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A Little Dash of Logic

Foundations for Proof

1. Joseph reads a journal article that states that yogurt with live cultures greatly helps digestion and prevents problems associated with lactose intolerance. He notices that his mother has problems with digestion and is lactose intolerant. He suggests that she try eating yogurt because he thinks it may help her feel better.

   a. What is the specific information in this situation?

   b. What is the general information in this situation?

   c. What is the conclusion in this situation?

   d. Did Joseph use inductive reasoning or deductive reasoning to make his conclusion? Explain your reasoning.

   e. Is Joseph's conclusion correct? Explain your reasoning.

2. Chaun is looking through records at a record store with her friend Ronaldo. She comes across a record she has not heard by a band she enjoys. Ronaldo knows that Chaun has five records at home by this band and that she likes all of them. He concludes that she will probably like any record made by this band. He tells Chaun so. She buys the record, saying to herself, "I will probably like this record, because I like records made by this band."

a. What conclusion did Ronaldo make? Why?

b. What type of reasoning did Ronaldo use? Explain your reasoning.

c. What conclusion did Chaun make? Why?

d. What type of reasoning did Chaun use? Explain your reasoning.

e. Is Ronaldo's conclusion definitely true? Is Chaun's conclusion definitely true? Explain your reasoning.

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3. Use the following statement to answer each question.

The sum of the measures of angle *A* and angle *B* is 90 degrees. Therefore, the angles are complementary.

a. Write the conditional statement in propositional form.

b. Identify the hypothesis and the conclusion of the conditional statement.

c. If the hypothesis and conclusion of the conditional statement are both false, what does this mean in terms of the conditional statement?

d. What is the truth value of the conditional statement if the hypothesis and conclusion are both false?

4. Sketch a figure to illustrate the given conditional statement. Then rewrite the conditional statement by separating the hypothesis and conclusion into "Given" information and "Prove" information.

If $\angle AXB$ is a right angle and $\overrightarrow{XY}$ bisects $\angle AXB$, then $m\angle AXY = 45°$ and $m\angle BXY = 45°$.

Given:

Prove:

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And Now From a New Angle

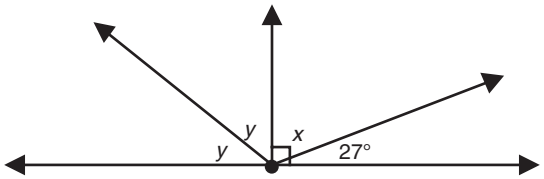
Special Angles and Postulates

1. Use a protractor to draw a pair of supplementary angles that do not share a common side. Label each angle with its measure.

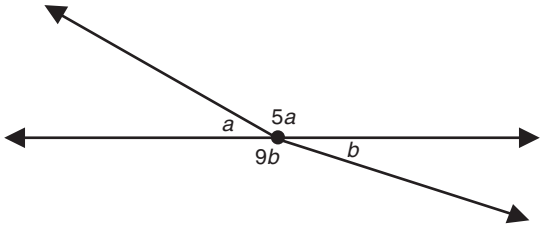
2. Use a protractor to draw a pair of complementary angles that share a common side. Label each angle with its measure.

3. Suppose that $m\angle A = 66°$, $\angle B$ is complementary to $\angle A$, and $\angle C$ is supplementary to $\angle B$. What are the measures of angles B and C?

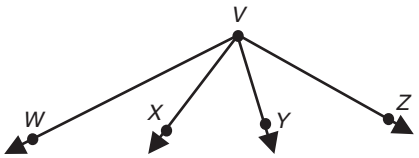
4. The variables x and y in the figure represent the measures of angles. Solve for x and y.



5. The variables a and b in the figure represent the measures of angles. Solve for a and b.



6. Name all pairs of adjacent angles in the figure.



7. What is the difference between two supplementary angles and two angles that form a linear pair?

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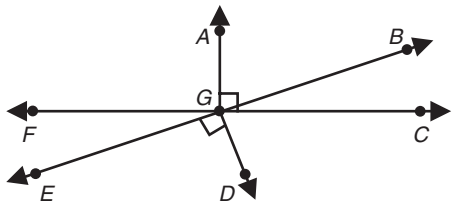
8. Identify each of the following in the figure.



a. Name two pairs of complementary angles.

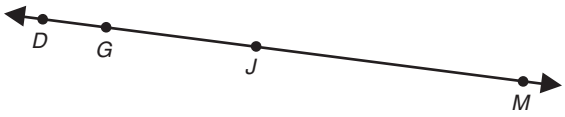
b. Name six pairs of supplementary angles.

c. Name four pairs of angles that form linear pairs.

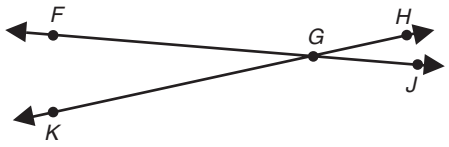
d. Name two pairs of vertical angles.

9. Sketch and label a figure to illustrate the Linear Pair Postulate. Then use the Linear Pair Postulate to write a symbolic statement about the figure.

10. Use the Segment Addition Postulate to write four different statements about the figure shown.



11. Name the postulate that tells you that $m\angle FGH + m\angle HGJ = m\angle FGJ$ in the figure shown.



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Forms of Proof

Paragraph Proof, Two-Column Proof, Construction Proof, and Flow Chart Proof

1. Identify the property that justifies each statement.

a. If $\overline{AB} \cong \overline{PR}$ and $\overline{PR} \cong \overline{ST}$, then $\overline{AB} \cong \overline{ST}$.

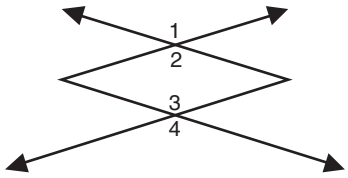
b. If $JK = 6$ centimeters and $CD = 6$ centimeters, then $JK = CD$.

c. Angle ABC is congruent to angle ABC.

d. If $m\angle 3 = m\angle 1$, then $m\angle 3 + m\angle 2 = m\angle 1 + m\angle 2$.

2. Enter the reasons to complete the two-column proof below.

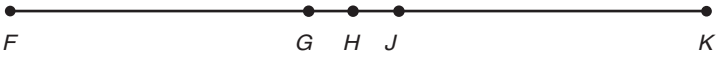
Given: $\angle 1 \cong \angle 4$
Prove: $\angle 2 \cong \angle 3$



Statements	Reasons
1. $\angle 1 \cong \angle 4$	**1.**
2. $\angle 4 \cong \angle 3$	**2.**
3. $\angle 1 \cong \angle 2$	**3.**
4. $\angle 1 \cong \angle 3$	**4.**
5. $\angle 2 \cong \angle 3$	**5.**

3. The boxes below show the parts of a flow chart proof. Rearrange the boxes and draw arrows to connect the boxes in a logical sequence to prove the statement.

Given: $FG = JK$
Given: $GH = HJ$
Prove: $FH = HK$



$FG + GH = GH + JK$ Addition Property of Equality	$FH = HK$ Substitution	$FG = JK$ Given
$GH = HJ$ Given	$HJ + JK = HK$ Segment Addition Postulate	$GH = GH$ Identity Property
$FG + GH = HJ + JK$ Substitution	$FG + GH = FH$ Segment Addition Postulate	

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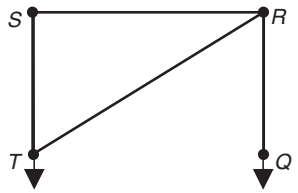
4. Write a paragraph proof to prove the statement.

Given: $m\angle QRS = 90°$

Given: $\angle RTS \cong \angle QRT$

Prove: $\angle RTS$ and $\angle TRS$ are complementary.

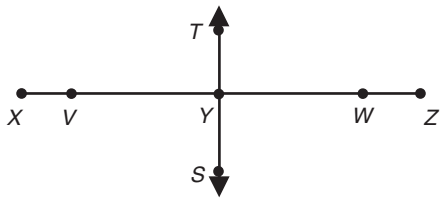


5. Use a construction to prove the statement.

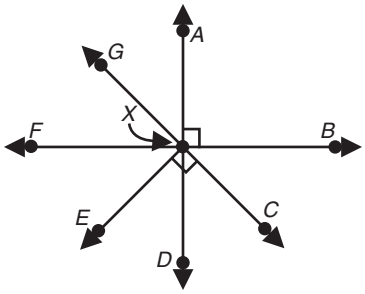
Given: Line ST is a perpendicular bisector of $\overline{XZ}$.

Given: $XV = WZ$

Prove: $VY = YW$



6. In the figure, $\angle GXF \cong \angle CXD$.



a. What theorem tells you that $\angle AXG \cong \angle CXD$?

b. What theorem tells you that $\angle EXF \cong \angle EXD$?

c. What theorem tells you that $\angle GXD \cong \angle CXF$?

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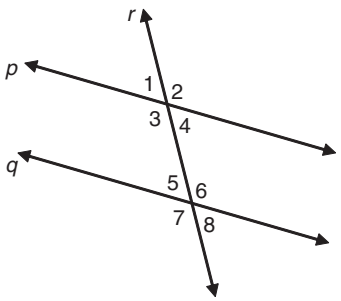
What's Your Proof?

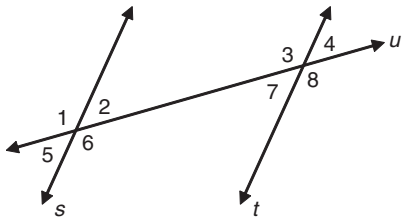
Angle Postulates and Theorems

1. Use the given information to determine the measures of each of the numbered angles.

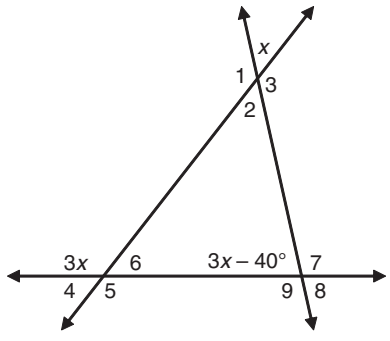
a. $p \parallel q$ and $m\angle 1 = 54°$



b. $s \parallel t$ and $m\angle 1 = 137°$

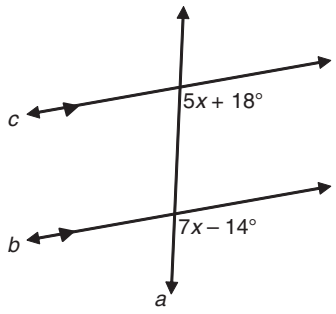


2. Write an expression for the measure of each numbered angle in the figure.

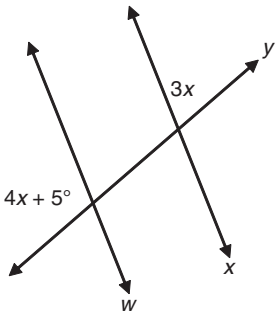


3. Solve for x in each figure.

a.



b.



4. Suppose that two parallel lines are intersected by a transversal and all corresponding angles are supplementary. How is this possible? Sketch and label a figure to support your answer.

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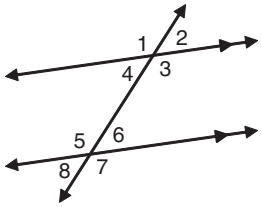
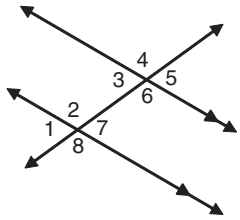
5. Determine the relationship between the indicated angles and write a postulate or theorem that justifies your answer.

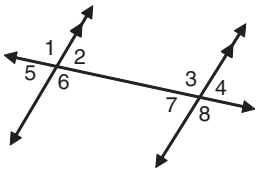
a. Angles 2 and 8



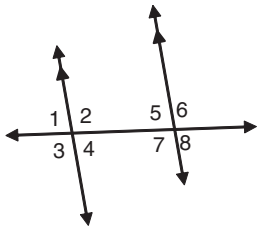
b. Angles 6 and 7



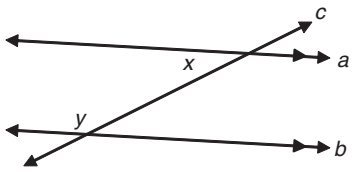
c. Angles 1 and 4



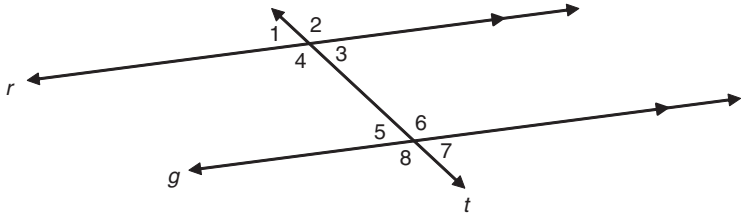
d. Angles 4 and 5



6. What postulate or theorem tells you that $x + y = 180°$ in the figure shown?



7. The following boxes show the parts of a flow chart proof of the Same-Side Interior Angle Theorem. Rearrange the boxes and draw arrows to connect the boxes in a logical sequence to prove the Same-Side Interior Angle Theorem.



Angles 1 and 4 are a linear pair.
Linear Pair Postulate

$m\angle 1 = m\angle 5$
Definition of congruent angles

$r \parallel g$
Given

$\angle 5$ and $\angle 4$ are supplementary
Definition of supplementary angles

$m\angle 5 + m\angle 4 = 180°$
Substitution

$m\angle 1 + m\angle 4 = 180°$
Definition of linear pair

$\angle 1 \cong \angle 5$
Corresponding Angles Postulate

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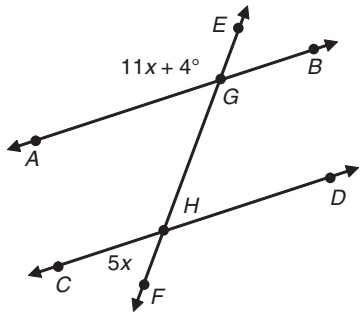
8. Use the figure to determine the measure of each indicated angle.



a. $m\angle EGA$

b. $m\angle CHF$

c. $m\angle FHD$

d. $m\angle EGB$

9. Suppose that two parallel lines are intersected by a transversal and all same side interior angles are congruent. How is this possible? Sketch and label a figure to support your answer.

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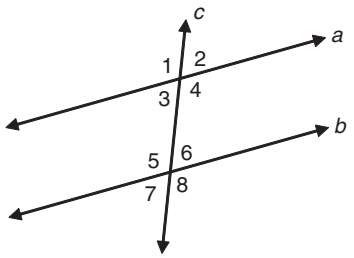
A Reversed Condition

Parallel Line Converse Theorems

1. Use the figure to write the postulate or theorem that justifies each statement.



a. $m\angle 1 = m\angle 8$, so $a \parallel b$

b. $m\angle 4 + m\angle 6 = 180°$, so $a \parallel b$

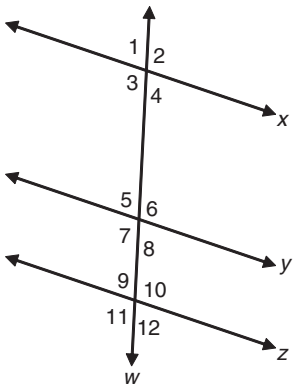
c. $a \parallel b$, so $m\angle 3 = m\angle 7$

d. $m\angle 2 + m\angle 8 = 180°$, so $a \parallel b$

e. $m\angle 4 = m\angle 5$, so $a \parallel b$

f. $a \parallel b$, so $m\angle 3 + m\angle 5 = 180°$

2. Use the given information to determine the pair of lines that are parallel. Write the postulate or theorem that justifies your answer.



a. $m\angle 4 = m\angle 5$

b. $m\angle 2 + m\angle 12 = 180°$

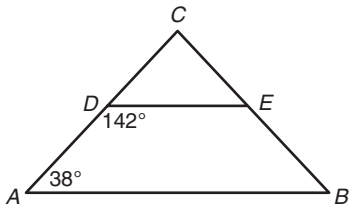
c. $m\angle 7 = m\angle 11$

d. $m\angle 8 + m\angle 10 = 180°$

e. $m\angle 1 + m\angle 7 = 180°$

f. $m\angle 2 = m\angle 11$

3. Given triangle *ABC* as shown, prove that segment *AB* is parallel to segment *DE*.



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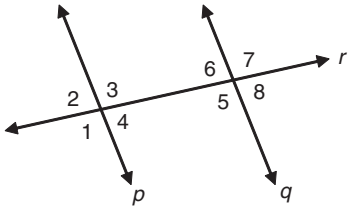
4. In the figure, $m\angle 1 = (7x - 12)°$, $m\angle 3 = (6x + 4)°$, and $m\angle 8 = (5x)°$. Show that line p is parallel to line q. Explain your reasoning.



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