Dimensions Needed

Students are asked to solve problems involving square roots and cube roots.

General Information

Subject(s): Mathematics
Grade Level(s): 8
Intended Audience: Educators

Freely Available: Yes

Keywords: MFAS, area, volume, square root, cube root

Instructional Component Type(s): Formative Assessment

Resource Collection: MFAS Formative Assessments

Attachment

MFAS_DimensionsNeeded_Worksheet.docx

Formative Assessment Task

Instructions for Implementing the Task
This task can be implemented individually, with small groups, or with the whole class.

1. The teacher asks the student to complete the problems on the *Dimensions Needed* worksheet.
2. The teacher asks follow-up questions, as needed.

TASK RUBRIC

Getting Started

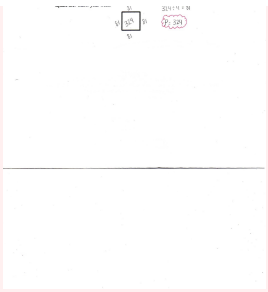
Misconception/Error

The student is unable to evaluate square roots and cube roots.

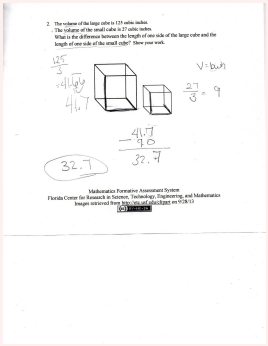
Examples of Student Work at this Level

The student:

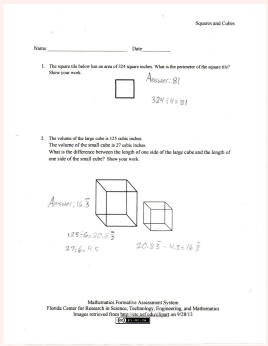
- Divides the area of the square by four to find the length of a side. The student explains that the four sides are needed in order to find perimeter.



- Divides the volume of each cube by three to find the lengths of their edges. Then the student subtracts these values to find their difference.



- Divides the area of the square by four to find the length of a side and the volumes of the cubes by six to find the lengths of their edges.



Questions Eliciting Thinking

Why did you divide the area by four (or two)?

What is the difference between dividing by four (or two) and taking a square root?

How do you calculate the area of a square? What is the inverse of squaring?

Did you expect the area to be the same as the perimeter?

Why did you divide the volume of each cube by three (four or six)? What is the difference between dividing by three (four or six) and taking a cube root?

How do you calculate the volume of a cube? What is the inverse of cubing?

Instructional Implications

Provide direct instruction on evaluating squares, square roots, cubes, and cube roots. Emphasize the inverse relationship between squares and square roots and between cubes and cube roots. Use square root and cube root symbols and be sure the student understands the distinction between evaluating square roots and cube roots and dividing. Use visuals or manipulatives as needed to convey how taking the square root of an area and dividing the area by four will differ. Provide additional practice with evaluating square roots and cube roots. Encourage the student to gain a ready familiarity with square roots and cube roots of small perfect squares and perfect cubes.

Compare and contrast the geometric figures *square* and *cube*. Discuss their dimensions and directly relate their dimensions to area and volume measurement. Provide additional opportunities to find the areas of squares and volumes of cubes given the length of a side or edge, and to find the length of a side or edge given an area or volume. Then, consider implementing this task again but with different values.

Consider implementing NCTM Illuminations Lesson *In Search of Perfect Squares* (*http://illuminations.nctm.org/Lesson.aspx?id=3089*).

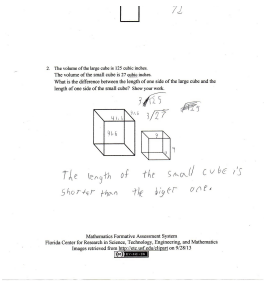
Making Progress

Misconception/Error

The student can evaluate a square root but is unable to evaluate a cube root.

Examples of Student Work at this Level

The student takes the square root of the area to determine the length of one side of the square. However, the student divides the volume of each cube by three to determine the lengths of their edges.



Questions Eliciting Thinking

Why did you divide the volume of each cube by three (four or six)? What is the difference between dividing by three (four or six) and taking a cube root?

How do you calculate the volume of a cube? What is the inverse of cubing?

Instructional Implications

Provide direct instruction on evaluating cubes and cube roots. Emphasize the inverse relationship between cubes and cube roots. Use the cube root symbol and be sure the student understands the distinction between evaluating cube roots and dividing. Use stacking cubes to illustrate the difference. Provide additional practice with evaluating cube roots. Encourage the student to gain a ready familiarity with cube roots of small perfect cubes.

Compare and contrast the geometric figures *square* and *cube*. Discuss their dimensions and directly relate their dimensions to area and volume measurement. Provide additional opportunities to find the areas of squares and volumes of cubes given the length of a side or edge and to find the length of a side or edge given an area or volume. Then, consider implementing this task again but with different values.

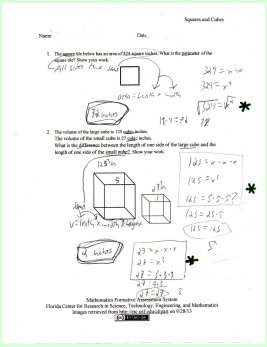
Got It

Misconception/Error

The student provides complete and correct responses to all components of the task.

Examples of Student Work at this Level

The student takes the square root of the area of the square to determine the length of its sides getting a length of 18 inches. The student multiplies 18 by four to find the perimeter of the square, 72 in. The student takes the cube roots of the volumes of the cubes to determine the length of their sides, 5 in. and 3 in. Then, the student subtracts the length of the small cube from the length of the large cube getting 2 inches.



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Questions Eliciting Thinking

Why did you take the square root of the area of the square?

Why did you use the same variable for the length and the width of the square?

You wrote 72 inches as your answer. Would 72 square inches be an acceptable answer? Why or why not?

Why did you take the cube root of the volume of each cube?

Why did you use the same variable for the length, width, and height of each cube?

You wrote two inches as your answer. Would two square inches or two cubic inches be acceptable? Why or why not?

Instructional Implications

If necessary, provide additional guidance in communicating mathematical work in written form. Encourage the student to label work and present it in a logical format. Be sure the student understands to include units of measure when appropriate and to clearly distinguish between length, area, and volume measurements.

Challenge the student to determine the length of one side of a square with an area of 85 square inches. Discuss with the student the distinction between exact (e.g., $\sqrt{85}$ in.) and approximate forms (e.g., 9.2 in.) and when the use of each is appropriate.

Consider using the MFAS task *Roots and Radicals* (8.EE.1.2).

Accommodations & Recommendations

Special Materials Needed:

- *Dimensions Needed* worksheet
- Calculator

Source and Access Information

Contributed by: MFAS FCRSTEM
Name of Author/Source: MFAS FCRSTEM
District/Organization of Contributor(s): Okaloosa
Is this Resource freely Available? Yes
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Aligned Standards

Name	Description
MAFS.8.EE.1.2:	Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.