LESSON MAKER PRO

Parallel or Not?

Use angle equations to test lines cut by a transversal.

HIGH SCHOOL · G.2D.1.2

G.2D.1.2 "Use the angle relationships formed by lines cut by a transversal to determine if the lines are parallel and verify, using algebraic and deductive proofs."

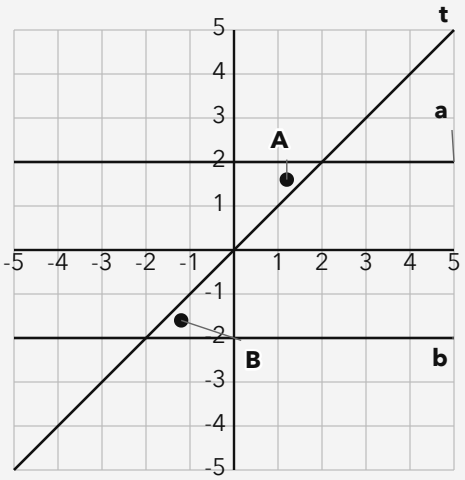
NAME _____ DATE _____

THE ANGLE TEST

In each figure, a labeled dot marks an angle region. Lines cut by a transversal are parallel if corresponding angles are equal, alternate interior angles are equal, or same-side interior angles add to 180°. Find x with an equation, then check the angle relationship to justify your conclusion.

WORKED EXAMPLE

Angles A and B are alternate interior angles. If $m\angle A = (2x + 13)°$ and $m\angle B = (3x - 3)°$, find x that makes a and b parallel, then verify the angle condition.

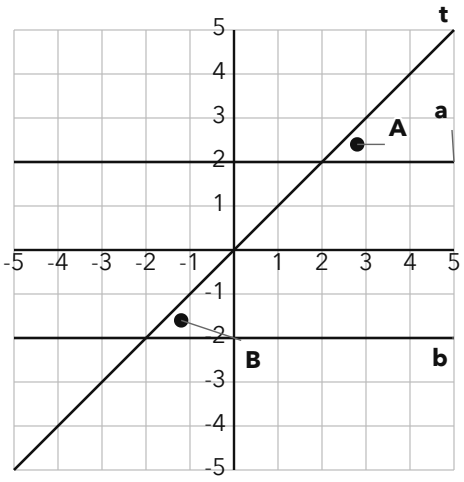


1. For a and b to be parallel, alternate interior angles A and B must be equal.
2. Set $2x + 13 = 3x - 3$.
3. Solve: $x = 16$.
4. Check: $m\angle A = 45°$ and $m\angle B = 45°$.

Answer: x = 16; a and b are parallel by the converse of the alternate interior angles theorem.

PRACTICE Problems 1–2

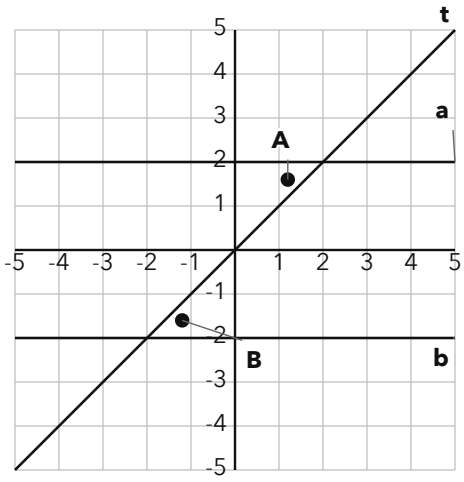
1 Angles A and B are corresponding angles. If m∠A = (3x + 6)° and m∠B = (5x - 20)°, find x that makes a and b parallel, then verify the angle condition.



ANSWER _____

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2 Angles A and B are alternate interior angles. If m∠A = (4x + 9)° and m∠B = (7x - 18)°, find x that makes a and b parallel, then verify the angle condition.

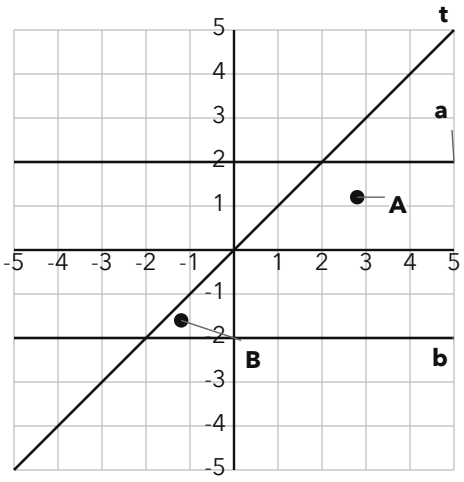


ANSWER _____

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PRACTICE Problems 3–4

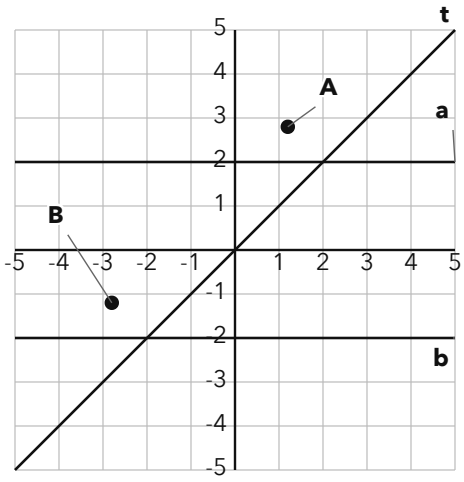
3 Angles A and B are same-side interior angles. If $m\angle A = (5x + 85)°$ and $m\angle B = (2x + 25)°$, find x that makes a and b parallel, then verify the angle condition.



ANSWER _____

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4 Angles A and B are corresponding angles. If $m\angle A = (4x + 27)°$ and $m\angle B = (6x - 27)°$, find x that makes a and b parallel, then verify the angle condition.

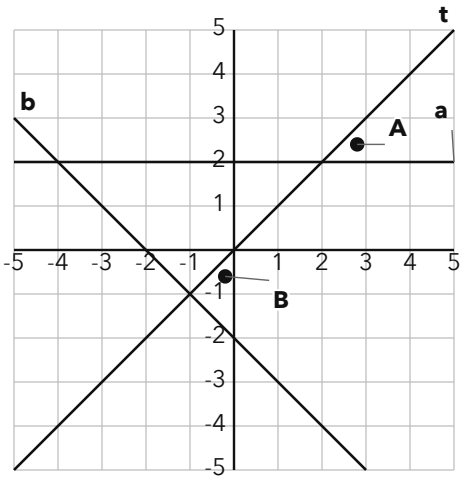


ANSWER _____

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PRACTICE Problems 5–6

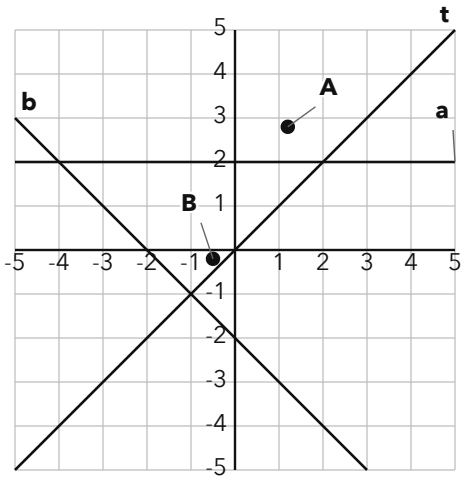
5 For x = 6, m∠A = (5x + 15)° and m∠B = (10x + 30)°. Are a and b parallel? Use the angle relationship in the figure to justify your answer.



ANSWER _____

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6 For x = 8, m∠A = (10x + 55)° and m∠B = (5x + 50)°. Are a and b parallel? Use the angle relationship in the figure to justify your answer.

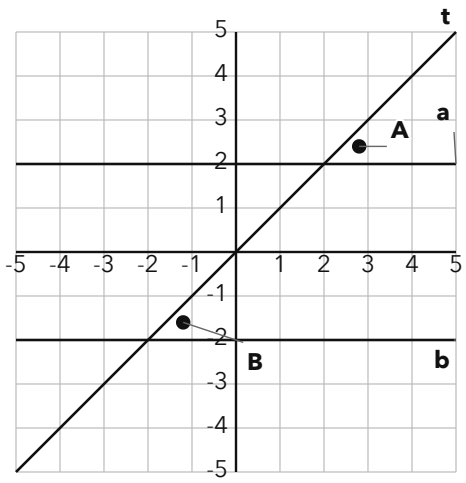


ANSWER _____

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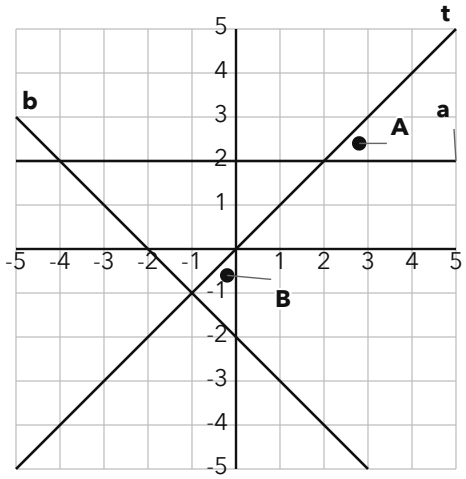
APPLY IT Show your work

1 A stage crew places two LED strips, a and b, across a wall. A cable, t, crosses both strips. The marked angles have measures m∠A = (2x + 21)° and m∠B = (3x + 9)°. Find the value of x that makes the strips parallel, then verify it using the figure.



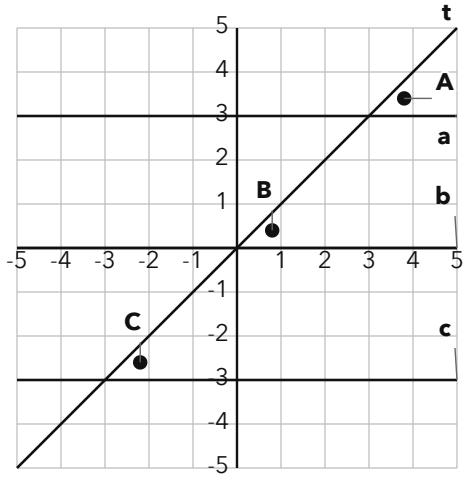
ANSWER _____

2 On a bike-route plan, paths a and b cross path t. For x = 7, the marked angles measure m∠A = (4x + 17)° and m∠B = (9x + 27)°. Are paths a and b parallel? Justify your answer using the figure.



ANSWER _____

CHALLENGE One step up



The transversal t crosses lines a, b, and c. The three marked angles are in corresponding positions. If m∠A = (2x + 15)°, m∠B = (4x - 15)°, and m∠C = (5x - 30)°, find x that makes a parallel to b, then use b to prove that a is parallel to c.

WORK SPACE AND ANSWER

Parallel or Not?

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Angles A and B are corresponding angles. If $m\angle A = (3x + 6)°$ and $m\angle B = (5x - 20)°$, find x that makes a and b parallel, then verify the angle condition.	**x = 13; both angles are 45°, so a and b are parallel by the converse of the corresponding angles theorem.**
2	Angles A and B are alternate interior angles. If $m\angle A = (4x + 9)°$ and $m\angle B = (7x - 18)°$, find x that makes a and b parallel, then verify the angle condition.	**x = 9; both angles are 45°, so a and b are parallel by the converse of the alternate interior angles theorem.**
3	Angles A and B are same-side interior angles. If $m\angle A = (5x + 85)°$ and $m\angle B = (2x + 25)°$, find x that makes a and b parallel, then verify the angle condition.	**x = 10; the angles are 135° and 45°. They add to 180°, so a and b are parallel by the converse of the same-side interior angles theorem.**
4	Angles A and B are corresponding angles. If $m\angle A = (4x + 27)°$ and $m\angle B = (6x - 27)°$, find x that makes a and b parallel, then verify the angle condition.	**x = 27; both angles are 135°, so a and b are parallel by the converse of the corresponding angles theorem.**
5	For x = 6, $m\angle A = (5x + 15)°$ and $m\angle B = (10x + 30)°$. Are a and b parallel? Use the angle relationship in the figure to justify your answer.	**No. A and B are corresponding angles, but $m\angle A = 45°$ and $m\angle B = 90°$, so a and b are not parallel.**
6	For x = 8, $m\angle A = (10x + 55)°$ and $m\angle B = (5x + 50)°$. Are a and b parallel? Use the angle relationship in the figure to justify your answer.	**No. A and B are corresponding angles, but $m\angle A = 135°$ and $m\angle B = 90°$, so a and b are not parallel.**

PART 2 · APPLY IT

1. **x = 12; both angles are 45°, so the LED strips are parallel.** Corresponding angles A and B must be equal, so 2x + 21 = 3x + 9 and x = 12. Substitution gives 45° for each angle, establishing parallel lines by the converse of the corresponding angles theorem.
2. **No; the paths are not parallel.** Angles A and B are corresponding angles. Substituting x = 7 gives 45° and 90°, so the corresponding angles are unequal and the paths cannot be parallel.

CHALLENGE

x = 15. Then A = B = C = 45°. Because corresponding angles A and B are equal, a is parallel to b. Because corresponding angles B and C are equal, b is parallel to c. Lines parallel to the same line are parallel to each other, so a is parallel to c.

Accept a correct angle calculation and the relevant converse angle theorem as justification. For the nonparallel items, unequal corresponding angles are sufficient to rule out parallel lines.