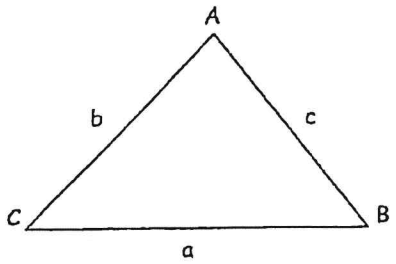
4.5 INVESTIGATING THE COSINE LAW

* For a triangle labeled as shown, the COSINE LAW can be written as:

$a^2 = b^2 + c^2 - [2bc(\cos A)]$ or
$b^2 = a^2 + c^2 - [2ac(\cos B)]$ or
$c^2 = a^2 + b^2 - [2ab(\cos C)]$



* To use the cosine law to solve a triangle, you must know either:

  → Two sides and the contained angle. (This will determine the 3rd side of the Δ)
  → Three sides. (This will determine a missing angle measure)

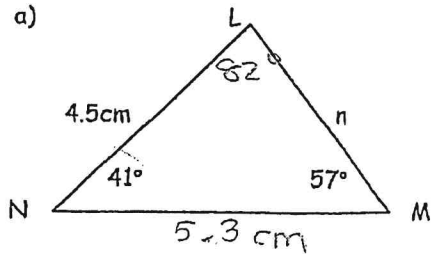
- Once you have put the given information into the cosine law formula, you isolate for the missing side or angle measure.

- Recall :
  → When finding a missing angle measure, you must use the $\cos^{-1}$ function on your calculator.
  → To solve a triangle means to find <u>all</u> missing side lengths and angle measures.

Examples :

1. Find the length of the indicated side, to one decimal place.

a)



$\angle L = 180^\circ - \angle N - \angle H$
$= 180^\circ - 41^\circ - 57^\circ$
$\angle L = 82^\circ$

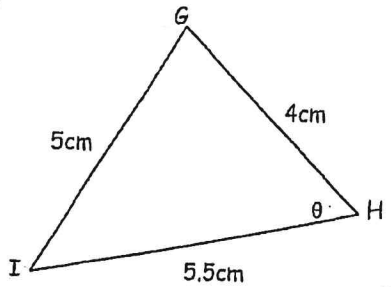
$n^2 = m^2 + l^2 - 2ml(\cos N)$
$= (4.5)^2 + (5.3)^2 - 2(4.5)(5.3)(\cos 41^\circ)$
$\doteq 20.25 + 28.09 - 35.9996$
$n \doteq \sqrt{12.3404}$
$n \doteq 3.5 \text{ cm}$

* The cosine law can be rearranged to find an angle measure:

$$\cos C = \frac{c^2 - a^2 - b^2}{-2ab}$$

2. Find the measure of the indicated angle, to the nearest degree

a)



$\cos H = \frac{h^2 - g^2 - i^2}{-2gi}$
$= \frac{(5)^2 - (5.5)^2 - (4)^2}{-2(5.5)(4)}$
$= \frac{-21.25}{-44}$
$\angle H \doteq \cos^{-1}(0.4830)$
$\angle H \doteq 61^\circ$

INVESTIGATING THE COSINE LAW

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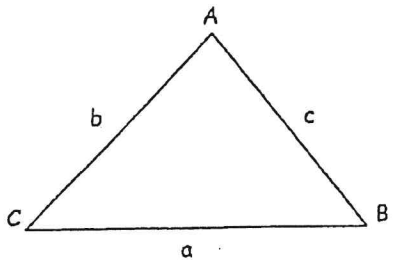

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  → To solve a triangle means to find <u>all</u> missing side lengths and angle measures.

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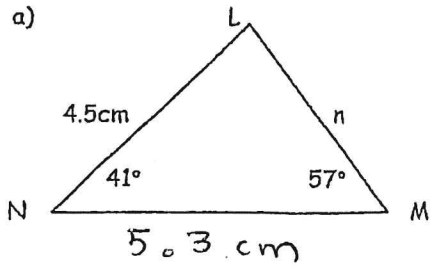

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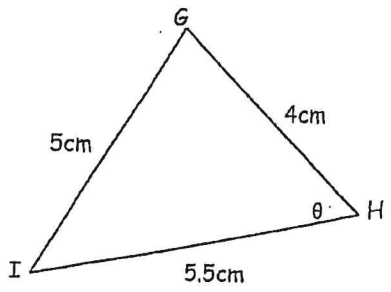
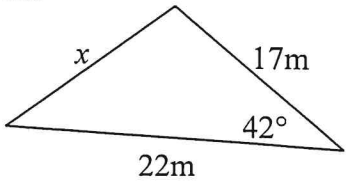


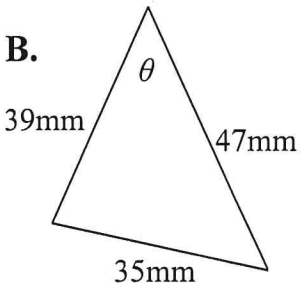
COSINE LAW WORKSHEET

1. Solve for the unknown in each triangle. Round to the nearest hundredth.

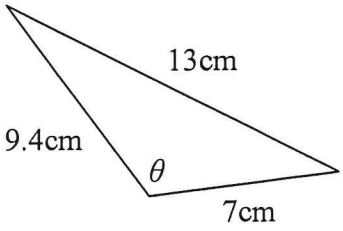
A.



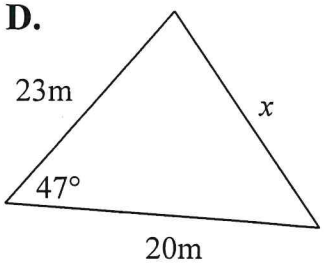
B.



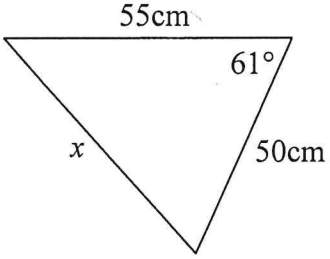
C.



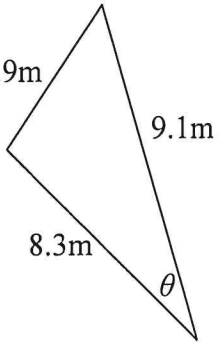
D.



E.



F.



2. Solve for **all** missing sides and angles in each triangle. Round to the nearest hundredth. ** USE PROPER VARIABLES

A. ΔXYZ: $x = 29m, y = 15m, \angle Z = 122°$

B. ΔGHI: $g = 13cm, h = 8cm, i = 15cm$

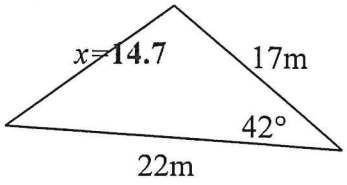
C. ΔMNO: $n = 31m, o = 28m, \angle M = 62°$

3. A triangle has sides equal to 4 m, 11 m and 8 m. Find its angles (round answers to nearest tenth)

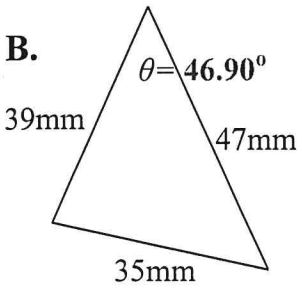
COSINE LAW WORKSHEET ANSWER KEY

1. Solve for the unknown in each triangle. Round to the nearest hundredth.

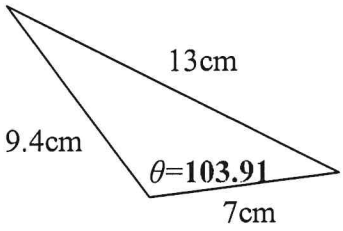
A.



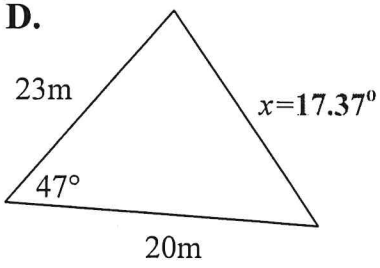
B.



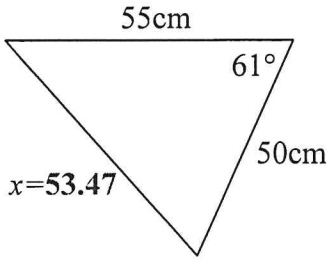
C.



D.



E.



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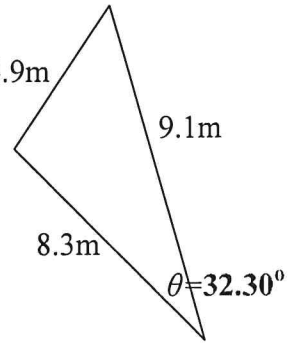

2. Solve for **all** missing sides and angles in each triangle. Round to the nearest hundredth. ** USE PROPER VARIABLES

A. ΔXYZ: $x = 29m, y = 15m, \angle Z = 122°$

z=39.08m **<X= 38.99°** **<Y =19.01°**

B. ΔGHI: $g = 13cm, h = 8cm, i = 15cm$

<G=60° **<H=32.20°** **<I=87.80°**

C. ΔMNO: $n = 31m, o = 28m, \angle M = 62°$

m=30.50 **<N=63.83°** **<O=54.16°**

3. A triangle has sides equal to 4 m, 11 m and 8 m. Find its angles (round answers to nearest tenth) **16.21°, 129.84°, 33.95°**

COSINE LAW WORKSHEET ANSWER KEY

1. Solve for the unknown in each triangle. Round to the nearest hundredth.

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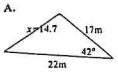
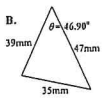
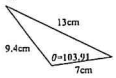


B.



C.



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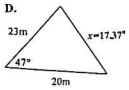

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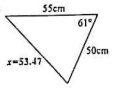

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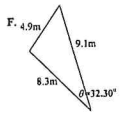

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