Grade 5: Lighthouse

5.G.A.2 - Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation

This is a map of an island. There is a coordinate system on the map.
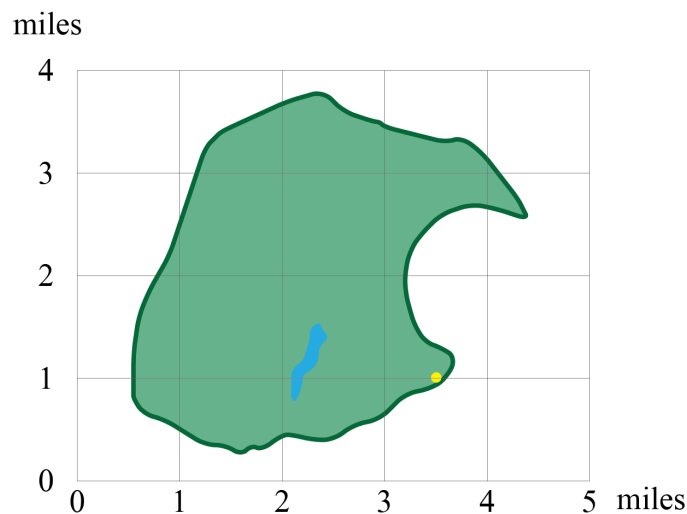
The small yellow dot ⬤ shows where there is a lighthouse on the island. What are the coordinates of the lighthouse?

- ○ (3.5, 1)
- ○ (4, 1)
- ○ 3.5
- ○ 4

Correct if student selects (3.5, 1).

There is a horizontal scale at the bottom edge of the map and a vertical scale at the left-hand edge of the map. According to these scales, the origin point of the coordinate system is located at the lower-left corner of the map. Horizontal coordinates increase in value in the direction from the origin to the right. Vertical coordinates increase in value in the direction from the origin upwards.

The lighthouse is located 3.5 miles to the right of the origin, so its horizontal coordinate is 3.5. The lighthouse is located 1 mile above the origin, so its vertical coordinate is 1. Therefore, the coordinates of the lighthouse are (3.5, 1). The first answer choice was the correct answer.

The second answer choice was (4, 1). Those are the coordinates of the red point shown below, not the coordinates of the lighthouse.
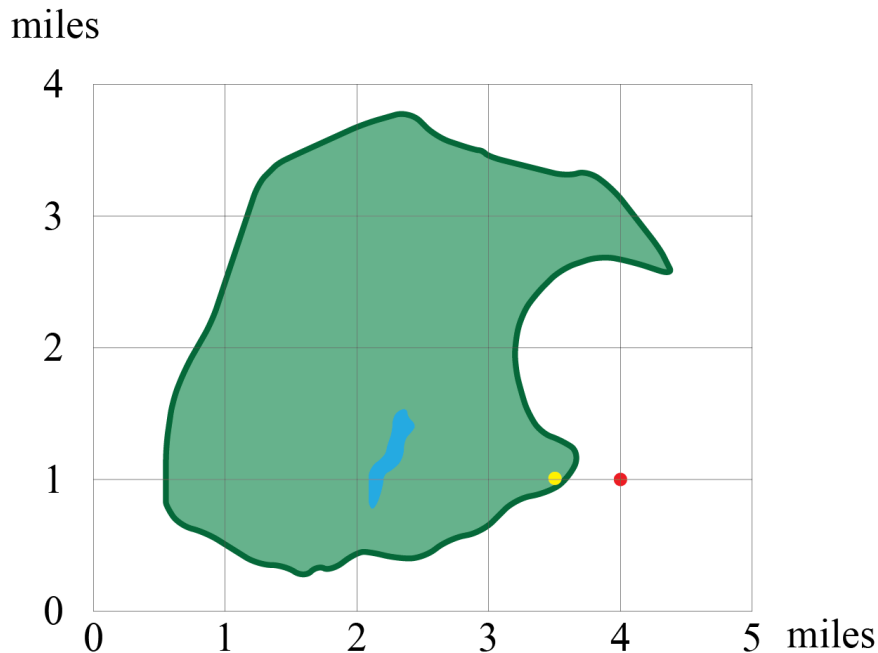
The third answer choice was 3.5. Although this is one of the coordinates of the lighthouse, the lighthouse has two coordinates, so the answer 3.5 by itself is incorrect. The fourth answer choice was also incorrect.

If the student chose the answer (4, 1), perhaps it was because they were seeing the grid as consisting of squares arranged in rows and columns. (The number 4 could then come from the fact that the yellow dot is located in the 4th column of squares.) However, instead of seeing a coordinate system as consisting of rows and columns of squares, students must think of it more as a pair of rulers that work together. The measurements of the two rulers are indicated by the *gridlines*—not the "boxes" they outline. (Look back at the red dot to see where a point would be if its horizontal coordinate were 4.)

Elaboration on Alignment

A *two-dimensional coordinate system* employs a pair of perpendicular number lines (crossing at their common zero point) as a scheme for labeling points in a plane with ordered pairs of numbers. This task assesses familiarity with the scheme, which is introduced in the grade 5 standards.

The number lines in a coordinate system could be oriented diagonally relative to the edges of the paper (just so long as the lines themselves are mutually perpendicular); moreover, even if the number lines are horizontal and vertical, the numerical values don't necessarily have to increase upward and/or to the right. However, this task does not assess any such exotic possibilities.

The task involves fractional thinking to the extent that the targeted location lies between the whole-number gridlines. (The answer choices use decimal format.) This also brings up the possibility of a student thinking that one coordinate of the yellow dot must be 4 (because the yellow dot lies in the 4th column of white boxes.)

The distractors offer the possibility (4, 1) (discussed in the previous section) as well as raising the more basic question of the format of coordinates (since two of the choices are single numbers). The last answer choice is the least sensible but using a more natural distractor such as 1 would have broken the symmetry of the choices as an entire slate, making the final distractor pointless.

The task has a context. The map shows South Manitou Island in Lake Michigan. The map is reasonably accurate and to scale. The yellow dot shows the location of South Manitou Island Lighthouse.

The map in the problem was designed to show a small territory in order to avoid any problems with the curvature of the Earth's surface.

The dot is intentionally drawn small so as to emphasize that coordinates label *points* (which are actually infinitesimally small). On a map of this scale, a lighthouse would have negligible dimensions, which makes it reasonable to talk about the lighthouse's *single* location.
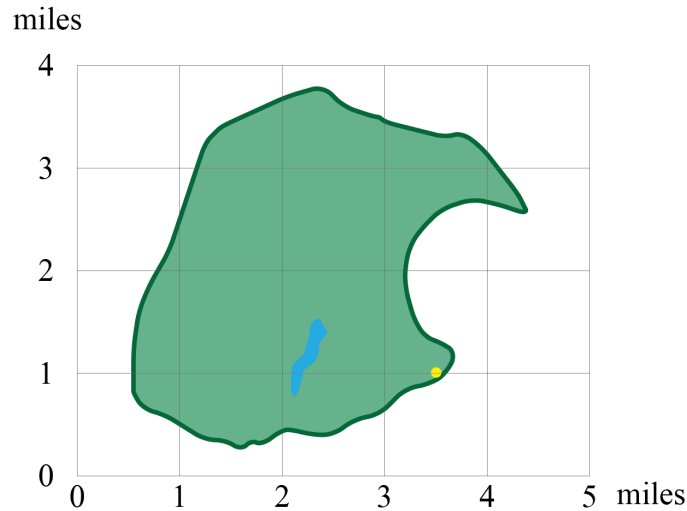
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https://bealearninghero.org/readiness-check

Name: _____

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