Assignment

Name _____ Date _____

Properties of Triangles
Angle Relationships in a Triangle

The measure of $\angle A$ in ΔABC is 36°. Use this information to answer Questions 1 through 3.

1. a. Give three examples of possible angle measures for $\angle B$ and $\angle C$ which make ΔABC an acute triangle.

b. Draw ΔABC with $m\angle A = 36°$, $m\angle B = 80°$, and $m\angle C = 64°$.

c. Name the angles of ΔABC from smallest to largest.

d. Name the sides of ΔABC from shortest to longest.

2. **a.** Give three examples of possible angle measures for $\angle B$ and $\angle C$ which make ΔABC an obtuse triangle.

b. Draw ΔABC with $m\angle A = 36°$, $m\angle B = 120°$, and $m\angle C = 24°$.

c. Name the angles of ΔABC from smallest to largest.

d. Name the sides of ΔABC from shortest to longest.

5

3. **a.** Can ΔABC be a right triangle? If yes, how many unique triangles can be formed? Explain.

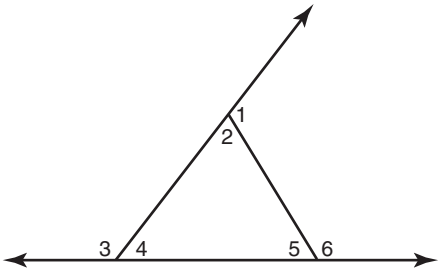
Name _____ Date _____

b. Draw ΔABC with $m\angle C = 90°$.

c. Name the angles of ΔABC from smallest to largest.

d. Name the sides of ΔABC from shortest to longest.

Use the diagram to answer Questions 4 through 6.



4. a. Name the interior angles of the triangle.

b. Name the labeled exterior angles of the triangle.

5. a. With respect to $\angle 1$, which angles are remote interior angles?

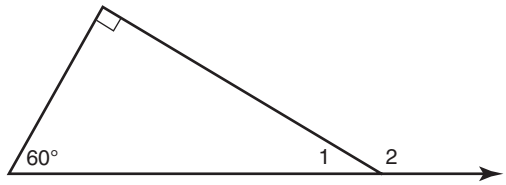
b. With respect to $\angle 3$, which angles are remote interior angles?

c. With respect to $\angle 6$, which angles are remote interior angles?

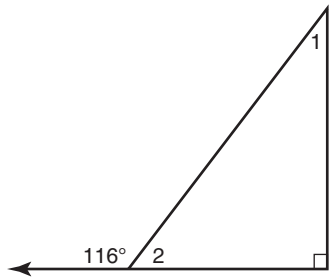
6. Is the equation $m\angle 3 = m\angle 2 + m\angle 5$ true? Explain.

Determine the measures of $\angle 1$ and $\angle 2$.

7.



8.



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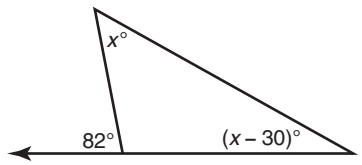
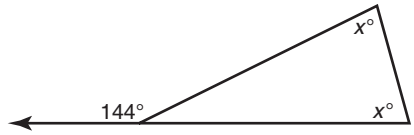
Solve for x in each triangle in Questions 9 through 11.

9.

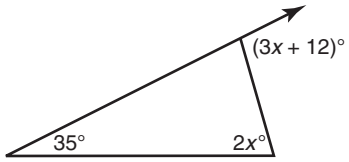


Name _____ Date _____

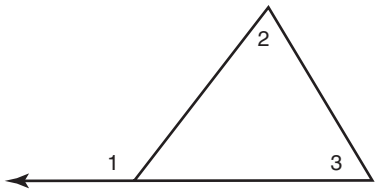
10.



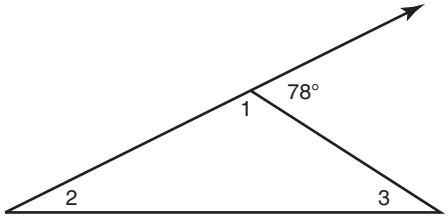
11.



12. Use the diagram to write an inequality that states the Exterior Angles Inequality Theorem.



13. Use the diagram and the Exterior Angles Inequality Theorem to answer parts (a) and (b).



a. Write an inequality for $m\angle 3$.

b. Write an inequality for $m\angle 2$.

5

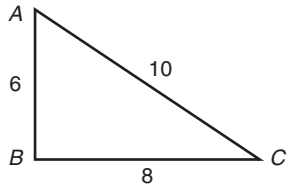
Assignment

Name _____ Date _____

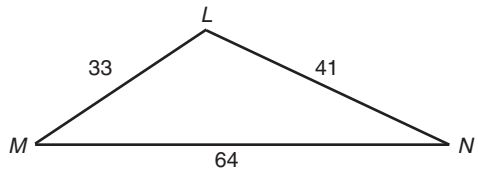
Properties of Triangles
Side Relationships in a Triangle

List the interior angles of each triangle in order from smallest to largest.

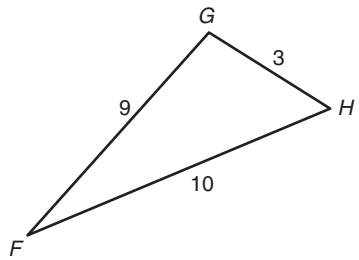
1.



2.



3.



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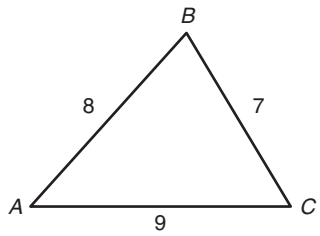


Determine whether the set of segment lengths given will form a triangle. If they will, classify the triangle as scalene, isosceles or equilateral. Explain your answer.

5. 3 cm, 4 cm, 5 cm

6. 6 cm, 6 cm, 10 cm

7. 65 in., 30 in., 12 in.

8. 20 in., 20 in., 20 in.

Name _____ Date _____

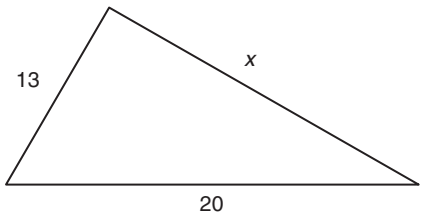
Answer the following questions about triangles.

9. A triangle has side lengths of 16 feet and 7 feet. What length(s) can be used for the third side to form an isosceles triangle? Explain.

10. How can you determine the smallest and largest interior angle of a triangle using only the side lengths?

Use the Triangle Inequality Theorem to write an inequality for *x* in Questions 12 through 17.

11.



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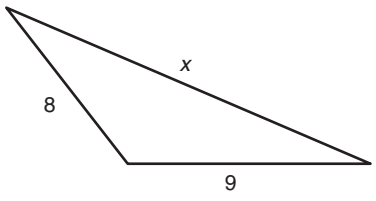

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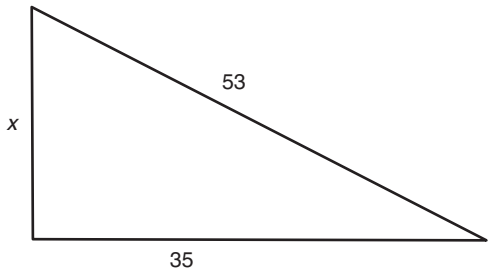


14. A triangle with side lengths 2, 6, and x

15. A triangle with side lengths x, 100, and 86

16. A triangle with side lengths x, 9, and 12

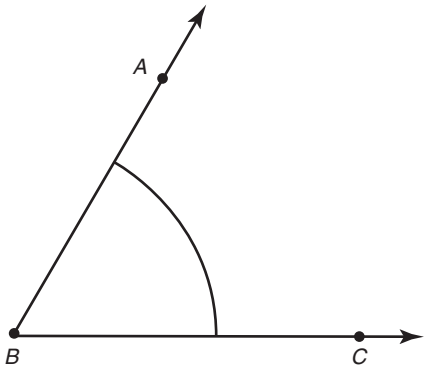
Assignment

Name _____ Date _____

Properties of Triangles
Points of Concurrency

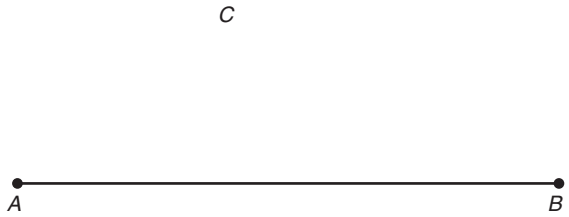
In Questions 1 through 3, perform each of the following constructions using a compass and a straight edge.

1. Construct the angle bisector of $\angle BAC$.

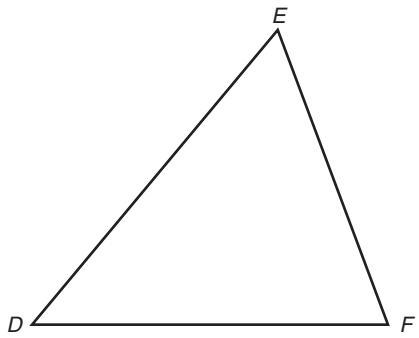


2. Construct the perpendicular bisector of $\overline{AB}$.

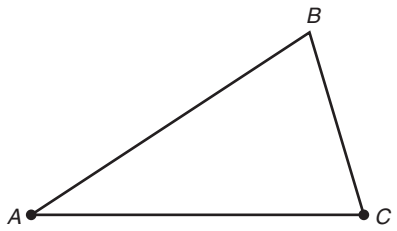
3. Construct a segment perpendicular to $\overline{AB}$ that passes through point C.



4. Construct the incenter of $\triangle DEF$.

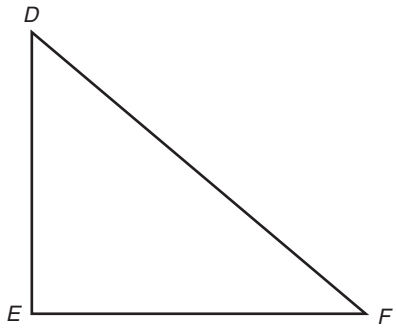


5. Construct the circumcenter of $\triangle ABC$.

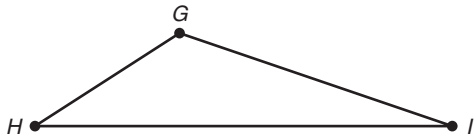


Name _____ Date _____

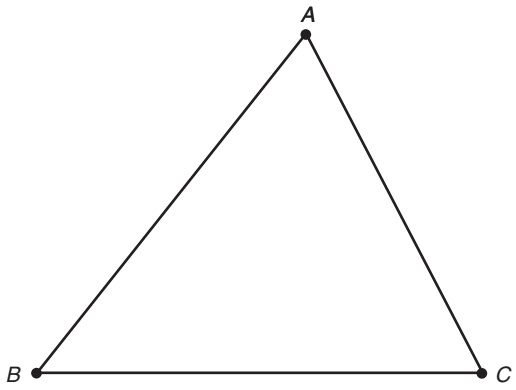
6. Construct the circumcenter of ΔDEF.



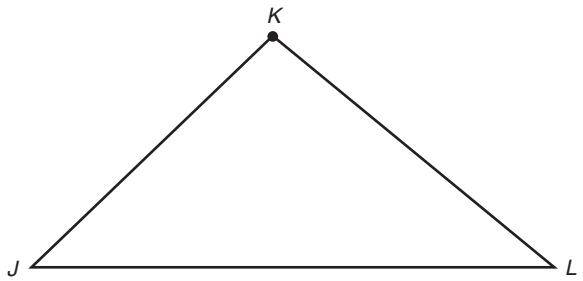
7. Construct the circumcenter of ΔGHI.



8. Construct the centroid of ΔABC.



9. Construct the orthocenter of $\triangle JKL$.



In Questions 10 through 14, write the term that best completes the statement.

10. The incenter of a triangle is the point of concurrency of the _____ of a triangle.

11. The circumcenter of a triangle is the point of concurrency of the _____ of a triangle.

12. The centroid of a triangle is the point of concurrency of the _____ of a triangle.

13. The orthocenter of a triangle is the point of concurrency of the _____ of a triangle.

14. is an obtuse triangle. In an obtuse triangle, the orthocenter is always located on the _____ of the triangle.

Answer the following questions about triangles.

15. For an acute triangle, where is the circumcenter is located?

Name _____ Date _____

16. For a right triangle, where is the circumcenter located?

17. For an obtuse triangle, where is the circumcenter located?

18. Suppose that the length of a median of a triangle is 6 inches. What is the distance along the median from the vertex to the centroid? What is the distance from the centroid to the midpoint opposite the vertex?

5

Assignment

Name _____ Date _____

Properties of Triangles
Direct and Indirect Proof

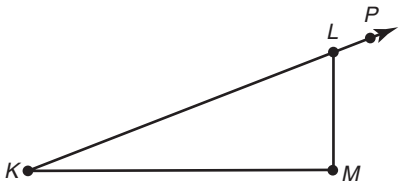
Complete each proof.

1. The Triangle Exterior Angle Theorem states:

The measure of the exterior angle of a triangle is equal to the sum of the measures of the two remote interior angles of the triangle.

Prove the Triangle Exterior Angle Theorem using a two-column proof by contradiction.

The reasons for the proof are provided. Write each step of the proof.

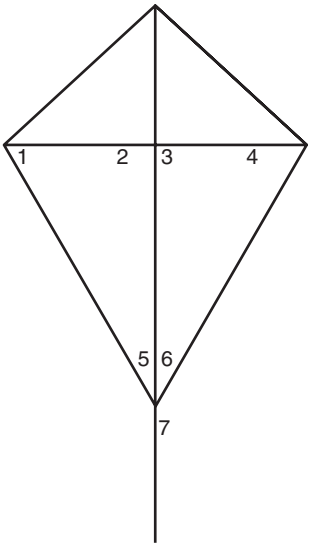


Given: Triangle *KLM* with exterior $\angle PLM$

Prove: $m\angle K + m\angle M + m\angle PLM$

Statements	Reasons
	1. Given
	2. Negation of conclusion
	3. Addition Property of Inequality
	4. Triangle Sum Theorem
	5. Linear Pair Postulate
	6. Definition of a Linear Pair
	7. Substitution using equations from steps 3, 4, and 5.

2. Complete the direct proof. The reasons for the proof are provided. Write each step of the proof.



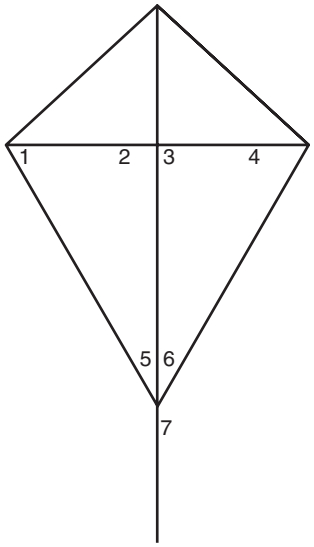
Given: $m\angle 1 = m\angle 4$, $m\angle 2 = m\angle 3$

Prove: $m\angle 5 = m\angle 6$

Statements	Reasons
	1. Given
	2. Given
	3. Triangle Sum Theorem
	4. Triangle Sum Theorem
	5. Substitution using equations from steps 3 and 4
	6. Substitution using equations from steps 1, 2, and 5
	7. Subtraction Property of Equality

Name _____ Date _____

3. Complete the indirect proof. The steps for the proof are provided. Write a reason for each step.

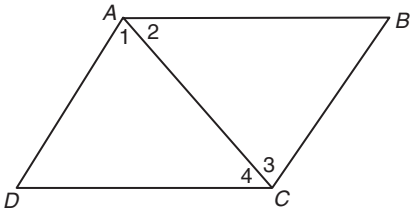


Given: $m\angle 1 = m\angle 4$, $m\angle 2 = m\angle 3$

Prove: $m\angle 7 = m\angle 1 + m\angle 3$

Statements	Reasons
1. $m\angle 1 = m\angle 4$	
2. $m\angle 2 = m\angle 3$	
3. $m\angle 7 \neq m\angle 1 + m\angle 3$	
4. $m\angle 7 = m\angle 3 + m\angle 4$	
5. $m\angle 7 = m\angle 3 + m\angle 1$	
6. $m\angle 7 \neq m\angle 7$	

4. Complete the direct proof. The steps for the proof are provided. Write a reason for each step.



Given: $m\angle 1 = m\angle 3$

Prove: $m\angle DBA + m\angle ABC = 180°$

Statements	Reasons
1. $m\angle 1 = m\angle 4$	
2. $m\angle 2 + m\angle ABC + m\angle 3 = 180°$	
3. $m\angle 2 + m\angle ABC + m\angle 1 = 180°$	
4. $(m\angle 1 + m\angle 2) + m\angle ABC = 180°$	
5. $m\angle 1 + m\angle 2 = m\angle DAB$	
6. $m\angle DBA + m\angle ABC = 180°$	

Assignment

Name _____ Date _____

Computer Graphics
Proving Triangles Congruent: SSS and SAS

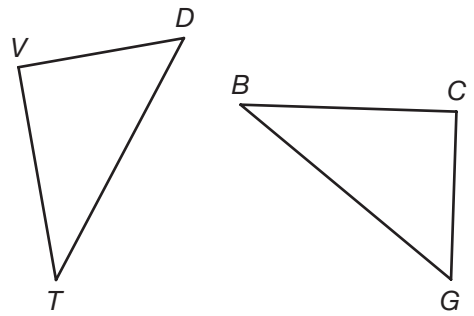
Complete the statements below about triangle congruence.

1. If you know that the _____ sides of two triangles are congruent, then the triangles are congruent by the _____.

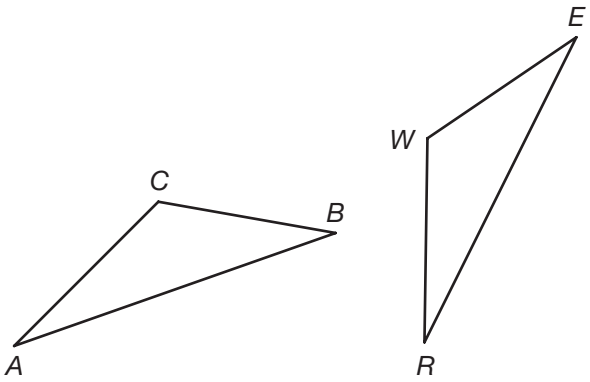
2. If you know that two pairs of _____ are congruent, and the _____ are congruent, then you know that triangles are congruent by the _____.

In Questions 3 and 4, prove that the triangles are congruent.

3. $\overline{VT} \cong \overline{CB}$; $\overline{VD} \cong \overline{CG}$; $\overline{TD} \cong \overline{GB}$

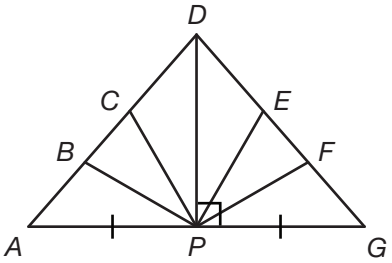


4. $\overline{AB} \cong \overline{RE}$; $m\angle B = m\angle E$; $\overline{BC} \cong \overline{EW}$



Read the scenario below. Use the scenario to complete Question 5.

The figure below is a basic plan for a decorative porch roof. For construction purposes, $\Delta DPA \cong \Delta DPG$. You know from your construction that $\overline{DP} \perp \overline{AG}$ and $\overline{DP}$ bisects $\overline{AG}$.



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5. Can you prove $\Delta DPA \cong \Delta DPG$? Complete the two-column proof.

Statements	Reasons
1. $\overline{DP} \perp \overline{AG}$	**1.**
2. $\angle DPA$ and $\angle DPG$ are right angles.	**2.**
3. $\angle DPA \cong \angle DPG$	**3.**
4. $\overline{AP} \cong \overline{GP}$	**4.**
5. $\overline{DP} \cong \overline{DP}$	**5.**
6. $\Delta DPA \cong \Delta DPG$	**6.**

Assignment

Name _____ Date _____

Wind Triangles
Proving Triangles Congruent: ASA and AAS

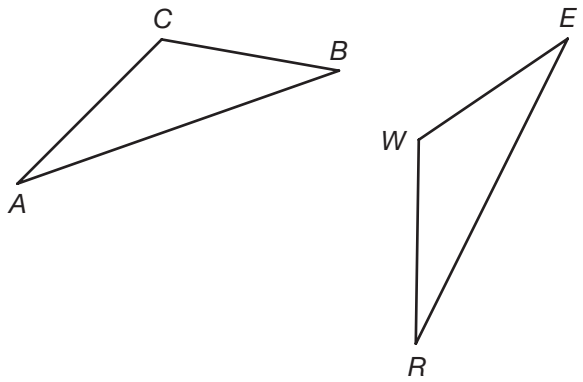
Complete the statements below about triangle congruence.

1. If you know that _____ of one triangle are congruent to _____ of another triangle and the included _____ are congruent, the triangles are congruent by the _____ Congruence Postulate.

2. If you know that two _____ of one triangle are congruent to two _____ of another triangle and two _____ non-included sides are congruent, then the triangles are congruent by the _____ Congruence Theorem.

Using Questions 1 and 2 and the triangles below, state the third congruence that must be given to prove the triangles are congruent using the method indicated.

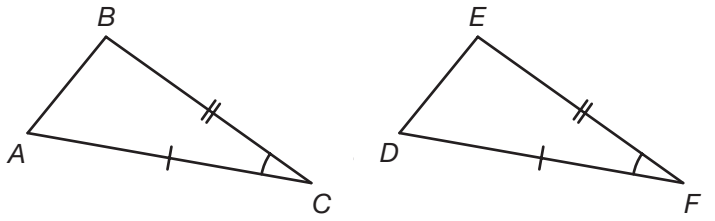
3.



Given	$\angle A \cong \angle R$ $\angle C \cong \angle W$	$\angle B \cong \angle E$ $\angle C \cong \angle W$
Method	ASA	AAS
Need		

In Questions 4 through 6, write the given information, then state the postulate or theorem that is used to conclude that the triangles are congruent.

4.



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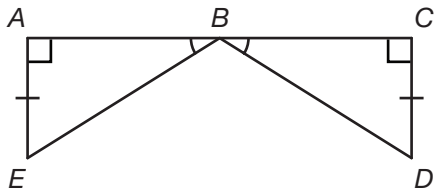

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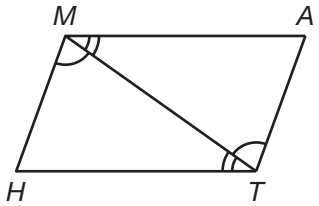


5

Assignment

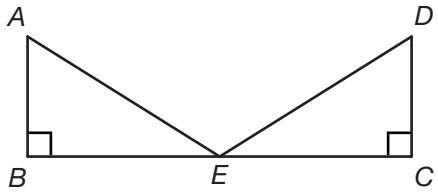
Name _____ Date _____

Planting Grape Vines
Proving Triangles Congruent: HL

Complete the statement below about triangle congruence and the Hypotenuse-Leg Congruence Theorem.

1. If you know that the _____ and a leg of a _____ triangle are congruent to the _____ and leg of another _____ triangle, then the triangles are congruent.

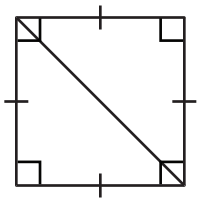
Use the figure below to answer Questions 2 and 3. Use the Hypotenuse-Leg Congruence Theorem to prove that the triangles are congruent in each situation. If there is not enough information, note what is needed.



2. $\overline{AB} \cong \overline{DC}; \overline{AE} \cong \overline{DE}$

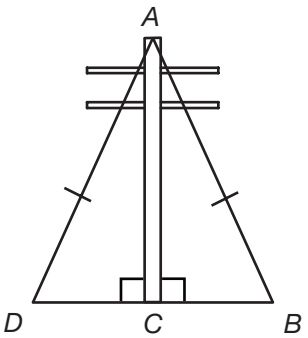
3. $\angle B \cong \angle C; \overline{BE} \cong \overline{CE}$

4. If you fold a square piece of paper on the diagonal, you get a special pair of right triangles. What are they and how can you prove that they are congruent?

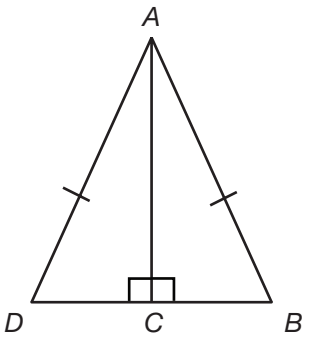


Read the scenario and use the figure below to answer Questions 5 and 6.

The pole is supported by 2 wires that are the same length.



5. How do you know the wires are fastened to the ground equal distances from the pole? Use complete sentences to explain your answer.



6. $\overline{AC}$ is the perpendicular bisector of $\overline{DB}$. Complete the two-column proof to show that $\angle D = \angle B$.

Statements	Reasons
1. $\overline{AC} \perp \overline{DB}$	**1.**
2. $\angle ACD$ and $\angle ACB$ are right angles.	**2.**
3. $\angle ACD \cong \angle ACB$	**3.**
4. $\overline{DC} \cong \overline{BC}$	**4.**
5. $\overline{AC} \cong \overline{AC}$	**5.**
6. $\Delta ACD \cong \Delta ACB$	**6.**
7. $\angle D \cong \angle B$	**7.**