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Chapter 5 Performance Task

Park Redesign
People come to Wild Lake Park for many activities, but it can be difficult to get around the park in a vehicle. Mr. Miller, an architect, has been hired to redesign the roads. Currently two parallel roads exist: Wild Way and Shore Street. They are intersected by Lake Lane. Mr. Miller suggests building Right Road and Boat Boulevard.

Write your answers on another piece of paper. Show all your work to receive full credit.

Part A
The map shows that Wild Way intersects Lake Lane at a 55° angle. Find the values of $x$ and $y$, the measures of the angles formed when Boat Boulevard intersects Shore Street and Lake Lane. Explain how you found your answers.

Part B
Mr. Miller named one of the new roads Right Road because it forms a right angle when it intersects Shore Street. His business partner wants to ensure that the road is perpendicular before naming it. Use the converse of the Pythagorean Theorem to determine whether Right Road was designed correctly. Explain your reasoning.

Part C
At the intersection of Right Road and Boat Boulevard, what is the measure of angle labeled $z^\circ$? Justify your response.
To help pay for the renovations, a music festival will be held to benefit Wild Lake Park. The festival director, Valeria, maps out the event locations. On the festival map, each unit is equal to 0.2 mile.

Part D
Local regulations for outdoor festivals require that restrooms be available within 0.5 mile of food stands. Does the current setup fit this criterion? Explain.

Part E
Valeria will need to travel from Information to Security frequently.
- She can ride a golf cart along the solid lines from one to the other at 12 miles per hour.
- She can walk along the dashed line at 4 miles per hour.
She wants to use the faster method. How should she travel? Explain.

Part F
Valeria wants to place the first aid station so that it is exactly 1 mile from each of the stages. In what location should the first aid station be placed? Prove that your location is the correct distance from all three stages.
## Task Scenario
Students will find missing angle measures and side lengths, prove a triangle is a right triangle, and find distances on the coordinate plane. Students will use parallel lines cut by transversals and the Pythagorean Theorem and its converse to solve problems about a park and a music festival.

### CCSS Content Standard(s)
- 8.EE.2, 8.G.5, 8.G.7, 8.G.8

### Mathematical Practices
- MP1, MP2, MP3, MP4, MP6

### Depth of Knowledge
- DOK2, DOK3

<table>
<thead>
<tr>
<th>Part</th>
<th>Maximum Points</th>
<th>Scoring Rubric</th>
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| A    | 2              | Full Credit:  
  \[ x^\circ = 55^\circ \]  
  The angle labeled 55° and the angle labeled \[ x^\circ \] are alternate interior angles, so they are congruent.  
  \[ y^\circ = 100.4^\circ \]  
  The three angles along Boat Boulevard are supplementary angles, so they add to 180°.  
  \[ 24.6 + x + y = 180; 24.6 + 55 + y = 180; 79.6 + y = 180; y = 100.4 \]  
  Partial Credit (1 point) will be given for one correct angle.  
  No credit will be given for an incorrect answer. |
| B    | 1              | Full Credit:  
  \[ a^2 + b^2 = c^2 \]  
  \[ 2^2 + (\sqrt{21})^2 = 5^2 \]  
  \[ 4 + 21 = 25 \]  
  \[ 25 = 25 \]  
  By the converse of the Pythagorean Theorem, the triangle must be a right triangle, and the right angle is opposite the longest side; \( 5 > \sqrt{21} > 2 \). So, Right Road is perpendicular to Shore Street, and was designed correctly.  
  No credit will be given for an incorrect or incomplete answer. |
| C    | 2              | Full Credit:  
  \[ z^\circ = 65.4^\circ \]  
  The angle adjacent to the \( z^\circ \) angle and between Wild Way and Boat Boulevard is an alternate exterior angle with the angle labeled 24.6°. Alternate exterior angles are congruent, so those two angles have the same measure. Because Right Road and Boat Boulevard form a 90° angle, \( z = 90 - 24.6 = 65.4 \).  
  Partial Credit (1 point) will be given for the correct angle measure OR a correct explanation.  
  No credit will be given for an incorrect answer. |
### Chapter 5 Performance Task Rubric, continued

<table>
<thead>
<tr>
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<th>Maximum Points</th>
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</table>
| **D** | 2 | Full Credit:  
Sample answer: From the food stands at (2, 8) to the nearest restrooms at (0, 5), the distance is:  
\[d = \sqrt{2^2 + 3^2} = \sqrt{13} \approx 3.61 \text{ units}\]  
Each unit is 0.2 mile: 3.61(0.2) = 0.722 mi  
0.722 mi > 0.5 mi, so the restrooms are not close enough to the food stands.  
Partial Credit (1 point) will be given for the correct distance OR an appropriate explanation.  
No credit will be given for an incorrect answer. |
| **E** | 3 | Full Credit:  
Golf cart: 8 units + 15 units = 23 units  
23 units × 0.2 mi/unit = 4.6 mi  
4.6 mi × \(\frac{1}{12}\) mi = 0.38 h  
Walking distance:  \[d = \sqrt{8^2 + 15^2} = \sqrt{289} = 17 \text{ units}\]  
17 units × 0.2 mi/unit = 3.4 mi  
3.4 mi × \(\frac{1}{4}\) mi = 0.85 h  
Valeria should take the golf cart because 0.38 h < 0.85 h.  
Partial Credit (2 points) will be given for both correct distances and times without a final answer.  
Partial Credit (1 point) will be given for one correct distance and time.  
No credit will be given for an incorrect answer. |
| **F** | 2 | Full Credit:  
1 mi × \(\frac{1\text{ unit}}{0.2\text{ mi}}\) = 5 units, so the station must be 5 units from each stage. The station should be at (–1, 2).  
The stages are at (–4, 6), (3, –1), and (–4, –2). From each stage to (–1, 2), a right triangle can be drawn with sides of 3 units and 4 units, and a hypotenuse of 5 units.  
\[a^2 + b^2 = c^2\]  
\[3^2 + 4^2 = c^2\]  
\[\sqrt{25} = c\]  
5 = c; So the first aid station is 1 mi from each stage.  
Partial Credit (1 point) will be given for identifying the location OR for proving the location is the correct distance from the stages.  
No credit will be given for an incorrect answer. |
| **TOTAL** | 12 | |
Chapter 5 Performance Task Student Work Sample

Part A

\[ x = 55^{\circ} \] because it is the alternate interior angle to the 60\(^{\circ}\) angle.

\[ x = 100^{\circ} \] because it is the alternate interior angle to the 40\(^{\circ}\) angle.

\[ y = 100^{\circ} \] because it is the alternate interior angle to the 40\(^{\circ}\) angle.

Part B

\[ \frac{DE}{EF} = \frac{2}{3} \]

\[ \frac{AB}{AC} = \frac{1}{2} \]

Part C

The measure of \( z \) is 65\(^{\circ}\). I know this because the opposite interior angles are equal, so the congruence of the angles at the vertices is 65\(^{\circ}\) because the angles are vertical angles.

The measure of \( x \) is 55\(^{\circ}\). I know this because the opposite interior angles are equal, so the congruence of the angles at the vertices is 55\(^{\circ}\) because the angles are vertical angles.

Part D

The distance between the two tracks and the pens is:

\[ d = \frac{2 \times 2}{2 \times 2} \]

\[ = 2 \, \text{miles} \]

\[ x = 0.12 \, \text{miles} \]

The distance is greater than 0.12 miles, which is not indicated in the problem setup.

Part E

The sides of the polygon are:

\[ AB = 8 \, \text{m} + 15 \, \text{m} = 23 \, \text{m} \]

\[ CD = 13 \, \text{m} \]

\[ DE = 2 \, \text{m} \]

\[ EF = 2 \, \text{m} \]

\[ FG = 2 \, \text{m} \]

\[ GH = 3 \, \text{m} \]

\[ HI = 2 \, \text{m} \]

\[ IJ = 2 \, \text{m} \]

\[ JA = 2 \, \text{m} \]

Part F

The height is:

\[ h = 12 \, \text{in} \]

The base is:

\[ b = 15 \, \text{in} \]

The area of the triangle is:

\[ A = \frac{1}{2} \times b \times h \]

\[ = \frac{1}{2} \times 15 \, \text{in} \times 12 \, \text{in} \]

\[ = 90 \, \text{in}^2 \]
Chapter 5 Performance Task Student Work Sample

She should use the hypotenuse.

I drew three circles with a hypotenuse of 5 cm each stage. They intersect at approximately (1, 1, 1, 1), so that is where she should put the sign.

I'm using sinusoids at 24.36, 34.15, 36.8, 45.2.1, 42.1...

Yes, it is a perpendicular intersection.

Hinges a, b, and c: 90.4. (See drawing above for labels.)

So, yes, it is a perpendicular intersection.

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Chapter 5 Performance Task Student Work Sample

Part D

\[ a^2 + b^2 = c^2 \]
\[ a^2 + c^2 = b^2 \]
\[ a = \frac{c}{b} \]
\[ \text{No, too far.} \]

Part E

\[ \theta + \theta + \theta = 180° \]
\[ 3\theta = 180° \]
\[ \theta = 60° \]

Part F

\[ s = \frac{8}{3} \]
\[ s + \frac{5}{3} = 8 \]
\[ \frac{10}{3} = 8 \]
\[ \frac{3}{2} = 8 \]

There is no spot that is 1 mile north and 2 miles east from any of the stages because it would go well past the shores of the line.

Chapter 5 Performance Task

Part A

\[ \angle A = 55° \]
\[ \angle B = 45° \]
\[ \angle C = 80° \]

Part B

\[ a^2 + b^2 = c^2 \]
\[ (a^2 + b^2)^2 = c^2 \]
\[ (a^2 + b^2)^2 = c^2 \]

Part C

\[ \angle A = 90° \]
\[ \angle B = 60° \]
\[ \angle C = 30° \]

Part D

\[ a^2 + b^2 = c^2 \]
\[ a^2 + c^2 = b^2 \]
\[ a = \frac{c}{b} \]
\[ \text{No, it is not a right triangle.} \]

Part E

\[ s = \frac{8}{3} \]
\[ s + \frac{5}{3} = 8 \]
\[ \frac{10}{3} = 8 \]
\[ \frac{3}{2} = 8 \]

There is no spot that is 1 mile north and 2 miles east from any of the stages because it would go well past the shores of the line.

Part F

\[ s = \frac{8}{3} \]
\[ s + \frac{5}{3} = 8 \]
\[ \frac{10}{3} = 8 \]
\[ \frac{3}{2} = 8 \]
Chapter 5 Performance Task Student Work Sample

Part A

180° - 55° = 125°

180° - 125° = 55°

Part B

\[ d^2 + b^2 = c^2 \]

\[ a + \sqrt{3} = 5 \]

\[ a = 2 \]

Part C

\[ 2\sqrt{2} = 5 \]

Part D

No

\[ 3 + 2 = 5 \]

\[ 5 \times 2 = 10 \text{ milo} \]

Part E

The hypotenuse will be shorter, but she gets to walk slower. The longer way she gets to drive 3 times faster and it doesn't look too far away.

Part F

There is no place to put the fire station because the stages are too far apart.

\[ 1 \times 2 = 2 \]

\[ 3 \times 3 = 9 \text{ times} \] as long, so I say drive.

\[ z = 90° \text{ because it is} \ L. \]