LECTURE # 4

In this lecture you will learn about:

- Instruments For Setting-Out Right Angles
- Right Angle with Chain Or Tape
- Obstacles In Chaining
- Examples

Course Name:

"Surveying I"

Course Code: CT-123

Credit Hours: 2

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Obstacles In Chaining

Various obstacles or obstructions such as wood , hills, ponds rivers etc. continually meet with the chaining.

It is however necessary that chaining should be continued in a straight line.

The various obstacles may be classed as:

- **A. Chaining Free, Vision Obstructed.**
- **B. Chaining Obstructed, Vision Free.**
- **C. Both Chaining and Vision Obstructed**

A. Chaining Free, Vision Obstructed

Two further cases

- **Case 1.** Both ends are visible from intermediate point on the line (Reciprocal ranging/Indirect ranging).
- **Case 2.** Both ends are not visible from some intermediate point

Case 1: Indirect Ranging / Reciprocal Ranging

» Fix the two ranging rods at the given stations A and B which are not intervisible due to raising ground.

» Select two intermediate points M1 and N1 such that from each point both A and B are visible.

» The person at M1 directs the person at N1 to move t new position N2 in line with M1B.

» The person at N2 then directs the person at M1 to move to a new position M2 in line with N2A.

» The person at M2 directs the person at N2 to a new position N3 in line with M2B.

» The person at N3 directs the person at M2 to a new position M3 in line with N3A.

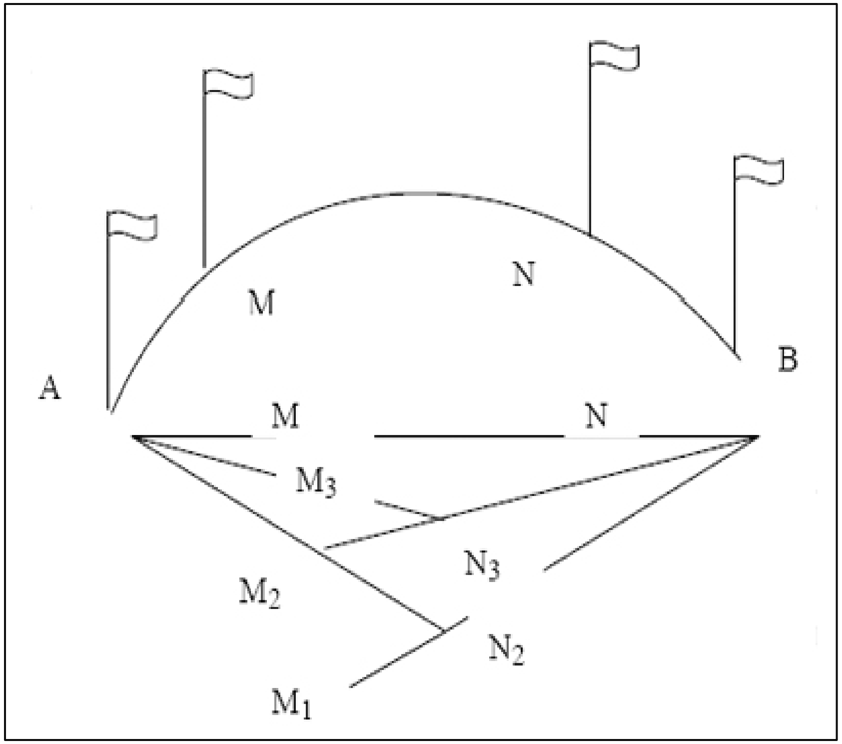
Case 1: Indirect Ranging / Reciprocal Ranging

» The person at N3 directs the person at M2 to a new position M3 in line with N3A.

» The process is repeated till the points M and N are located in such a way that M finds the person at N in l with AB and the person at N finds the person at M in l with AB.

» After fixing the points M and N, other points are also fixed by direct ranging and the length of the line is measured.

Case 1: Indirect Ranging / Reciprocal Ranging

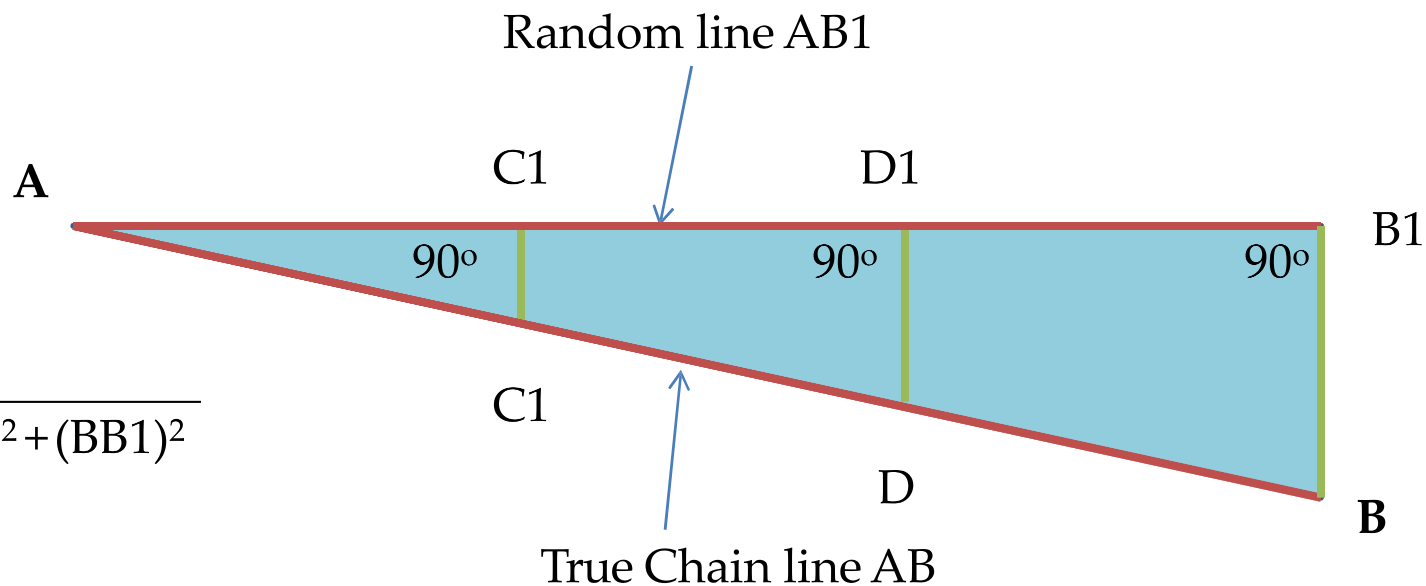


Result: Distance of AB = distance AM + distance MN + distance NB

Case 2: Both Ends Are Not Visible From Some Intermediate Point

This occurs when it is desired to run a line across a wooded field, trees or underbrush preventing the fixing of intermediate point.

Random line method is suitable.



$$AB = \sqrt{(AB1)^2 + (BB1)^2}$$

B. Chaining Obstructed, Vision Free

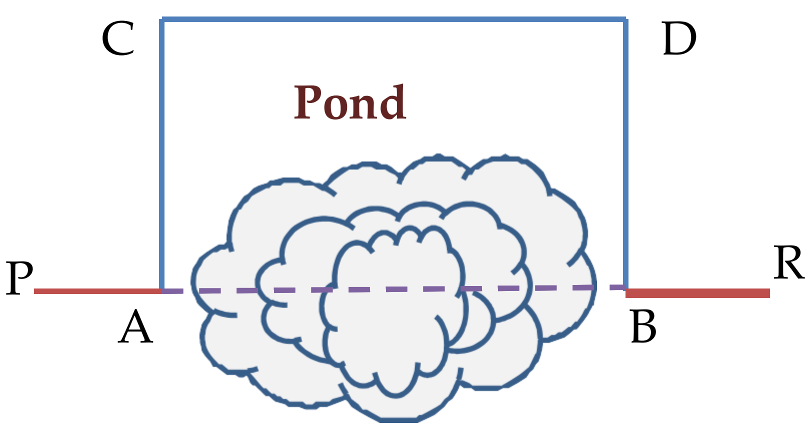
For example pond, plantation, river etc.

Two further cases

- Case1 . When it is possible to chain round the obstacle e.g. pond.
- Case2 . When it is not possible to chain round the obstacle e.g. River.

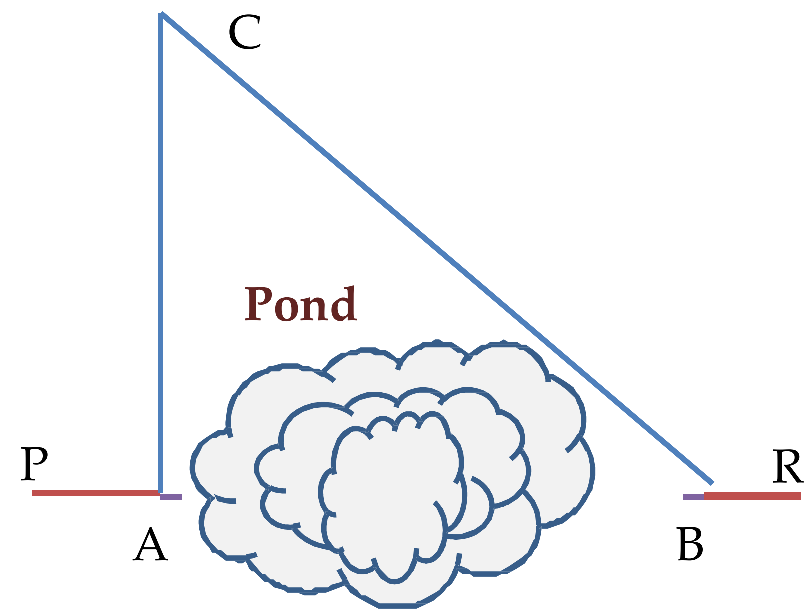
Case 1 . When It Is Possible To Chain Round The Obstacle

Several methods available.



$AB = CD$

<u>Method 1</u>



$AB = \sqrt{(BC)^2 + (AC)^2}$

<u>Method 2</u>

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Method 3

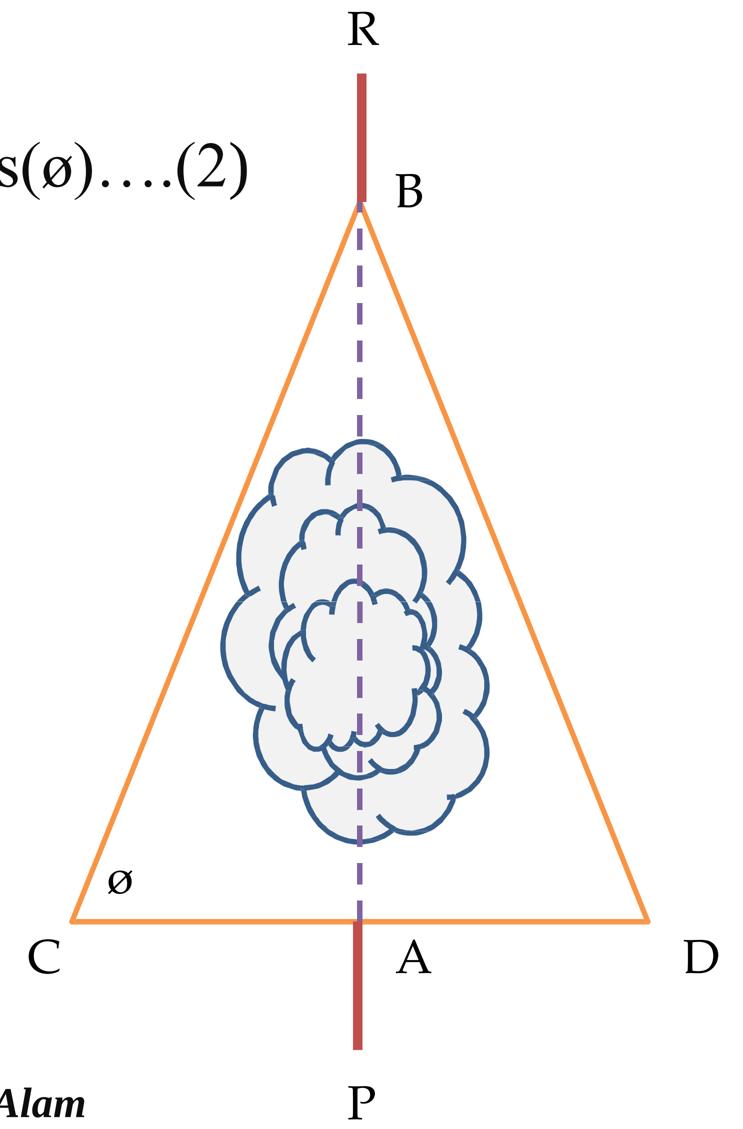
- Select two points A and B on line PR on each side of the obstacle. Set out a line CAD such that CB and DB clear obstacle. Measured distance AC, CB, and DB.
- Then apply cosine formula to calculate the width AB for BCD
- In Δ BCD

$BD^2 = CB^2 + CD^2 - 2 \times CB \times CD \times Cos(ø)$….(1)

Method 3

- In Δ BCA
- $AB^2 = CB^2 + CA^2 - 2 \times CB \times CA \times \cos(ø)$….(2)
- Equating the values of Cos(ø)

$$AB = \sqrt{\frac{CB^2 \times AD + DB^2 \times AC}{CD} - AC \times AD}$$

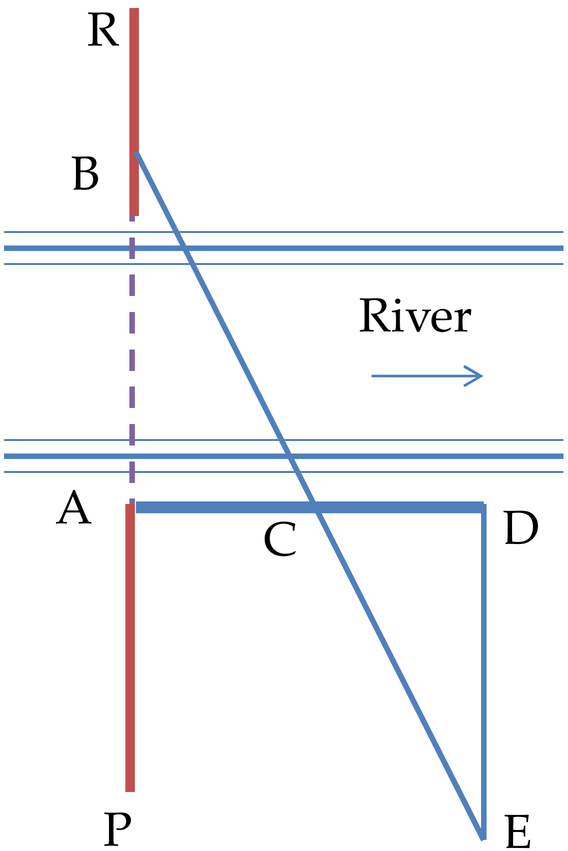


Case 2 . When It Is Not Possible To Chain Round The Obstacle

- Typically for rivers.

Method 1

- Select two points on chain line PR, A and
- Set out perpendicular AD. Bisect it at
- At D draw perpendicular DE such that point E becomes inline with C and B.
- Measure DE.
- ΔABC and ΔCED are similar.
- So **AB=DE**



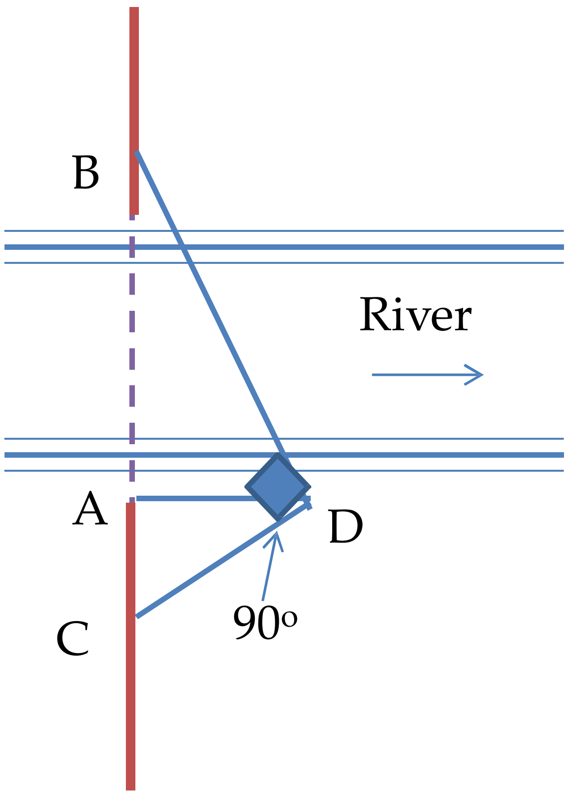
Case 2 . When It Is Not Possible To Chain Round The Obstacle

Method 2

- Select two points. Setout ⊥ AD at A. erect ⊥ BD at D, cutting chain at C.
- Measure AD and AC.
- Δ ABD and Δ ACD are similar

$$\frac{AB}{AD} = \frac{AD}{AC}$$

So $$AB = \frac{AD^2}{CA}$$

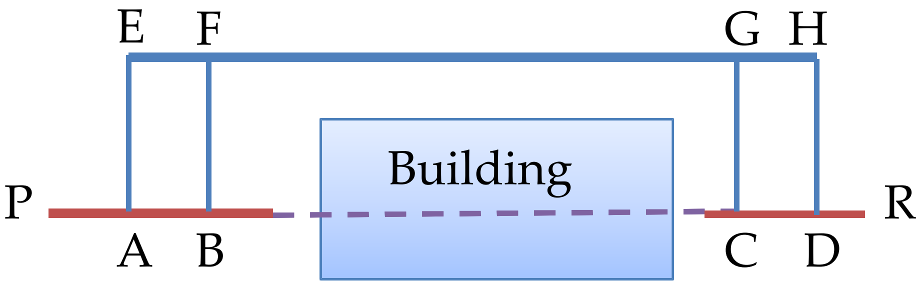


C. Both Chaining and Vision Obstructed

Typical example is building.

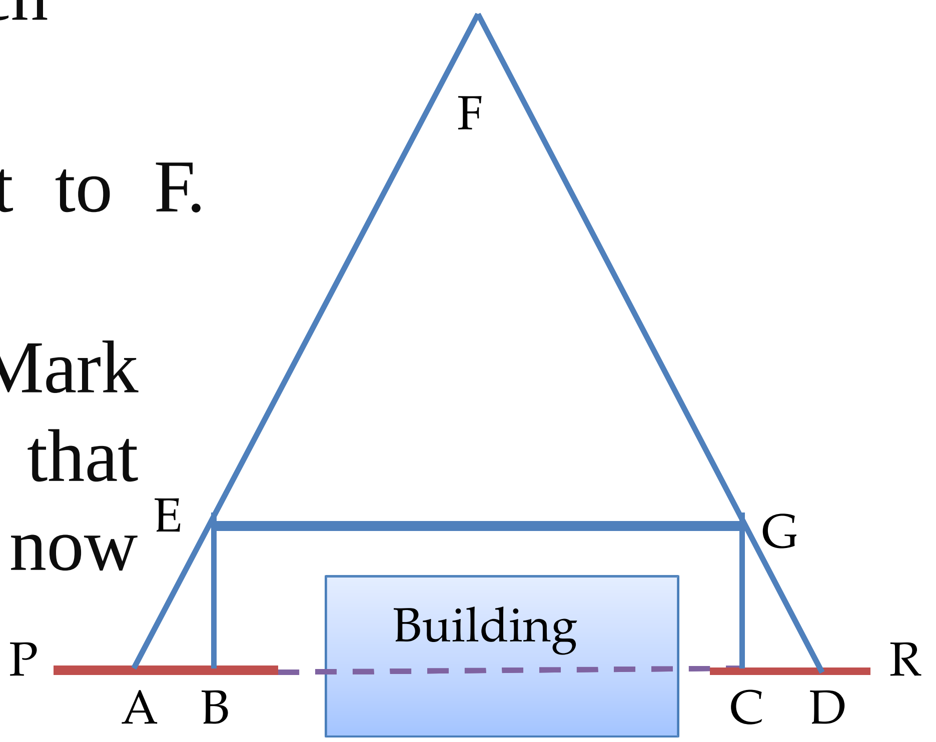
Method 1

- Select two points on chain line PR, A and B and erect ⊥ AE and BF of equal length. Prolong EF line pass the obstacle and select two G and H and erect ⊥ to chain line.
- **BC=FG**



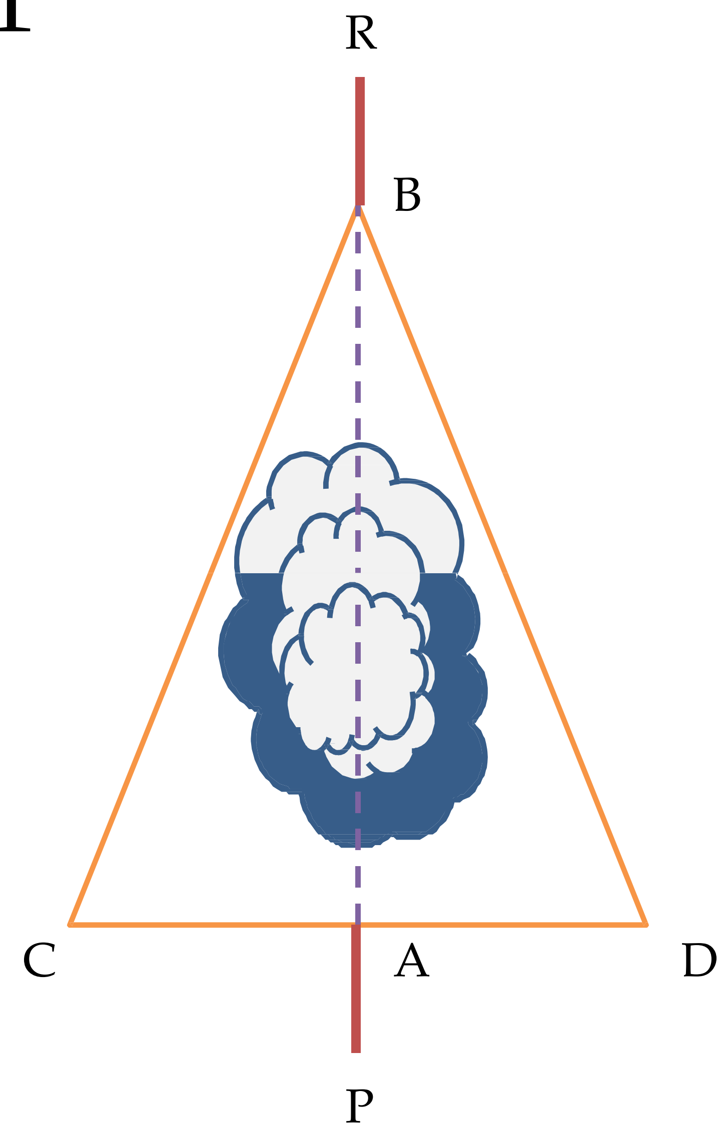
Method 2

- Select point B and erect ⊥ BE. Mark an other point A such that AB=BE.
- Join AE and produce it to F. Draw
- ⊥ on F making FA= FD. Mark a point G on FD such that FG=EF locate C, now measure EG.
- AB=EG



Example 1

- While chaining across a pond two points A and B were taken on opposite side of the pond. A line CB 270 m long was laid on left of AB and an other line BD was laid down on the right of line AB is 315 m, such that points C,A and D becomes inline with each other. CA and AD were then measured and found to be 156 m and 174 m respectively.
- Find the length AB



Solution

$BD^2 = CB^2 + CD^2 - 2 \times CB \times CD \times \text{Cos}(ø)$….(1) $\text{Cos}(ø) = CB^2 + CD^2 - BD^2$ $2xCBxCD$

$Ø = 62^o\ 23`$

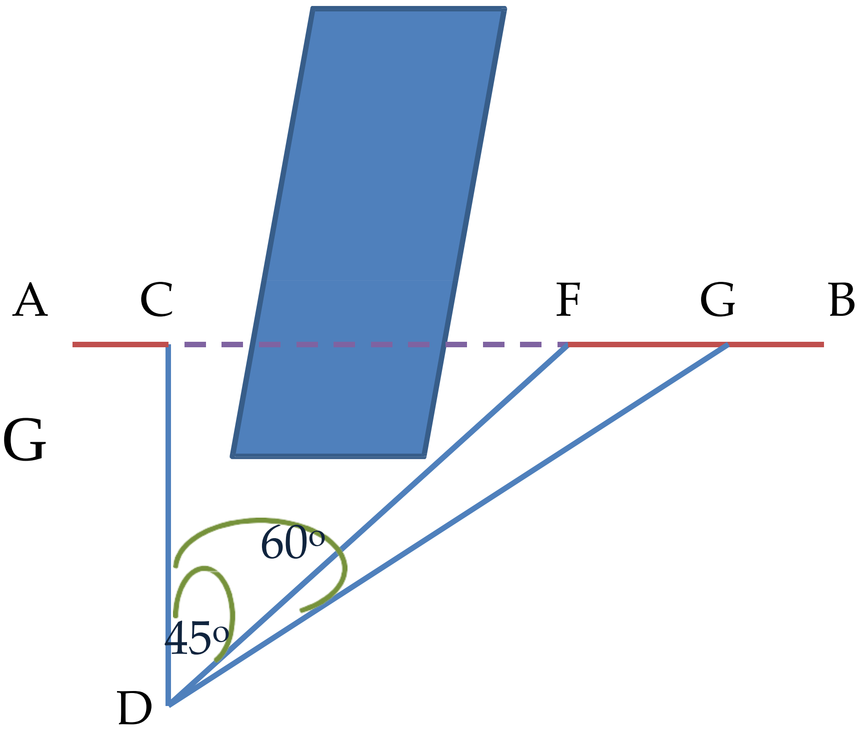
$AB^2 = CB^2 + CA^2 - 2 \times CB \times CA \times \text{Cos}(ø)$ AB = 244.2 m

OR

$$AB = \sqrt{\frac{CB^2 \times AD + DB^2 \times AC}{CD} - AC \times AD} = 244.2m$$

Example 2

- A survey line AC intersect a building. To prolong the line behind the building per CD 120m long drawn at C. From D two lines DF and DG are drawn at angle 45^o and 60^o respectively.
- Determine the length DF and DG and also obstructed length CF.



Solution

- DG= CD x Sec 60^o = 240 m
- DF = CD x Sec 45^o = 169.63 m
- CF = CD tan 45^o = 120 m


THANK
YOU
GRACIAS
ARIGATO
SHUKURIA
DANKSCHEEN
TASHAKKUR ATU
YAQHANYELAY
SUKSAMA
EKHMET
GRAZIE
MEHRBANI
PALDIES
BOLZÏN
MERCI
BÏYAN
SHUKRIA
TINGKI
GOZAIMASHITA
EFCHARISTO
KOMAPSUMNIDA
MAAKE
JUSPAXAR