GRADE 7 · UNIT 5 · LESSON 6

Scale Factors — Area

MA.7.GR.1.5

I can use a scale factor to find the area of a scaled copy, and say why area uses k squared.

Warm-Up

1. A side of 6 cm becomes 21 cm. Find the scale factor.
2. 35% of a random sample said yes. Predict for 1,200.
3. Find the median: 25, 31, 18, 40, 22, 35, 29
4. Area of a rectangle 7 cm by 5 cm?

Warm-Up

1. A side of 6 cm becomes 21 cm. Find the scale factor. **3.5**
2. 35% of a random sample said yes. Predict for 1,200. **420**
3. Find the median: 25, 31, 18, 40, 22, 35, 29 **29**
4. Area of a rectangle 7 cm by 5 cm? **35 cm^2**

Vocabulary

scale factor

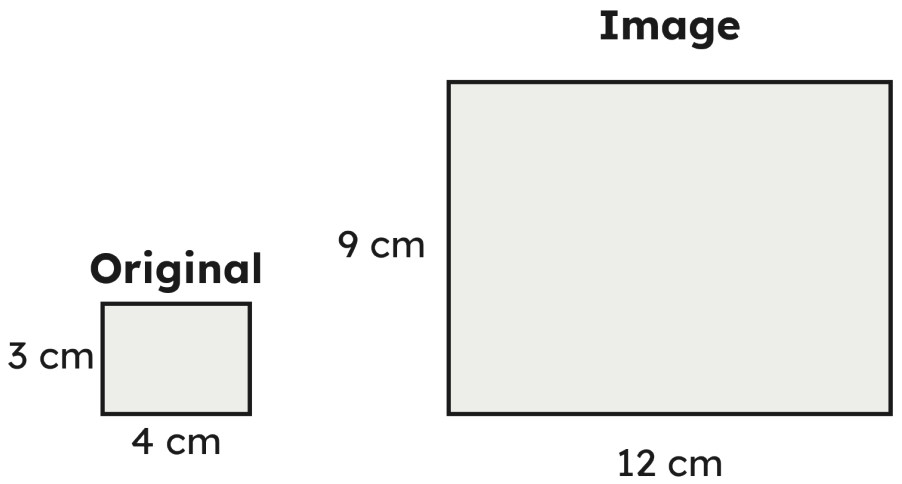
the number every length is multiplied by, from the original to the image

square units

the units of an area — cm^2, m^2 — and the clue to why the factor is squared

Notes

I. Count the area before the rule



Areas, in cm^2: $4 \cdot 3 = 12$ $12 \cdot 9 = 108$ $\frac{108}{12} = 9 = 3^2$

Notes

II. Two rules, and the units tell you which

A length (side, perimeter, height; cm, m, in.) is multiplied by k.

An area (cm^2, m^2, in^2) is multiplied by k^2.

A rectangle is $\ell \cdot w$; both are scaled, so the area gets $k \cdot k$.

Notes

III. Shrinking shrinks faster

$k = \frac{1}{3}$: length $\cdot \frac{1}{3}$ area $\cdot \frac{1}{9}$

Example 1

A 5 cm by 2 cm rectangle is scaled by k = 3.

Find the area of the original and of the copy, then compare them.

Example 1

$$5 \cdot 2 = 10$$

$$15 \cdot 6 = 90$$

$$\frac{90}{10} = 9 = 3^2$$

Answer: 10 cm² and 90 cm² — nine times, which is 3^2

Your Turn

A 6 cm by 2 cm rectangle is scaled by k = 4.

Find the area of the original and of the copy, then compare them.

Your Turn

A 6 cm by 2 cm rectangle is scaled by k = 4.

Find the area of the original and of the copy, then compare them.

Original: $6 \cdot 2 = 12$

Copy: $24 \cdot 8 = 192$

$$\frac{192}{12} = 16 = 4^2$$

Answer: 12 cm² and 192 cm² — 16 times, which is 4^2

Example 2

A copy was made with a scale factor of 3.

The copy's area is 180 cm^2.

What was the area of the original?

Example 2

$k^2 = 3^2 = 9$

$180 \div 9 = 20$

$20 \cdot 9 = 180$

Answer: 20 cm²

Your Turn

A copy was made with a scale factor of 3.

The copy's area is 153 cm^2. Find the original's area.

Your Turn

A copy was made with a scale factor of 3.

The copy's area is 153 cm^2. Find the original's area.

$$k \cdot k = 3 \cdot 3 = 9$$

Original: $153 \div 9 = 17$

Check: $17 \cdot 9 = 153$

Answer: 17 cm^2

Whiteboards · Question 1 of 9

A rectangle is 6 cm by 4 cm.

Find its area.

Answer it.

Whiteboards · Question 1 of 9

A rectangle is 6 cm by 4 cm.

Find its area.

$$6 \cdot 4 = 24$$

Answer: 24 cm^2

Whiteboards · Question 2 of 9

That 24 cm^2 rectangle is scaled by k = 2.5.

Find the area of the copy.

Answer it.

Whiteboards · Question 2 of 9

That 24 cm² rectangle is scaled by k = 2.5.

Find the area of the copy.

$$k \cdot k = 2.5 \cdot 2.5 = 6.25$$

$$24 \cdot 6.25 = 150$$

Answer: 150 cm²

Whiteboards · Question 3 of 9

A figure is scaled by k = 4.

Which pair is right?

A. perimeter times 4, area times 4

B. perimeter times 16, area times 4

C. perimeter times 16, area times 16

D. perimeter times 4, area times 16

Answer it.

Whiteboards · Question 3 of 9

A figure is scaled by k = 4.

Which pair is right?

Perimeter is a length: multiply by 4.

Area uses two lengths: $4 \cdot 4 = 16$

Answer: D — perimeter times 4, area times 16

Whiteboards · Question 4 of 9

A shape has an area of 36 cm^2.

It is scaled by $k = \frac{1}{3}$.

Find the new area.

Answer it.

Whiteboards · Question 4 of 9

A shape has an area of 36 cm^2.

It is scaled by $k = \frac{1}{3}$.

Find the new area.

$$k \cdot k = \frac{1}{3} \cdot \frac{1}{3} = \frac{1}{9}$$

$$36 \cdot \frac{1}{9} = 4$$

Answer: 4 cm^2

Whiteboards · Question 5 of 9

A copy was made with a scale factor of 4. The copy's area is 208 cm^2.

Find the area of the original.

Answer it.

Whiteboards · Question 5 of 9

A copy was made with a scale factor of 4. The copy's area is 208 cm².

Find the area of the original.

$$k \cdot k = 4 \cdot 4 = 16$$

Original: $208 \div 16 = 13$

Answer: 13 cm²

Whiteboards · Question 6 of 9

"Every side is 5 times as long, so the area is 5 times as big."

What is wrong?

A. The area is 25 times as big: both dimensions are scaled.

B. The area does not change.

C. Nothing — the area is 5 times as big.

D. The area is 10 times as big, because 5 + 5.

Answer it.

Whiteboards · Question 6 of 9

“Every side is 5 times as long, so the area is 5 times as big.”

What is wrong?

Both the length and the width are 5 times as long.

$5 \cdot 5 = 25$

Answer: A — multiplied by 25

Whiteboards · Question 7 of 9

Over 5 drawings, a shape of area 55 in^2 was scaled by k = 3.

Find the area of the copy.

Answer it.

Whiteboards · Question 7 of 9

Over 5 drawings, a shape of area 55 in² was scaled by k = 3.

Find the area of the copy.

$$k \cdot k = 3 \cdot 3 = 9$$

$$55 \cdot 9 = 495$$

Answer: 495 in²

Whiteboards · Question 8 of 9

A figure's perimeter goes from 20 cm to 60 cm. Its original area is 21 cm^2.

Find the area of the copy.

Answer it.

Whiteboards · Question 8 of 9

A figure's perimeter goes from 20 cm to 60 cm. Its original area is 21 cm^2.

Find the area of the copy.

Scale factor from the perimeters: $60 \div 20 = 3$

$k \cdot k = 3 \cdot 3 = 9$

$21 \cdot 9 = 189$

Answer: 189 cm^2

Whiteboards · Question 9 of 9

Every side of a rectangle is multiplied by 4.

Explain why the area is multiplied by 16, without using an example.

Write your answer in sentences.

Whiteboards · Question 9 of 9

Every side of a rectangle is multiplied by 4.

Explain why the area is multiplied by 16, without using an example.

$$\text{New area} = (4 \cdot \text{length})(4 \cdot \text{width})$$

$$4 \cdot 4 = 16, \text{ so it is } 16 \cdot (\text{length} \cdot \text{width}).$$

Answer: Length and width are both multiplied by 4, so the area is multiplied by 16.

Independent Practice

1. A rectangle is 12 cm by 5 cm. Find its area.

2. That rectangle is scaled by k = 4. Find the area of the copy.

3. The same 60 cm^2 rectangle is scaled by k = 3 instead. Find the area of the copy.

4. Across 3 posters, a shape of area 28 in^2 was scaled by k = 1/2. Find the new area.

5. A copy was made with k = 5. Its area is 400 cm^2. Find the original's area, and show the forward check.

6. A student says a figure scaled by 6 has 6 times the area. In one sentence, say what is wrong and give the right factor.

Before You Go

Length times k. Area times k times k.

The units tell you which one to use.

Next: drawing a scaled copy on a grid.

IXL

1. Open IXL and start today's skills.
2. Work on paper where the question needs work. The answer box does not show it.
3. Every skill listed is required, to a SmartScore of 60. Due by the Unit 5 test.

Today's skills — all required

Perimeter and area: changes in scale (ZC6)