

Coordinate Case Files

Use slopes and distances to classify figures on a coordinate plane.

HIGH SCHOOL • MA.912.GR.3.2

MA.912.GR.3.2 "Given a mathematical context, use coordinate geometry to classify or justify definitions, properties and theorems involving circles, triangles or quadrilaterals."

NAME _____

DATE _____

CLASSIFY WITH COORDINATES

Use slope to test side relationships. Equal slopes show parallel lines, and negative reciprocal slopes show perpendicular lines. Use the distance formula to compare side lengths when you need to identify equal sides.

WORKED EXAMPLE

Classify quadrilateral JKLM with $J(11,14)$, $K(17,14)$, $L(17,20)$, and $M(11,20)$.

1. Slope $JK = 0$ and slope $LM = 0$, so JK is parallel to LM .
2. KL and JM are vertical, so KL is parallel to JM and perpendicular to JK .
3. $JK = KL = LM = JM = 6$.
4. The figure has four equal sides and four right angles.

Answer: JKLM is a square.

PRACTICE 6 problems

- 1** Classify triangle ABC by its sides and angles: $A(0,0)$, $B(4,0)$, $C(0,4)$. Show evidence.

ANSWER _____

- 2** Classify quadrilateral ABCD: $A(1,1)$, $B(5,1)$, $C(9,5)$, $D(5,5)$. Show the slopes of opposite sides.

ANSWER _____

- 3** Classify quadrilateral EFGH: $E(0,1)$, $F(7,1)$, $G(7,5)$, $H(0,5)$.

ANSWER _____

- 4** Classify quadrilateral PQRS: $P(0,4)$, $Q(5,7)$, $R(10,4)$, $S(5,1)$. Show evidence using side lengths.

ANSWER _____

- 5** A circle has center $C(4,3)$ and radius 5. Does point $P(1,7)$ lie on the circle? Show the distance from C to P .

ANSWER _____

- 6** Classify triangle ABC by its side lengths: $A(-1,0)$, $B(3,0)$, $C(1,5)$.

ANSWER _____

APPLY IT Show your work

- 1** The student tech crew marks the corners of a performance area at $A(3,4)$, $B(13,4)$, $C(13,9)$, and $D(3,9)$. Is the marked area a rectangle, a square, or neither? Justify your answer with slopes and side lengths.

WORK SPACE

ANSWER _____

- 2** A phone scavenger-hunt app has a circular check-in zone with center $(-2,4)$ and radius 5. A student is standing at $(1,8)$. Is the student exactly on the boundary of the check-in zone? Show your calculation.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Quadrilateral $WXYZ$ has vertices $W(-3,2)$, $X(1,6)$, $Y(5,2)$, and $Z(1,-2)$. What is the most specific classification of $WXYZ$? Explain your reasoning using both slopes and side lengths.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Classify triangle ABC by its sides and angles: A(0,0), B(4,0), C(0,4). Show evidence.	Right isosceles triangle. AB = 4 and AC = 4, and AB is horizontal while AC is vertical.
2	Classify quadrilateral ABCD: A(1,1), B(5,1), C(9,5), D(5,5). Show the slopes of opposite sides.	Parallelogram. Slopes AB and CD are 0, and slopes BC and AD are 1.
3	Classify quadrilateral EFGH: E(0,1), F(7,1), G(7,5), H(0,5).	Rectangle. Opposite sides are parallel, and horizontal sides are perpendicular to vertical sides. It is not a square because its side lengths are 7 and 4.
4	Classify quadrilateral PQRS: P(0,4), Q(5,7), R(10,4), S(5,1). Show evidence using side lengths.	Rhombus. Each side has length $\sqrt{34}$.
5	A circle has center C(4,3) and radius 5. Does point P(1,7) lie on the circle? Show the distance from C to P.	Yes. $CP = \sqrt{(-3)^2 + 4^2} = \sqrt{25} = 5$, which equals the radius.
6	Classify triangle ABC by its side lengths: A(-1,0), B(3,0), C(1,5).	Isosceles triangle. AB = 4, AC = $\sqrt{29}$, and BC = $\sqrt{29}$.

PART 2 • APPLY IT

- Rectangle, not a square.** AB and CD have slope 0, while BC and AD are vertical, so adjacent sides are perpendicular and opposite sides are parallel. AB and CD are 10 units long, and BC and AD are 5 units long.
- Yes, the student is on the boundary.** The distance from (-2,4) to (1,8) is $\sqrt{3^2 + 4^2} = 5$. Because the distance equals the radius, the point is on the circle.

CHALLENGE

WXYZ is a square. The side slopes are 1, -1, 1, and -1, so adjacent sides are perpendicular and opposite sides are parallel. Each side has length $4\sqrt{2}$, so all four sides are equal.

Accept equivalent distance expressions, such as $\sqrt{16 + 16}$ for $4\sqrt{2}$. Require slope or distance evidence when a prompt asks students to justify a classification.