Unit 3+4 Review – Trigonometry

Prerequisite Skills
1) Triangle Rules
   - Know the difference between a right triangle and non-right triangle
   - Identify an acute or obtuse angle within a triangle
   - Use the rule that the sum of the angles in a triangle is 180 to solve for an unknown angle
   - Use the Pythagorean theorem to find a missing side
2) Trigonometry Ratios
   - Know SOH CAH TOA
   - Set calculator in degrees and use inverse button to find angle
   - Be able to use SOH CAH TOA to find any side or angle in a right triangle
   - Solve a problem involving two steps
3) Obtuse Angles
   - Explain the general patterns that the trig ratios generate
   - Explain why the sine ratio generates two possible answers for an angle 0-180

Learning Outcomes
B3. Solve problems that involve the cosine law and the sine law, including the ambiguous case.
   - 3.1 Draw a diagram to represent a problem that involves the cosine law or sine law.
   - 3.2 Explain the steps in a given proof of the sine law or cosine law.
   - 3.3 Solve a problem involving the cosine law that requires the manipulation of a formula.
   - 3.4 Explain, concretely, pictorially or symbolically, whether zero, one or two triangles exist, given two sides and a non-included angle.
   - 3.5 Solve a problem involving the sine law that requires the manipulation of a formula.
   - 3.6 Solve a contextual problem that involves the cosine law or the sine law.

By the end of the unit, you should be able to solve this type of question...

1) The pendulum of a grandfather clock is 85.0 cm long. When the pendulum swings from one side to the other side, it travels a horizontal distance of 10.5 cm. Determine the angle through which the pendulum swings. Round your answer to the nearest tenth of a degree.

2) A landowner says that his property is triangular, with one side 500 m long and another side 350 m long. The opposite angle to the 350 m side measures 20°. Determine two possible lengths of the third side, to the nearest metre. Show your work.
Prerequisite Skills

1) Triangle Rules

Draw an example of each:

<table>
<thead>
<tr>
<th>Acute Angle</th>
<th>Obtuse Angle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Find x

- \( \sin 30 = \) _______
- \( \cos 60 = \) _______
- \( \tan 45 = \) _______
- \( \sin 90 = \) _______
- \( \sin 120 = \) _______
- \( \cos 150 = \) _______
- \( \tan 90 = \) _______
- \( \sin X = 0.5 \) \( X = \) _______
- \( \cos X = 0.5 \) \( X = \) _______
- \( \tan X = 0.5 \) \( X = \) _______
- \( \sin X = 1.2 \) \( X = \) _______
- \( \cos X = -0.5 \) \( X = \) _______
- \( \tan X = 0.0 \) \( X = \) _______
Find the length AB, to the nearest tenth.

a) 

h)
3) Obtuse Angles
Explain why the sine ratio can generate two different answers for an angle inside a triangle. Give an example.

Given that $0^0 \leq \angle C \leq 180^0$, determine the value(s) of $\angle C$ (to the nearest whole number)

a) $\sin C = 0.5$

b) $\cos C = 0.866$

c) $\cos C = -0.5$

d) $\sin C = 0.2543$

**Learning Outcomes**
*Solve problems that involve the cosine law and the sine law, including the ambiguous case.*

3.2 Explain the steps in a given proof of the sine law or cosine law.

Using basic trig ratios and the height of the triangle, write the steps to prove the Sine Law for the following triangle.
3.5 Solve a problem involving the sine law that requires the manipulation of a formula.

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

Use the Sine Law to find the measure of angles B and C.

3.1 Draw a diagram to represent a problem that involves the sine law.

In \( \triangle PQR \), angle \( P = 80^\circ \), angle \( Q = 48^\circ \) and \( r = 20 \text{ cm} \). Solve the triangle.
3.3 Solve a problem involving the cosine law that requires the manipulation of a formula.

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

Use the Cosine Law to find the measure of angle \( A \).

3.1 Draw a diagram to represent a problem that involves the cosine law.

In \( \triangle PQR \), \( p = 5 \text{ cm} \), \( q = 8 \text{ cm} \), and \( r = 12 \text{ cm} \). Solve the triangle.
3.4 Explain, concretely, pictorially or symbolically, whether zero, one or two triangles exist, given two sides and a non-included angle.

1) \( \angle A = 65^\circ, a = 10 \text{ m}, b = 8 \text{ m} \)

2) \( \angle A = 45^\circ, a = 7 \text{ m}, b = 7 \text{ m} \)

3) \( \angle A = 25^\circ, a = 8 \text{ m}, b = 12 \text{ m} \)

4) \( \angle A = 70^\circ, a = 4 \text{ m}, b = 5 \text{ m} \)
3.6 Solve a contextual problem that involves the cosine law or the sine law.

1) Two airplanes leave the Fort Chipewyan airport in Alberta at the same time. One airplane travels at 360 km/h. The other airplane travels at 430 km/h. About 30 min later, they are 150 km apart. Determine the angle between their paths, to the nearest degree.

2) A landowner says that his property is triangular, with one side 500 m long and another side 350 m long. The opposite angle to the 350 m side measures 20°. Determine two possible lengths of the third side, to the nearest metre. Show your work.
3) A radar operator on a ship discovers a large sunken vessel lying parallel to the ocean surface, 165 m directly below the ship. The length of the vessel is a clue to which wreck has been found. The radar operator measures the angles of depression to the front and back of the sunken vessel to be 40° and 62°. How long, to the nearest tenth of a metre, is the sunken vessel?

4) A canoeist leaves the dock and paddles toward a buoy 140 m away. After reaching the buoy, she changes directions and paddles another 80 m. From the dock, the angle between the buoy and the canoeist’s current position measures 25°. How far is the canoeist from the dock? Give two possible answers. Show your work.
5) A building is observed from two points, P and Q, that are 94.0 m apart on the same side of the building. The angle of elevation is 42° at P and 33° at Q. Sketch the situation. Determine the height of the building to the nearest tenth of a metre.

6) In a parallelogram, two adjacent sides measure 8.4 cm and 7.2 cm. The shorter diagonal is 10.5 cm. Determine, to the nearest degree, the measures of the larger angles in the parallelogram.