

Volume Shift Lab

Track how one changed dimension changes volume.

GRADE 7 • 7.MG.1.d

7.MG.1.d "Describe how the volume of a rectangular prism is affected when one measured attribute is multiplied by a factor of 14, 13, 12, 2, 3, or 4, including those in contextual situations."

NAME _____

DATE _____

ONE CHANGE, SAME FACTOR

The volume of a rectangular prism is $V = l \times w \times h$. When only one measured attribute is multiplied by a factor, the volume is multiplied by that same factor. For example, doubling one dimension doubles the volume.

WORKED EXAMPLE

A rectangular prism is 11 cm long, 5 cm wide, and 7 cm high. Its length is multiplied by 2. What is the new volume?

1. Original volume = $11 \times 5 \times 7 = 385 \text{ cm}^3$.
2. New length = $11 \times 2 = 22 \text{ cm}$.
3. New volume = $22 \times 5 \times 7 = 770 \text{ cm}^3$.

Answer: 770 cm^3

PRACTICE 6 problems

- 1** A rectangular prism has a volume of 144 cubic units. Its length is multiplied by $1/4$. What is the new volume?

ANSWER _____

- 2** A rectangular prism has a volume of 156 cubic units. Its width is multiplied by $1/3$. What is the new volume?

ANSWER _____

- 3** A rectangular prism has a volume of 324 cubic units. Its height is multiplied by 3. What is the new volume?

ANSWER _____

- 4** A rectangular prism has a volume of 224 cubic units. Its length is multiplied by 4. What is the new volume?

ANSWER _____

- 5** A rectangular prism has a volume of 243 cubic units. Its width is multiplied by $1/3$. What is the new volume?

ANSWER _____

- 6** A rectangular prism has a volume of 360 cubic units. Its height is multiplied by $1/4$. What is the new volume?

ANSWER _____

APPLY IT Show your work

- 1** A student is designing a shipping box for a phone stand. The rectangular box has a volume of 480 cubic centimeters. For a slimmer version, the height is multiplied by $\frac{1}{2}$. What is the volume of the slimmer box?

WORK SPACE

ANSWER _____

- 2** The robotics club has a rectangular display case that is 15 cm long, 12 cm wide, and 9 cm high. For a new design, the width is multiplied by $\frac{1}{3}$. What is the volume of the new display case?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A rectangular prism has a volume of 504 cubic units. Its length is multiplied by 4, and its width is multiplied by $\frac{1}{3}$. What is the new volume? Explain how the two changes affect the volume.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	A rectangular prism has a volume of 144 cubic units. Its length is multiplied by $\frac{1}{4}$. What is the new volume?	36 cubic units, or $\frac{1}{4}$ of the original volume
2	A rectangular prism has a volume of 156 cubic units. Its width is multiplied by $\frac{1}{3}$. What is the new volume?	52 cubic units, or $\frac{1}{3}$ of the original volume
3	A rectangular prism has a volume of 324 cubic units. Its height is multiplied by 3. What is the new volume?	972 cubic units, or 3 times the original volume
4	A rectangular prism has a volume of 224 cubic units. Its length is multiplied by 4. What is the new volume?	896 cubic units, or 4 times the original volume
5	A rectangular prism has a volume of 243 cubic units. Its width is multiplied by $\frac{1}{3}$. What is the new volume?	81 cubic units, or $\frac{1}{3}$ of the original volume
6	A rectangular prism has a volume of 360 cubic units. Its height is multiplied by $\frac{1}{4}$. What is the new volume?	90 cubic units, or $\frac{1}{4}$ of the original volume

PART 2 • APPLY IT

- 240 cubic centimeters** Only the height changes, so the volume is multiplied by $\frac{1}{2}$. Calculate $480 \times \frac{1}{2} = 240$.
- 540 cubic centimeters** The original volume is $15 \times 12 \times 9 = 1620$ cubic centimeters. Multiplying the width by $\frac{1}{3}$ multiplies the volume by $\frac{1}{3}$, so $1620 \times \frac{1}{3} = 540$.

CHALLENGE

672 cubic units. The volume is multiplied by $4 \times \frac{1}{3} = \frac{4}{3}$, so $504 \times \frac{4}{3} = 672$.

Accept equivalent wording that correctly states the scale factor for the volume. For the challenge, students should show that changing two attributes means multiplying both factors together.