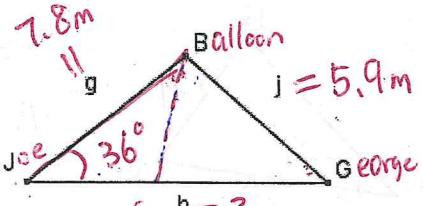
MCR3U May 6 **Sine and Cosine Law** * Unit Test : Friday
Ms. Kueh

Example 5 Joe and George are part of a scientific team studying thunderclouds. The team is about to launch a weather balloon into an active part of a cloud. Joe's rope is $7.8\ m$ long and makes an angle of $36°$ with the ground. George's rope is $5.9\ m$ long. How far, to the nearest tenth of a metre, is Joe from George?



$g = 7.8\ m$
$j = 5.9\ m$
$\angle J = 36°$

Ad > Opp and given ∠ = acute
→ Ambiguous case of sine law

$$\frac{G}{7.8} = \frac{\sin 36°}{5.9}$$

$$\frac{\sin G}{7.8} = \frac{\sin 36}{5.9} \rightarrow \frac{5.9 \cdot \sin G}{5.9} = \frac{7.8 \cdot \sin 36°}{5.9}$$

$$\frac{\sin G}{\sin} = \frac{7.8 \cdot \sin 36°}{5.9}$$

$$G = \sin^{-1}\left(\frac{7.8 \cdot \sin 36°}{5.9}\right)$$

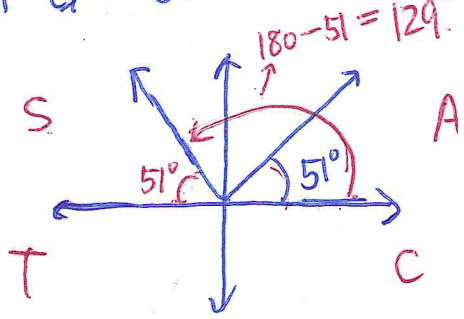
Show your work here...

$\angle G = 51°$

However, this situation satisfies the ambiguous case as $j < g$ and $\angle J$ is acute.

Case 2:
$\angle G = 180° - 51°$ (1st G)
$\angle G = 129°$ → 2nd G

1st G = 51°



∴ 2nd G = 180 − 51 = 129

<u>Find the distance between them in Case 1:</u>

1st G: $\angle G = 51°$ → $\angle B = 180 - 51 - 36 = 93°$

$\angle B = 93°$

Using sine law, $b = 10.02\ m$ $\quad \frac{b\ (\text{side})}{\sin 93°} = \frac{5.9}{\sin 36°}$

<u>Find the distance between them in Case 2:</u>

2nd G: $\angle G = 129°$ → $\angle B = 180 - 129 - 36 = 15°$

$\angle B = 15°$

Using sine law, $2.600\ m$ $\quad \frac{b}{\sin 15} = \frac{5.9}{\sin 36}$

$b =$

So, if they are on the same side of the balloon, they are 2.6 m apart. If they are on opposite sides of the balloon, they are 10.02 m apart.

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Sine and Cosine Law Worksheet

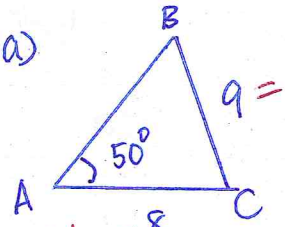
1. Determine whether the ambiguous case of the sine law exists in each of the following:

a) ΔABC, where $\angle A = 50°, a = 9, b = 8$

b) ΔABC, where $\angle A = 50°, a = 7, b = 8$

c) ΔXYZ, where $\angle Z = 37°, x = 17.2, z = 13.5$

1(a)



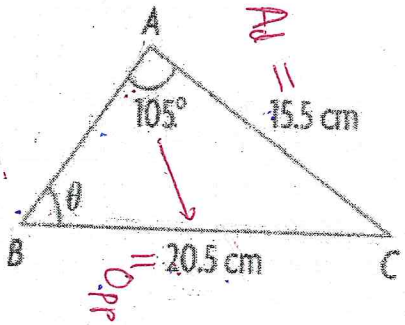
q = Opp

Ad = 8

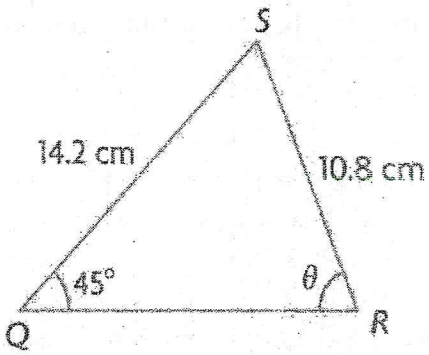
Opp > Ad

∴ Not ambiguous

2. a)



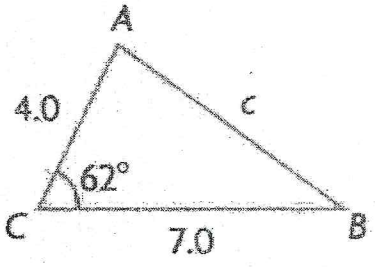
b)



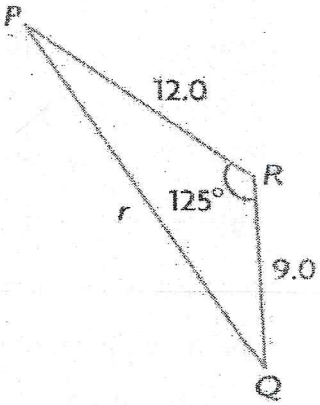
c) $a = 7.2\ mm, b = 9.3\ mm, \angle A = 35°$

3. Determine each unknown side length to the nearest tenth.

a)

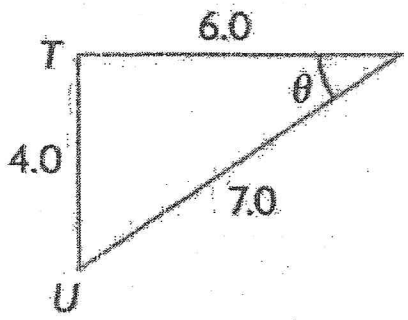


b)

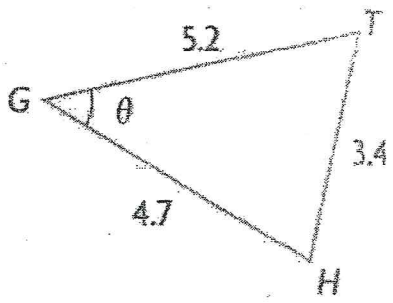


4. For each triangle, determine the value of θ to the nearest degree.

a)



b)



5. Is it possible to have an ambiguous case using the cosine law? If so, show an example. If not, explain why not?

6. For each of the following, select the most appropriate trigonometric tool among primary trig ratios, the sine law, and the cosine law. Justify your choice. Do not solve.
   a) In ΔABC, $\angle A = 90°$, $\angle B = 39°$, and $a = 10cm$. Determine b.
   b) In ΔPQR, $\angle P = 35°$, $\angle R = 65°$, and $p = 3m$. Determine q.
   c) In ΔDEF, $\angle D = 60°$, $\angle F = 50°$, and $d = 12cm$. Determine f.
   d) In ΔXYZ, $\angle X = 42°$, $z = 20\ km$, and $y = 25km$. Determine x.

7. Solve question 6.

Answers

1. a) No b) Yes c) Yes
2. a) 47^0 b) ~~128^0~~ b) 68^0 or 112^0 d) 48^0 or 132^0
3. a) 6.2 b) 18.7
4. a) 35^0 b) 40^0
5. No. There is only one solution between 0^0 and 180^0.
6. a) primary trig ratios (SOHCAHTOA) b) sine law c) sine law d) cosine law
7. a) 6.3cm b) 5.2m c) 10.6cm d) 16.8km

Lesson 8 : Read ~~text~~ examples 1, 2 and 3 on page 250 (If necessary)

Start HW (Classwork) p 254 #3-5, 7, 10, 11, 14, 18, 21