

Geometry 8.6

Use the law of sines to solve triangles

Use the law of cosines to find angles in a triangle

Use the law of cosines to solve triangles

sine

cosine

tangent

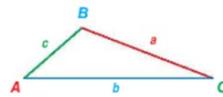
proportion

law of sines

→ law of cosines

whiteboards

$$\frac{\sin A}{a} = \frac{\sin B}{b}$$



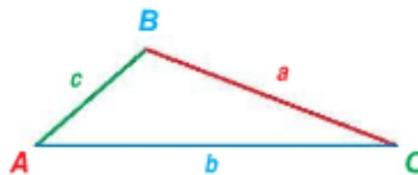
Quiz Thurs. 8.5-8.6

Must have a pair!

**Theorem 8.10** Law of Sines

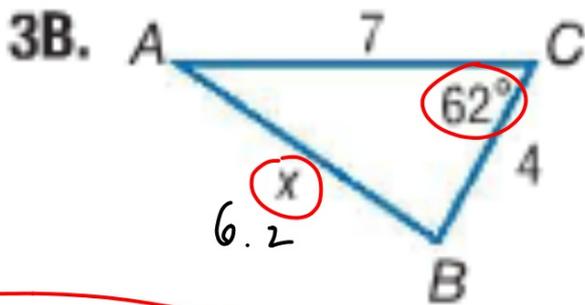
If  $\triangle ABC$  has lengths  $a$ ,  $b$ , and  $c$ , representing the lengths of the sides opposite the angles with measures  $A$ ,  $B$ , and  $C$ , then

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}.$$



You will prove one of the proportions for Theorem 8.10 in Exercise 45.

You can use the Law of Sines to solve a triangle if you know the measures of two angles and any side (AAS or ASA).



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

$$x^2 = 7^2 + 4^2 - (2 \cdot 7 \cdot 4 \cdot \cos 62)$$

$$x^2 = 49 + 16 - (28 - 2904)$$

$$x^2 = 38.7096$$

$$x = 6.2$$

When you don't have a pair! (order of operations)

SAS

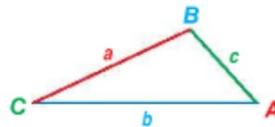
**Theorem 8.11** Law of Cosines

If  $\triangle ABC$  has lengths  $a$ ,  $b$ , and  $c$ , representing the lengths of the sides opposite the angles with measures  $A$ ,  $B$ , and  $C$ , then

$$a^2 = b^2 + c^2 - 2bc \cos A,$$

$$b^2 = a^2 + c^2 - 2ac \cos B, \text{ and}$$

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



You will prove one of the equations for Theorem 8.11 in Exercise 46.

You can use the **Law of Cosines** to solve a triangle if you know the measures of two sides and the included angle (SAS).

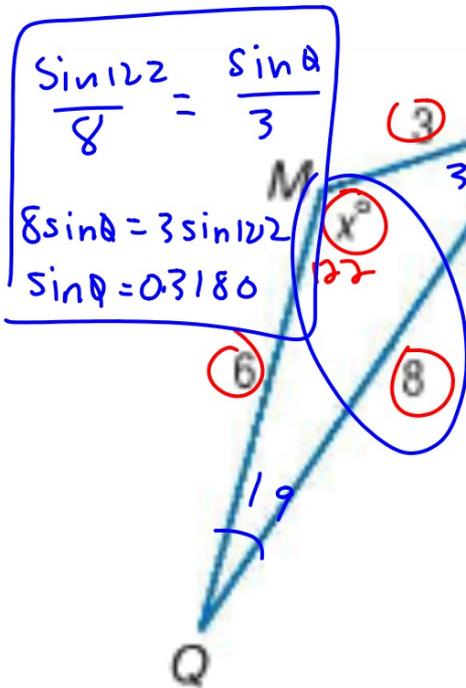
Example 4 Law of Cosines (SSS)

Find  $x$ . Round to the nearest degree.

What if no angles are given?

Order of operations...

How do we find an angle if we know its cosine?



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

$$8^2 = 3^2 + 6^2 - (2 \cdot 3 \cdot 6 \cos x)$$

$$64 = 9 + 36 - (36 \cos x)$$

-9 -36   -9   -36

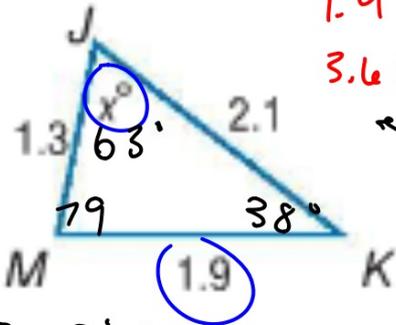
$$\frac{19}{-36} = \frac{-36 \cos x}{-36}$$

$$-0.5278 = \cos x$$

$$x = 122$$

### Guided Practice

4A.

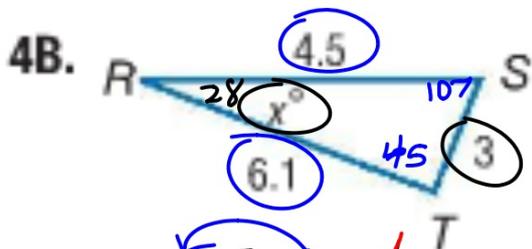


$$\frac{\sin 63}{1.9} = \frac{\sin x}{1.3}$$
$$\sin x = 0.6096$$

$$a^2 = b^2 + c^2 - (2bc \cos A)$$
$$1.9^2 = 1.3^2 + 2.1^2 - (2 \cdot 1.3 \cdot 2.1 \cdot \cos x)$$
$$3.61 = 1.69 + 4.41 - (5.46 \cos x)$$
$$-2.49 = -5.46 \cos x$$

$$0.4560 = \cos x$$

$$x = 63$$



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

$$\frac{\sin 28}{3} = \frac{\sin T}{4.5}$$

$$3 \sin T = 2.1126$$

$$\sin T = 0.7042$$

$$3^2 = 4.5^2 + 6.1^2 - (2 \cdot 4.5 \cdot 6.1 \cdot \cos X)$$

$$9 = 20.25 + 37.21 - (54.9 \cos X)$$

$$-48.46 = -54.9 \cos X$$

$$0.8827 = \cos X$$

$$X = 28$$

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8.6

WB prac 1-13

skills 14-16