GRADE 7 ACCELERATED · UNIT 5 · LESSONS 2–3

Scale Factor: Perimeter and Area

MA.7.GR.1.5

I can find the perimeter and the area of a scale copy from the original and k, and find k from two areas.

Warm-Up

1. A 20 cm side becomes 8 cm in the copy. Find the scale factor.
2. Find the value: $\sqrt{144}$
3. Find the values: 3^2 and 3^3
4. Find the perimeter and the area of a 3 cm by 5 cm rectangle.

Warm-Up

1. A 20 cm side becomes 8 cm in the copy. Find the scale factor.

   k = 0.4

2. Find the value: $\sqrt{144}$ **12**

3. Find the values: 3^2 and 3^3 **9 and 27**

4. Find the perimeter and the area of a 3 cm by 5 cm rectangle.

   P = 16 cm, A = 15 cm²

Vocabulary

k squared

k^2, k times k: what an area is multiplied by when every length is multiplied by k

perimeter ratio

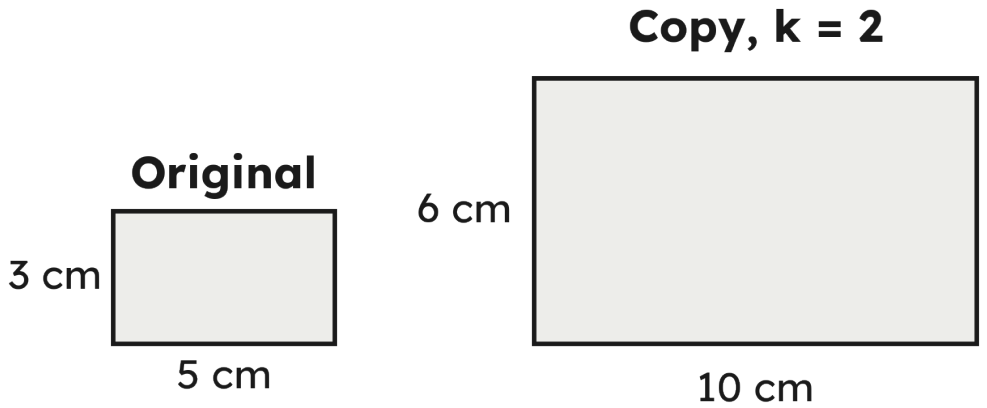
copy's perimeter ÷ original's perimeter — it equals k

area ratio

copy's area ÷ original's area — it equals k^2

Notes

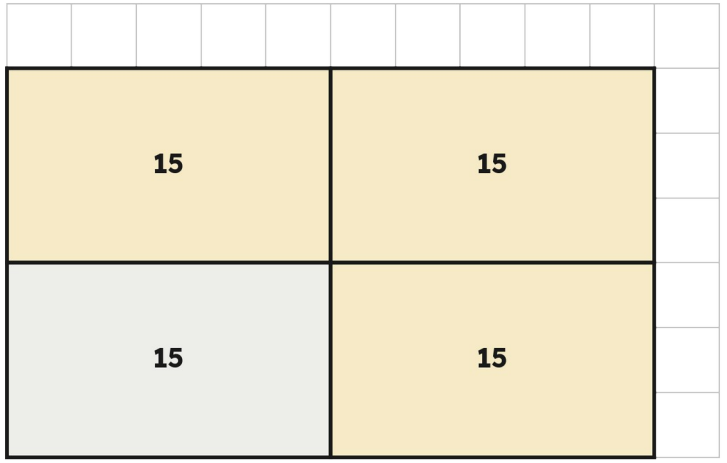
I. Every side × k, so the perimeter × k



$P : 16 \rightarrow 32$ $\qquad$ $32 \div 16 = 2 = k$

Notes

II. Area is two lengths, so the area × k × k



the copy, 10 by 6, holds four of the original

$$A : 15 \rightarrow 60 \qquad 60 \div 15 = 4 = k^2$$

Notes

III. From two areas back to k: a square root

$$\frac{180}{20} = 9 = k^2 \qquad k = \sqrt{9} = 3 \qquad 4 \text{ cm} \times 3 = 12 \text{ cm}$$

Area ratio = k^2. k = the square root of the area ratio.

Example 1

A 2 cm by 4 cm rectangle is scaled by $k = 3$.

Find the copy's perimeter and area.

Example 1

$P = 2(2 + 4) = 12$ $\quad 12 \times 3 = 36$

$A = 2 \times 4 = 8$ $\quad 8 \times 3^2 = 72$

Answer: $P = 36$ cm, $A = 72$ cm²

Your Turn

A 3 cm by 6 cm rectangle is scaled by $k = 4$.

Find the copy's perimeter and area.

Your Turn

A 3 cm by 6 cm rectangle is scaled by $k = 4$.

Find the copy's perimeter and area.

$$P = 18 \times 4 = 72$$

$$A = 18 \times 4^2 = 18 \times 16 = 288$$

Answer: $P = 72$ cm, $A = 288$ cm²

Example 2

A figure has area $15\,\text{cm}^2$.

Its scale copy has area $240\,\text{cm}^2$.

A side of the original is 3 cm.

Find k, then the matching side of the copy.

Example 2

$$\frac{240}{15} = 16 = k^2$$

$$k = \sqrt{16} = 4 \qquad 3 \times 4 = 12$$

Answer: k = 4; the side is 12 cm

Your Turn

A figure has area $12\,\text{cm}^2$.

Its scale copy has area $300\,\text{cm}^2$.

A side of the original is 2 cm.

Find k, then the matching side of the copy.

Your Turn

A figure has area $12\,\text{cm}^2$.

Its scale copy has area $300\,\text{cm}^2$.

A side of the original is 2 cm.

Find k, then the matching side of the copy.

$$\frac{300}{12} = 25 = k^2$$

$$k = \sqrt{25} = 5 \qquad 2 \times 5 = 10$$

Answer: k = 5; the side is 10 cm

Whiteboards · Question 1 of 9

A figure with perimeter 14 cm is scaled by $k = 2$.

What is the copy's perimeter?

Answer it.

Whiteboards · Question 1 of 9

A figure with perimeter 14 cm is scaled by $k = 2$.

What is the copy's perimeter?

$$14 \times 2 = 28$$

Answer: 28 cm

Whiteboards · Question 2 of 9

A figure with area $12\,\text{cm}^2$ is scaled by $k = 2$.

What is the copy's area?

Answer it.

Whiteboards · Question 2 of 9

A figure with area $12\,\text{cm}^2$ is scaled by $k = 2$.

What is the copy's area?

$$12 \times 2^2 = 12 \times 4 = 48$$

Answer: 48 cm²

Whiteboards · Question 3 of 9

A figure with area $48\,\text{cm}^2$ is scaled by $k = \frac{1}{2}$.

What is the copy's area?

Answer it.

Whiteboards · Question 3 of 9

A figure with area $48\,\text{cm}^2$ is scaled by $k = \frac{1}{2}$.

What is the copy's area?

$$48 \times \left(\frac{1}{2}\right)^2 = 48 \times \frac{1}{4} = 12$$

Answer: 12 cm²

Whiteboards · Question 4 of 9

A figure with area $10\,\text{cm}^2$ is scaled by $k = 3$.

What is the copy's area?

A. 90

B. 60

C. 30

D. 13

Answer it.

Whiteboards · Question 4 of 9

A figure with area $10\,\text{cm}^2$ is scaled by $k = 3$.

What is the copy's area?

$$10 \times 3^2 = 10 \times 9 = 90$$

Answer: A — 90 cm²

Whiteboards · Question 5 of 9

A figure with area $8\,\text{cm}^2$ is scaled by $k = 1.5$.

What is the copy's area?

Answer it.

Whiteboards · Question 5 of 9

A figure with area $8\,\text{cm}^2$ is scaled by $k = 1.5$.

What is the copy's area?

$$1.5^2 = 2.25$$

$$8 \times 2.25 = 18$$

Answer: 18 cm²

Whiteboards · Question 6 of 9

A figure's perimeter is 20 cm; its copy's perimeter is 60 cm.

What is the area ratio, copy to original?

A. 6

B. 3

C. 40

D. 9

Answer it.

Whiteboards · Question 6 of 9

A figure's perimeter is 20 cm; its copy's perimeter is 60 cm.

What is the area ratio, copy to original?

$k = \frac{60}{20} = 3$: the perimeter ratio is k

$k^2 = 9$: the area ratio

Answer: D — 9

Whiteboards · Question 7 of 9

A triangle with sides 6, 8 and 10 cm is scaled by $k = \frac{1}{2}$.

Its area is $24\,\text{cm}^2$.

Find the copy's perimeter and area.

Answer it.

Whiteboards · Question 7 of 9

A triangle with sides 6, 8 and 10 cm is scaled by $k = \frac{1}{2}$.

Its area is $24\,\text{cm}^2$.

Find the copy's perimeter and area.

$$P = 24 \times \frac{1}{2} = 12$$

$$A = 24 \times \frac{1}{4} = 6$$

Answer: P = 12 cm, A = 6 cm²

Whiteboards · Question 8 of 9

A 4 in by 6 in photo, taken 3 years ago, is enlarged at $k = 2.5$.

What is the enlargement's area?

Answer it.

Whiteboards · Question 8 of 9

A 4 in by 6 in photo, taken 3 years ago, is enlarged at $k = 2.5$.

What is the enlargement's area?

$$A = 4 \times 6 = 24$$

$$24 \times 2.5^2 = 24 \times 6.25 = 150$$

Answer: 150 in²

Whiteboards · Question 9 of 9

Jo says that doubling every side of a rectangle doubles its area.

Explain why not, with a counterexample.

Write your answer in sentences.

Whiteboards · Question 9 of 9

Jo says that doubling every side of a rectangle doubles its area.

Explain why not, with a counterexample.

$$2 \times 7 = 14 \quad 4 \times 14 = 56 \quad 56 \div 14 = 4$$

Answer: No: 2 by 7 doubled is 4 by 14, area 14 → 56 — × 4, as both lengths doubled.

Independent Set

1. A figure with perimeter 18 cm is scaled by $k = 3$. Find the copy's perimeter.
2. A figure with area $7\,\text{cm}^2$ is scaled by $k = 3$. Find the copy's area.
3. A figure with area $40\,\text{cm}^2$ is scaled by $k = \frac{1}{2}$. Find the copy's area.
4. A 2 cm by 5 cm rectangle is scaled by $k = 2.5$. Find the copy's perimeter and area.
5. A figure has area $9\,\text{cm}^2$ and its scale copy has area $144\,\text{cm}^2$. Find k.
6. A figure's perimeter is 12 cm and its copy's perimeter is 48 cm. What is the area ratio, copy to original?

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 67. Due by the Unit 5 test.

Today's skills — all required

Perimeter and area: changes in scale — ZC6

Scale drawings: find the scale factor or missing side — XHM