

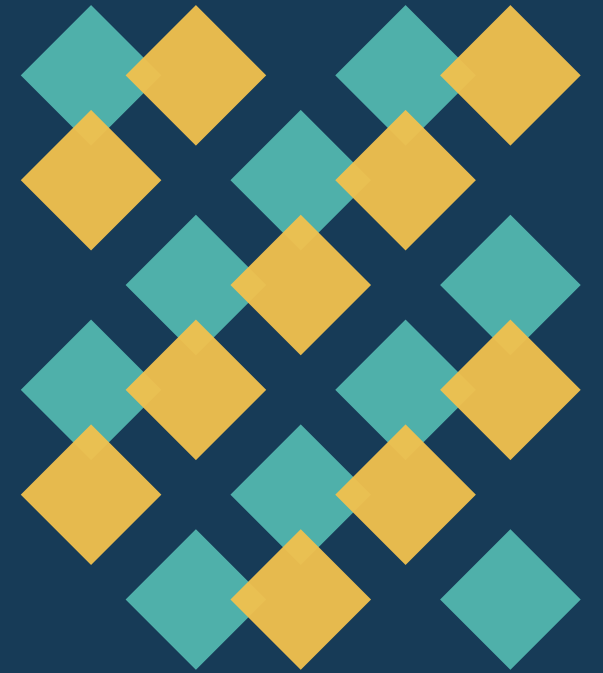
SQUARES & CUBES

Exponents, Cube Nets & Surface Area

Review for Math 6 • Unit 1 • Lessons 17–18

Goal: interpret exponents, recognize perfect squares and cubes, and calculate a cube's surface area and volume.

Access IDEAS presents a customized session for OUSD Math 6.



ACCESS IDEAS
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What are we trying to understand?

Two lessons connect through three big ideas.

1

BUILD

Squares and cubes connect numbers to geometric shapes.

2

REPRESENT

Exponents show repeated equal factors.

3

COMPARE

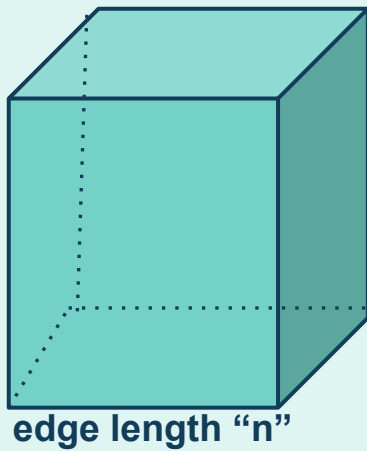
A cube's surface area and volume grow at different rates.

Big idea: n^2 uses two equal factors, while n^3 uses three.

Squares, cubes, and exponents

An exponent tells how many equal factors are multiplied.

ONE CUBE



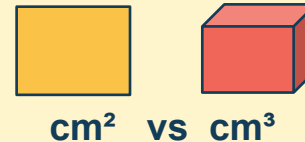
each face is a square

THREE IDEAS TO KNOW

- 1 $n^2 = n \times n$, called “n squared.”
- 2 $n^3 = n \times n \times n$, called “n cubed.”
- 3 The exponent is not a factor you multiply by.

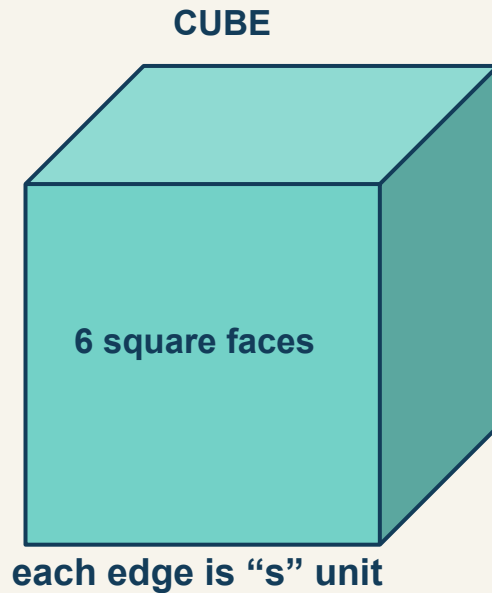
**READ EXPONENTS
CAREFULLY**

$$5^2 = 25$$
$$5^3 = 125$$

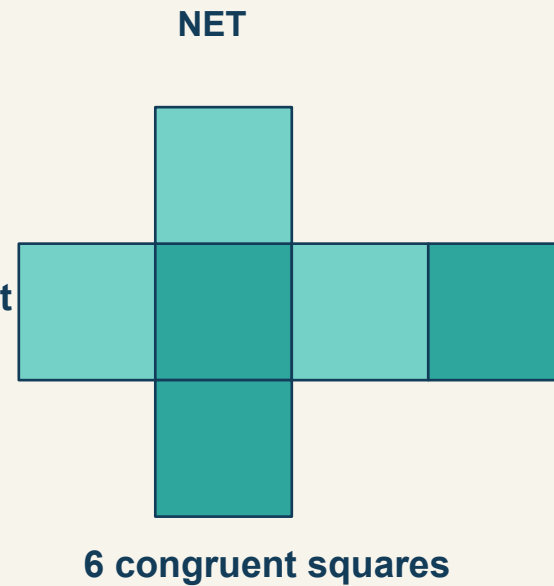


Surface area of a cube

A cube has six identical square faces. A net shows all six.



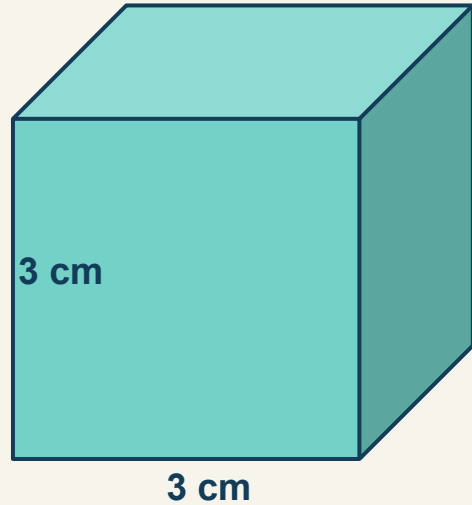
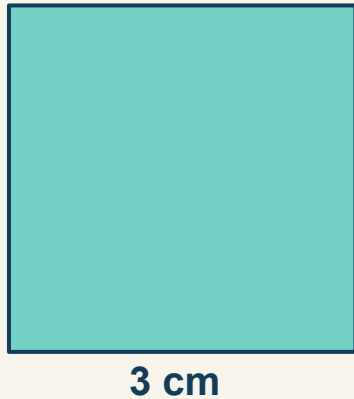
unfold → "s" unit



Each face has area s^2 ,
so the cube's surface area is $6s^2$.
Its volume is s^3 .

Example 1 — Try it first

A square has side length 3 cm. A cube has edge length 3 cm.
Write the area and volume using exponents, then evaluate.



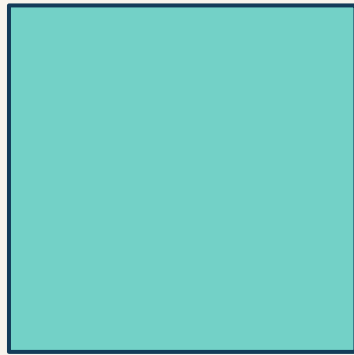
YOUR TURN

**Represent each measure with
an exponent.
Then evaluate.**

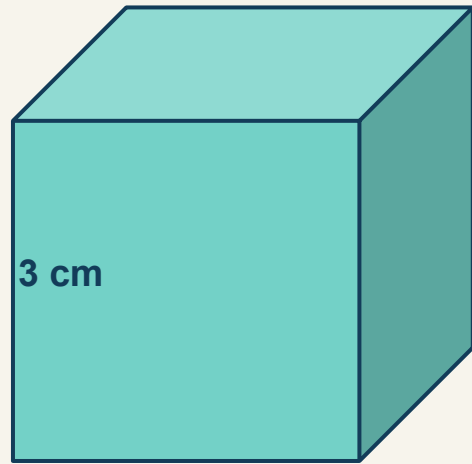
Ask: how many equal factors are
multiplied?

Example 1 — Solution

A square has side length 8 cm. A cube has edge length 3 cm.
Write the area and volume using exponents, then evaluate.



3 cm



3 cm

SOLUTION

Square area:

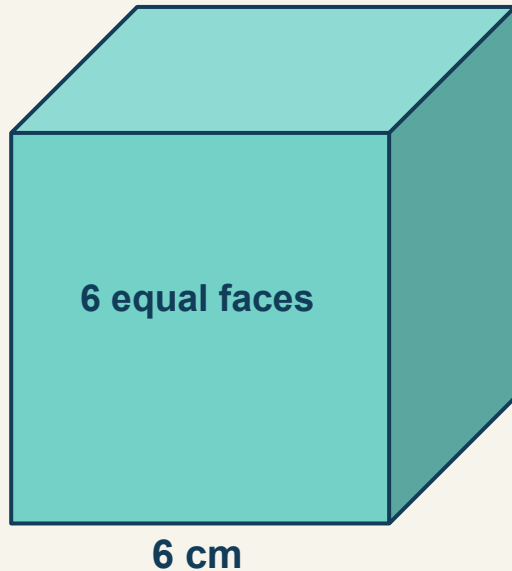
$$3^2 = 3 \times 3 = 9 \text{ cm}^2$$

Cube volume:

$$3^3 = 3 \times 3 \times 3 = 27 \text{ cm}^3$$

Example 2 — Try it first

A cube has edge length 6 cm. Find its surface area and volume.

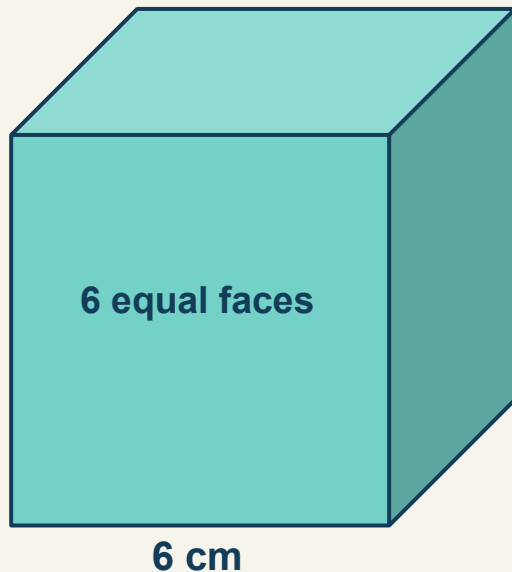


YOUR TURN

Find one face area first.
Then use all six faces.

Example 2 — Step 1: Find one face

A cube has edge length 6 cm. Find its surface area and volume.



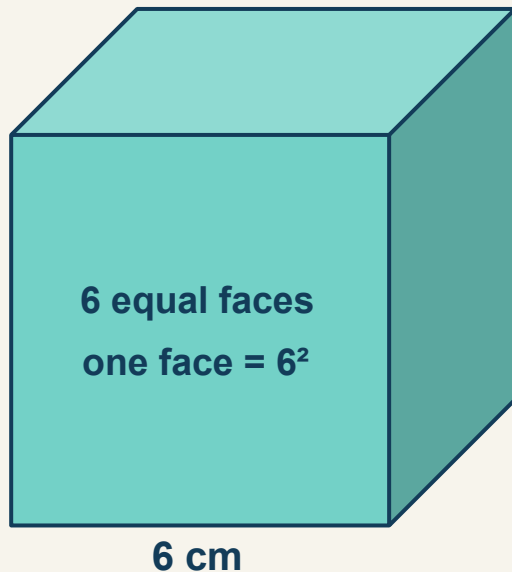
STEP 1: FIND ONE FACE

One face is a square:
 $6^2 = 6 \times 6 = 36 \text{ cm}^2$

Next: account for all six faces.

Example 2 — Solution

A cube has edge length 6 cm. Find its surface area and volume.



SOLUTION

Surface area:

(six squares)

$$6 \times 36 = 216 \text{ cm}^2.$$

Volume: $6^3 = 216 \text{ cm}^3$.

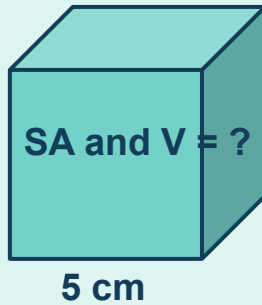
The numbers match here, but the units and meanings differ.

Example 3 — Try it first

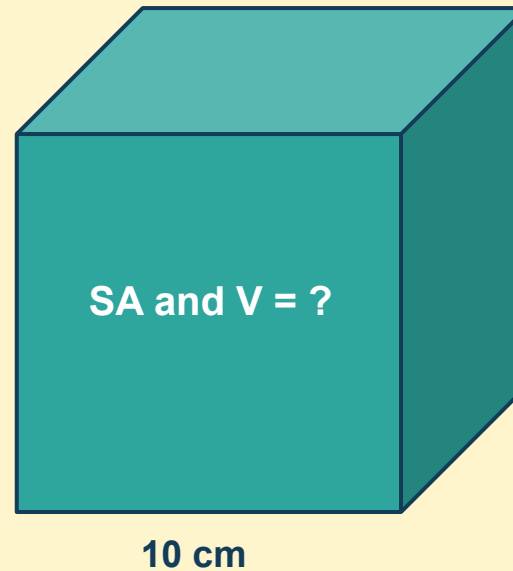
Cube A has edge 5 cm. Cube B has edge 10 cm.

How does doubling the edge affect surface area and volume?

CUBE A



CUBE B

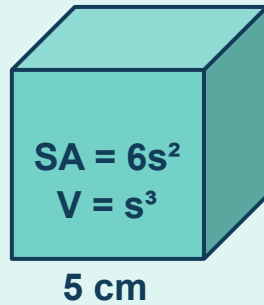


Predict first: will each measure double, quadruple, or multiply by 8?

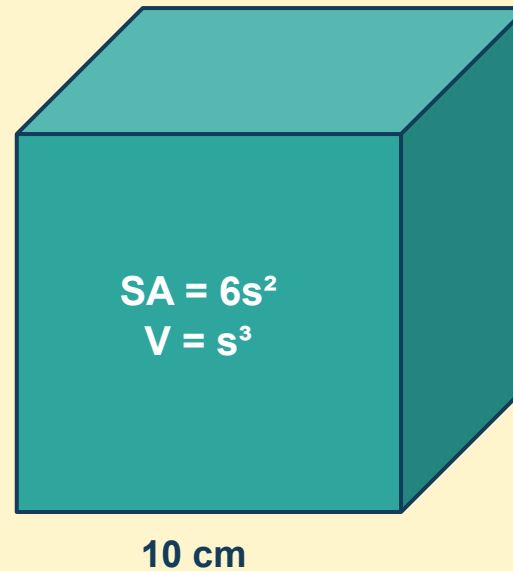
Example 3 — Step 1: Write expressions

Use $6s^2$ for surface area and s^3 for volume.

CUBE A



CUBE B

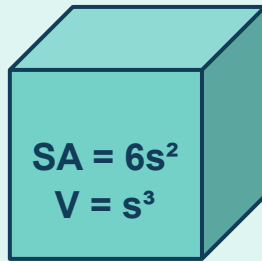


**Substitute 5 for Cube A
and 10 for Cube B.**

Example 3 — Solution

Doubling the edge multiplies surface area by 4 and volume by 8.

CUBE A

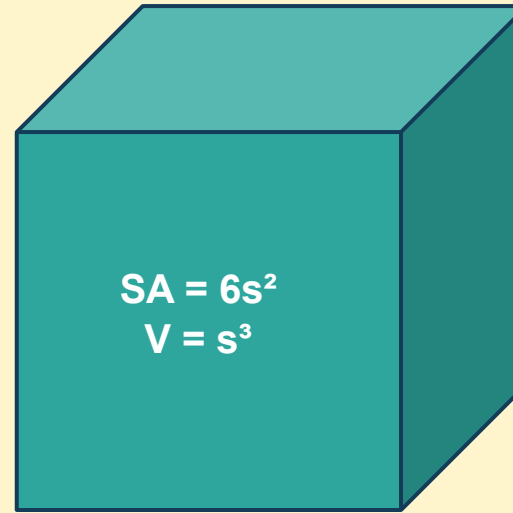


$$SA = 6s^2$$
$$V = s^3$$

5 cm

$$SA = 150 \text{ cm}^2$$
$$V = 125 \text{ cm}^3$$

CUBE B



$$SA = 6s^2$$
$$V = s^3$$

10 cm

$$SA = 600 \text{ cm}^2$$
$$V = 1,000 \text{ cm}^3$$

**Cube B has 4 times the surface area and
8 times the volume of Cube A.**

Common mistakes to avoid

Check the exponent, formula, and units before calculating.

A

The exponent is treated as multiplication by 2 or 3.

3^2 means 3×3 , not 3×2 .
The exponent counts equal factors.

expand powers

identify measure

check units

B

Only one face is used for a cube's surface area.

A cube has six congruent faces, so multiply one face area by 6.

Use square units for area and surface area;
use cubic units for volume.

A cube net helps verify that all six faces are included.

Takeaway + exit ticket

Squares use two equal factors; cubes use three.

1

Interpret the exponent

Write the repeated multiplication.

2

Surface area of a cube

Use $6s^2$ and write square units.

3

Volume of a cube

Use s^3 and write cubic units.

EXIT TICKET

**A cube has edge length 4 m. Find its surface area and volume.
Explain why the exponents and units are different.**

Bonus: sketch a cube net and label every face with its area.



THANK YOU

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