ALBERT

Name _____ Date _____

Lines and Angles Proofs Worksheet

Geometry · Common Core HSG-CO.C.9

> Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.

Practice

Builds the skill step by step.

1. Two lines cross. One angle measures 47°. What is the measure of the angle vertical to it?

2. Two parallel lines are cut by a transversal. One angle measures 112°. What is the measure of its corresponding angle?

3. Two parallel lines are cut by a transversal. One alternate interior angle measures 65°. What is the other?

4. Two parallel lines are cut by a transversal. One same-side interior angle measures 70°. What is the other?

5. Two angles form a linear pair. One measures 38°. What does the other measure?

6. Point P is on the perpendicular bisector of segment AB, and PA = 9. What is PB?

7. Two vertical angles measure $(3x + 5)°$ and $(5x - 25)°$. What is x?

8. Two parallel lines are cut by a transversal. Which pair of angles is always congruent?

   A. same-side interior angles

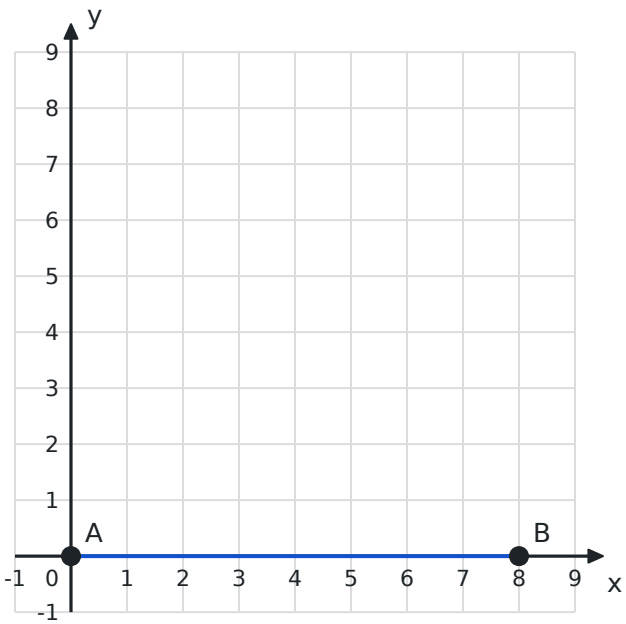
   B. alternate interior angles

   C. any two angles

   D. a linear pair

9. Two parallel lines are cut by a transversal. Corresponding angles measure $(2x + 10)°$ and $70°$. What is x?

10. A(0, 0) and B(8, 0). What is the equation of the perpendicular bisector of AB?



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On Level

Grade-level practice.

1. Parallel lines are cut by a transversal. Alternate interior angles measure $(4x - 8)°$ and $(2x + 30)°$. What is x?

2. Parallel lines are cut by a transversal. Same-side interior angles measure $3x°$ and $(x + 40)°$. What is x?

3. Prove that vertical angles are congruent. Let $\angle 1$ and $\angle 3$ be vertical angles and $\angle 2$ be the angle between them that forms a linear pair with each.

4. Point P is the same distance from A(2, 1) and B(6, 1). What must the x-coordinate of P be?

5. Two lines are cut by a transversal. A pair of alternate interior angles measure 80° and 85°. Are the lines parallel?

   A. Yes, because the angles are close.

   B. Yes, because there is a transversal.

   C. No, because the alternate interior angles are not congruent.

   D. You can't tell.

6. ∠1 and ∠2 form a linear pair. ∠2 and ∠3 are vertical angles. m∠1 = 124°. What is m∠3?

7. Parallel lines are cut by a transversal. Alternate exterior angles measure (3x + 15)° and (5x − 9)°. What is x?

8. P is on the perpendicular bisector of AB. PA = 2x + 3 and PB = 5x − 12. What is PA?

9. Which statement can be used to prove two lines are parallel?

   A. If two lines are parallel, alternate interior angles are congruent.

   B. If two angles are vertical, they are congruent.

   C. If two angles form a linear pair, they are supplementary.

   D. If alternate interior angles are congruent, the lines are parallel.

10. Parallel lines are cut by a transversal. One same-side interior angle is 3 times the other. What is the larger angle?

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Challenge

Multi-step and word problems that stretch it.

1. Two lines cross. One angle measures $(x + y)°$ and its vertical angle measures $80°$. An angle that forms a linear pair with them measures $(x - y)°$. What is x?

2. Parallel lines are cut by a transversal. $\angle 1$ and $\angle 2$ are corresponding angles, and $\angle 2$ and $\angle 3$ are vertical angles, so $\angle 1$ and $\angle 3$ are alternate interior angles. Prove $\angle 1 \cong \angle 3$.

3. What is the slope of the perpendicular bisector of the segment from A(1, 2) to B(5, 6)?

4. A(0, 0), B(6, 0) and P(3, 4). P is on the perpendicular bisector of AB. What is PA?

5. PA = PB. Where must P lie?

   A. on the perpendicular bisector of AB

   B. on segment AB

   C. on a line parallel to AB

   D. at the midpoint of AB only

6. Two lines are cut by a transversal. Same-side interior angles measure $(3x + 10)°$ and $(2x + 20)°$. For what value of x are the lines parallel?

7. Three lines meet at one point and form six angles. Opposite angles are vertical. Three adjacent angles measure a, b and c, with $a = 50°$ and $b = 70°$. What is c?

8. Which is the converse of the perpendicular bisector theorem?

   A. If a point is equidistant from the endpoints of a segment, it is on the segment's perpendicular bisector.

   B. If a point is on the perpendicular bisector of a segment, it is equidistant from the endpoints.

   C. Every segment has a midpoint.

   D. Perpendicular lines form right angles.

9. Two parallel lines run left to right. A bent path goes from the top line to a point between them and back to the bottom line, making a 35° angle with the top line and a 50° angle with the bottom line, both on the same side. What is the angle at the bend?

10. What is the equation of the perpendicular bisector of the segment from (0, 0) to (4, 2)?

