Math
Released Item 2018
Grade 7
Grid Coordinates of a Square
VH225469
Anchor Set
A1 – A8

With Annotations
Prompt

The coordinates of two of the vertices of square $QRST$ are shown.

- $Q (3.6, 2.1)$
- $R (-5.4, 2.1)$

**Part A**

What is the length, in units, of each side of square $QRST$? Use the coordinates to show or explain how you determined the length.

Enter your answer and your work or explanation in the space provided.

**Part B**

A student claims that vertex $S$ of square $QRST$ has only one possible location.

Is the student’s claim correct?

- If the student’s claim is correct, explain why there is only one possible location for vertex $S$ and identify this location.
- If the student’s claim is incorrect, explain how you know and identify all possible locations for vertex $S$.

Enter your answer and your work or explanation in the space provided.
<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>2</td>
<td>Student response includes the following 2 elements.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Reasoning component</strong> = 1 point</td>
</tr>
<tr>
<td></td>
<td>o Valid process for determining the length of each side of the square.</td>
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<td></td>
<td>Note:</td>
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<td></td>
<td>o The point is earned if a computation error is made as long as the process is correct.</td>
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<tr>
<td></td>
<td>• <strong>Computation component</strong> = 1 point</td>
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<tr>
<td></td>
<td>o Correct length of 9 units.</td>
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<td></td>
<td>Note:</td>
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<td></td>
<td>o The point is earned if no reasoning process is included in the response.</td>
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<td>Sample Student Response:</td>
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<tr>
<td></td>
<td>The coordinates of point Q are (3.6,2.1) and the coordinates of point R are (-5.4,2.1). Since the y-coordinates of each point are the same, the length of each side of square QRST is the positive difference between the x-coordinates.</td>
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<tr>
<td></td>
<td>This length would be</td>
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<td></td>
<td>Or other valid response.</td>
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<tr>
<td>1</td>
<td>Student response includes 1 of the 2 elements.</td>
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<td>Student response is incorrect or irrelevant.</td>
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<td>o Valid process for determining at least one correct location for vertex S on the coordinate plane.</td>
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Note:
  o The point is earned if a computation error is made as long as the process is correct.

Note:
  o The point is earned if the process shows how to determine the location (in either direction) of vertex S based on an incorrect answer to Part A.

- **Computation component** = 1 point
  o Correct locations for vertex S are provided, \((-5.4,11.1)\) and \((-5.4,-6.9)\)

Sample Student Response:

The student’s claim is incorrect because vertex S can be located directly above or below vertex R. Each side of square QRST is 9 units long. The x-coordinate of vertex S must be -5.4 and the y-coordinate of vertex S can be \(2.1 + 9 = 11.1\) or \(2.1 - 9 = -6.9\). So, one possible set of coordinates for vertex S is \((-5.4,11.1)\) and the other possible set of coordinates is \((-5.4,-6.9)\).

<table>
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Part A

Q (3.6, 2.1) \[ 3.6 \times 5.4 = 9 \]
R (-5.4, 2.1) \[ 3.6 + 5.4 = 9 \]

Part B

2.1 - 9 = 11.1
2.1 - 9 = -6.9

The student is incorrect. The line RS can either extend up on the y-axis or down. Therefore there are 2 possible locations for vertex "s".
Anchor Paper 1
Part A: Score Point 2

This response receives full credit. The response earns both of the required elements.

- The response uses the coordinates to show a correct process for determining the length of each side of the square (3.6 + 5.4 = 9).
- The response shows the correct length of each side of the square (9 units).

Note: A label of “units” for the side length is not required.

Note: Only adding positive numbers is considered good support when done correctly. A student can switch minus negative 5.4 to positive 5.4 in their head, so it is fine to show it that way in their work. Also, referencing absolute value is not required to earn credit.

Part B: Score Point 2

This response receives full credit. The response earns both of the required elements.

- The response shows a correct process for determining at least one correct location for vertex S on the coordinate plane (2.1 + 9 = 11.1, 2.1 – 9 = -6.9. The student is incorrect. The line $RS$ can either extend up on the y-axis or down).
- The response shows all possible locations for vertex S (-5.4, -6.9) (-5.4, 11.1).
Part A

I used the distance formula to solve it. I plugged in: $d = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$.

$d = \sqrt{(3.6+5.4)^2 + (2.1-2.1)^2}$

$d = \sqrt{9^2 + 0^2}$

$d = 3\sqrt{9}$

$d = 9$

Each side is 9 units long.

Part B

No, there are not two possible locations for S. This is because QRST is a square, so all its sides must be equal. Additionally, all sides of a square are perpendicular to adjacent sides. Looking at the coordinates of Q and R, you may notice that they have the same y coordinate. That means that the line QR runs parallel to the x-axis, and since the line RS must run perpendicular to QR, then it must be parallel to the y-axis. Using that, you can determine that S has the same x-coordinate as R, and its y-coordinate is either 9 more than R's or 9 less than R's. Therefore, S must be either (-5, 4, 11, 1) or (-5, -4, 11, 1).
This response receives full credit. The response earns both of the required elements.

- The response uses the coordinates to show a correct process for determining the length of each side of the square (I used distance formula to solve it. I plugged the 2 coordinates into distance formula, then solved. \( d=\sqrt{(3.6 + 5.4)^2 + (2.1 - 2.1)^2} \), \( d=\sqrt{81} \), \( d=9 \)). The response correctly uses the distance formula.

Note: For the process credit, the response needs to use the coordinates. Following are some of the common processes: Adding the two x coordinates \([3.6+5.4]\), finding the difference \([3.6 - - 5.4]\), using the distance formula, and explaining that the x coordinates are added or the difference in the x coordinates were found.

- The response shows the correct length of each side of the square (9 units).

Part B: Score Point 2

This response receives full credit. The response earns both of the required elements.

- The response shows a correct process for determining at least one correct location for vertex S on the coordinate plane (S has the same X coordinate as R, and its Y coordinate is either 9 more than R’s or 9 less than R’s).

- The response shows all possible locations for vertex S (-5.4, -6.9) (-5.4, 11.1).
Part A

Equation: Distance Formula
\[ d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \]

Work: \[ d = \sqrt{(3.4 - (-5.4))^2 + (2.1 - 2.1)^2} \]
\[ d = \sqrt{8.8^2 + 0^2} = 8.8 \text{ units} \]

Answer: The length, in units, of each side of square QRST is 8.8 units.

Part B

Is his claim correct? Yes

Explanation: I know there is only one possible location for vertex S because according to the question it is SQUARE QRST. Because of that order we know S comes after R. We also know it is a square proving that it is a units away from point R by the y coordinate and the same for the x coordinate.

Possible Point: (-5.4, 11.1)
Part A: Score Point 2

This response receives full credit. The response earns both of the required elements.

- The response uses the coordinates to show a correct process for determining the length of each side of the square (Plug in values for $\scriptsize X_1, X_2, Y_1, Y_2, \sqrt{(3.6 - (-5.4)^2 + (2.1 - 2.1)^2}, \sqrt{81}, \Rightarrow 9$). The response correctly uses the distance formula.
- The response shows the correct length of each side of the square (9 units).

Part B: Score Point 1

This response receives partial credit. The response earns one of the required elements.

- The response shows a correct process for determining at least one correct location for vertex S on the coordinate plane [We also know it is a square proving that it is 9 units away from point R by the y coordinate. Possible point: (−5.4, 11.1)]. The student does not explain or show the process of finding the possible location of vertex S, but explaining that it is 9 units away from the original point is a sufficient explanation.

The response does not provide all possible locations for vertex S by providing only one possible correct location (−5.4, 11.1).
The coordinates of two of the vertices of square QRST are shown.
- Q(3.6, 2.1)
- R(−5.4, 2.1)

Part A
What is the length, in units, of each side of square QRST? Use the coordinates to show or explain how you determined the length.

Enter your answer and your work or explanation in the space provided.

The length of each side of square QRST is 9 units, as \[3.6 - (-5.4) = 9\]. I used 3.6 and −5.4 because the y values stayed at 2.1 for both of the x values, and since only the x values were moving, you just have to find how much they are moved apart from each other, or the difference of the two values.

Part B
A student claims that vertex S of square QRST has only one possible location.

Is the student’s claim correct?
- If the student’s claim is correct, explain why there is only one possible location for vertex S and identify this location.
- If the student’s claim is incorrect, explain how you know and identify all possible locations for vertex S.

Enter your answer and your work or explanation in the space provided.

This student’s claim is incorrect, this is because there are only two current points labeled for QRST: Q and R. You don’t know whether point S will be on the same x value as Q or R, as well as which way the square will be going, up or down. So point S could either be \((3.6, 11.1)\), \((3.6, -6.9)\), \((-5.4, 11.1)\), or \((-5.4, -6.9)\).
Anchor Paper 4
Part A: Score Point 2

This response receives full credit. The response earns both of the required elements.

- The response uses the coordinates to show a correct process for determining the length of each side of the square \(3.6 - (-5.4) = 9\).
- The response shows the correct length of each side of the square (9 units).

Part B: Score Point 1

This response receives partial credit. The response earns one of the required elements.

- The response shows a correct process for determining at least one correct location for vertex S on the coordinate plane [The student’s claim is incorrect, this is because there are only two current points labeled for QRST: Q and R. You don’t know whether point S will be on the same x value as Q or R, as well as which way the square will be going, up or down. So point S could either be \((-5.4, 11.1)\) \((-5.4, -6.9)\). The student’s minimal explanation of the process leads to two correct locations.

Although both correct coordinate pairs are given, the response provides 4 possible locations for vertex S including two incorrect coordinate pairs \((3.6, 11.1)\) \((3.6, -6.9)\). Providing additional incorrect coordinate pairs is incorrect and credit cannot be given for this element.
Part A: Score Point 2

Part A

What is the length, in units, of each side of square QRST? Use the coordinates to show or explain how you determined the length.

Enter your answer and your work or explanation in the space provided.

if you take 3.6, then find the difference to −5.4, there is a difference of 9. Each side of the square is 9 units.

Part B

A student claims that vertex S of square QRST has only one possible location.

Is the student's claim correct?

• If the student's claim is correct, explain why there is only one possible location for vertex S and identify this location.
• If the student's claim is incorrect, explain how you know and identify all possible locations for vertex S.

Enter your answer and your work or explanation in the space provided.

Yes, this student is correct. Since it is a square, the sides have to be the same length.
Part A: Score Point 2

This response receives full credit. The response earns both of the required elements.

- The response uses the coordinates to show a correct process for determining the length of each side of the square (If you take 3.6, then find the difference to -5.4, there is a difference of 9). Providing the 2 correct x coordinates to explain how the length was determined helps to show understanding.

- The response shows the correct length of each side of the square (9 units).

Part B: Score Point 0

This response receives no credit. The response earns none of the required elements.

The response does not provide a correct process for determining either correct location for vertex S on the coordinate plane (Yes, this student is correct. Since it is a square, the sides have to be the same length). 9 units is not being added or subtracted and there is no reference to moving 9 units above or below Point R.

The response does not provide possible locations for vertex S.
Part A:

9 units

\[ Q = 3.6 \]
\[ R = -5.4 \]

they are both up 2.1
and Q is 3.6 in one direction,
R is 5.4 in another, which
adds up to be 9 units.

Part B:

the student's claim is incorrect

S could go in 2 possible places:
(-5.4, 6.9) or (3.6, -6.9), because
if it is 2.1 in one direction, it has to be
6.9 in the other to make 9, the other 2
are the same, because they have to
line up.
Annotation

Anchor Paper 6
Part A: Score Point 1

This response receives partial credit. The response earns one of the required elements.

- The response shows the correct length of each side of the square (9 units).

The response shows an incorrect process for determining the length of each side of the square (3.6 + -5.4 = 9). The process provided would equal negative 1.8 since the equation written adds negative 5.4 instead of subtracting it.

Part B: Score Point 1

This response receives partial credit. The response earns one of the required elements.

- The response shows a correct process for determining at least one correct location for vertex S on the coordinate plane (the student’s claim is incorrect. S could go in 2 possible places, (-5.4, -6.9) . . . because if it is 2.1 in one direction, it has to be 6.9 in the other to make 9. the other 2 are the same, because they have to line up).

The response does not provide all possible locations for vertex S. The response indicates an incorrect coordinate pair (3.6, -6.9).
Part A

9 units long on each side.

Part B

The student is correct because a square only has 4 vertices and there are 4 points so the only place to put it is right in the middle.
Anchor Paper 7
Part A: Score Point 1

This response receives partial credit. The response earns one of the required elements.

- The response shows the correct length of each side of the square. (9 units)

The response does not provide a process for determining the length of each side of the square.

Part B: Score Point 0

This response receives no credit. The response earns none of the required elements.

The response does not provide a correct process for determining either correct location for vertex S on the coordinate plane (The student is correct because a square only has 4 vertexes and theres 4 points so the only Place to put it right in the middle).

The response does not provide possible locations for vertex S.
Part A

\[ \begin{align*}
8.6 & \quad 9 \text{ units} \\
\frac{t - 5.4}{9.0} & = I \text{ added the QR first units together,}\n\text{skipping the negative because it would lead into the negative,}\n\text{anyway.}
\end{align*} \]

Part B

It only has two possible locations. They would be in either \((5.4, -2.1)\) or \((-3.6, 2.1)\).
Part A: Score Point 1

This response receives partial credit. The response earns one of the required elements.

- The response shows the correct length of each side of the square (9 units).

The response shows an incorrect process for determining the length of each side of the square. (3.6 + -5.4 = 9.0). The student attempts to explain the process (I added the QR first units together, skipping the negative because it would lead into the negatives anyway) but is too vague and does not help explain the incorrect addition work shown.

Part B: Score Point 0

This response receives no credit. The response earns none of the required elements.

The response does not provide a correct process for determining either correct location for vertex S on the coordinate plane [It has two possible locations. They would be in either (-5.4, -2.1) or (-3.6, 2.1)]. Note that while the student correctly indicates vertex S has two possible locations, this understanding does not lead to at least one correct location, so credit is not received for this element.

The response does not provide all possible locations for vertex S. The response indicates incorrect coordinate pairs [(-5.4, -2.1) or (-3.6, 2.1)].
Practice Set
P1 - P5

No Annotations Included
The coordinates of two of the vertices of square QRST are shown.

- Q(3.6, 2.1)
- R(−5.4, 2.1)

Part A

What is the length, in units, of each side of square QRST? Use the coordinates to show or explain how you determined the length.

Enter your answer and your work or explanation in the space provided.

9 units, coordinates Q and R are 9 units away from each other so the side must be 9 units long. Since its a square each side is the same length so all the sides are 9 units long.

Part B

A student claims that vertex S of square QRST has only one possible location.

Is the student’s claim correct?

- If the student’s claim is correct, explain why there is only one possible location for vertex S and identify this location.
- If the student’s claim is incorrect, explain how you know and identify all possible locations for vertex S.

Enter your answer and your work or explanation in the space provided.

The student’s claim is incorrect because in square QRST’s case S comes right after R and since R is 9 units to the left of Q, S can either be located 9 units up from R(−5.4, 11.1) or 9 units down from R(−5.4, −7.1). Unit S cannot be located 9 units to the left or to the right of R because if it was to the right it would be in the same position as Q, and it can’t go to the left because the sides of the square are 9 units and if S was to the left it would make the side 18 units long.
Part A

Q: (3.6, 2.1)  R: (-5.4, 2.1)

5.4 + 3.6 = 9 units

Each side of square QRST is 9 units. Even though -5.4 is negative, it's the distance apart from the two points that I'm looking for. So, by adding 5.4 & 3.6 together, I can figure out the distance between the parts.

Part B

Q: (3.6, 2.1)  R: (-5.4, 2.1)

The student's claim is incorrect since I don't know where vertex T is located. Also, I'm not sure whether or not the vertex is located above or below vertices QR, so there are 4 possibilities:

(3.6, 11.1), (-5.4, 11.1), (3.6, -4.9), (-5.4, -4.9)

S: (3.6, 11.1) or (-5.4, 11.1) or (3.6, -4.9)

2.1 + 9 = 11.1

Each side is 9 units, so add 9 or subtract 9 from 2.1 to see where the 4 points could be located.
Part A

Answer: 9 units

Explanation:
I subtracted 3.6 - (-5.4) to get the distance in units between the two. 3.6 - (-5.4) = 9.

Part B

This student is incorrect. In a square, all of the sides are equal. If the top is 1.8 units long, then the sides must be 1.8 units long. However, we do not know if the line \( \overline{AB} \) is the top or bottom. Therefore, there are four possible locations. One possible is: 0. The possible locations are:

\[ S(3.6, 0), S(3.6, -5.4), S(-5.4, 3.6), S(-5.4, 0) \]
The coordinates of two of the vertices of square QRST are shown.

- Q(3.6, 2.1)
- R(−5.4, 2.1)

Part A
What is the length, in units, of each side of square QRST? Use the coordinates to show or explain how you determined the length.

Enter your answer and your work or explanation in the space provided.

\[ 5.4 + 3.6 = 9 \text{ they are 9 spaces apart.} \]

Part B
A student claims that vertex S of square QRST has only one possible location.

Is the student’s claim correct?

- If the student’s claim is correct, explain why there is only one possible location for vertex S and identify this location.
- If the student’s claim is incorrect, explain how you know and identify all possible locations for vertex S.

Enter your answer and your work or explanation in the space provided.

The student’s claim is incorrect because it could be 9 spaces above R or below R. So it could have \(-5.4, 11.1\) or \(-5.4, -6.9\).
The coordinates of two of the vertices of square QRST are shown.

- Q (3.6, 2.1)
- R (-5.4, 2.1)

**Part A**

What is the length, in units, of each side of square QRST? Use the coordinates to show or explain how you determined the length.

Enter your answer and your work or explanation in the space provided.

The length would be 3 units because you cannot have a decimal while working with units.

**Part B**

A student claims that vertex S of square QRST has only one possible location.

Is the student's claim correct?

- If the student's claim is correct, explain why there is only one possible location for vertex S and identify this location.
- If the student's claim is incorrect, explain how you know and identify all possible locations for vertex S.

Enter your answer and your work or explanation in the space provided.

the student is correct, (S) can only have one possible location.
## Practice Set

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