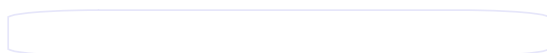


Before we begin, are there any questions from last day's work?

pp. 402-403 #7a, 10, 11, 13, 15



Warm-up (not on handout)

New Lesson: The Cosine LAW

Today's Learning Goal(s):

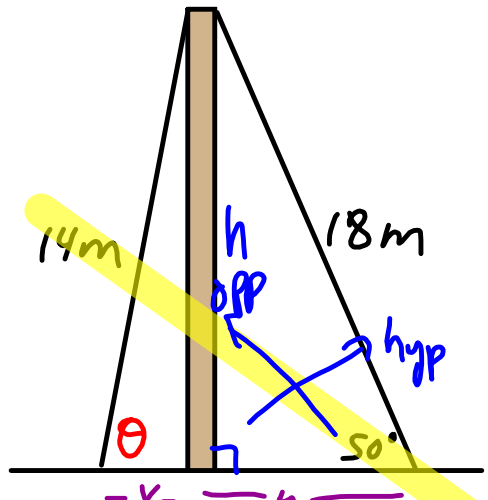
By the end of the class, I will be able to:

- a) Correctly write the cosine LAW to find an unknown side.
- b) Use the cosine law to solve a non-right triangle.

p.403 #11

11. A telephone pole is supported by an 18-m guy wire that makes an angle of 50° with the horizontal ground. A 14-m guy wire is to be fastened on the other side of the pole for reinforcement. Both wires attach to the pole at its top. Round your answers to the nearest unit, if necessary.

- What angle should the second wire make with the ground?
- How tall is the pole?
- How far is the base of each wire from the base of the pole?
- Could you solve this problem without using the sine law? Explain.



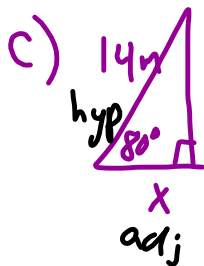
$$a) \frac{\sin \theta}{18} = \frac{\sin 50^\circ}{14}$$

$$\sin \theta = 18 \times \frac{\sin 50^\circ}{14}$$

$$\theta = \sin^{-1} \left(18 \times \frac{\sin 50^\circ}{14} \right)$$

$$\approx 80.0$$

$$\approx 80^\circ$$



$$\cos 80^\circ = \frac{x}{14}$$

$$x = 14 \cos 80^\circ$$

$$\approx 2.43$$

$$\approx 2.4 \text{ m}$$

b)

$$\sin 50^\circ = \frac{h}{18}$$

$$\sin 50^\circ = \frac{h}{18}$$

$$18 \sin 50^\circ = h$$

$$h \approx 13.78$$

$$\approx 13.8 \text{ m}$$



$$\cos 50^\circ = \frac{y}{18}$$

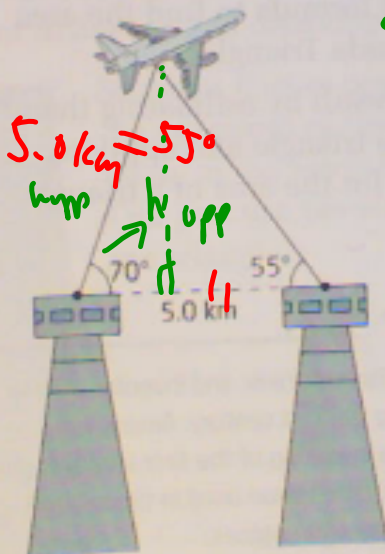
$$y = 18 \cos 50^\circ$$

$$\approx 11.57$$

$$\approx 11.6 \text{ m}$$

p.403 #13

13. Chapter Problem You and your partner are observing an aircraft from two observation decks, located 5.0 km apart. From your point of view, the aircraft is at an angle of elevation of 70° . From your partner's point of view, the angle of elevation is 55° . Determine the altitude of the aircraft, to the nearest tenth of a kilometre.



$$\text{Sol 4 } \sin 70^\circ = \frac{h}{5.0}$$

$$h = 5.0 \sin 70^\circ$$

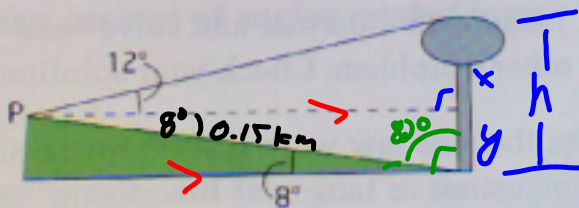
$$\approx 4.69$$

$$\approx 4.7 \text{ km}$$

$$\frac{5}{\sin 55^\circ} = \frac{x}{\sin 55^\circ}$$

p.403 #15

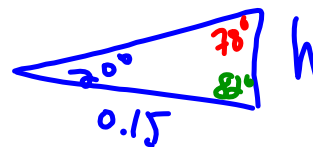
15. To measure the height of a water tower, Kelly walks 0.15 km from the base of the tower along an inclined path to point P. From P, the top of the tower appears at an angle of elevation of 12° .



Find the height of the water tower, to the nearest metre.

Aside: $\frac{\sin 80^\circ}{\sin 20^\circ} \neq \sin 40^\circ$

$$h = x + y$$



$$\frac{h}{\sin 20^\circ} = \frac{0.15}{\sin 78^\circ}$$

$$h = \sin 20^\circ \times \frac{0.15}{\sin 78^\circ}$$

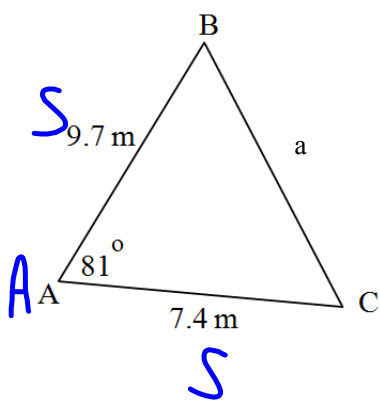
$$\doteq 0.05244 \text{ km}$$

$$\doteq 52.44$$

$$\doteq 52.4 \text{ m}$$

Warm-up

Write the sine law for the following triangle:



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

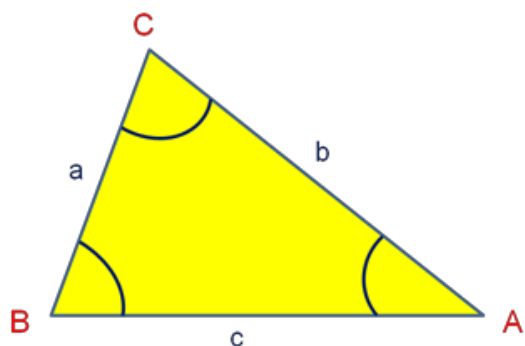
$$\frac{a}{\sin 81^\circ} = \frac{7.4}{\sin B} = \frac{9.7}{\sin C}$$

MPM 2D1

8.2 The Cosine Law

Date: Dec. 21/16

The Cosine Law can be used with any triangle, even if it is not a right triangle.
Given any triangle,



$$a^2 = b^2 + c^2 - 2bc \cos A$$

or

$$b^2 = a^2 + c^2 - 2ac \cos B$$

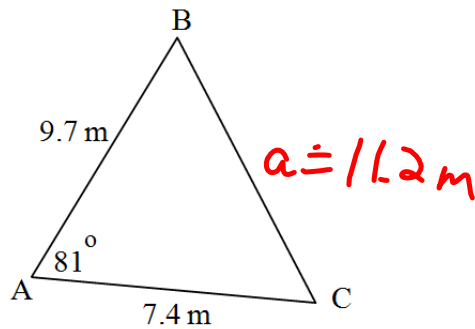
or

$$c^2 = a^2 + b^2 - 2ab \cos C$$

When the triangle we are solving involves 2 known sides and the contained angle (a.k.a. SAS), then we must use this formula, because the sine law will not work.

Remember to take the square root of the answer to find a .

Ex. 1 Solve the triangle. (Round side lengths and angles to the nearest tenth.)



a	$\angle B$	$\angle C$
<p>Write the cosine law for finding a.</p> $a^2 = b^2 + c^2 - 2bc \cos A$ $a^2 = 9.7^2 + 7.4^2 - 2(9.7)(7.4) \cos 81^\circ$ $a^2 = 9.7^2 + 7.4^2 - 2 \times 9.7 \times 7.4 \times \cos 81^\circ$ $\doteq 126.392 \quad \text{this value is } a^2$ $a \doteq \sqrt{126.392}$ $\doteq 11.24$ $\doteq 11.2 \text{ m}$	<p>Now use the sine law (it's easier)</p> $\frac{\sin B}{b} = \frac{\sin A}{a}$ $\frac{\sin B}{7.4} \doteq \frac{\sin 81^\circ}{11.2}$ $\sin B \doteq \frac{7.4 \sin 81^\circ}{11.2}$ $B \doteq \sin^{-1} \left(\frac{7.4 \sin 81^\circ}{11.2} \right)$ $\doteq 40.73$ $\doteq 40.7^\circ$	<p>Now use the triangle sum</p> $\angle C \doteq 180^\circ - 81^\circ - 40.7^\circ$ $\doteq 58.3^\circ$

Review the learning goals. Were we successful today?

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

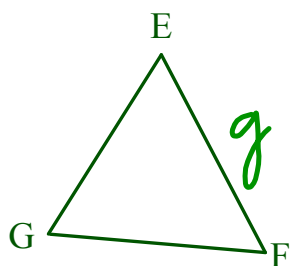
- Correctly write the cosine LAW to find an unknown **side**.
- Use the cosine law to solve a non-right triangle.

Review the learning goals. Were we successful today?

Today's practice: *Enrichment for 3U*: Read p.406 which develops the Cosine Law

pp. 409-410 #1a, 2c, 4b, 5b, 8, 11

Enrichment: p. 411 #15, 18, 21



Practice: Write the cosine law for side "g"

$$g^2 = f^2 + e^2 - 2fe \cos G$$