SCALE DRAWINGS

Scaled Copies, Factors & Area

Review for Math 7 • Unit 1 • Lessons 1–6

Goal: recognize, create, and reason about scaled copies—and predict how scaling changes area.

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What are we trying to understand?

Six lessons connect through three big ideas.

1

RECOGNIZE

A scaled copy multiplies every length by the same factor.

2

CREATE

Multiply corresponding lengths—never add the same amount.

3

REASON

Angles stay equal; area changes by the factor squared.

Big idea: one scale factor controls every corresponding distance.

Lessons 1–3: build the foundation

Each lesson adds one tool for working with scaled copies.

1

LESSON 1

Identify scaled copies by checking that shape is preserved.

2

LESSON 2

Match corresponding parts and determine the scale factor.

3

LESSON 3

Create scaled copies by multiplying every length.

Use the same multiplier for every corresponding length.

Lessons 4–6: reason with relationships

These lessons move from checking copies to predicting area.

1

LESSON 4

Verify equal corresponding angles and proportional distances.

2

LESSON 5

Predict whether a factor makes a copy larger, smaller, or equal.

3

LESSON 6

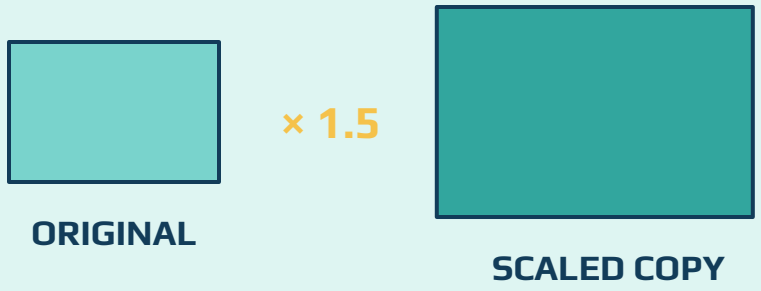
Explain why area changes by the square of the scale factor.

Lengths change by k; areas change by k^2.

A scaled copy uses one multiplier

Every length in the original is multiplied by the same number.

ONE RULE



same shape

all lengths × k

CHECK THREE THINGS

1. Corresponding points match.
2. Corresponding angles are equal.
3. Corresponding lengths share one factor.

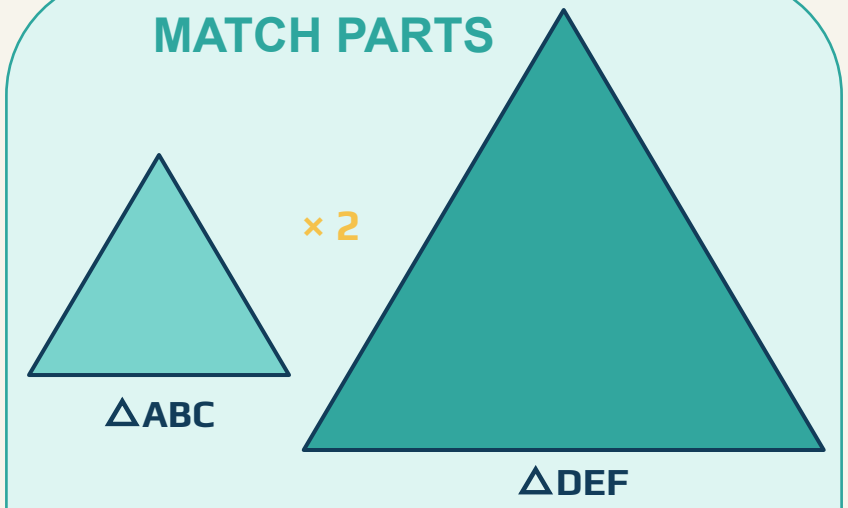
NOT A SCALED COPY: **stretched** **squished** **added**

Changing only one direction changes the shape.

Corresponding parts stay matched

Points, segments, angles, and distances can correspond.

MATCH PARTS



△ABC ↔ △DEF

A↔D, B↔E, C↔F

SCALE FACTOR k

1. copy length ÷ original length
2. Use any corresponding pair.
3. Verify with another pair.

ANGLES DO NOT SCALE

same measure

same order

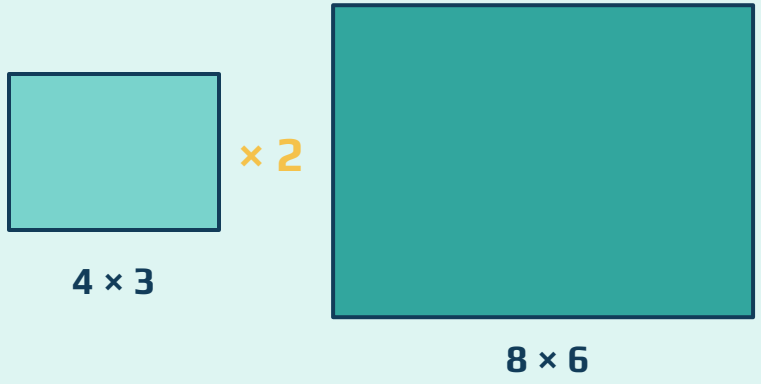
same shape

Only lengths are multiplied by k.

To make a copy, multiply every length

A scale factor changes size while preserving the figure's shape.

MAKE A COPY



original 4 by 3

factor 2 → 8 by 6

USE THIS PROCESS

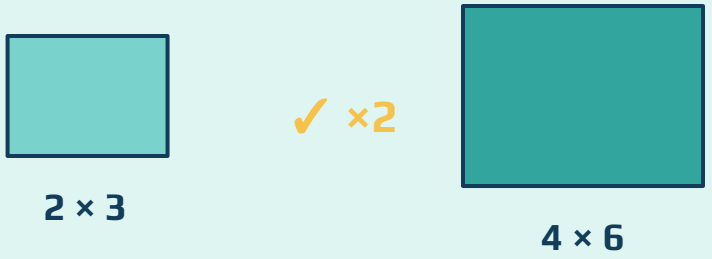
1. Choose corresponding points.
2. Multiply every distance by k.
3. Connect points in the same order.

Do not add.
Adding the same amount is not scaling.

Two checks confirm a scaled relationship

Equal angles alone are not enough; length ratios must also agree.

VERIFY



Same angles + same ratio

check angles

check length ratios

A TRUE SCALED COPY

1. Angles match.
2. All length ratios equal k.
3. Vertex order corresponds.

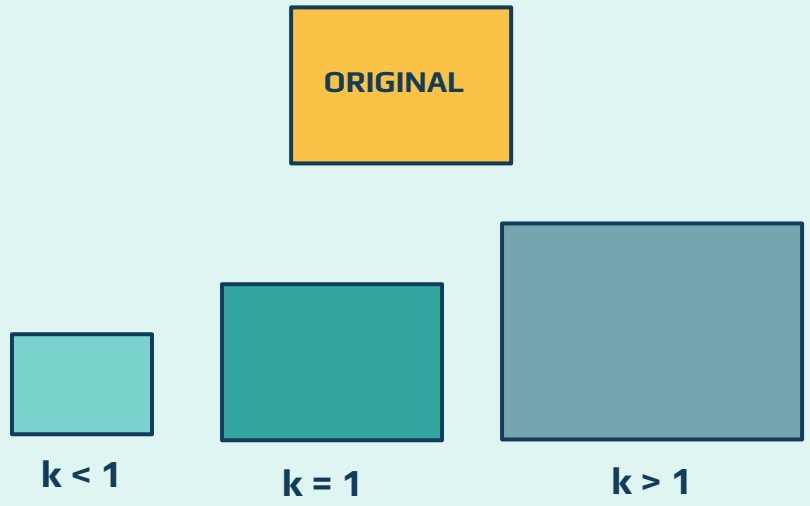
WARNING SIGNS: **different ratios** **one side changed** **distorted**

One failed ratio proves it is not scaled.

The factor predicts the copy's size

Compare k with 1 before calculating every length.

SIZE EFFECT



THREE CASES

1. 0 < k < 1: smaller
2. k = 1: same size
3. k > 1: larger

REVERSE FACTORS

1/2 ↔ 2

2/3 ↔ 3/2

reciprocals

Reversing direction uses the reciprocal factor.

Lengths scale by k; areas scale by k²

Scaling both dimensions multiplies area twice.

4 × 2
Area = 8

× 3

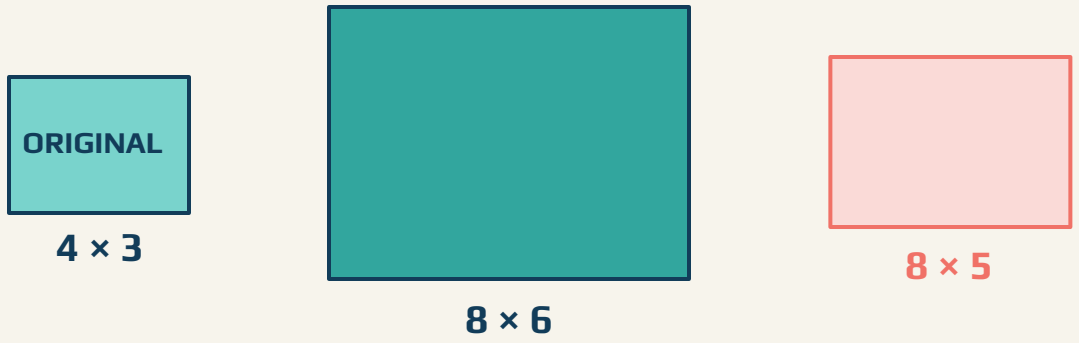
12 × 6
Area = 72

lengths × 3 • area × 9

**Because area uses two dimensions,
the area factor is k × k = k².**

Example 1 — Try it first

Original is 4 by 3. Copy A is 8 by 6. Copy B is 8 by 5. Which figure is a scaled copy?



YOUR TURN

Choose Copy A or Copy B. Be ready to justify your choice.

Start with a pair of corresponding lengths.

Example 1 — Step 1: Compare one pair

Original is 4 by 3. Copy A is 8 by 6. Copy B is 8 by 5. Which figure is a scaled copy?

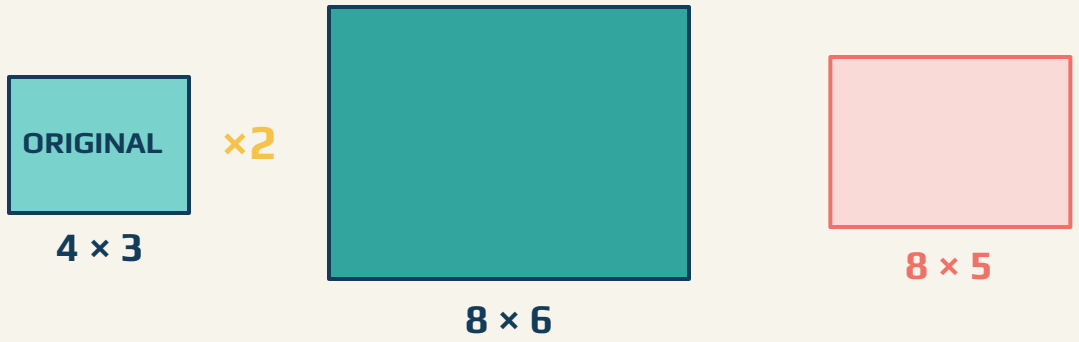
STEP 1: FIND A FACTOR

4 → 8 gives a factor of 2.

Next: test the other dimension.

Example 1 — Step 2: Verify the factor

Original is 4 by 3. Copy A is 8 by 6. Copy B is 8 by 5. Which figure is a scaled copy?



STEP 2: CHECK BOTH DIMENSIONS

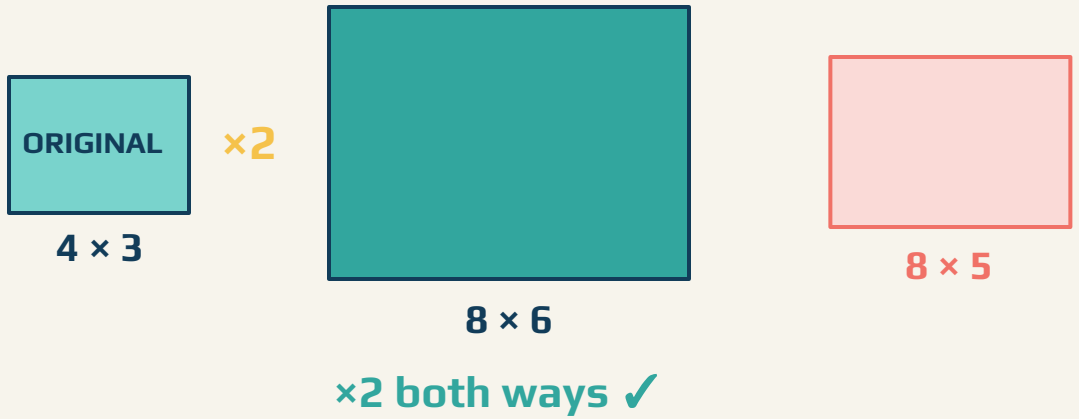
For Copy A:
3 → 6 is also ×2

For Copy B:
3 → 5 is not ×2

The ratios agree only for Copy A.

Example 1 — Solution

Original is 4 by 3. Copy A is 8 by 6. Copy B is 8 by 5. Which figure is a scaled copy?



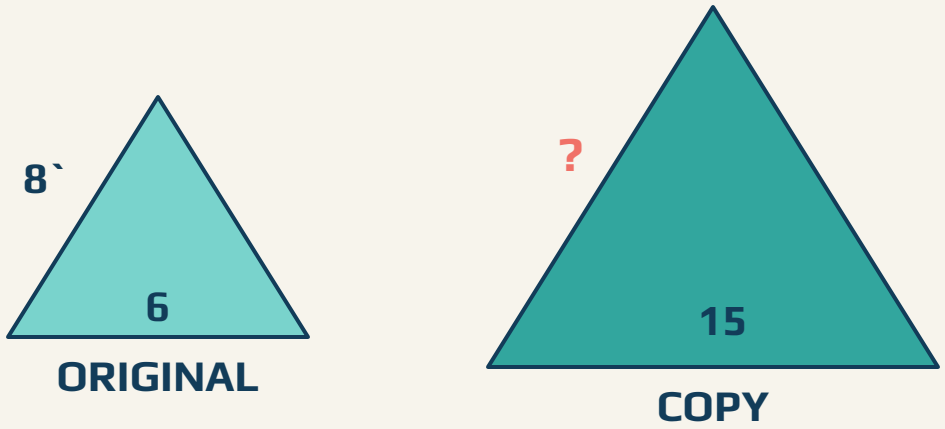
SOLUTION

Copy A is scaled.
Factor = 2.

Both dimensions use ×2.

Example 2 — Try it first

A copy has a corresponding side of 15 when the original side is 6.
If another original distance is 8, what is its copied distance?



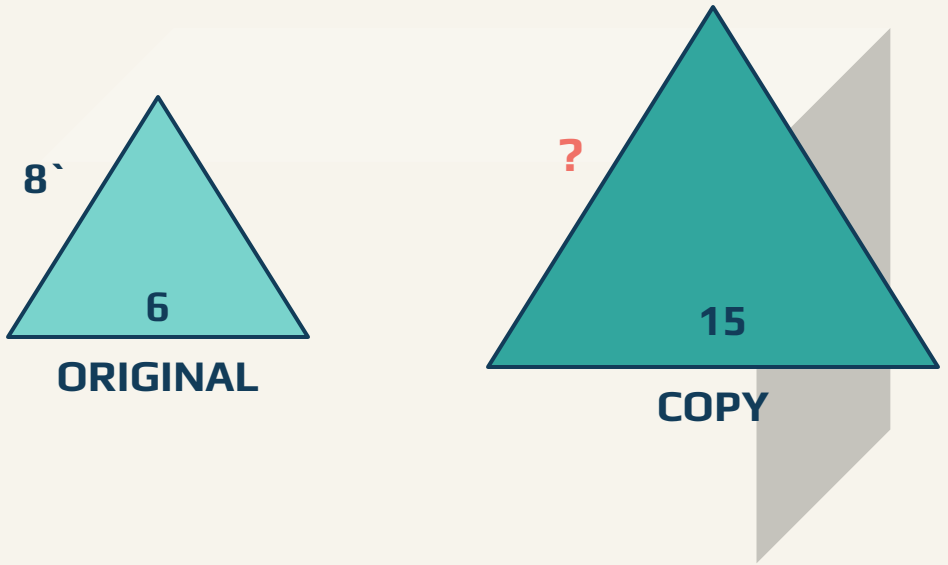
YOUR TURN

Find the scale factor first.
Then use it on 8.

Write copy ÷ original.

Example 2 — Step 1: Find the factor

A copy has a corresponding side of 15 when the original side is 6.
If another original distance is 8, what is its copied distance?



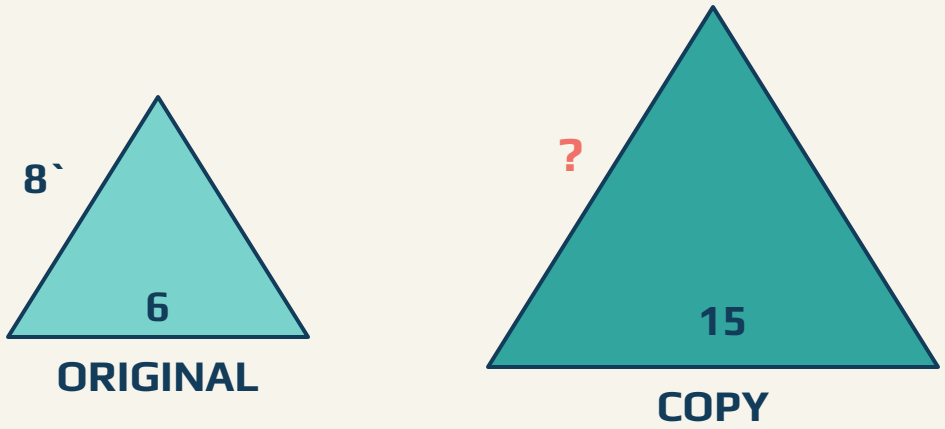
STEP 1: FIND k

k = copy ÷ original
k = 15 ÷ 6 = 2.5

Next: apply k to 8.

Example 2 — Step 2: Scale the distance

A copy has a corresponding side of 15 when the original side is 6.
If another original distance is 8, what is its copied distance?



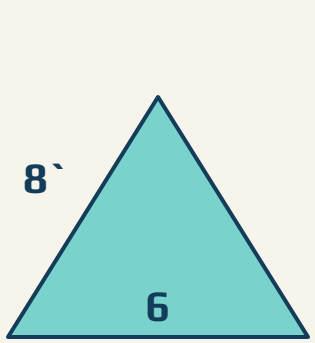
STEP 2: MULTIPLY

$$8 \times 2.5 = 20$$

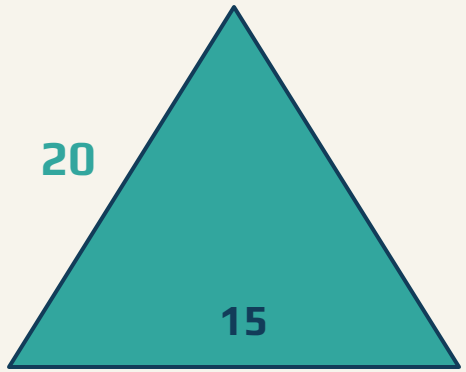
Check: 20 ÷ 8 = 2.5.

Example 2 — Solution

A copy has a corresponding side of 15 when the original side is 6.
If another original distance is 8, what is its copied distance?



ORIGINAL



COPY

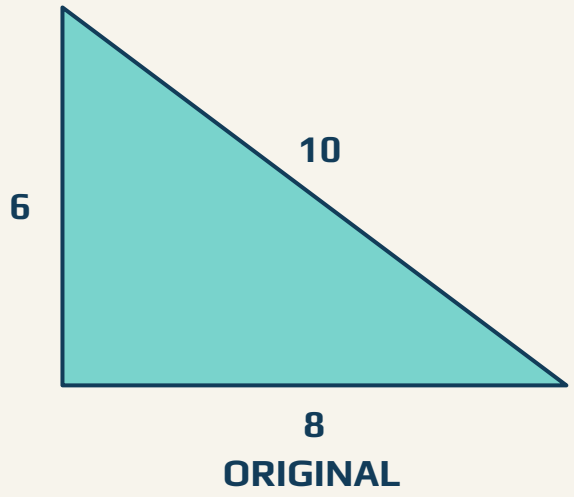
SOLUTION

Copied distance = 20.
Factor = 2.5.

20 ÷ 8 = 2.5.

Example 3 — Try it first

A triangle has side lengths 6, 8, and 10.
Make a scaled copy using scale factor 1/2.



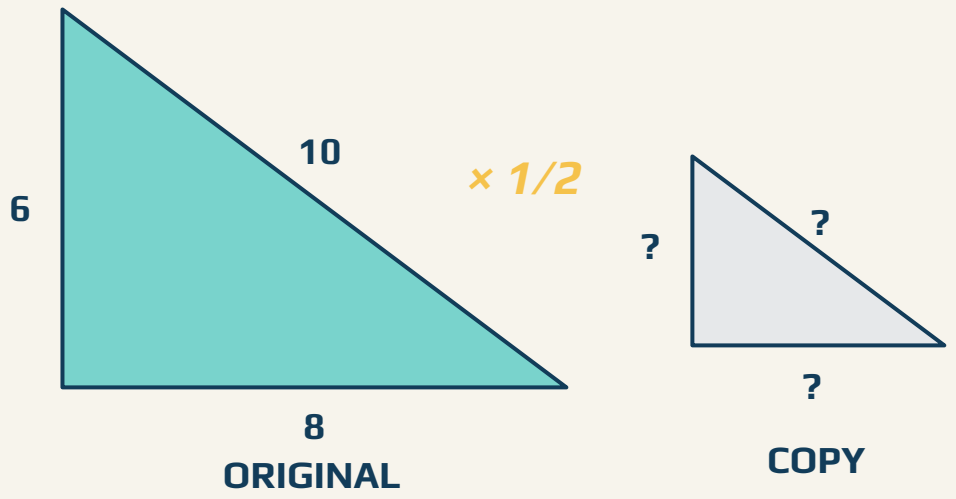
YOUR TURN

Predict first: will the copy be larger or smaller?

Do not subtract the same amount.

Example 3 — Step 1: Use the factor

A triangle has side lengths 6, 8, and 10.
Make a scaled copy using scale factor 1/2.



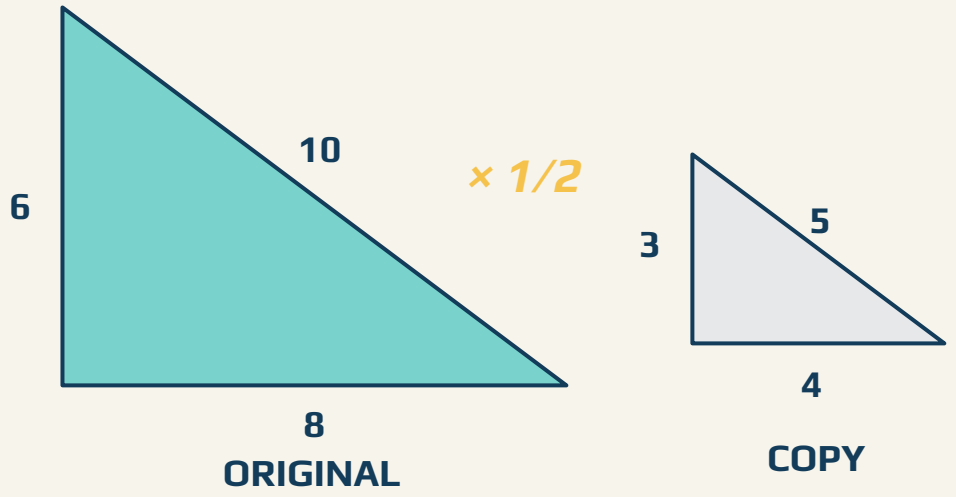
STEP 1: MULTIPLY

Multiply every length by 1/2.

Next: calculate all three products.

Example 3 — Step 2: Calculate each side

A triangle has side lengths 6, 8, and 10.
Make a scaled copy using scale factor 1/2.



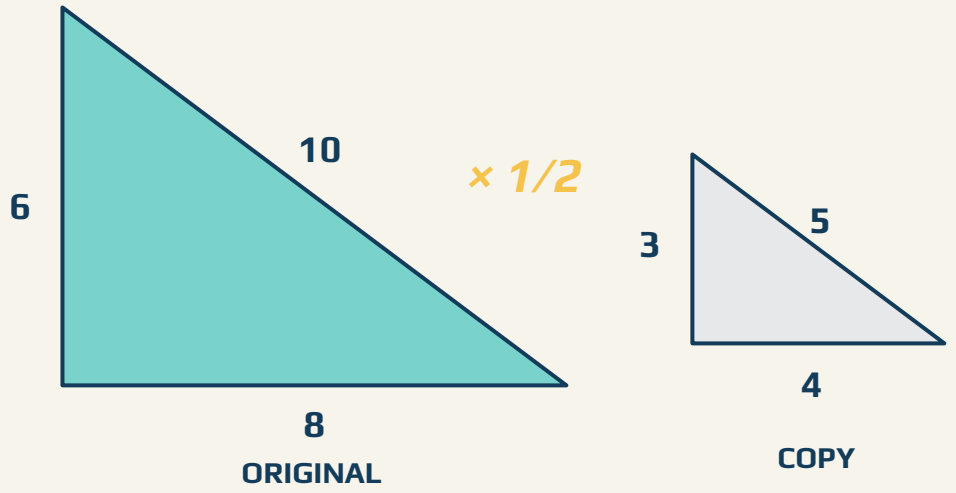
STEP 2: NEW LENGTHS

$6 \times 1/2 = 3$
$8 \times 1/2 = 4$
$10 \times 1/2 = 5$

All three lengths use the same factor.

Example 3 — Solution

A triangle has side lengths 6, 8, and 10.
Make a scaled copy using scale factor 1/2.



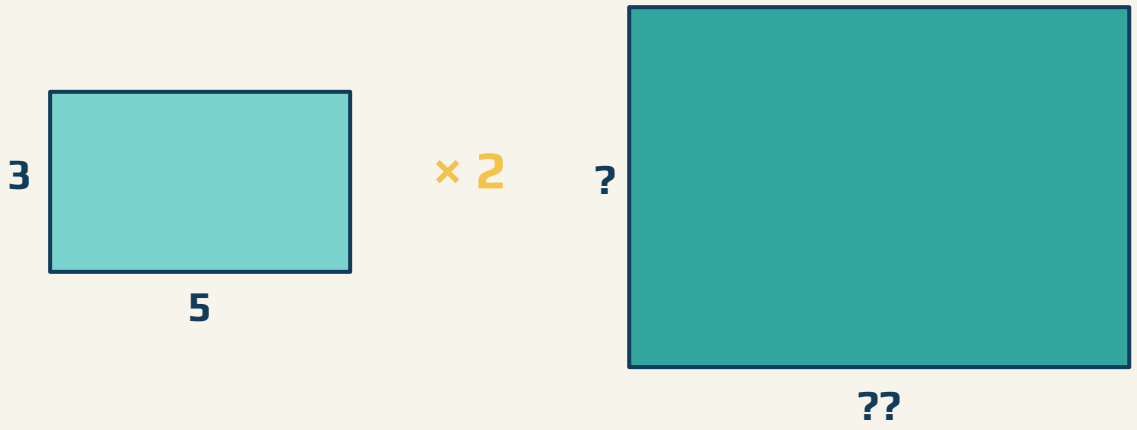
SOLUTION

Copy sides: 3, 4, 5.
Smaller because 1/2 < 1.

Same shape; half-size lengths.

Example 4 — Try it first

A 3-by-5 rectangle is scaled by a factor of 2.
What is the area of the copy?



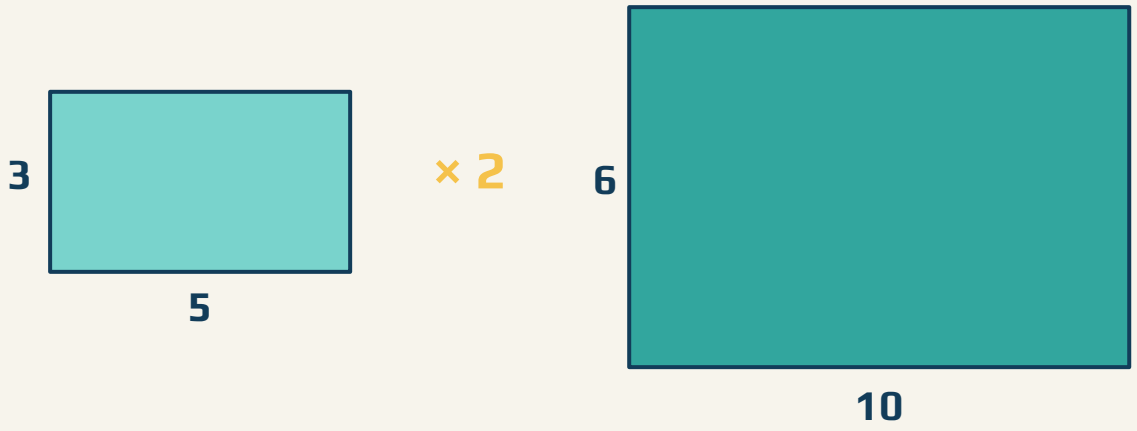
YOUR TURN

Find the new dimensions.
Then find the new area.

Remember: both dimensions scale.

Example 4 — Step 1: Scale the lengths

A 3-by-5 rectangle is scaled by a factor of 2.
What is the area of the copy?



STEP 1: NEW DIMENSIONS

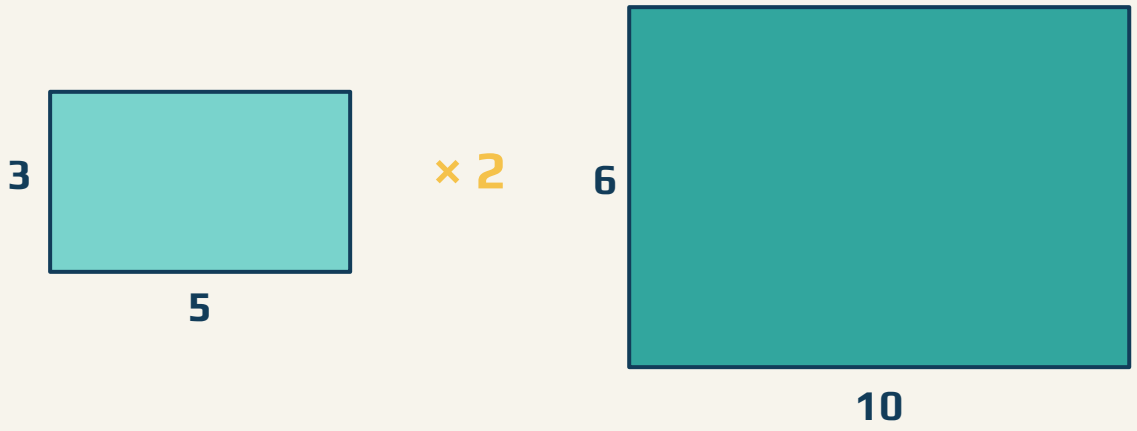
$3 \times 2 = 6$

$5 \times 2 = 10$

Next: compare 15 and 60.

Example 4 — Step 2: Compare areas

A 3-by-5 rectangle is scaled by a factor of 2.
What is the area of the copy?



STEP 2: AREA FACTOR

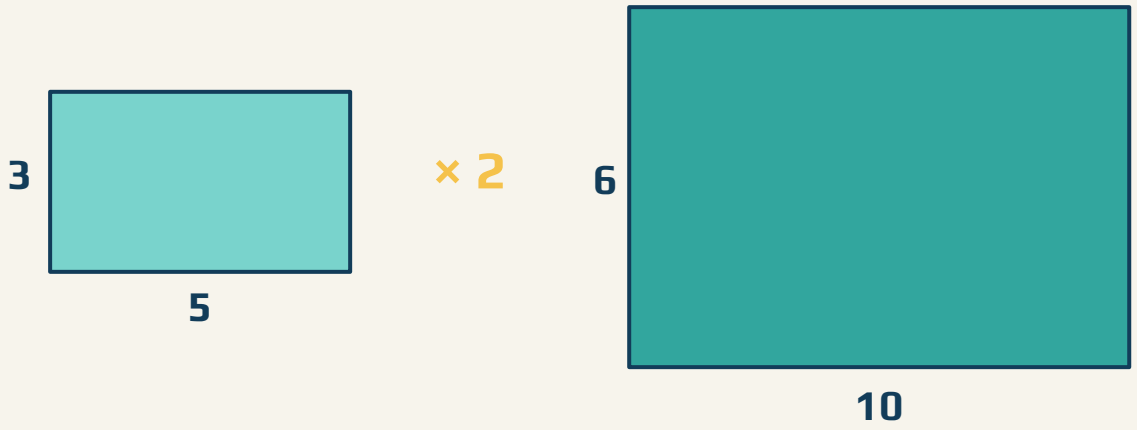
Original area: 3 × 5 = 15

Copy area: 6 × 10 = 60

Area Factor: 60 ÷ 15 = 4.

Example 4 — Solution

A 3-by-5 rectangle is scaled by a factor of 2.
What is the area of the copy?



SOLUTION

Copy area =
60 square units

Area factor = 4

Common mistakes to avoid

Use the definition of scaling before trusting a picture.

A

Add the same amount to every length.

Scaled copies multiply every length by one factor; adding changes ratios.

multiply

one factor

check ratios

B

Assume matching angles are enough.

Equal angles do not prove that all corresponding lengths share one factor.

Check at least two corresponding length ratios.

For area, remember the factor is squared: k^2, not k.

Takeaway + exit ticket

One scale factor controls corresponding lengths; area changes by its square.

1 Recognize

Match parts, equal angles, one length ratio.

2 Create

Multiply every corresponding length by k.

3 Reason

Predict size from k and area from k^2.

EXIT TICKET

A rectangle is 4 units by 7 units. A scaled copy uses factor 3/2. Find the copy's dimensions and area. Explain the area factor.

Bonus: describe how to reverse the scaling.

THANK YOU

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