



Lesson Question

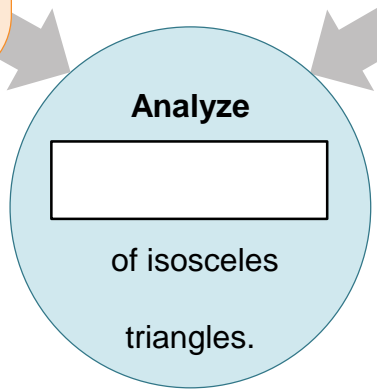


Lesson Goals

Prove

about the properties of isosceles triangles.

Apply properties and theorems to solve  involving isosceles triangles.



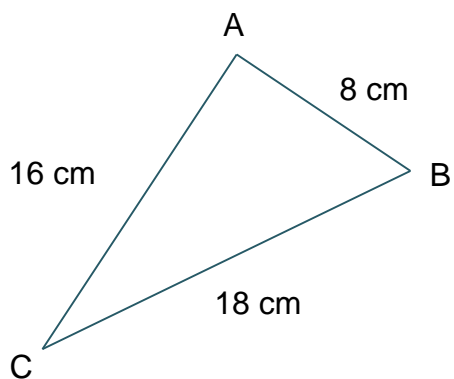
W  
2k**Words to Know**

Write the letter of the definition next to the matching word as you work through the lesson. You may use the glossary to help you.

- |   |  |
|---|--|
| _____ assume                              | A. a triangle in which at least two sides are congruent                          |
| _____ angle bisector                      | B. a ray, line, or line segment that divides an angle into two congruent angles  |
| _____ base angle of an isosceles triangle | C. to accept as true without proof   |
| _____ equilateral triangle                | D. in an isosceles triangle, either of the two congruent angles along the base   |
| _____ isosceles triangle                  | E. in an isosceles triangle, the angle formed where the two congruent sides meet |
| _____ vertex angle                        | F. a triangle in which all three sides are congruent                             |

**The Triangle Parts Relationship Theorem**

**Triangle parts relationship theorem:** If one side of a triangle is  than another side, then the angle opposite the longer side is  than the angle opposite the shorter side.



$$CB > \text{  }$$

$$\text{  } > \angle C$$

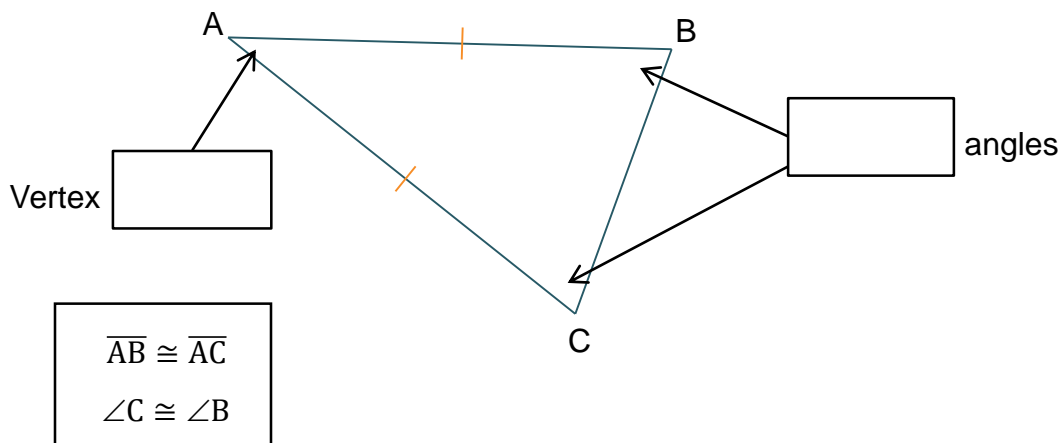
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2

**Isosceles Triangles**

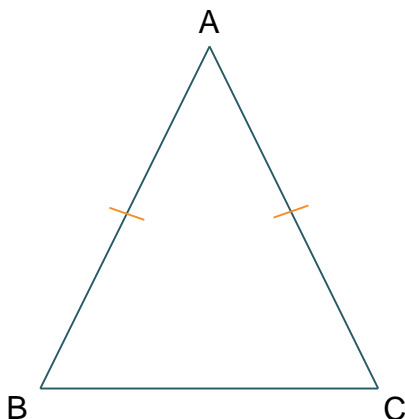
An **isosceles triangle** is a triangle with at least two sides that are

. An isosceles triangle has two  **angles** and one  **angle**.



Slide

2

**Proof by Contradiction**Given:  $\triangle ABC$  is isosceles;  $\overline{AB} \cong \overline{AC}$ Prove:  $\angle B \cong \angle C$ 

Proof by contradiction:

1.  the statement to be proven is not true.  
Assume:  $m\angle B \neq$
2. Show that this assumption  other facts or given information.
3. Conclude the original statement is true because the  cannot be true.

Slide

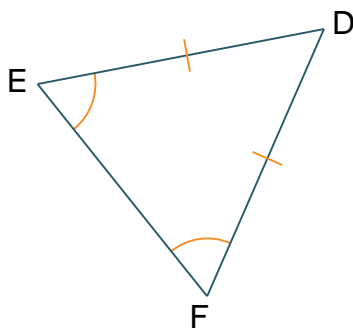
4

**The Isosceles Triangle Theorem and Converse**

**Isosceles triangle theorem:** If two sides of a triangle are congruent, then the

opposite those sides are . That is, the

angles of an isosceles triangle are congruent.



**Converse of the isosceles triangle theorem:** If  angles of a triangle

are congruent, then the sides  those angles are congruent.

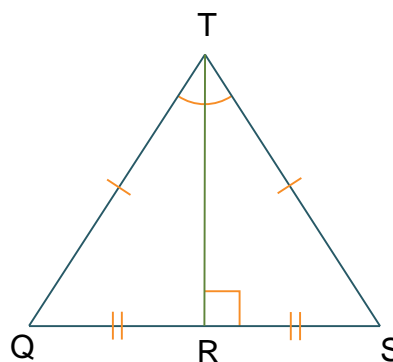
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7

### The Vertex Angle of an Isosceles Triangle Theorem

**Vertex angle of an isosceles triangle theorem:** The  of the vertex angle of an isosceles triangle is the  bisector of the base.

$$m\angle QTR = m\angle \text{  }$$

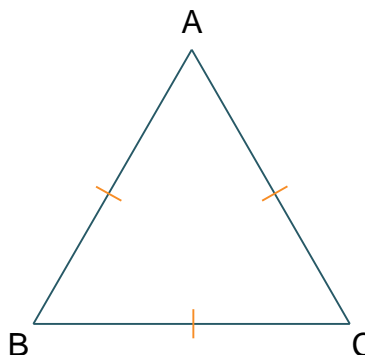
$$\text{  } = RS$$



### Equilateral Triangles

An **equilateral triangle** is a  of an isosceles triangle.

$$AB = AC = \text{  }$$



Slide

7

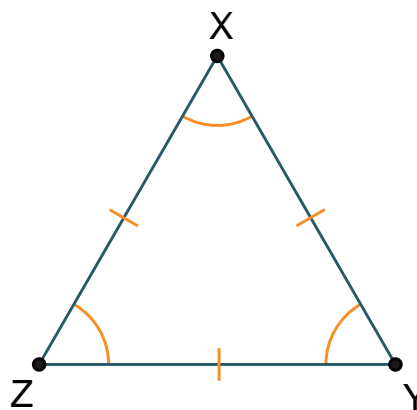
**The Isosceles Triangle Theorem, Its Converses, and Corollaries****Corollary of the isosceles triangle**

**theorem:** If a  is equilateral, then it is equiangular.

**Corollary of the converse of the**

**isosceles triangle theorem:** If a triangle is , then it is equilateral.

The converse of a theorem is nothing more than switching the  with the conclusion.





Slide

9

## Applying the Isosceles Triangle Theorem

What are the measures of the base angles and the vertex of the isosceles triangle?

$$8x - 15 = 4x + 9$$

$$4x - 15 = \boxed{\phantom{00}}$$

$$4x = \boxed{\phantom{00}}$$

$$x = \boxed{\phantom{00}}$$

$$\angle A: 4(6) + 9 = 24 + 9 = \boxed{\phantom{00}}$$

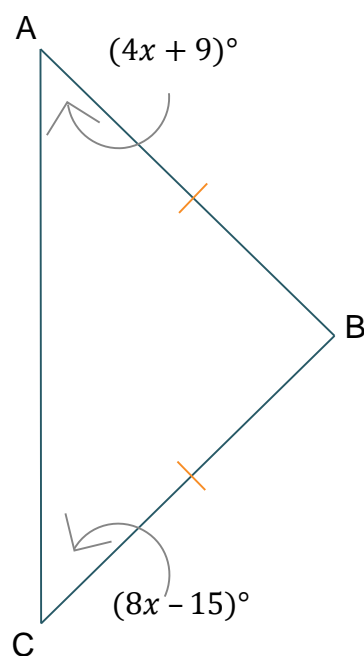
So,  $\angle A$  and  $\angle C$  each measure  $33^\circ$ .

$$33^\circ + 33^\circ + \boxed{\phantom{00}} = 180^\circ$$

$$33 + 33 + m\angle B = 180$$

$$\boxed{\phantom{00}} + m\angle B = 180$$

$$m\angle B = \boxed{\phantom{00}}^\circ$$



Slide

11

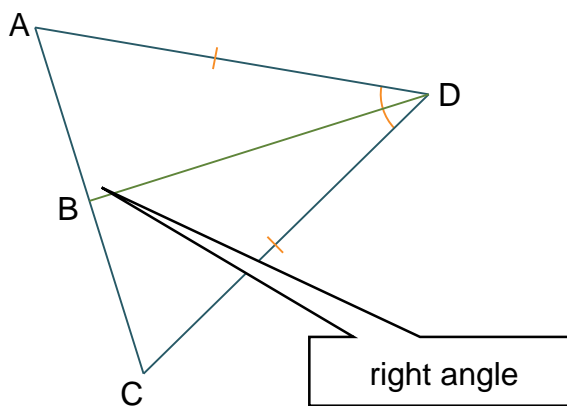
### Applying the Vertex Angle of an Isosceles Triangle Theorem

$\overline{BD}$  is the **angle bisector** of  $\angle ADC$ . If the measure of  $\angle ABD$  is  $(32x - 6)^\circ$ , what is the value of  $x$ ?

$$32x - 6 = \boxed{\phantom{000}}$$

$$32x = \boxed{\phantom{000}}$$

$$x = \boxed{\phantom{000}}$$



If  $AB = 21$  and  $CB = 2y - 3$ , what is the value of  $y$ ?

$$AB = BC$$

$$21 = 2y - 3$$

$$24 = 2y$$

$$\boxed{\phantom{000}} = y$$

Slide

13

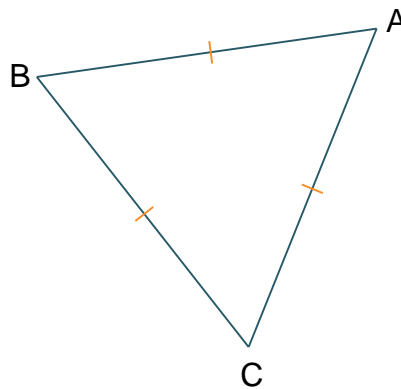
**Applying the Converse of the Corollary of the Isosceles Triangle Theorem**

The measure of  $\angle BAC = (5x - 20)^\circ$ . What is the value of  $x$ ?

$$5x - 20 = \boxed{\phantom{00}}$$

$$5x = \boxed{\phantom{00}}$$

$$x = \boxed{\phantom{00}}$$



# Summary

## Isosceles Triangles



### Lesson Question

What properties do isosceles triangles have?



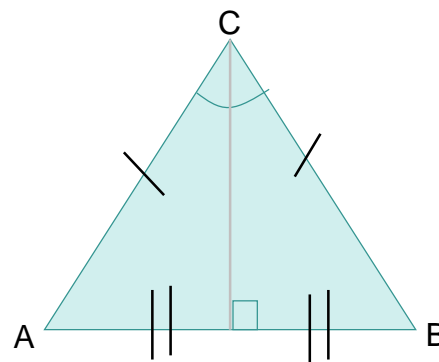
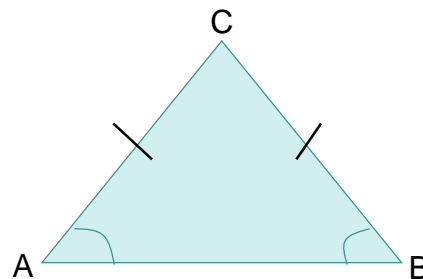
### Answer

Slide

2

### Review: Key Concepts

- Isosceles triangle theorem
  - If  $AC = BC$ , then  $m\angle A =$
- Corollary of the isosceles triangle theorem
  - If  $AC = BC = CA$ , then  $m\angle A = m\angle B =$
- Vertex angle of isosceles triangle theorem
  - The  of the vertex of an isosceles triangle is the perpendicular bisector of the .





# Summary

## Isosceles Triangles

*Use this space to write any questions or thoughts about this lesson.*