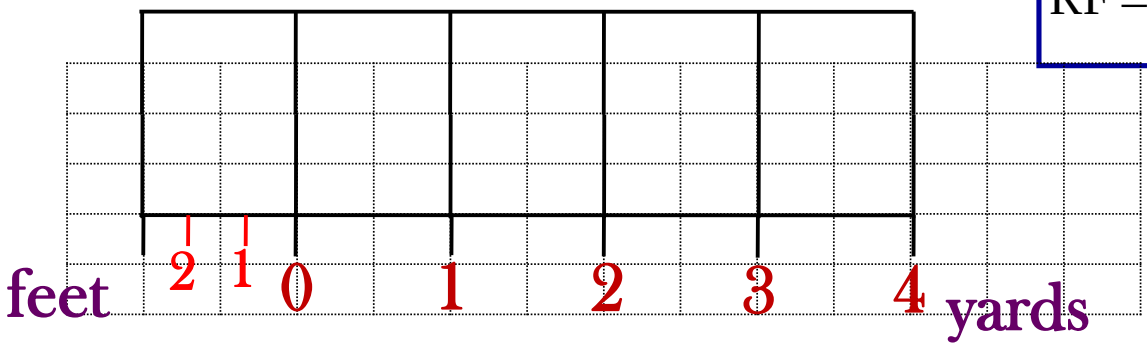

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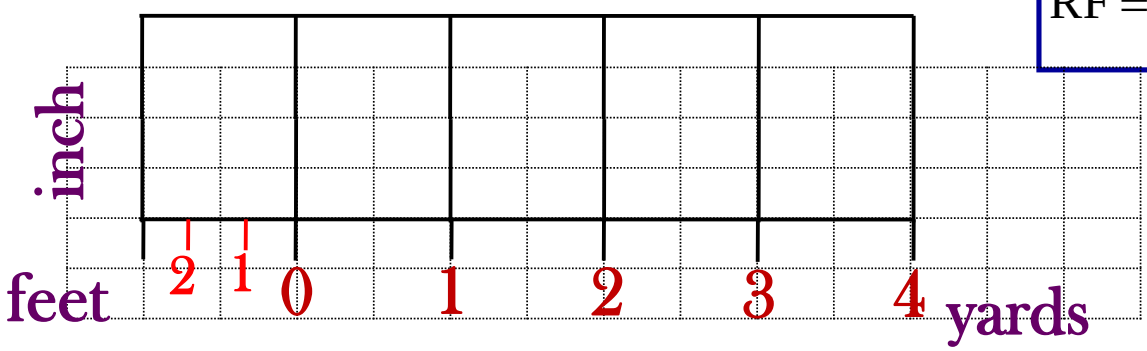

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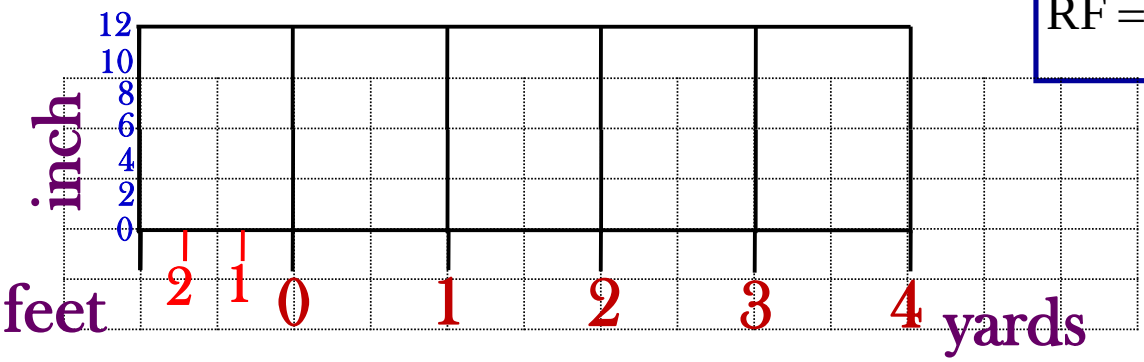

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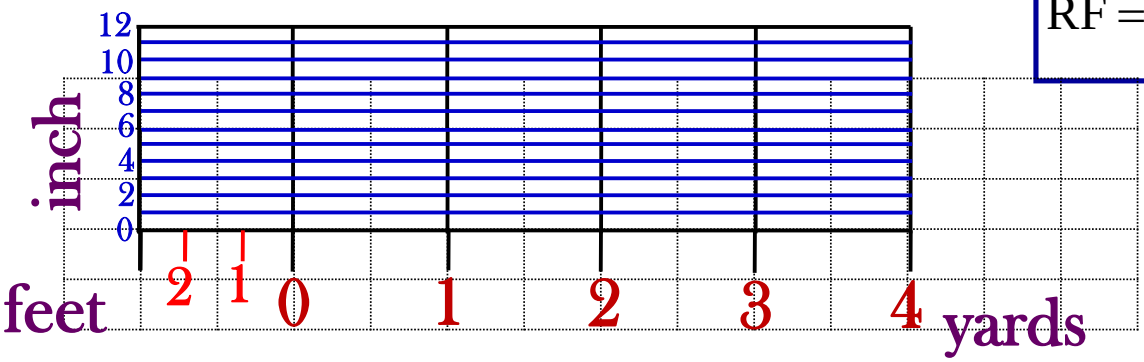

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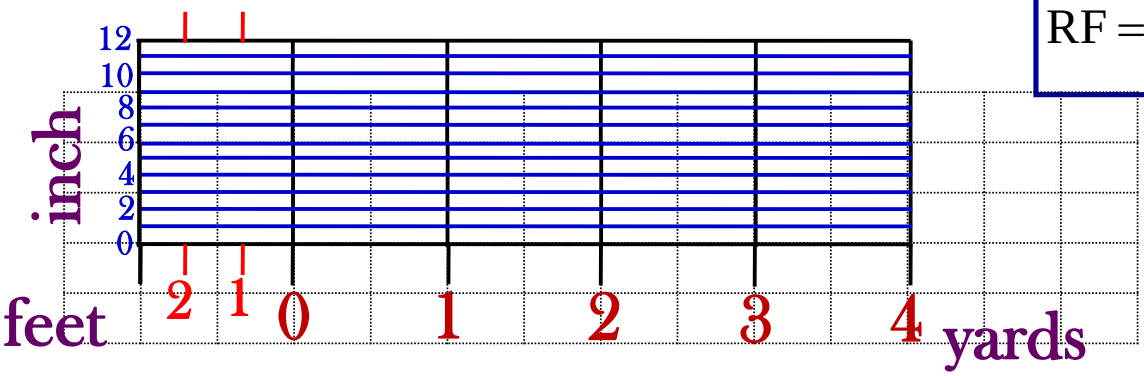

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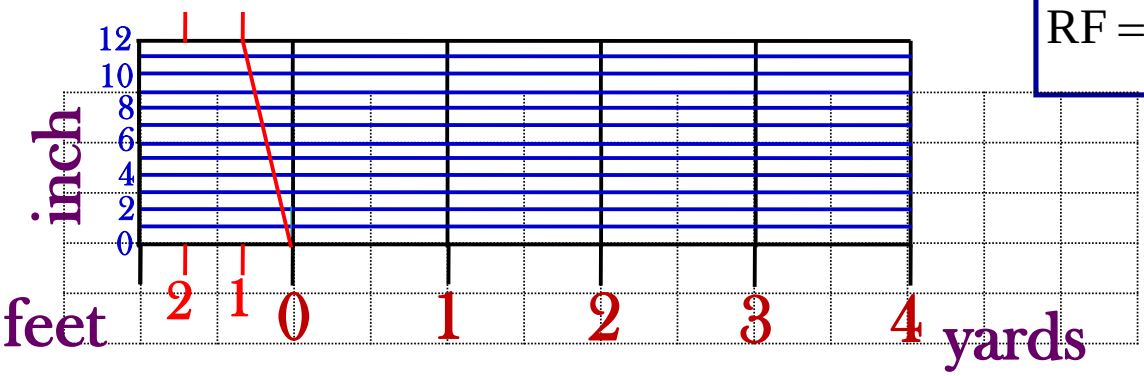

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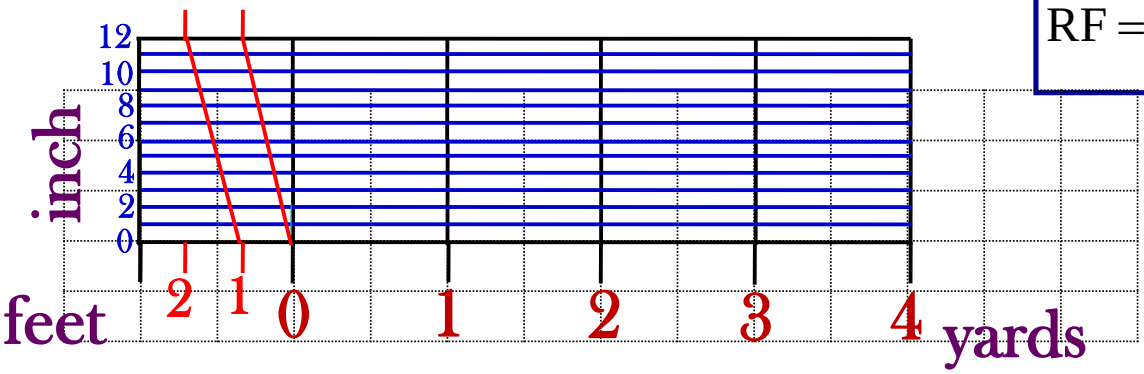

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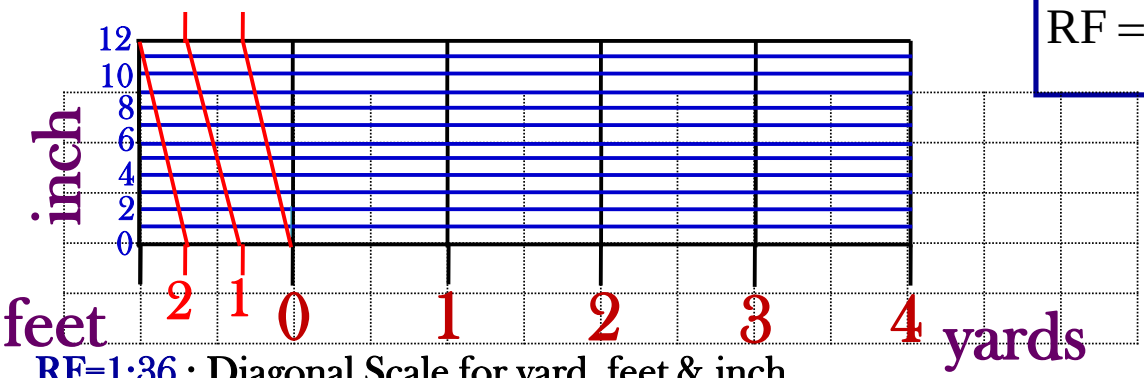

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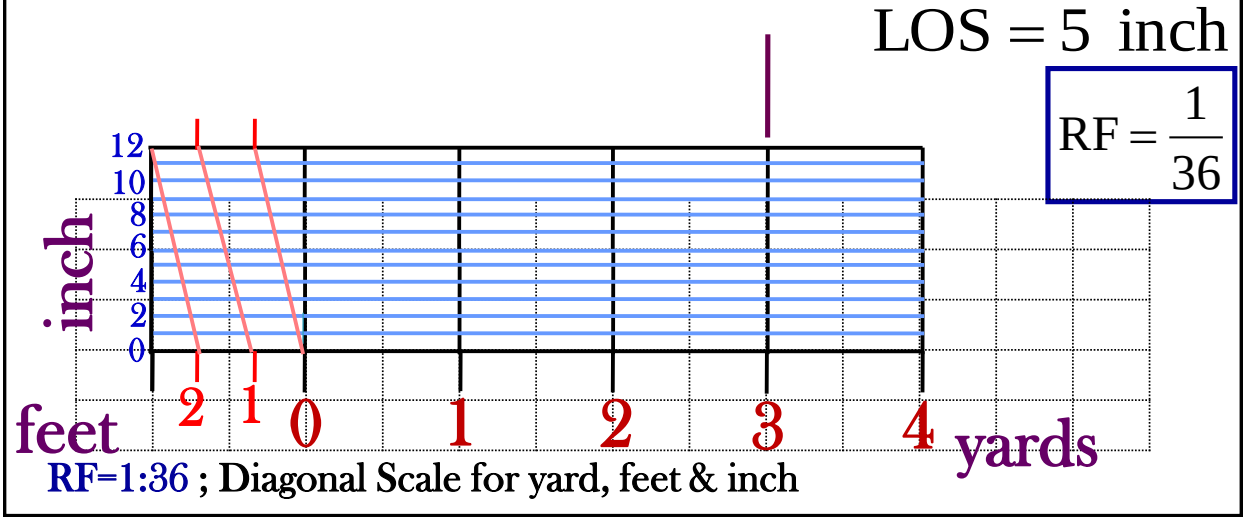

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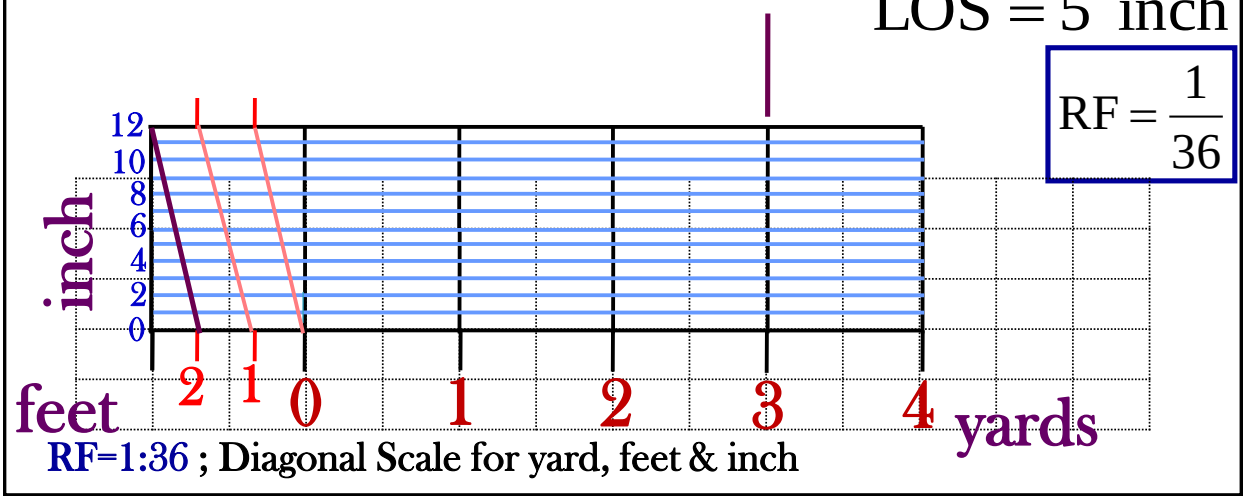

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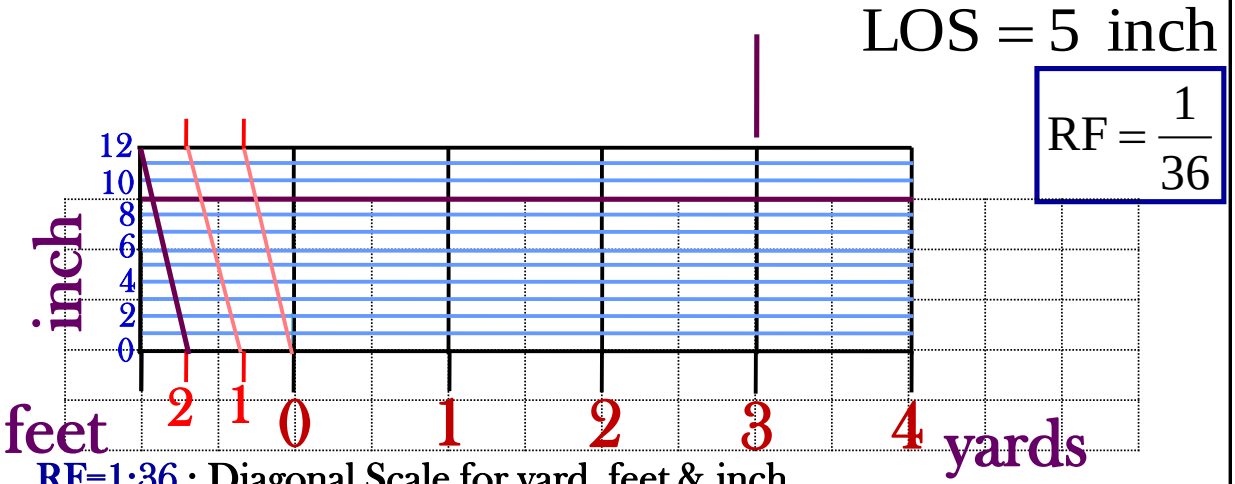

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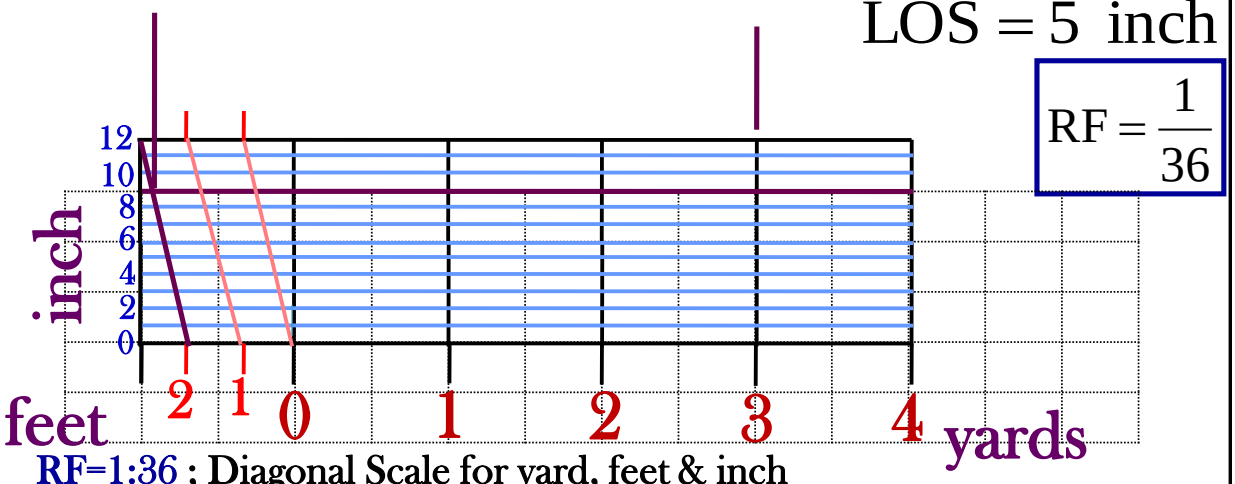

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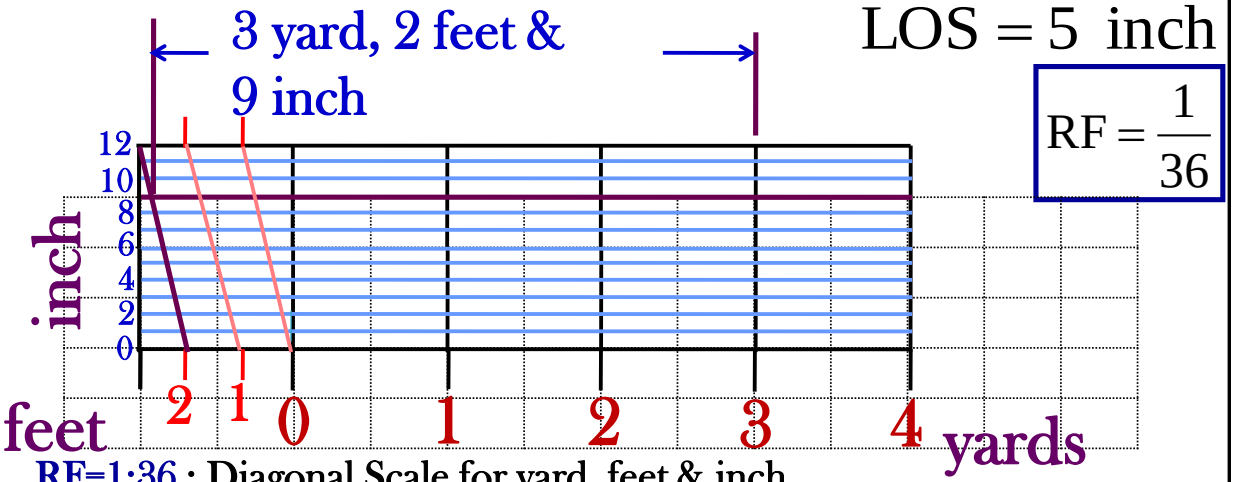

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An area of 144 sq. cm on a map represents an area of 36 sq. km on the field. Construct a diagonal scale to show kilometres, hectometres and decametres and to measure up to 10 kilometres. Indicate on the scale a distance of 7 kilometres, 5 hectometres and 6 decametres.

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If Dimension in Length is given

Representative Factor

$$= \frac{\text{Dimension (Length) of Object in Drawing}}{\text{Actual Dimension (Length) of Object}}$$

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If Dimension in Area is given

$$RF = \sqrt{\frac{\text{Area of Object in Drawing}}{\text{Actual Area of Object}}}$$

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If Dimension in Volume is given

$$RF = \sqrt[3]{\frac{\text{Volume of Object in Drawing}}{\text{Actual Volume of Object}}}$$

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If Dimension in Area is given

$$RF = \sqrt{\frac{\text{Area of Object in Drawing}}{\text{Actual Area of Object}}} = \sqrt{\frac{144\ Sq.cm}{36\ Sq.km}}$$

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If Dimension in Area is given

$$\text{RF} = \sqrt{\frac{144 \text{ S}q.cm}{36 \text{ S}q.km}} = \sqrt{\frac{144 \ cm^2}{36 \ km^2}}$$

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$$\text{RF} = \sqrt{\frac{144 \ cm^2}{36 \ km^2}} = \sqrt{\frac{144 \ cm^2}{36*100000*100000 \ cm^2}}$$

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If Dimension in Area is given

$$\text{RF} = \sqrt{\frac{144\ cm^2}{36*100000*100000\ cm^2}} = \sqrt{\frac{4\ cm^2}{100000*100000\ cm^2}}$$

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$$\text{RF} = \sqrt{\frac{4\ cm^2}{100000*100000\ cm^2}} = \frac{2}{100000} = \frac{1}{50000}$$

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$$LOS = RF \times \text{Max. Dimensions to be Measured}$$

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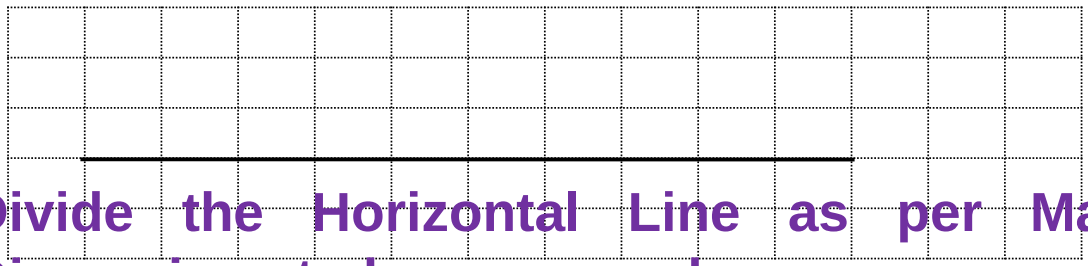

Divide the Horizontal Line as per Max. Dimensions to be measured

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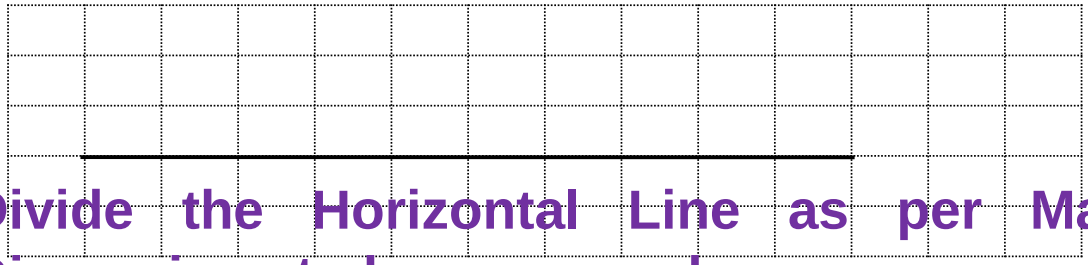
20 cm line shows 10 km

So, to devide in ??? divisions



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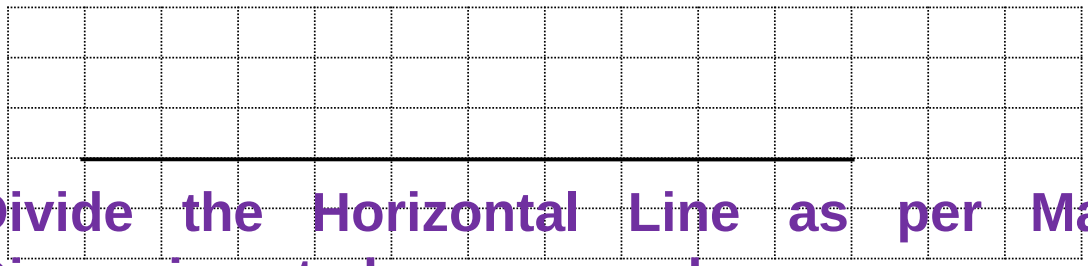

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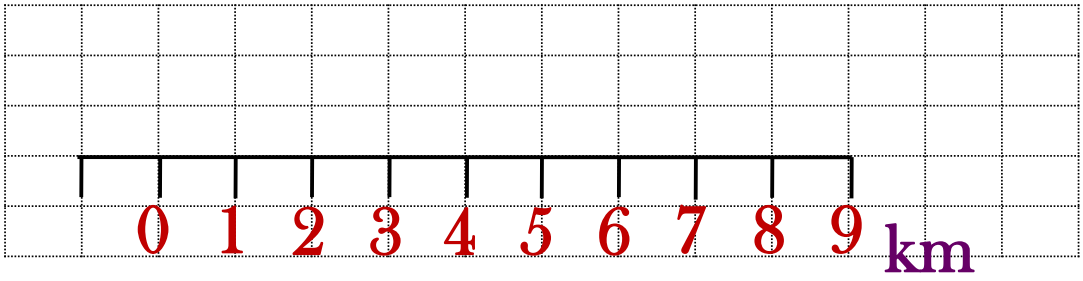

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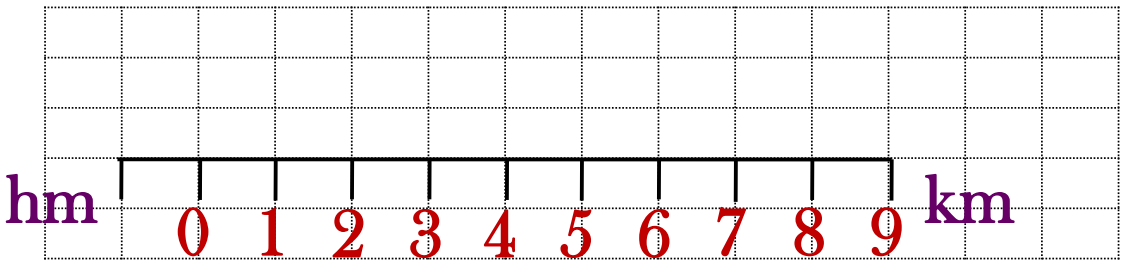

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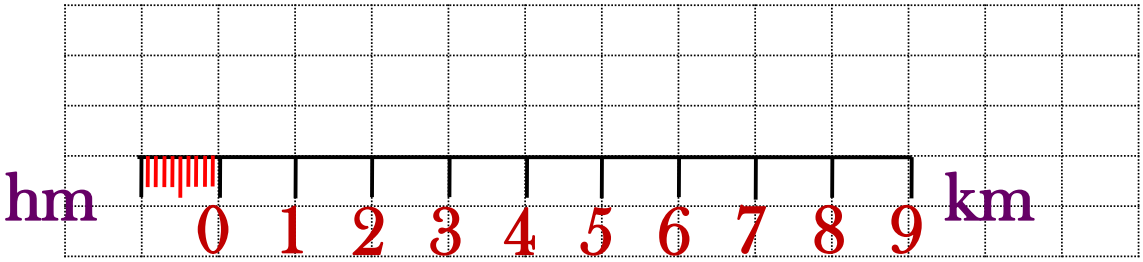

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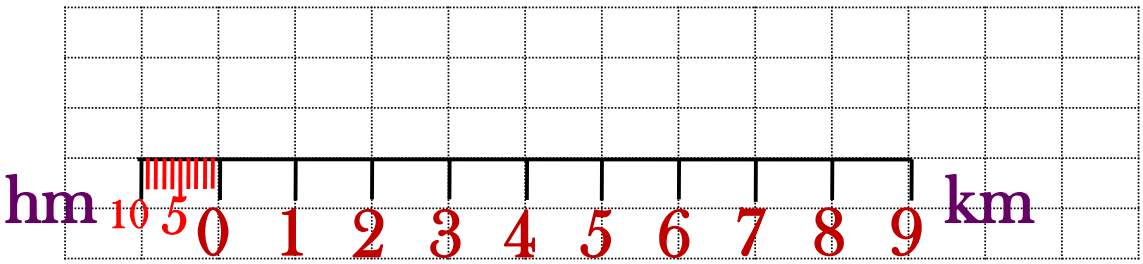

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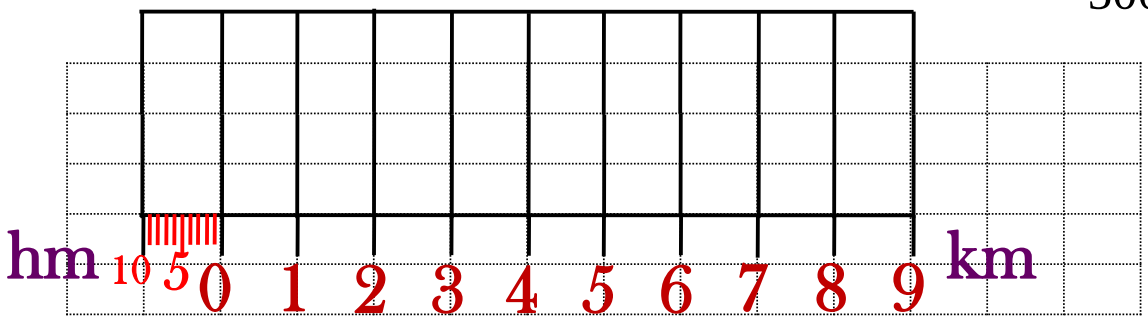

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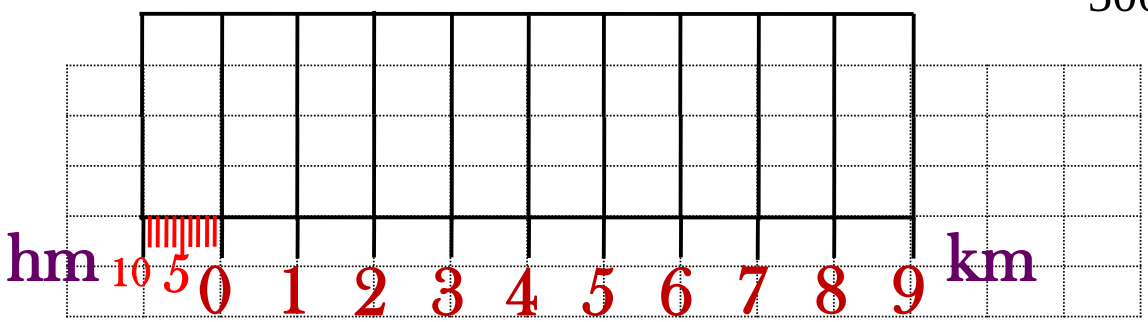

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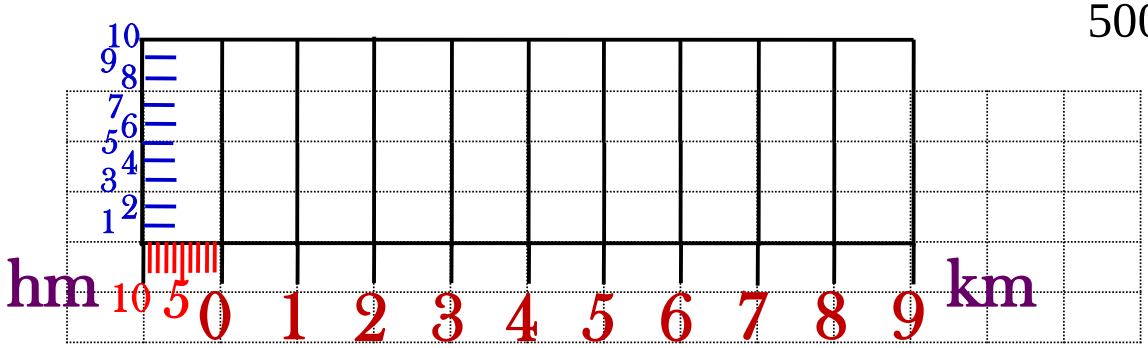

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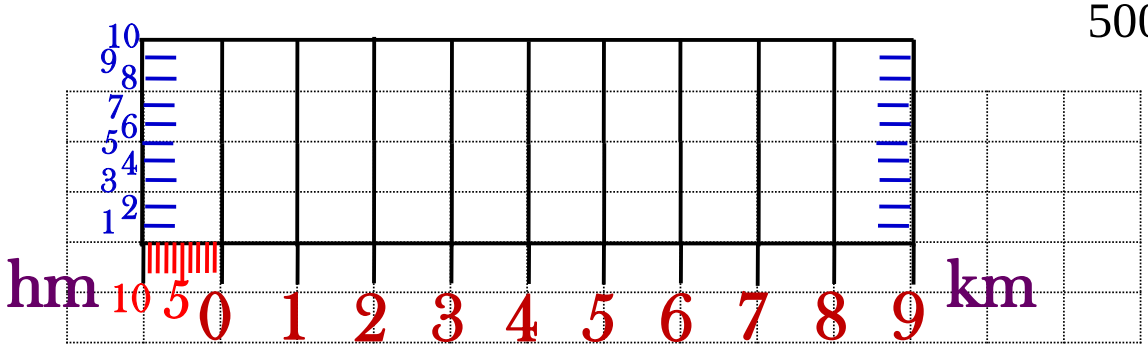

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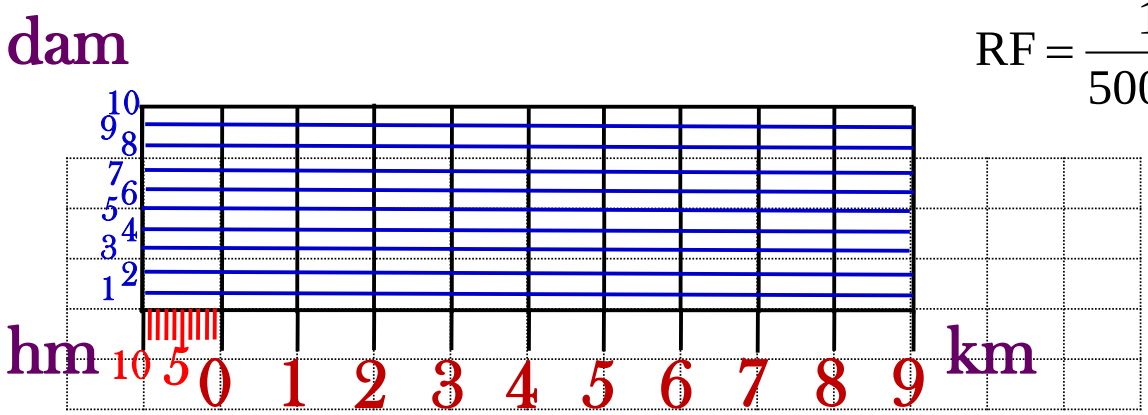

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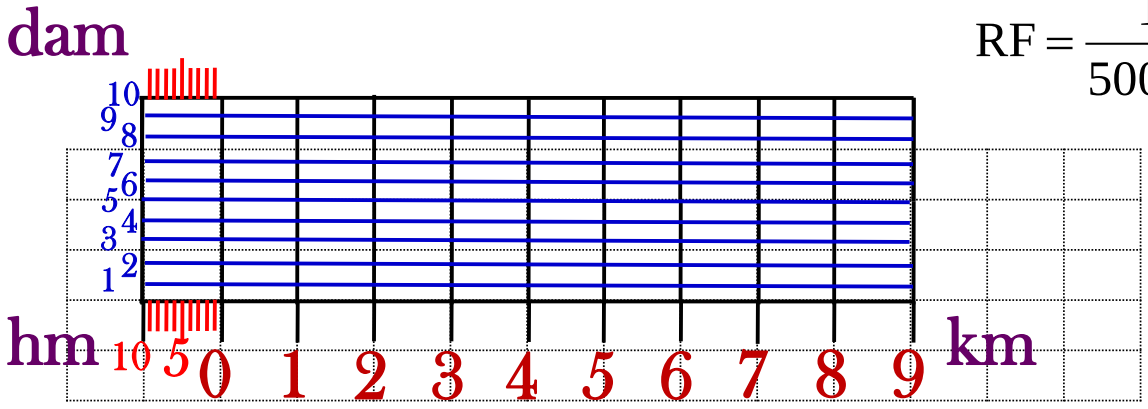

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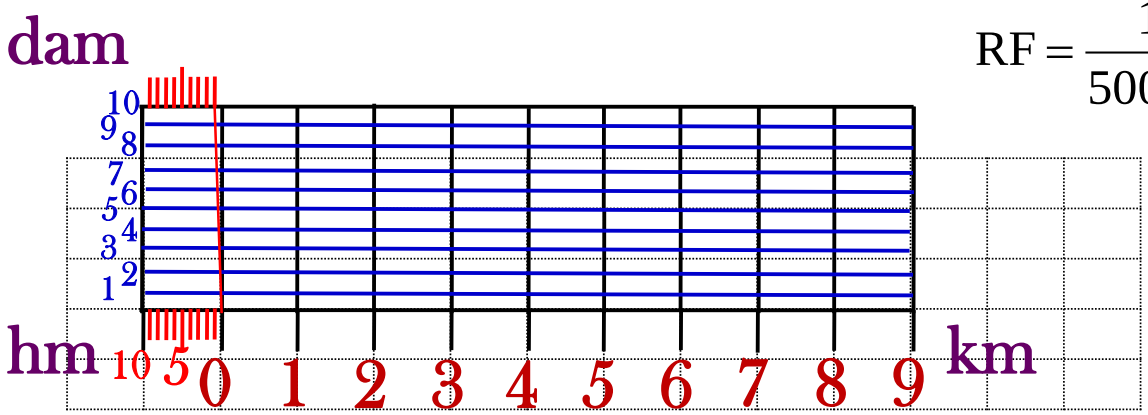

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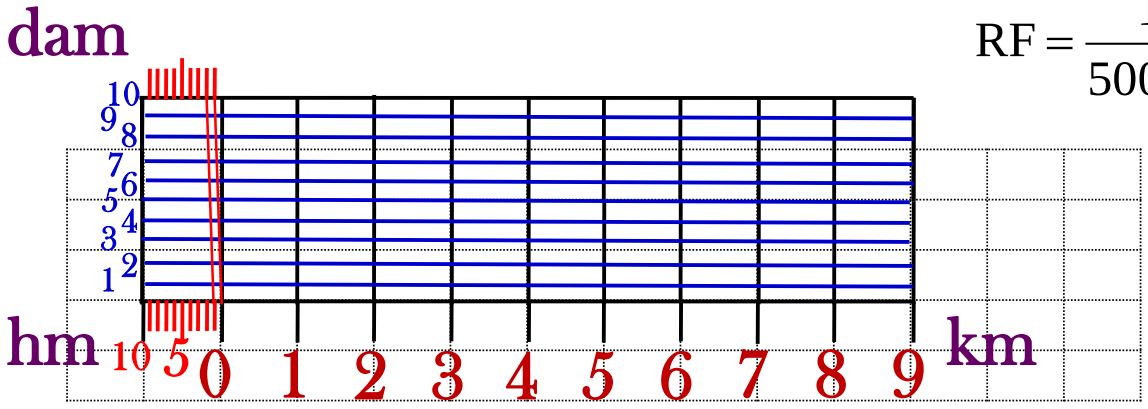

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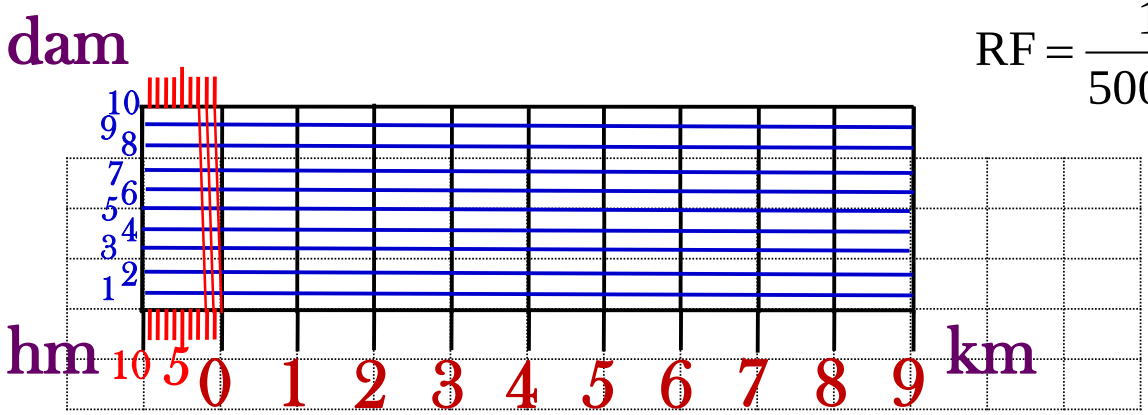

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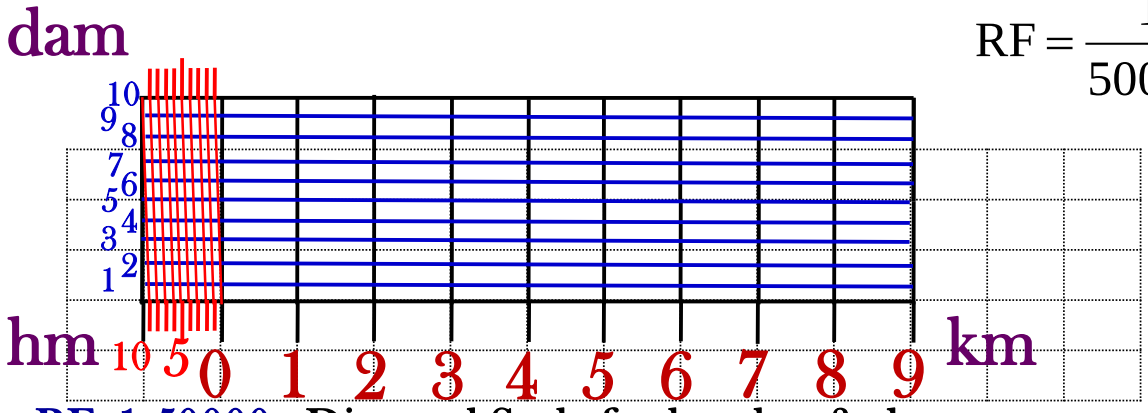

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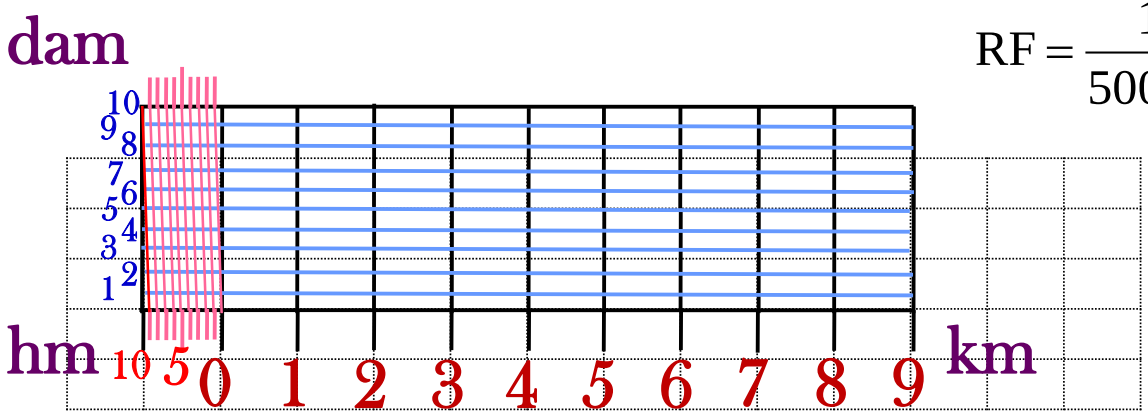

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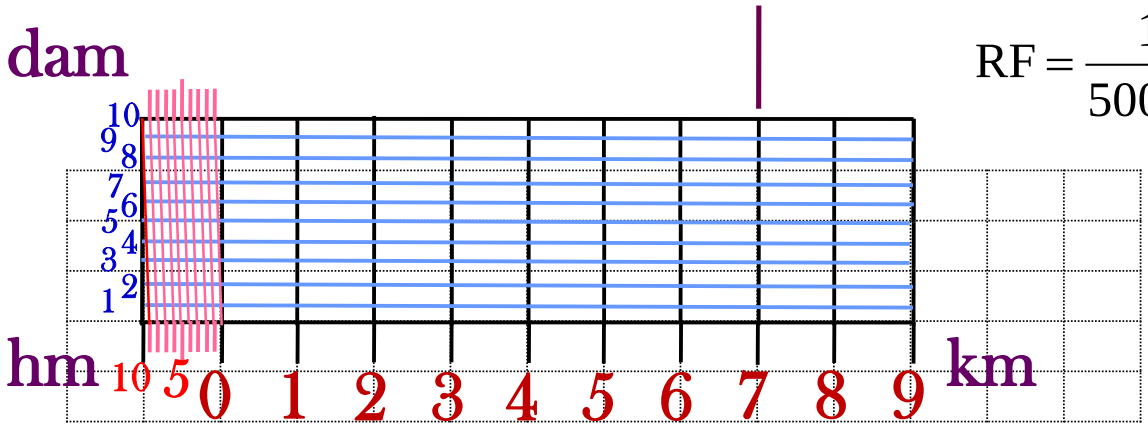

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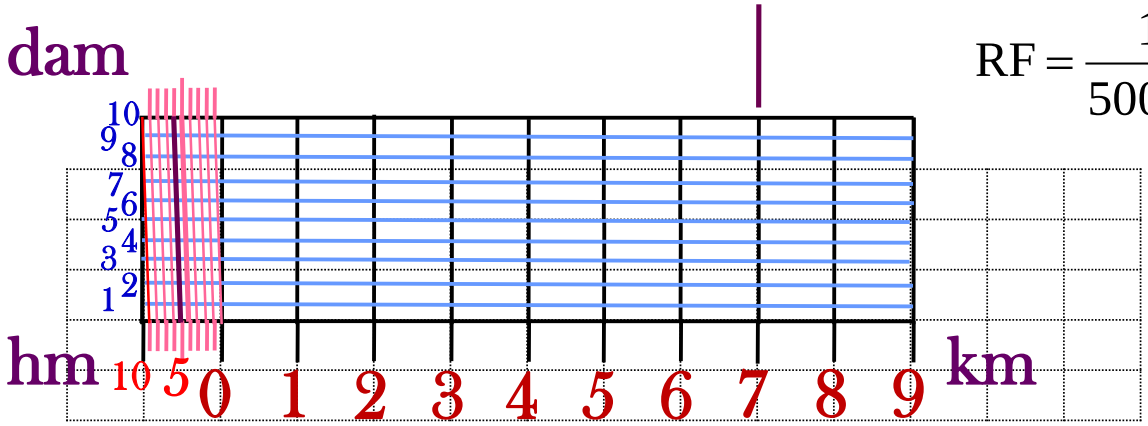

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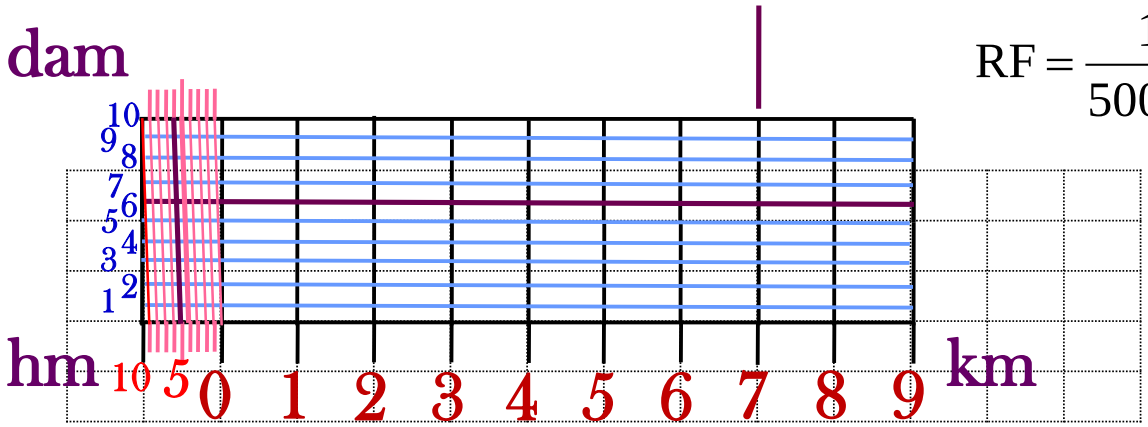

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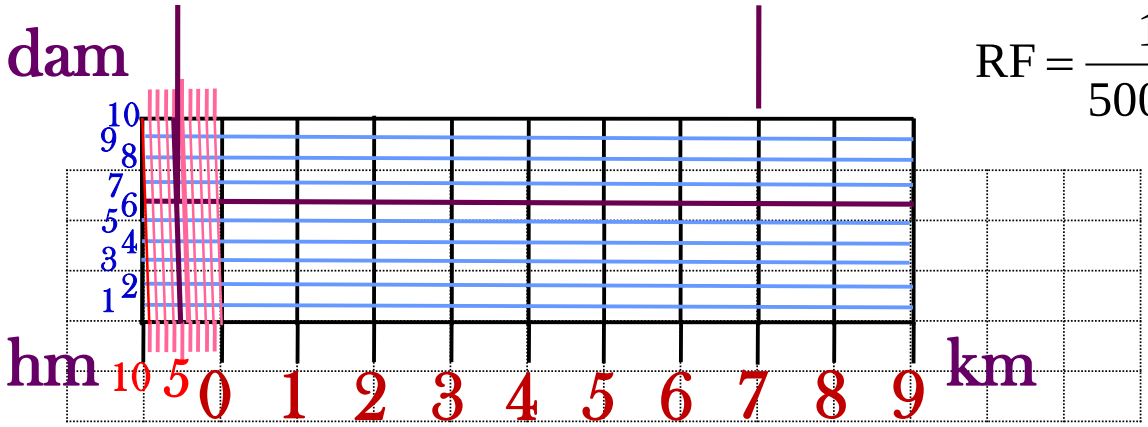

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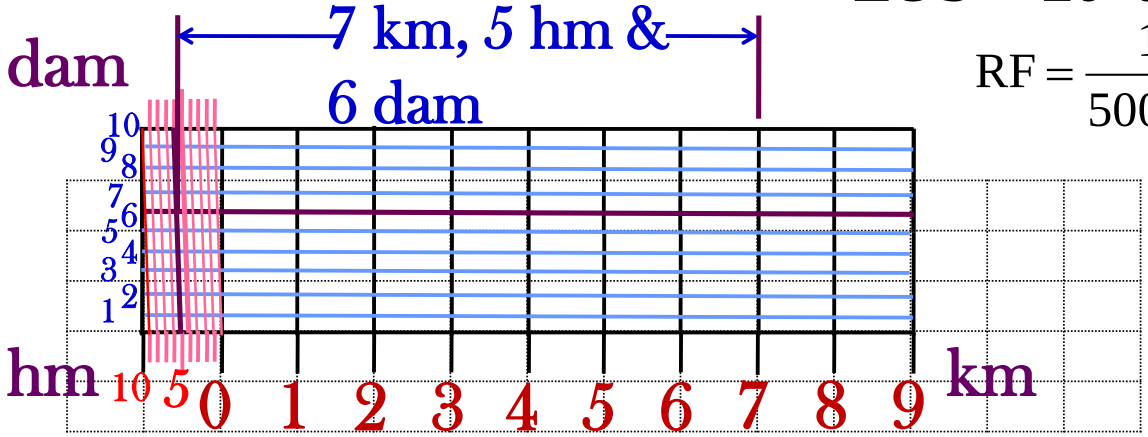

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QUESTIONS ?

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