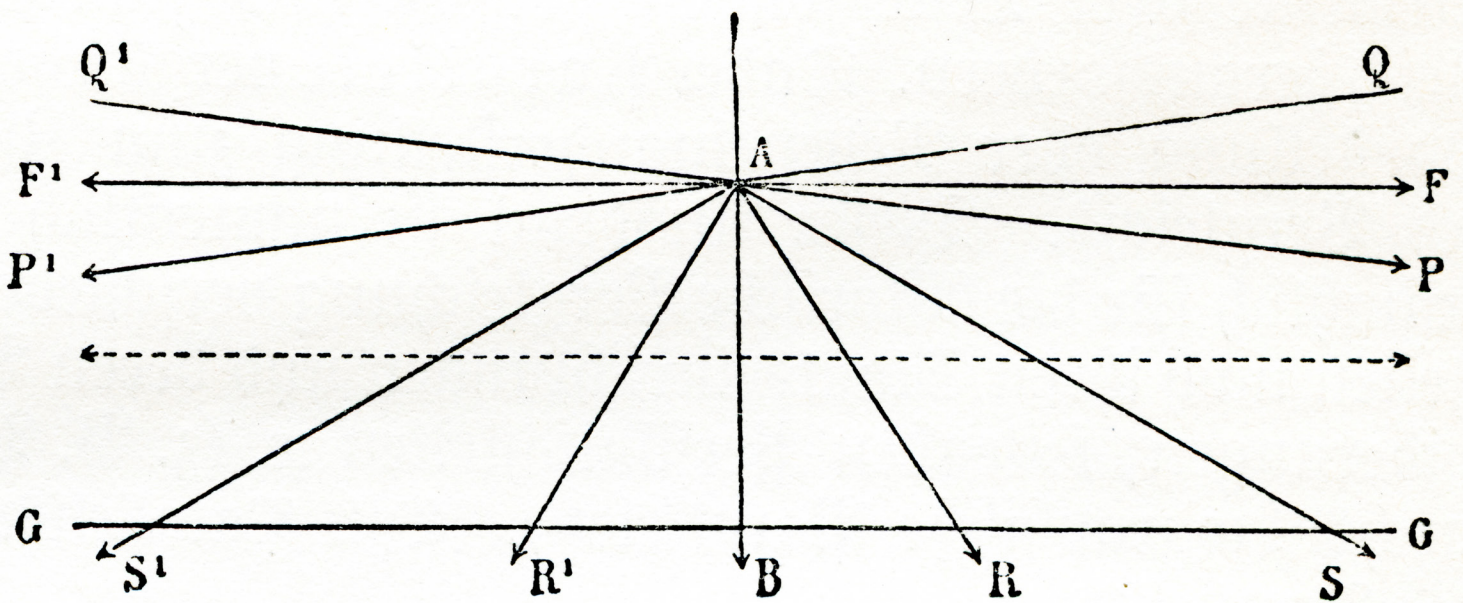


# MeTEOR Performance Task

## Geometry

Mathematics

*Proving a Polygon*



## **Performance Task Item: Proving a Polygon**

*Grade Level: High School Geometry*

**Focus Area:** Using Coordinates to Prove Simple Geometric Figures

**Essential Question:** How can you use coordinate geometry to classify polygons?

### **Core Ideas:**

- Understands the relationship between parallel or perpendicular lines can sometimes be used to write the equation of a line.
- Understands that the slopes of parallel lines are equal.
- Understands that the slopes of perpendicular lines must be opposite reciprocals of each other.
- Understands that using the formulas for slope, distance and midpoint can help classify figures in the coordinate plane.

### **Learning Targets:**

- Students will calculate slope.
- Students will write equations with parallel and perpendicular slopes.
- Students will use the distance formula.
- Students will classify figures in the coordinate plane.
- Students will explain their reasoning.

## **STANDARDS**

**Domain: Geometry-Expressing Geometric Properties with Equations**

### **Content Standards:**

- Use coordinates to prove simple geometric theorems algebraically.
- Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems.
- Find the point on a directed line segment between two given points that partitions the segment in a given ratio.
- Use coordinates to compute perimeters of polygons and area of triangles and rectangles using the distance formula.

### **Supporting Standard:**

- Know precise definitions.

### **Math Practice Standards:**

MP 1: Make sense of problems and persevere in solving them.

MP 3: Construct viable arguments and critique the reasoning of others.

MP 4: Model with mathematics.

MP 6: Attend to precision.

MP 7: Look for and make use of structure.

**Materials:**

- Performance Task
- Pencil
- Paper
- Calculator
- Graph paper (if needed)

**Task/Question 1:**

**DOK Level 1:** Recall & Reproduction

**Math Practice Standard:**

- MP 6: Attend to precision.

**A.** Write the Slope formula:

**B.** Write the Distance formula:

**C.** Calculate the slopes of the given points:

(2, 7) and (5, 8) \_\_\_\_\_ (1, -3) and (7, 2) \_\_\_\_\_

**D.** Find the distance between the given points (9, 12) and (12, 16):

**Task/Question 2:**

**DOK Level 2:** Basic Application of Skills and Concepts

**Math Practice Standards:**

- MP 6: Attend to precision.
- MP 7: Look for and make use of structure.

- A.** Using mathematical vocabulary, explain the difference between parallel and perpendicular lines:
- B.** Write the slope in the given equation:  $y = -5x + 4$ :
- C.** What is the slope in the equation  $2x + 4y = 12$ ?
- D.** Write an equation **parallel** to  $y = 4x - 3$  with a y-intercept of -5 in Slope-intercept form:
- E.** Write an equation **perpendicular** to  $y = \frac{1}{2}x + 3$  with a y-intercept of 6 in Slope-intercept form:

## Task/Question 3:

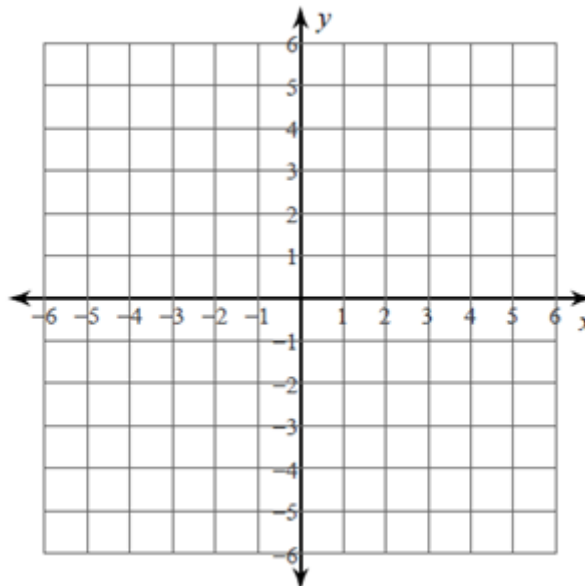
**DOK Level 2:** Basic Application of Skills and Concepts

### Math Practice Standards:

- MP 1: Make sense of problems and persevere in solving them.
- MP 4: Model with mathematics.
- MP 6: Attend to precision.

Kimmie, Marggie and Liz went camping. They had their own tents and set them up using a coordinate map. Kimmie put her tent up at point A(1, 0), Marggie put her tent up at point B(5, 0) and Liz put her tent up at point C(1, 3).

- A.** Use the coordinate grid below to **graph the points** where each girl's tent was set up:



- B.** Kimmie walked from her tent to Marggie's tent, then to Liz' tent and finally back to her own tent. What shape did she walk?

- C.** Calculate the distances between each point that Kimmie walked. List your distance in Deka-meters:

Distance from point A to point B:

Distance from point B to point C:

Distance from point C to point A:

**D.** What was the total distance Kimmie walked?

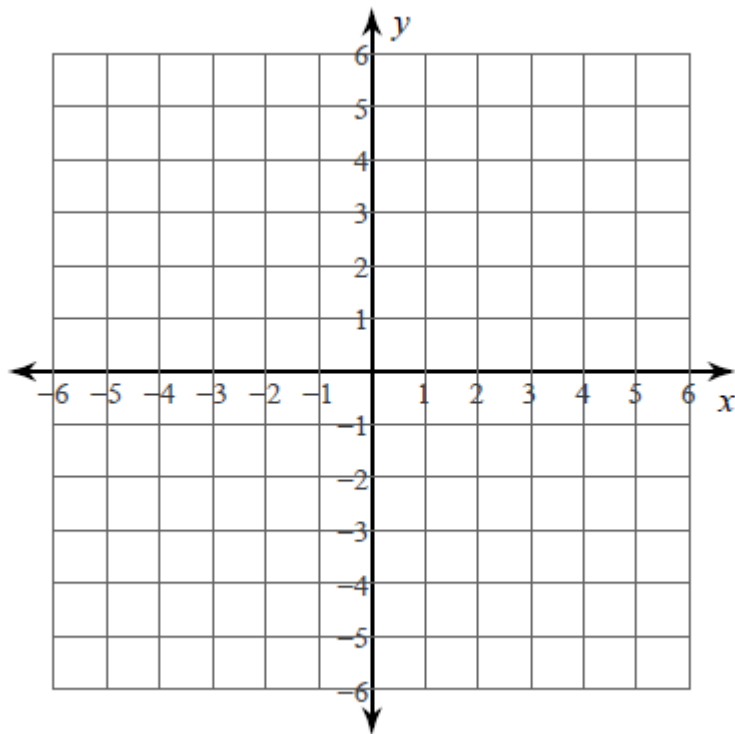
**E.** Explain how you figured out the total distance Kimmie walked:

**Task/Question 4:****DOK Level 3:** Strategic Thinking and Complex Reasoning**Math Practice Standards:**

- MP 1: Make sense of problems and persevere in solving them.
- MP 3: Construct viable arguments and critique the reasoning of others.
- MP 4: Model with mathematics.
- MP 6: Attend to precision.

**A.** Graph the vertices of CDEF on the graph below:

C(-2,1), D(0, -3), E(2, -2) and F(0, 2).



**B.** Explain how you know the opposite sides of CDEF are parallel:



C. Explain how you know the adjacent sides of CDEF are perpendicular:

D. What is the length of each side?

Length:  $\overline{CD}$  \_\_\_\_\_  $\overline{DE}$  \_\_\_\_\_  $\overline{EF}$  \_\_\_\_\_  $\overline{FD}$  \_\_\_\_\_

E. What is the most precise name for figure CDEF?

F. How did you determine the shape of CDEF? Justify and defend how your approach to solving this is the **most efficient**:

## Complete Performance Task Scoring Rubric Proving Polygons

23-25 Proficient 20-22 Good 17-19 Satisfactory 15-16 Poor 0-14 Unsatisfactory

	Depth of Knowledge Level	Points	Total Possible Points for Task	Total Points Earned by Student
<p><b>Task 1:</b></p> <p>A. <math>m = \frac{y_2 - y_1}{x_2 - x_1}</math></p> <p>B. <math>d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}</math></p> <p>C. 1/3; 5/6</p> <p>D. 5</p>	<b>1</b>	<b>1</b>  <b>1</b>  <b>1</b>  <b>1</b>	<b>4</b>	
<p><b>Task 2:</b></p> <p>A. Explanation: The difference between parallel and perpendicular lines is their slopes. Parallel lines have the same or equal slopes and perpendicular lines have opposite reciprocal slopes. A pair of perpendicular lines forms 90° angles.</p> <p>B. -5</p> <p>C. -1/2 or -2/4</p> <p>D. <math>y = 4x - 5</math></p> <p>E. <math>y = -2x + 6</math></p>	<b>2</b>	<b>2</b>    <b>1</b>  <b>1</b>  <b>1</b>  <b>1</b>	<b>6</b>	
<p><b>Task 3:</b></p> <p>A.</p>	<b>3</b>	<b>1</b>	<b>6</b>	

<p>B. Right Triangle</p> <p>C. From point A to B = 4 Deka-meters From point B to C = 5 Deka-meters From point C to A = 3 Deka meters</p> <p>D. Total distance: 12 Deka-meters</p> <p>E. Answers will vary. Possible Explanation: “I counted two of the three side lengths and used the Pythagorean Theorem to solve the hypotenuse. Then, I added the three side lengths together to get the total distance around the right triangle.” “I found the distance between each point using the Distance Formula. Once the side lengths are determined, I added them together to find the total distance around the triangle.”</p>		<p><b>1</b></p> <p><b>1</b></p> <p><b>1</b></p> <p><b>2</b></p>		
<p><b>Task 4:</b></p> <p>A.</p> <div style="text-align: center;"> </div> <p>B. Explanation: Line <math>\overline{CD}</math> has a slope of -2 and line <math>\overline{FE}</math> has a slope of -2. These lines have the same slope making them parallel to each other.</p> <p>Line <math>\overline{CF}</math> has a slope of <math>\frac{1}{2}</math> and line <math>\overline{DE}</math> has a slope of <math>\frac{1}{2}</math>. These lines have the same slope making them parallel to each other.</p> <p>C. Explanation: The adjacent sides are perpendicular because their slopes are</p>	<p><b>3</b></p>	<p><b>1</b></p> <p><b>1</b></p> <p><b>1</b></p> <p><b>1</b></p>	<p><b>9</b></p>	





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