Date: _____

Today's Learning Goal(s):

By the end of the class, I will be able to:

a) solve three dimensional problems using trigonometry.

Last day's work: pp. 325-327 #1b, 2b, 3bc, 4ac, 5, 6, 8 [12,14]

p. 327 #8   *Previous year's solution on next screen if short on time.*

8. Two forest fire towers, A and B, are 20.3 km apart. From tower A, the bearing of tower B is $70°$. The ranger in each tower observes a fire and radios the bearing of the fire from the tower. The bearing from tower A is $25°$ and from tower B is $345°$. How far, to the nearest tenth of a kilometre, is the fire from each tower?
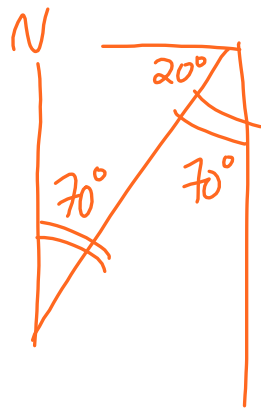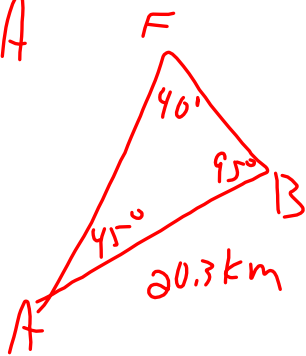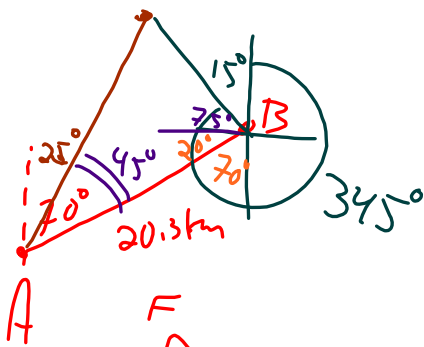
See next slide
for the rest of the solution.

p. 327 #8   Previous year's soluon

8. Two forest fire towers, A and B, are 20.3 km apart. From tower A, the bearing of tower B is $70°$. The ranger in each tower observes a fire and radios the bearing of the fire from the tower. The bearing from tower A is $25°$ and from tower B is $345°$. How far, to the nearest tenth of a kilometre, is the fire from each tower?
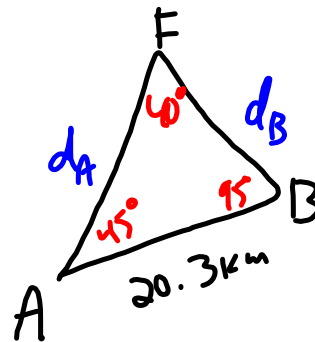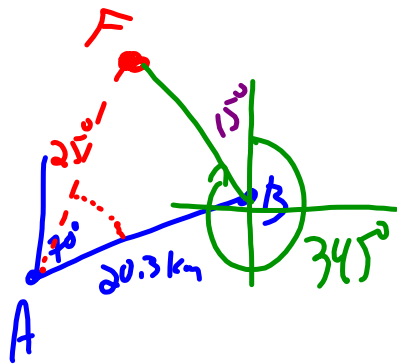
$$\frac{d_A}{\sin 95°} = \frac{20.3}{\sin 40°} \qquad \frac{d_B}{\sin 45°} = \frac{20.3}{\sin 40°}$$

$$d_A \doteq 31.5 \, km \qquad d_B = 22.3 \, km$$
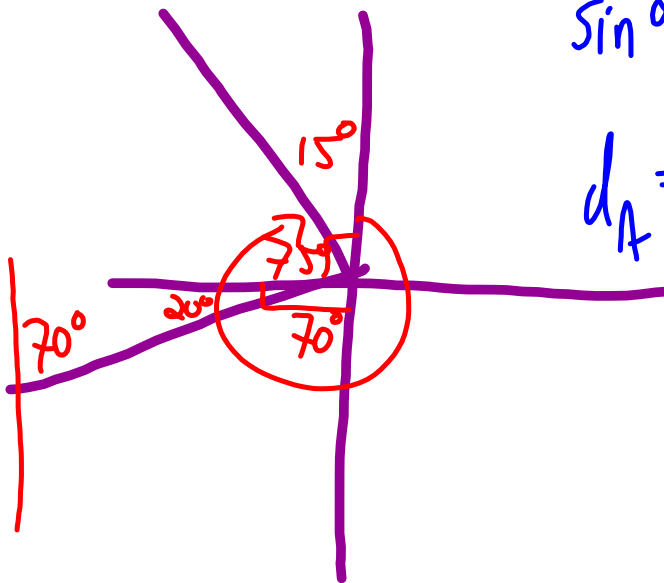
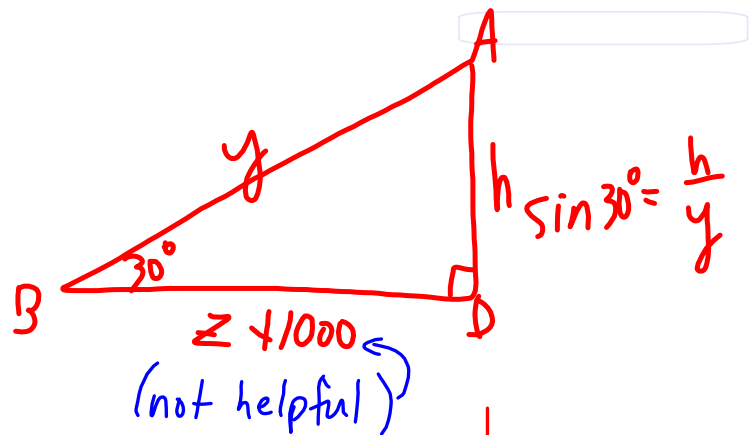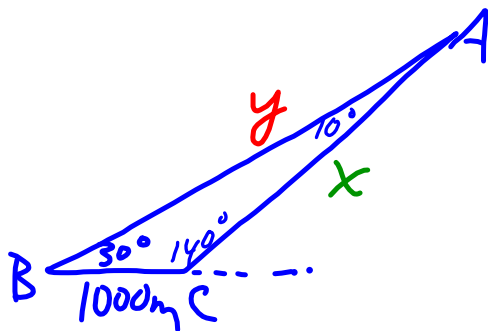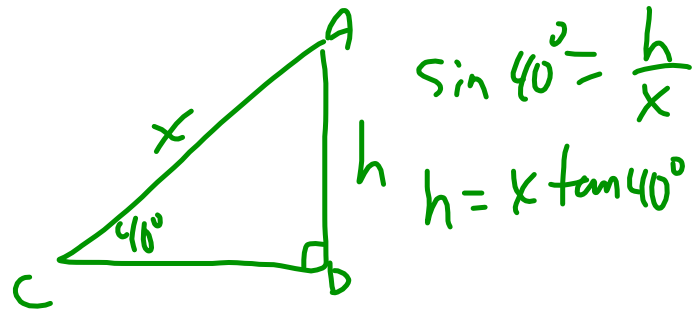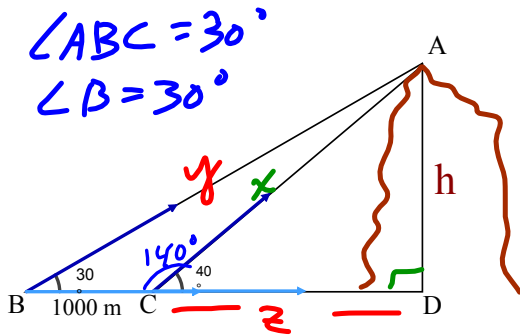## 5.8   Solving 3-Dimensional Problems Using Trigonometry

Success Criteria:

Date: *May 3/18*

- sketch a diagram
- ask: **Is it a Right Triangle?**
    - » If yes, use SOH CAH TOA
- ask: **Is there an Opposite Pair?**
    - » If yes, use Sine Law (don't forget the ambiguous case!)
- ask: **Is there a contained angle, or all 3 sides given?**
    - » If yes, use Cosine Law
    - » Are you finding a side or an angle?
- substitute in the numbers, and isolate the variable
- use your calculator to solve
- give a concluding statement
- ensure you have answered the question asked

Ex. 1

To determine the height of a hill, you measure the angle of elevation of the top to be 30º .
You then move 1000 m closer and find the angle of elevation to be 40º.
Calculate the height of the hill, to the nearest m.

$\angle ABC = 30°$
$\angle B = 30°$

A

y
x

140°

30   40

B   1000 m   C   — z —   D

h

A

x

h

40°

C

$\sin 40° = \frac{h}{x}$

$h = x \tan 40°$

A

y
10°
x

30° 140°

B
1000m C

A

y

h

30°

B

z + 1000

(not helpful)

$\sin 30° = \frac{h}{y}$

$$\frac{y}{\sin 140°} = \frac{1000}{\sin 10°}$$

$$y = \sin 140° \times \frac{1000}{\sin 10°}$$

$$\doteq 3701.66$$

$$\sin 30° \doteq \frac{h}{3701.66}$$

$$h \doteq 3701.66 \sin 30°$$

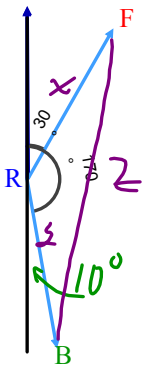$$\doteq 1850.8$$

$$\doteq 1851$$

∴ the height of the hill
is 1851 m.

Ex. 2

Ranger Rick is in his watch tower 500 m above a valley floor.
He spots "smoke" on a bearing of 030° (N30°E). The angle of depression is 12°.
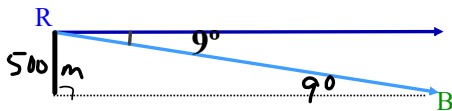Fireman Bob is on a bearing of 170° (S10°E) and his angle of depression is 9°.
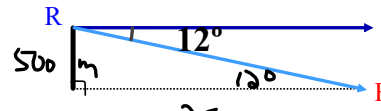How far, to the nearest m, is Fireman Bob from the fire?

From Above   *From Ground Level*
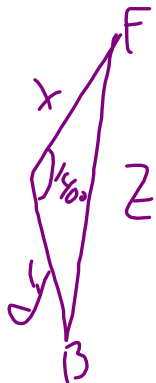
$$\tan 9° = \frac{500}{y}$$

$$y = \frac{500}{\tan 9°}$$

$$= 3156.87$$

$$\tan 12° = \frac{500}{x}$$

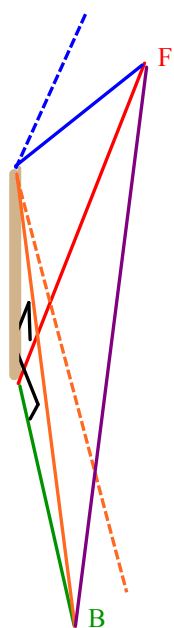$$x = \frac{500}{\tan 12°}$$

$$= 2352.31$$

$$z^2 = x^2 + y^2 - 2xy \cos 140°$$

$$z^2 = 2352.31^2 + 3156.87^2 - 2(2352.31)(3156.87)\cos 140°$$

$$z = \sqrt{26\ 876\ 385}.$$

$$\doteq 5184.2$$

$$\doteq 5184\ m$$

Bob is 5184 m from the fire.

F

------- horizontal lines of sight

—— distance along ground to Bob (from the tower)

—— distance along ground to Fire (from the tower)

—— distance along ground from Bob to the Fire

B

Today's Homework Practice includes:

pp. 332-335 #3 − 6 [7, 14]