

THE DIAGONAL OF A BOX

Performance Standard 9D.G

Solve a problem involving similar figures and the Pythagorean theorem and justify their reasoning and procedures:

- *Mathematical knowledge:* Demonstrate knowledge of proportionality, and the Pythagorean theorem;
- *Strategic knowledge:* Solve the problem using a systematic process;
- *Explanation:* Explain completely what was done and why it was done.

Procedures

1. Provide students with sufficient learning opportunities to develop the following in order to use trigonometric ratios and circular functions to solve problems:
 - Solve problems that involve the use of proportions and the Pythagorean theorem in similar right triangles with whole number side lengths.
2. Provide students with the assessment task worksheet. Make sure the students understand that the diagonal of a box must go from a lower front vertex to opposite upper back vertex, and that it is not just the diagonal of one of the faces of the box. Have students work individually. Calculators may be used.
3. Use the standard scoring rubric. Give each student a score in each of the three categories. A score of 4 should indicate completely correct solutions to all parts of the problem, with complete and correct justifications of their reasoning. A three should represent correct or nearly correct solutions to all parts, with only minor computational errors making their solutions inaccurate, their rationale should be sound, but may not be completely explained. A two would indicate that students have some idea about how to answer the questions, but make major errors in computation and or reasoning that affects their answers. A one may have a correct answer for one part, but generally shows little understanding in their rationale for their procedures and processes. A score of zero generally reflects no correct responses and no logical rationale for their procedures and processes.
4. Minor errors in computation include making errors in the actual addition or multiplication, rounding incorrectly. Major errors include using the wrong operations or formulas to relate terms.
5. The diagonal of the smaller box is 17 inches. Since the larger box is similar to the smaller box, and its height is 4 times that of the smaller box, the diagonal will also be 4 times that of the smaller box, so it has a diagonal of length 68 inches. Students will need to use Pythagorean theorem twice to find the length of the diagonal of the smaller box. To find the length of the diagonal of the larger box, they may use proportionality on the sides first, and then go through similar process as that used with the smaller box to find the larger box's diagonal. They may also set up a proportion between the similar triangles formed by the diagonal of the base and its height. There are several methods that may be used, however any one used should be thoroughly explained in terms of proportionality and the Pythagorean theorem.

Examples of Student Work not available

Time Requirements

- One class period

Resources

- Copies of "The Diagonal of a Box" task sheet
- Writing utensil
- Calculator
- Mathematics Rubric

NAME _____ DATE _____

THE DIAGONAL OF A BOX

Student Task Sheet

Solve the following problem. Make sure to explain your reasoning and justify your procedures.

Two large boxes are sitting on a table. Each is the shape of a rectangular solid. The first box is 12 inches long, 9 inches wide and 8 inches high. The second box is known to be similar to the first, but the only dimension given is its height of 56 inches. Find the length of the diagonal of each box.

