

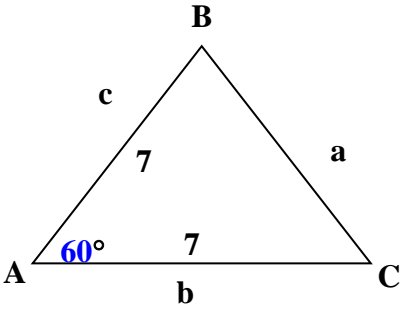
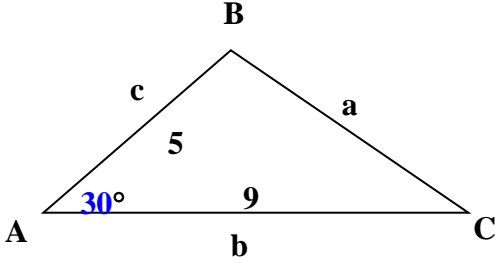
**GRADE 11 ESSENTIAL
UNIT G – TRIGONOMETRY
COSINE LAW WORKSHEET**

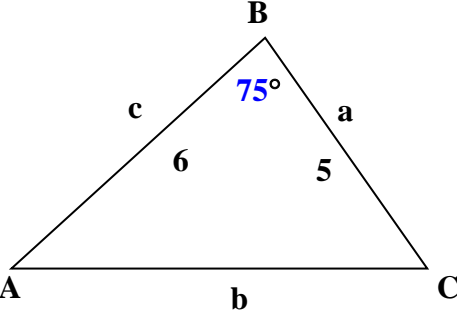
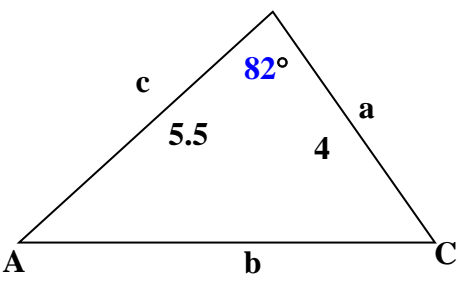


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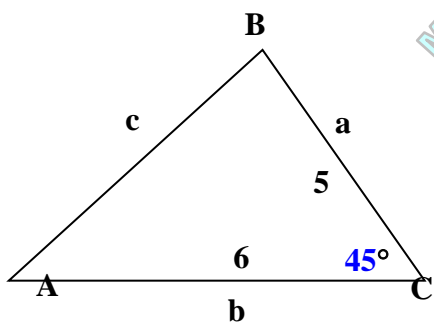
Show all work. Answers are given. **Formulas** are at the end. **Round all answers to three decimal places** (I only give you the answer to one decimal place so that you know you are likely right). **Caution:** shapes are *not necessarily to scale*; believe the numbers, not your eyes, or re-draw them a bit better.

1. Determine the measure of the unknown *side*

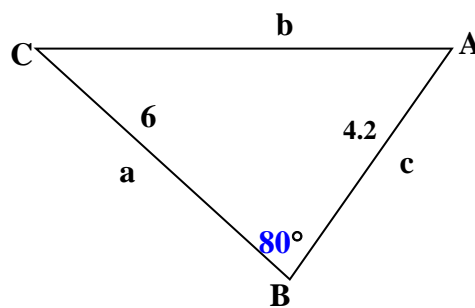
<p>a.</p>  <p style="text-align: center;">Approx Ans: $a = 7$ Obvious from Geometry?</p>	<p>b.</p>  <p style="text-align: center;">Approx Ans: $a = 5.3$</p>
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<p>c.</p>  <p style="text-align: center;">Approx Ans: $b = 6.7$</p>	<p>d.</p>  <p style="text-align: center;">Approx Ans: $b = 6.3$</p>
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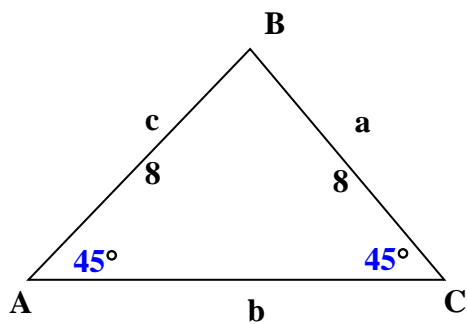
e.

Approx Ans: $c = 4.3$

f.

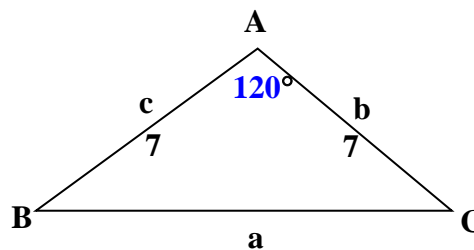
Approx Ans: $b = 6.7$

g.

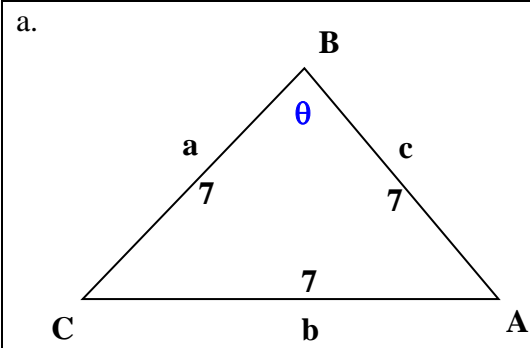


Ans: ???

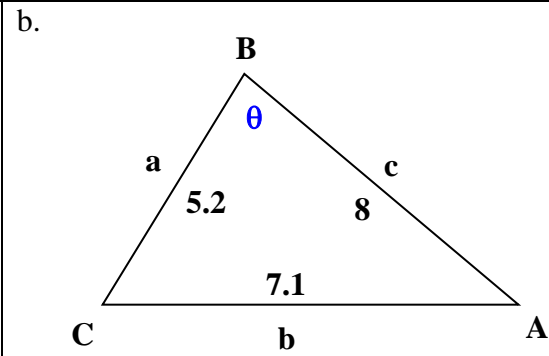
h.

Ans: $a = 12.1$

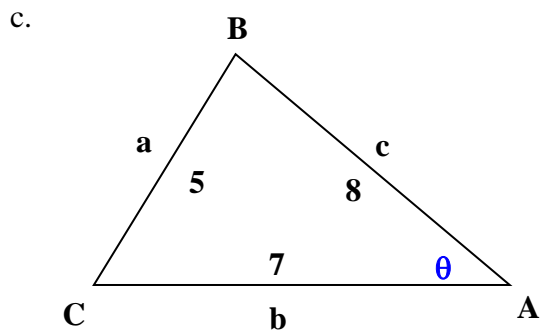
2. Find the unknown angle θ



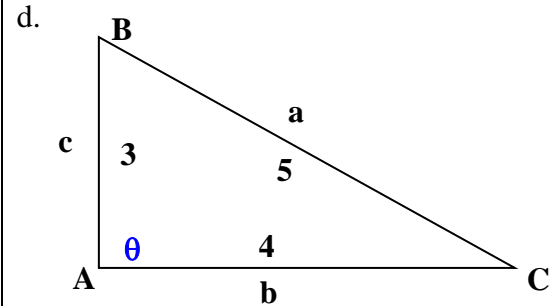
Ans: Obvious! 60°



Approx Ans: $B = 60.8$



Ans: $A = 38.2^\circ$



Ans: Obvious: $A = 90^\circ$ (since 3-4-5 Triangle)

Formulas and steps

For Cosine Law:

1. Label the Triangle with corners and sides (big letter corners; little letter sides opposite)
2. Make sure you have *either*:
 - a) Two sides with a given included angle (ie: an angle between them); or
 - b) Three given sides.

Otherwise, the Cosine Law is not useful. [The Sine Law will work though]

3. Apply the concept that “the square of the unknown side is equal to the sum of the squares of the given two sides less twice the product of the given two sides with the cosine of the angle opposite the unknown side.” As a formula this could be shown as:

$$a^2 = b^2 + c^2 - 2bc \cos(A); \text{ where } a \text{ is the unknown side and } A \text{ is the angle opposite it, and } b \text{ and } c \text{ are the given two sides.}$$

Of course: depending on how you label your triangle you may get a slightly different looking formula but it doesn't matter. You may get:

$$c^2 = a^2 + b^2 - 2ab \cos(C) \quad \text{or} \quad b^2 = a^2 + c^2 - 2ac \cos(B)$$

These two always go like this

4. The same Cosine Law formula can be used to find a missing angle also; you just have to do some algebra after plugging in given numbers, or else re-arrange the formula literally. So for example; you could always, if you want, re-arrange the formula using algebra to find the angle like this:

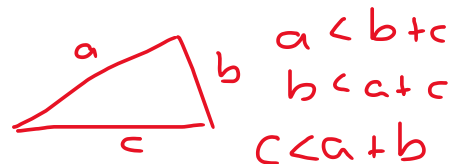
$$\text{Angle } A = \cos^{-1} \left(\frac{b^2 + c^2 - a^2}{2bc} \right) \text{ where it is understood still that angle Big A is opposite side little a.}$$

5. Don't forget to make sure your solution makes sense.

- Eyeball it.
- Use the Triangle Inequality Theorem: Any side of a triangle must be shorter than the other two sides added together.

When the three sides are a, b and c, we can write:

$$\begin{aligned} a &< b + c \\ b &< a + c \\ c &< a + b \end{aligned}$$



- Sides and angles across relationship:

In any triangle:

The shortest side is always opposite the smallest interior angle

The longest side is always opposite the largest interior angle

