LESSON MAKER PRO

Angle Connections

Use angle relationships and equal distances to solve.

HIGH SCHOOL · G.CO.9

G.CO.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..."

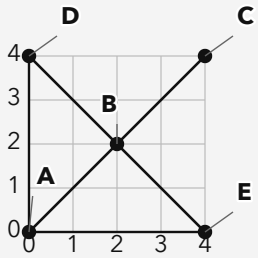
NAME _____ **DATE** _____

THE BIG IDEA

Vertical angles have equal measures. When a transversal crosses parallel lines, corresponding angles and alternate interior angles have equal measures. A point is on a segment's perpendicular bisector exactly when it is equally far from both endpoints.

WORKED EXAMPLE

In the figure, $m\angle ABD = 90°$. Find $m\angle CBE$.



1. BA and BC are opposite rays. BD and BE are opposite rays.
2. $\angle ABD$ and $\angle CBE$ are vertical angles, so they have equal measures.
3. $m\angle CBE = 90°$.

Answer: 90°

PRACTICE 4 problems

1 Vertical angles measure $(3x + 7)°$ and $(5x - 29)°$. Find x.

ANSWER _____

2 A transversal crosses parallel lines. Two corresponding angles measure $(4x + 12)°$ and $(7x - 33)°$. Find x.

ANSWER _____

3 Two alternate interior angles formed by parallel lines measure $(6x - 5)°$ and $(4x + 37)°$. Find x and state why the angles are equal.

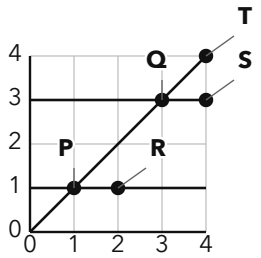
ANSWER _____

4 P lies on the perpendicular bisector of AB. $PA = 2x + 8$ and $PB = 5x - 13$. Find x.

ANSWER _____

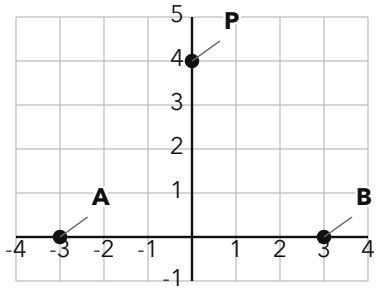
APPLY IT Show your work

1 A mural stripe crosses two parallel borders shown on the grid. If m∠RPQ = 45°, find m∠SQT. Name the angle relationship.



ANSWER _____

2 A Wi-Fi router at P serves gaming stations A and B. Use the grid to find PA and PB. Is P on the perpendicular bisector of AB? Explain.



ANSWER _____

CHALLENGE One step up

On a game map, a treasure spot is 13 units from each of two flags that are 10 units apart. Find the spot's distance from the flags' midpoint. Explain why the segment from the spot to the midpoint is perpendicular to the segment between the flags.

WORK SPACE AND ANSWER

ANSWER KEY

Angle Connections

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Vertical angles measure (3x + 7)° and (5x - 29)°. Find x.	**x = 18**
2	A transversal crosses parallel lines. Two corresponding angles measure (4x + 12)° and (7x - 33)°. Find x.	**x = 15**
3	Two alternate interior angles formed by parallel lines measure (6x - 5)° and (4x + 37)°. Find x and state why the angles are equal.	**x = 21; alternate interior angles are congruent when the lines are parallel.**
4	P lies on the perpendicular bisector of AB. PA = 2x + 8 and PB = 5x - 13. Find x.	**x = 7**

PART 2 · APPLY IT

1. **45°; corresponding angles** ∠RPQ and ∠SQT are corresponding angles formed by a transversal crossing parallel lines, so they are congruent.
2. **PA = 5 units and PB = 5 units. Yes, P is on the perpendicular bisector of AB.** Each distance is the hypotenuse of a right triangle with legs 3 and 4, so each is 5. A point equally far from A and B lies on the perpendicular bisector of AB.

CHALLENGE

12 units. The spot is equally far from both flags, so it lies on their segment's perpendicular bisector. Half the distance between the flags is 5 units, and $5^2 + 12^2 = 13^2$.

For angle problems, accept equations that set the congruent angle measures equal. In the challenge, accept the Pythagorean theorem or a 5-12-13 right triangle to find the distance.