



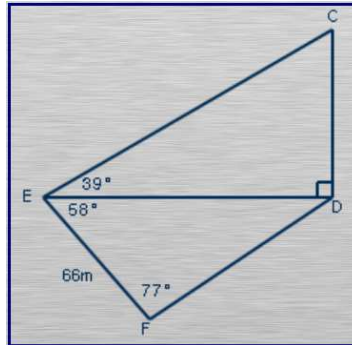
# CAMI Mathematics: Grade 12

## 12.9 Trigonometry

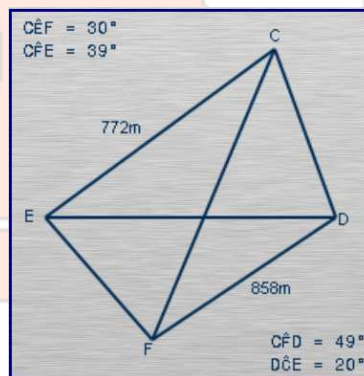
### 12.9 Problems in three dimensions

#### 1. Practical problems in three dimensions.

- (a) The distance between people at E and F is 66m. the angle of elevation of E to the top of a radio tower is  $39^\circ$ . Determine the height of the radio tower.



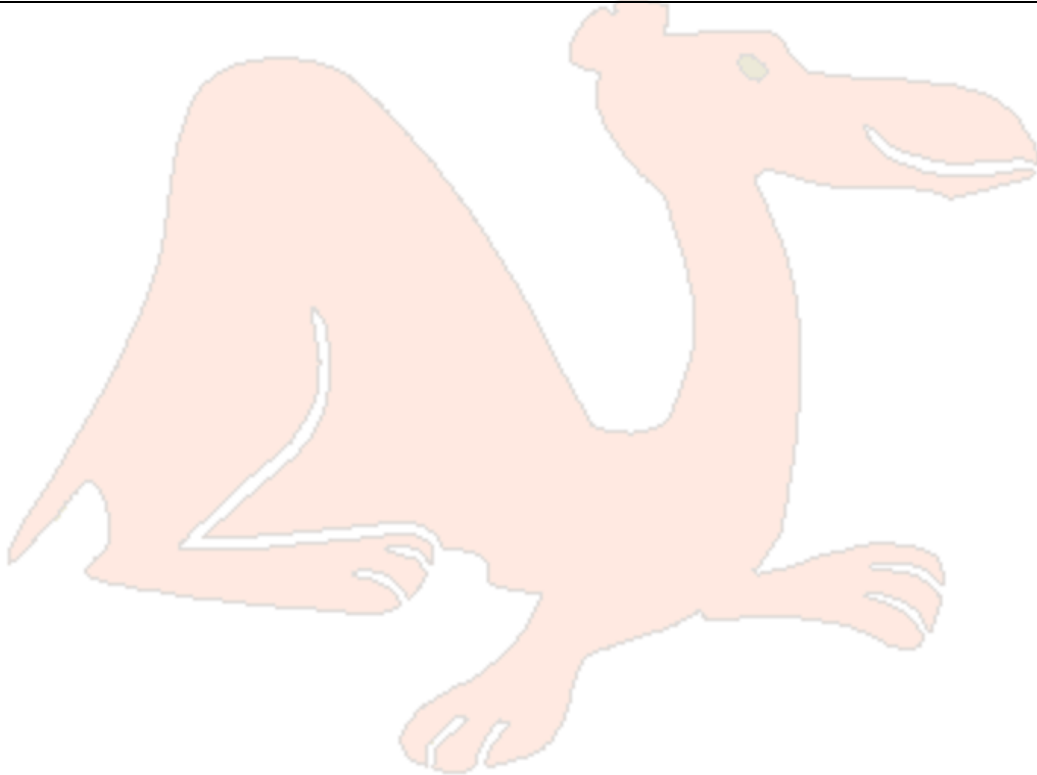
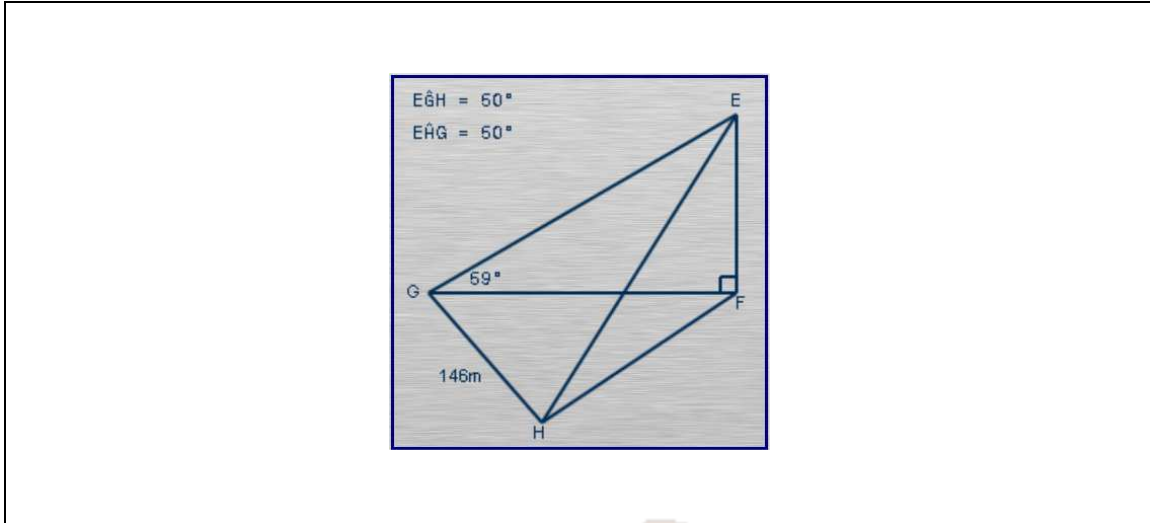
- (b) The figure shows a tunnel (DE) going through a mountain with peak C. A land surveyor, standing at F in the same horizontal plane as DE, supplied some of the measurements on the figure. Determine the length of the tunnel DE.



- (c) A boy standing at point G, 146m from point H, on the ground. He is holding a kite on a rope at an angle of  $59^\circ$  to the ground. Calculate the height of a kite.



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## MEMO

### 1. Practical problems in three dimensions. [7.7.5.2]

(a)

*In* $\triangle DEF$  :

$$\hat{D} = 180^\circ - 58^\circ - 77^\circ$$

$$\hat{E} = 45^\circ$$

*In* $\triangle DEF$  :

$$\frac{ED}{\sin 77^\circ} = \frac{EF}{\sin 45^\circ}$$

$$ED = \frac{66 \times \sin 77^\circ}{\sin 45^\circ}$$

$$EF = 90.95m$$

*In* $\triangle CED$  :

$$\frac{CD}{ED} = \tan 39^\circ$$

$$CD = 90.95 \times \tan 39^\circ$$

$$CD = 73.65m$$

(b)

*In* $\triangle CEF$  :

$$\frac{CF}{\sin 30^\circ} = \frac{CE}{\sin 39^\circ}$$

$$CF = \frac{772 \times \sin 30^\circ}{\sin 39^\circ}$$

$$CF = 613.36m$$

*In* $\triangle CDF$  :

$$CD^2 = DF^2 + CF^2 - 2.DF.CF \cos 49^\circ$$

$$CD^2 = 858^2 + 613.36^2 - 2(858)(613.36) \cos 49^\circ$$

$$CD = 649.50m$$

*In* $\triangle CDE$  :

$$DE^2 = CE^2 + CD^2 - 2.CE.CD \cos 20^\circ$$

$$DE^2 = 772^2 + 649.5^2 - 2(772)(649.5) \cos 20^\circ$$

$$DE = 274.74m$$



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(c)

*In* $\triangle EGH$  :

$$\frac{EG}{\sin 50^\circ} = \frac{GH}{\sin 80^\circ}$$

$$EG = \frac{146 \times \sin 50^\circ}{\sin 80^\circ}$$

$$EG = 113.57m$$

*In* $\triangle EFG$  :

$$\frac{EF}{EG} = \sin 59^\circ$$

$$EF = 113.57 \times \sin 59^\circ$$

$$EF = 97.35m$$

