ALBERT

Name _____ Date _____

Coordinate Proofs Worksheet

Geometry · Common Core HSG-GPE.B.4

> Use coordinates to prove simple geometric theorems algebraically.

Practice

Builds the skill step by step.

1. What is the midpoint of the segment from (2, 4) to (8, 10)?

2. What is the distance between (1, 2) and (4, 6)?

3. What is the slope of the line through (1, 2) and (5, 10)?

4. To show a quadrilateral is a parallelogram with coordinates, what can you show?

   A. The diagonals have equal slopes.

   B. All sides have different lengths.

   C. One angle is 90°.

   D. Both pairs of opposite sides have equal slopes.

5. Is the triangle with vertices (0, 0), (4, 0) and (0, 3) a right triangle?

   A. Yes: one side is horizontal and one is vertical.

   B. No: the sides are 3, 4 and 6.

   C. No: there are no equal sides.

   D. Yes: because it has an obtuse angle.

6. Rectangle ABCD has A(0, 0), B(4, 0), C(4, 3) and D(0, 3). How long is diagonal AC?

7. To prove that the diagonals of a quadrilateral bisect each other, what can you show?

   A. The diagonals are perpendicular.

   B. The diagonals have the same midpoint.

   C. The diagonals have the same slope.

   D. The diagonals have the same length.

8. Is the point (3, 4) on the circle centered at the origin with radius 5?

   A. Yes: its distance from the origin is 5.

   B. No: $3 + 4 \neq 5$.

   C. No: it is inside.

   D. Yes: because $4 - 3 = 1$.

9. What is the distance between $(-2, -3)$ and $(4, 5)$?

10. What is the midpoint of the segment from $(-4, 6)$ to $(2, -2)$?

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On Level

Grade-level practice.

1. Quadrilateral ABCD has A(1, 1), B(5, 2), C(6, 6) and D(2, 5). What is the most specific name for it?

   A. rectangle

   B. square

   C. rhombus

   D. trapezoid

2. For the same quadrilateral (A(1, 1), B(5, 2), C(6, 6), D(2, 5)), what is the midpoint of diagonal AC?

3. A triangle has vertices (0, 0), (6, 0) and (3, 5). Two of its sides are equal. How long is each? Give the exact value.

4. Prove that the triangle with vertices A(1, 1), B(5, 3) and C(3, 7) is a right isosceles triangle.

5. Does the point $(1, \sqrt{3})$ lie on the circle centered at the origin with radius 2?

   A. Yes: $1^2 + (\sqrt{3})^2 = 4$.

   B. No: $1 + \sqrt{3} \neq 2$.

   C. No: $\sqrt{3}$ is not a whole number.

   D. Yes: because $\sqrt{3} < 2$.

6. Rectangle ABCD has A(0, 0), B(6, 0), C(6, 4) and D(0, 4). How long is each diagonal? Give the exact value in simplest form.

7. Triangle ABC has A(0, 0), B(8, 0) and C(2, 6). How long is the segment joining the midpoints of AC and BC?

8. Which set of facts proves that ABCD is a rectangle?

   A. All four sides are equal.

   B. It has one pair of parallel sides.

   C. Its diagonals bisect each other.

   D. ABCD is a parallelogram and its diagonals are equal in length.

9. Parallelogram ABCD has A(1, 2), B(5, 2) and C(7, 6). What are the coordinates of D?

10. What is the centroid of the triangle with vertices (0, 0), (6, 0) and (0, 9)?

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Challenge

Multi-step and word problems that stretch it.

1. A rectangle has vertices (0, 0), (a, 0), (a, b) and (0, b). Prove that its diagonals are congruent.

2. Point P(x, 0) is the same distance from (1, 4) and (7, 2). What is x?

3. Quadrilateral ABCD has A(−2, 1), B(2, 4), C(5, 0) and D(1, −3). What is the most specific name for it?

   A. square

   B. rhombus

   C. rectangle

   D. parallelogram

4. What is the area of that quadrilateral (A(−2, 1), B(2, 4), C(5, 0), D(1, −3))?

5. A triangle has vertices (−3, 0), (3, 0) and (0, 3√3). All three sides are equal. How long is each side?

6. Is the point (3, 7) on the line $y = 2x + 1$?

   A. Yes: $2(3) + 1 = 7$.

   B. No: $3 + 7 \neq 1$.

   C. No: the slope is 2.

   D. Yes: because $7 > 3$.

7. A(0, 0), B(4, 2) and C(k, −4) form a triangle with a right angle at B. What is k?

8. A point on the perpendicular bisector of the segment from (0, 0) to (8, 4) has x-coordinate 6. What is its y-coordinate?

9. What is the distance from (2, 3) to (6, 6)?

10. To prove a fact about any rectangle with coordinates, which placement is most convenient?

    A. (0, 0), (1, 0), (1, 1), (0, 1)

    B. (1, 2), (5, 2), (5, 7), (1, 7)

    C. (0, 0), (a, 0), (a, b), (0, b)

    D. (a, b), (c, d), (e, f), (g, h)