Essential Question How can you use a coordinate plane to write a proof?

1 EXPLORATION: Writing a Coordinate Proof

Go to BigIdeasMath.com for an interactive tool to investigate this exploration.

Work with a partner.

a. Use dynamic geometry software to draw \( AB \) with endpoints \( A(0, 0) \) and \( B(6, 0) \).

b. Draw the vertical line \( x = 3 \).

c. Draw \( \triangle ABC \) so that \( C \) lies on the line \( x = 3 \).

d. Use your drawing to prove that \( \triangle ABC \) is an isosceles triangle.

2 EXPLORATION: Writing a Coordinate Proof

Go to BigIdeasMath.com for an interactive tool to investigate this exploration.

Work with a partner.

a. Use dynamic geometry software to draw \( AB \) with endpoints \( A(0, 0) \) and \( B(6, 0) \).

b. Draw the vertical line \( x = 3 \).

c. Plot the point \( C(3, 3) \) and draw \( \triangle ABC \). Then use your drawing to prove that \( \triangle ABC \) is an isosceles right triangle.
5.8 Coordinate Proofs (continued)

EXPLORATION: Writing a Coordinate Proof (continued)

Sample
Points
A(0, 0)
B(6, 0)
C(3, 3)
Segments
AB = 6
BC = 4.24
AC = 4.24
Line
x = 3

\[d.\] Change the coordinates of \( C \) so that \( C \) lies below the \( x \)-axis and \( \triangle ABC \) is an isosceles right triangle.

\[e.\] Write a coordinate proof to show that if \( C \) lies on the line \( x = 3 \) and \( \triangle ABC \) is an isosceles right triangle, then \( C \) must be the point (3, 3) or the point found in part (d).

Communicate Your Answer

3. How can you use a coordinate plane to write a proof?

4. Write a coordinate proof to prove that \( \triangle ABC \) with vertices \( A(0, 0) \), \( B(6, 0) \), and \( C(3, 3\sqrt{3}) \) is an equilateral triangle.
5.8 Notetaking with Vocabulary
For use after Lesson 5.8

In your own words, write the meaning of each vocabulary term.

coordinate proof

Notes:
**Extra Practice**

In Exercises 1 and 2, place the figure in a coordinate plane in a convenient way. Assign coordinates to each vertex. Explain the advantages of your placement.

1. an obtuse triangle with height of 3 units and base of 2 units

2. a rectangle with length of $2w$ and base of 2 units

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In Exercises 3 and 4, write a plan for the proof.

3. **Given** Coordinates of vertices of $\triangle OPR$ and $\triangle QRP$

   **Proof** $\triangle OPR \cong \triangle QRP$
4. **Given**  Coordinates of vertices of \( \triangle OAB \) and \( \triangle CDB \)

**Prove**  \( B \) is the midpoint of \( \overline{AD} \) and \( \overline{OC} \).

5. Graph the triangle with vertices \( A(0, 0), B(3m, m), \) and \( C(0, 3m) \). Find the length and the slope of each side of the triangle. Then find the coordinates of the midpoint of each side. Is the triangle a right triangle? isosceles? Explain. (Assume all variables are positive.)

6. Write a coordinate proof.

**Given**  Coordinates of vertices of \( \triangle OEF \) and \( \triangle OGF \)

**Prove**  \( \triangle OEF \cong \triangle OGF \)