

Coordinate Case Files

Use slopes, lengths, and coordinates to uncover geometric relationships.

HIGH SCHOOL • MA.912.GR.3.3

MA.912.GR.3.3 "Use coordinate geometry to solve mathematical and real-world geometric problems involving lines, circles, triangles and quadrilaterals."

NAME _____

DATE _____

COORDINATE GEOMETRY TOOLS

Subtract coordinates to find the horizontal and vertical changes between points. Use slope = (change in y)/(change in x) to test parallel or perpendicular lines, and use distance = $\sqrt{(\text{change in } x)^2 + (\text{change in } y)^2}$ to find side lengths. Equal slopes or lengths can identify shapes, and a circle with center (h,k) and radius r has equation $(x-h)^2 + (y-k)^2 = r^2$.

WORKED EXAMPLE

Find the slope and distance between A(11,23) and B(17,31).

1. Change in x = $17 - 11 = 6$.
2. Change in y = $31 - 23 = 8$.
3. Slope = $8/6 = 4/3$.
4. Distance = $\sqrt{6^2 + 8^2} = 10$.

Answer: Slope = 4/3; distance = 10

PRACTICE 6 problems

- 1** Find the distance between A(-5,7) and B(1,-2).

ANSWER _____

- 2** Find the midpoint of C(-9,3) and D(7,-5).

ANSWER _____

- 3** Triangle EFG has vertices E(0,0), F(5,0), and G(5,9). Classify the triangle by its angles.

ANSWER _____

- 4** Classify quadrilateral WXYZ with vertices W(-7,1), X(-1,4), Y(3,-2), and Z(-3,-5).

ANSWER _____

- 5** Write the equation of a circle with center (2,-3) and radius 5.

ANSWER _____

- 6** Does the point (-1,5) lie on the circle $(x+4)^2 + (y-1)^2 = 25$?

ANSWER _____

APPLY IT Show your work

- 1** On a multiplayer game map, a player's base is at $(-8,1)$ and a supply station is at $(1,13)$. What is the straight-line distance between them?

WORK SPACE

ANSWER _____

- 2** A student club designs a rectangular photo booth on a coordinate grid with corners $A(-6,-2)$, $B(2,-2)$, $C(2,4)$, and $D(-6,4)$. What are the booth's dimensions, area, and perimeter?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Quadrilateral ABCD has vertices $A(-2,1)$, $B(4,5)$, $C(8,-1)$, and $D(2,-5)$. Classify the quadrilateral as specifically as possible. Use slopes and side lengths to explain your reasoning.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Find the distance between A(-5,7) and B(1,-2).	$3\sqrt{13}$
2	Find the midpoint of C(-9,3) and D(7,-5).	$(-1,-1)$
3	Triangle EFG has vertices E(0,0), F(5,0), and G(5,9). Classify the triangle by its angles.	Right triangle, with the right angle at F
4	Classify quadrilateral WXYZ with vertices W(-7,1), X(-1,4), Y(3,-2), and Z(-3,-5).	Parallelogram
5	Write the equation of a circle with center (2,-3) and radius 5.	$(x-2)^2 + (y+3)^2 = 25$
6	Does the point (-1,5) lie on the circle $(x+4)^2 + (y-1)^2 = 25$?	Yes

PART 2 • APPLY IT

- 15 units** The horizontal change is 9 and the vertical change is 12. The distance is $\sqrt{9^2 + 12^2} = 15$.
- Dimensions: 8 units by 6 units; area: 48 square units; perimeter: 28 units** The horizontal side length is 8 units and the vertical side length is 6 units. Multiply for area and use $2(8 + 6)$ for perimeter.

CHALLENGE

Square. $AB = BC = CD = DA = 2\sqrt{13}$, and the slopes of AB and BC are $\frac{2}{3}$ and $-\frac{3}{2}$, which are perpendicular.

Accept equivalent exact distance forms, such as $\sqrt{117}$ for $3\sqrt{13}$, and equivalent circle equations with terms in a different order. For classifications, accept correct reasoning based on slopes, distances, or both.