

## 7.2 – Law of Cosines

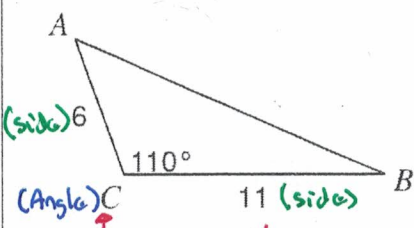
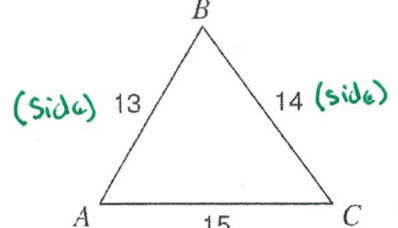
Law of Cosines "Formulas" →

1.)  $a^2 = b^2 + c^2 - 2bc \cos A$

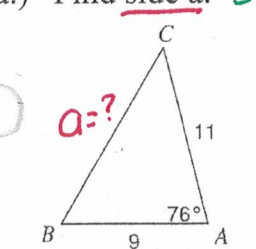
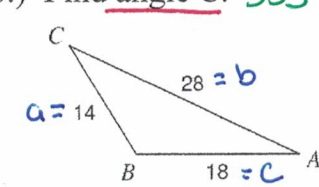
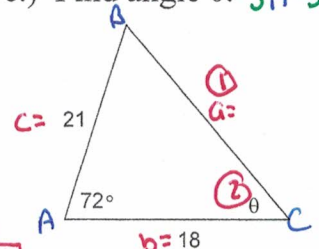
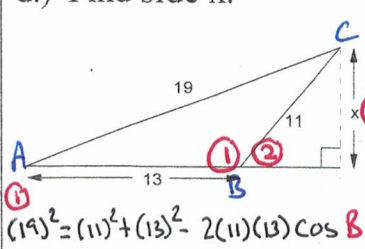
2.)  $b^2 = a^2 + c^2 - 2ac \cos B$

3.)  $c^2 = a^2 + b^2 - 2ab \cos C$

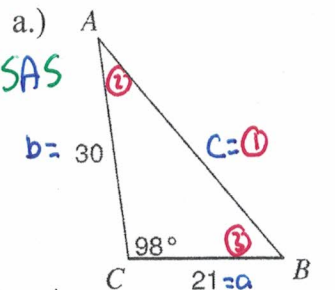
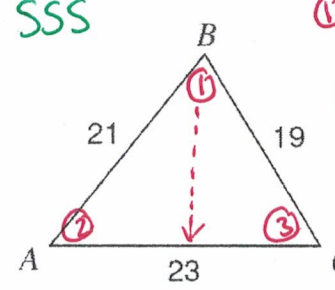
– Only use the Law of Cosines to solve a triangle if given the following:

Given Triangle # 1	Given Triangle # 2	Important when Solving w/ LOC
 <p>(side) 6 110° 11 (side) C Angle is included! Type of Triangle: <b>SAS</b></p>	 <p>(side) 13 14 (side) 15 (side) A C Type of Triangle: <b>SSS</b></p>	<ul style="list-style-type: none"> <li>• Given <b>SAS</b> triangle → <u>FIRST</u> find... the missing side of given angle</li> <li>• Given <b>SSS</b> triangle → <u>FIRST</u> find... the largest angle which will be across from longest side</li> <li>• Once used the Law of Cosines – <u>May use Law of Sines</u> because will be able to set up a proportion</li> </ul>

**Example 1:** Find indicated side or indicated angle. Round to tenth place.

<p>a.) Find side a. <b>SAS</b></p>  <p>a = ? 76° 9 11 A B C</p> $a^2 = (11)^2 + (9)^2 - 2(11)(9) \cos 76^\circ$ $a^2 = 154.0994647$ <p><b>a = 12.4</b></p>	<p>b.) Find angle C. <b>SSS</b></p>  <p>28 = b 14 = a 18 = c A B C</p> $(18)^2 = (14)^2 + (28)^2 - 2(14)(28) \cos C$ $324 = 980 - 784 \cos C$ <p><b>C = 33.2°</b></p>	<p>c.) Find angle θ. <b>SAS</b></p>  <p>21 = c 18 = b 72° A B C θ</p> $a^2 = (18)^2 + (21)^2 - 2(18)(21) \cos 72^\circ$ $a = 23.1$ <p><b>C = 59.8°</b></p>	<p>d.) Find side x.</p>  <p>19 13 11 A B C x θ</p> $(19)^2 = (11)^2 + (13)^2 - 2(11)(13) \cos B$ $B = \cos^{-1}\left(\frac{-71}{286}\right)$ $B = 104.4^\circ$ <p><b>x = 10.7</b></p>
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**Example 2:** Solve each triangle. Round to tenth place.

<p>a.) <b>SAS</b></p>  <p>21 = a 30 = b 98° A B C</p> <p><b>LOC</b></p> $c^2 = (21)^2 + (30)^2 - 2(21)(30) \cos 98^\circ$ $c^2 = 1516.358107$ <p><b>c = 38.9</b></p> <p><b>* Switch to LOS *</b></p> $\frac{38.9}{\sin 98} = \frac{21}{\sin A}$ $\sin A = \frac{21 \sin 98}{38.9}$ <p><b>A = 32.3°</b></p> <p><b>B = 180 - (98 + 32.3)</b></p> <p><b>B = 49.7°</b></p>	<p>b.) <b>SSS</b></p>  <p>21 19 23 A B C</p> $(23)^2 = (19)^2 + (21)^2 - 2(19)(21) \cos B$ $529 = 862 - 798 \cos B$ $-333 = -798 \cos B$ $B = \cos^{-1}\left(\frac{273}{798}\right)$ <p><b>B = 70°</b></p> <p><b>C = 180 - (70 + 50.9)</b></p> <p><b>C = 59.1°</b></p>
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