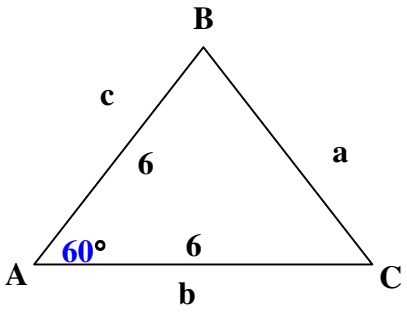
Name: _____
Date: _____

GRADE 11 ESSENTIAL
UNIT G – TRIGONOMETRY
COSINE LAW WORKSHEET

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 to scale*; believe the numbers, not your eyes.

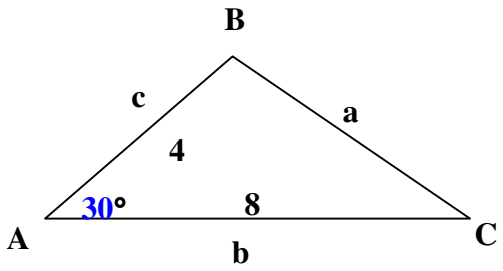
1. Find the measure of the unknown ***side***

a.



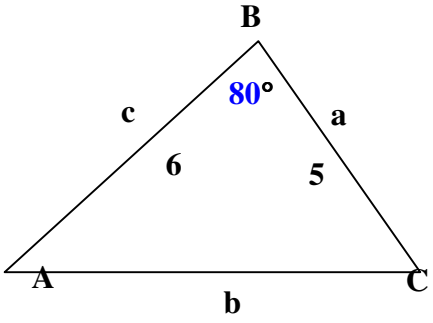
Ans: a = 6

b.



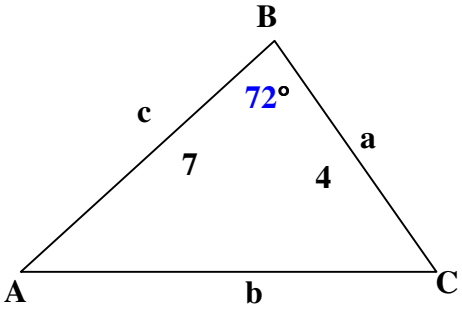
Ans: a = 5.0

c.



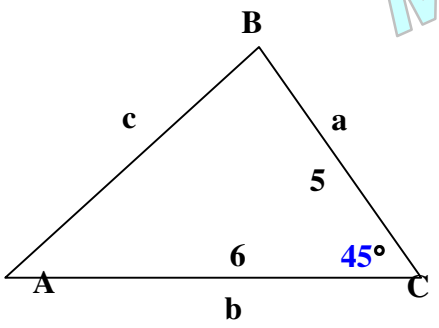
Ans: b = 7.1

d.



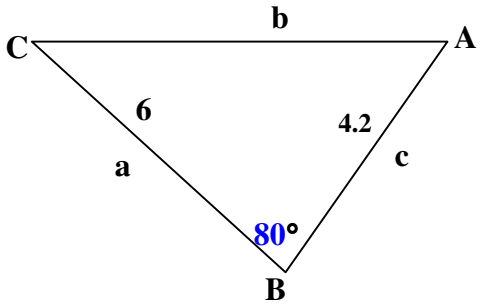
Ans: b = 6.9

e.



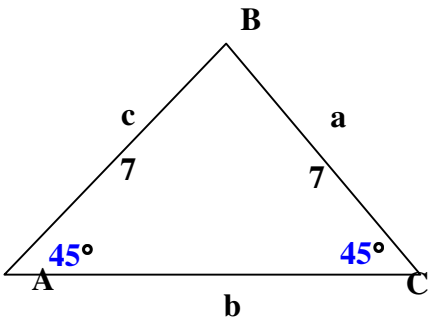
Ans: c = 4.3

f.



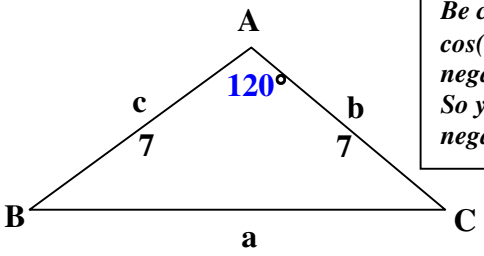
Ans: b = 6.7

g.



Ans: ???

h.

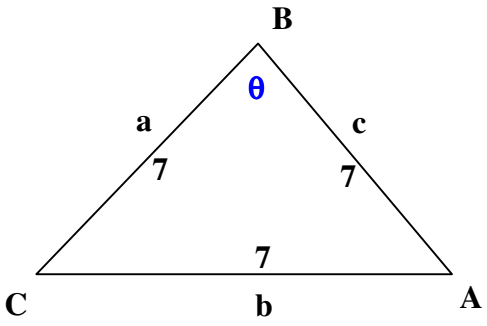


Be careful! cos(120°) is a negative number! So you will get a negative negative

Ans: a = 12.1

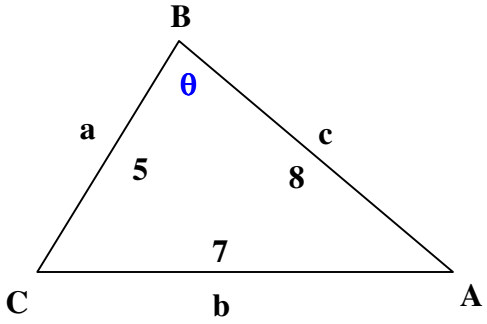
2. Find the unknown **angle θ** **Needs just a little bit of algebra! (lol)**

a.



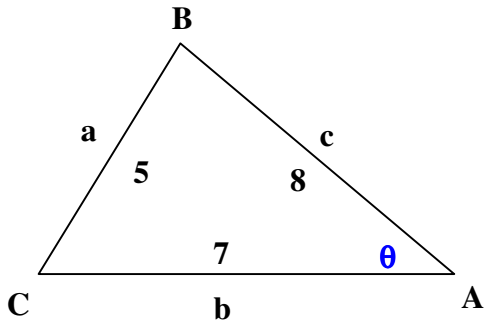
Ans: Obvious! 60°

b.



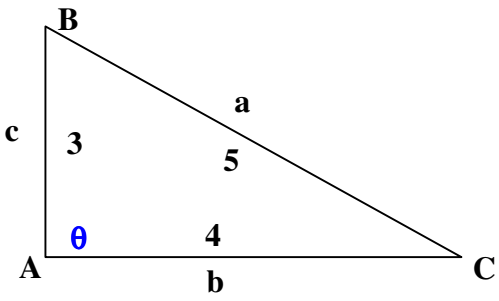
Ans: B = 60°

c.



Ans: A= 38.2°

d.



Ans: Obvious: A= 90° (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.

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:

   $a^2 = b^2 + c^2 - 2bc * \cos(A)$; where ***a*** is the unknown side and **A** is the angle opposite it, and ***b*** and ***c*** 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:

$c^2 = a^2 + b^2 - 2ab * \cos(C)$ or $b^2 = a^2 + c^2 - 2ac * \cos(B)$

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 a formula to find the angle like this:

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

Caution: for given angles that are greater than 90° you will get a cosine that is negative! Just be careful with the 'negative negative' you will get in the formula!