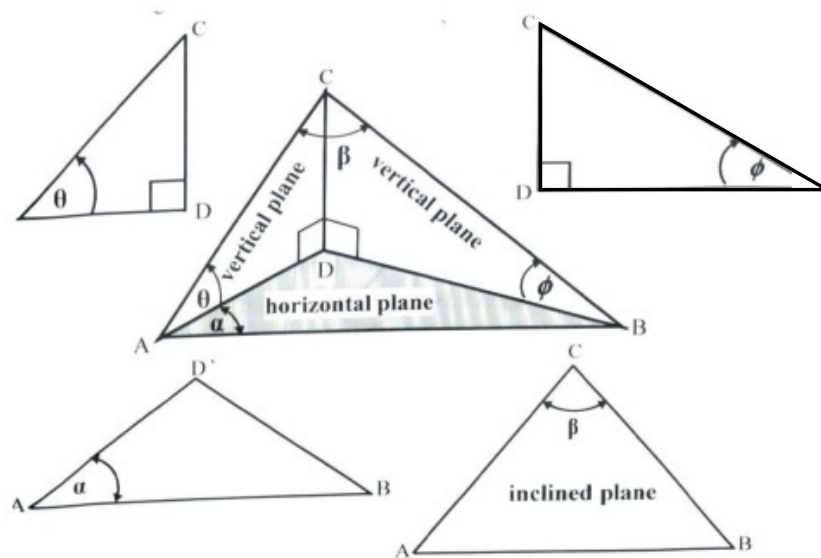


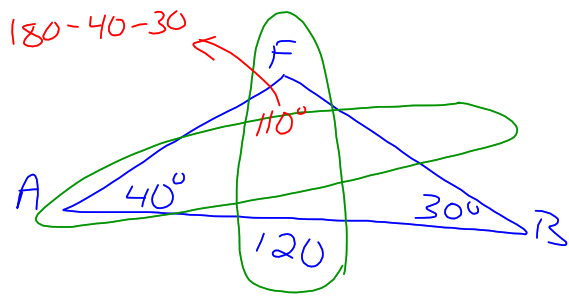
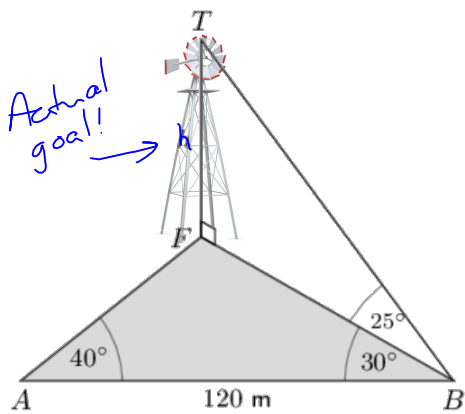
Lesson 4.5 Problems in Three Dimensions

Strategies for solving 3D Trig Problems

- Break the problem into two dimensional triangles.
- Use SOHCAHTOA in right angle triangles.
- Use Sine and Cosine laws in oblique triangles.
- Start in the triangle with the most given information.
- Look for common sides between triangles.
- Communicate your solution carefully - identify the triangle within which you are working.
- Label vertices so that it is simple to refer to side lengths and angles.

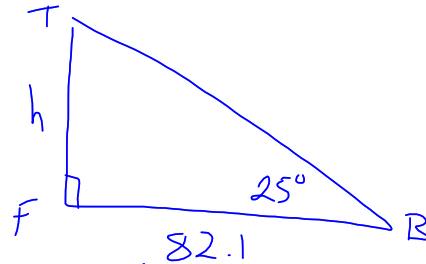


Ex. 1 Determine the height of the windmill.



$$\frac{120}{\sin 110^\circ} = \frac{FB}{\sin 40^\circ}$$

$$FB = 82.1$$



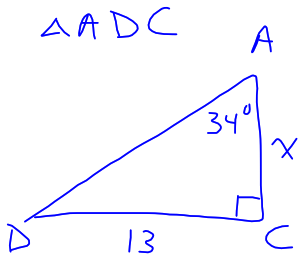
$$\tan 25^\circ = \frac{h}{82.1}$$

$$h = 82.1 \cdot \tan 25^\circ$$

$$= 38$$

∴ The windmill is 38 m high

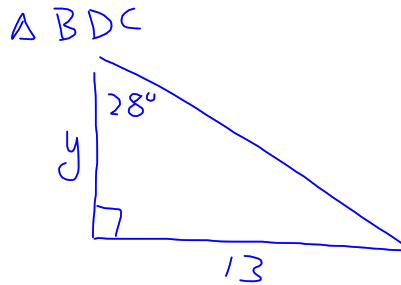
Ex. 2 Annika and Balerie are standing at opposite ends of a bridge and Charles and Denis are standing in the river below. The angle between Annika's sightlines to Charlie and Denis is 34° and the angle between Balerie's sightlines to Charlie and Denis is 28° . How long is the bridge? Additional measurements are included in the diagram.



$$\tan 34^\circ = \frac{13}{x}$$

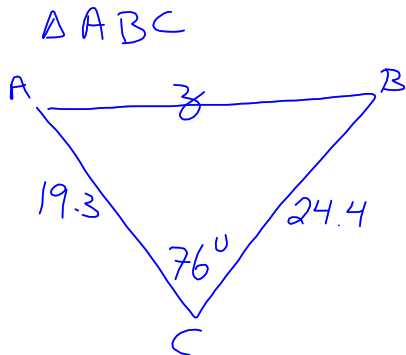
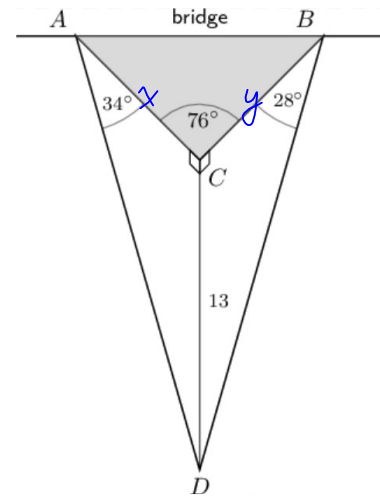
$$x = \frac{13}{\tan 34^\circ}$$

$$= 19.3$$



$$\tan 28^\circ = \frac{13}{y}$$

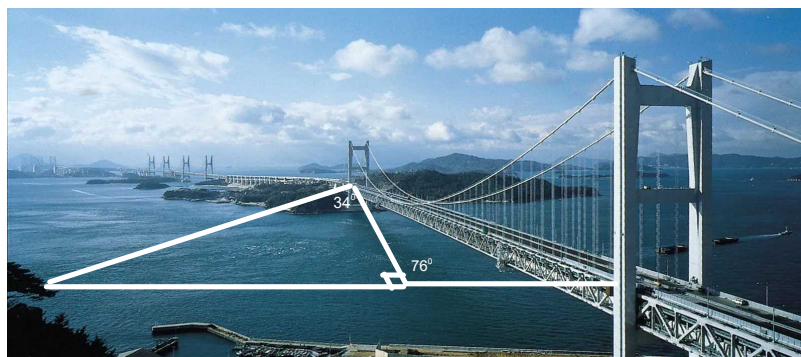
$$y = 24.4$$



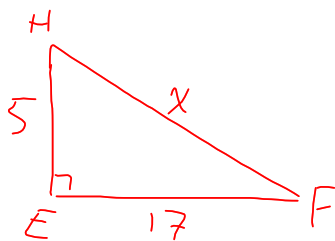
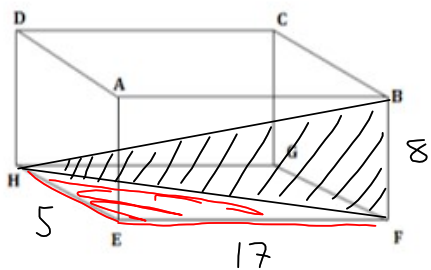
$$z^2 = 19.3^2 + 24.4^2 - 2(19.3)(24.4)\cos 76^\circ$$

$$z = 27.2$$

\therefore The bridge is 27m wide.

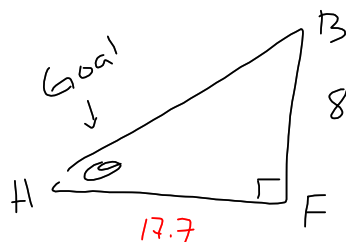


Ex. 3 A cuboid is shown below. The cuboid has a length of 17 cm, a width of 5 cm, and a height of 8 cm. Determine the size of angle BHF.



$$x^2 = 5^2 + 17^2$$

$$x = 17.7$$

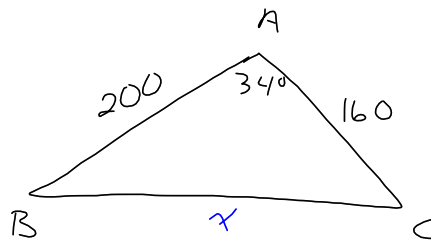
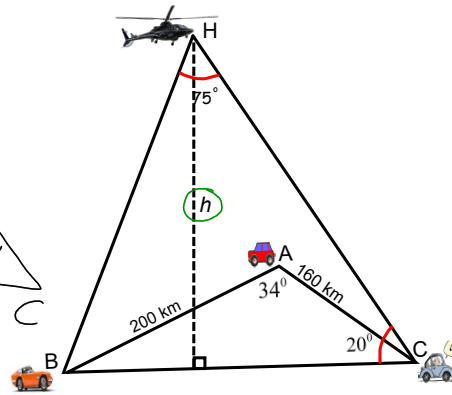
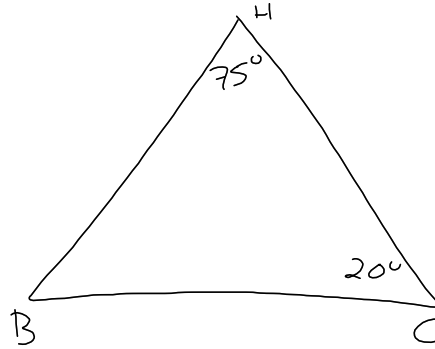
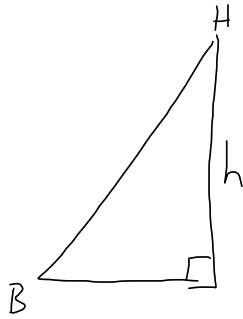


$$\tan \theta = \frac{8}{17.7}$$

$$\theta = 24^\circ$$

\therefore The angle BHF is 24°

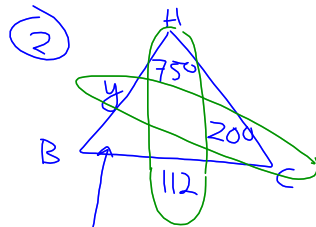
Ex. 4 Determine the height of the helicopter (H).



Plan

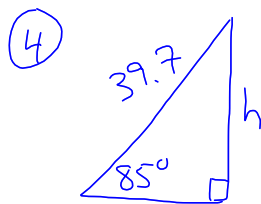
- ① cosine law for BC
- ② Sine law for BH
- ③ Find $\angle HBC$ using Sum of Angles
- ④ sin ratio for h

① $x^2 = 200^2 + 160^2 - 2(200)(160)\cos 34^\circ$
 $x = 112$



$\frac{112}{\sin 75^\circ} = \frac{y}{\sin 20^\circ}$
 $y = 39.7$

③ $\angle HBC = 180 - 75 - 20$
 $= 85^\circ$



$\sin 85^\circ = \frac{h}{39.7}$
 $h = 40$

∴ The helicopter is 40 km high

HOMEWORK

Pg. 332 # 3a, 4, 6, 7, 10, 13

