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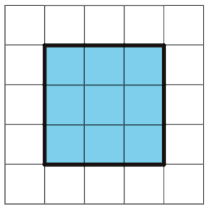
Unit 1, Lesson 17: Squares and Cubes

Let's investigate perfect squares and perfect cubes.

17.1: Perfect Squares

1. The number 9 is a perfect **square**.

   Find four numbers that are perfect squares and two numbers that are not perfect squares.



2. A square has side length 7 km. What is its area?

3. The area of a square is 64 sq cm. What is its side length?

17.2: Building with 32 Cubes

m.openup.org/1/6-1-17-2

Your teacher will give you 32 snap cubes. Use them to build the largest single cube you can. Each small cube has an edge length of 1 unit.

1. How many snap cubes did you use?

2. What is the edge length of the cube you built?

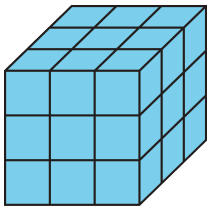
3. What is the area of each face of the built cube? Show your reasoning.

4. What is the volume of the built cube? Show your reasoning.

17.3: Perfect Cubes

1. The number 27 is a perfect **cube**.

   Find four other numbers that are perfect cubes and two numbers that are *not* perfect cubes.



2. A cube has side length 4 cm. What is its volume?

3. A cube has side length 10 inches. What is its volume?

4. A cube has side length s units. What is its volume?

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17.4: Introducing Exponents

Make sure to include correct units of measure as part of each answer.

1. A square has side length 10 cm. Use an **exponent** to express its area.
2. The area of a square is 7^2 sq in. What is its side length?
3. The area of a square is 81 m^2. Use an exponent to express this area.
4. A cube has edge length 5 in. Use an exponent to express its volume.
5. The volume of a cube is 6^3 cm^3. What is its edge length?
6. A cube has edge length s units. Use an exponent to write an expression for its volume.

Are you ready for more?

Find some numbers that are both perfect squares and perfect cubes, and write them using the notation. For example, 1 is both a perfect square because $1 \cdot 1 = 1$ and a perfect cube because $1 \cdot 1 \cdot 1 = 1$, and we can write it like this:

$$1 = 1^2$$

$$1 = 1^3$$

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Lesson 17 Summary

When we multiply two of the same numbers together, such as $5 \cdot 5$, we say we are **squaring** the number. We can write it like this:

$$5^2$$

Because $5 \cdot 5 = 25$, we write $5^2 = 25$ and we say, "5 squared is 25."

When we multiply three of the same numbers together, such as $4 \cdot 4 \cdot 4$, we say we are **cubing** the number. We can write it like this:

$$4^3$$

Because $4 \cdot 4 \cdot 4 = 64$, we write $4^3 = 64$ and we say, "4 cubed is 64."

We also use this notation for square and cubic units.

- A square with side length 5 inches has area 25 in^2.
- A cube with edge length 4 cm has volume 64 cm^3.

To read 25 in^2, we say "25 square inches," just like before.

The area of a square with side length 7 kilometers is 7^2 km^2. The volume of a cube with edge length 2 millimeters is 2^3 mm^3.

In general, the area of a square with side length s is s^2, and the volume of a cube with edge length s is s^3.

Lesson 17 Glossary Terms

- square of a number / squaring a number
- cube of a number / cubing a number
- exponent

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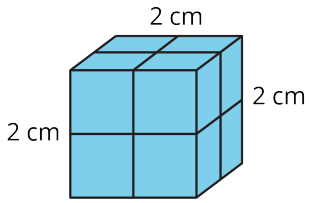
Unit 1, Lesson 17: Squares and Cubes

1. What is the volume of this cube?



2. a. Decide if each number on the list is a perfect square.

A. 16
B. 20
C. 25
D. 100
E. 125
F. 144
G. 225
H. 10,000

b. Write a sentence that explains your reasoning.

3. a. Decide if each number on the list is a perfect cube.

A. 1
B. 3
C. 8
D. 9
E. 27
F. 64
G. 100
H. 125

b. Explain what a perfect cube is.

4. a. A square has side length 4 cm. What is its area?

b. The area of a square is 49 m^2. What is its side length?

c. A cube has edge length 3 in. What is its volume?

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5. Prism A and Prism B are rectangular prisms. Prism A is 3 inches by 2 inches by 1 inch. Prism B is 1 inch by 1 inch by 6 inches.

   Select **all** statements that are true about the two prisms.

   A. They have the same volume.

   B. They have the same number of faces.

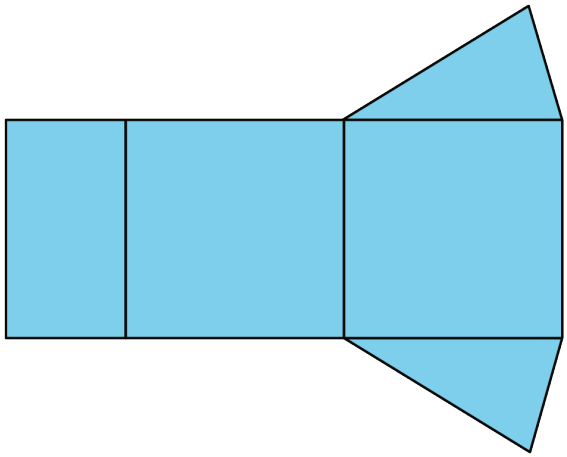
   C. More inch cubes can be packed into Prism A than into Prism B.

   D. The two prisms have the same surface area.

   E. The surface area of Prism B is greater than that of Prism A.

   (from Unit 1, Lesson 16)

6. a. What polyhedron can be assembled from this net?



   b. What information would you need to find its surface area? Be specific, and label the diagram as needed.

   (from Unit 1, Lesson 14)

7. Find the surface area of this triangular prism. All measurements are in meters.

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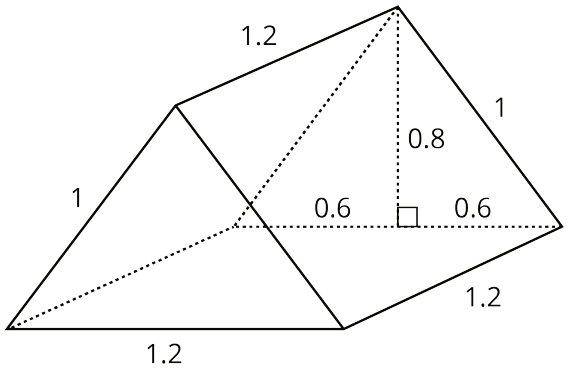

(from Unit 1, Lesson 15)