

CONGRUENCE

Exact Matches, Correspondence & Geometric Evidence

Math 8 • Unit 1 • Lessons 11–13

Goal: decide whether figures are congruent and justify the decision using rigid transformations and corresponding measurements.

Access IDEAS presents a customized session for OUSD Math 8.



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What are we trying to understand?

Three lessons turn rigid transformations into a precise test for congruence.

1

IDENTIFY

Recognize figures that can match exactly, including mirror images and rotated copies.

2

JUSTIFY

Describe a sequence of translations, rotations, and reflections that aligns two figures.

3

DISPROVE

Use a mismatched length, angle, order, or internal distance to show figures are not congruent.

Big idea: congruent figures match exactly under rigid transformations.

Lessons 11–12: defining and testing congruence

Students move from visual comparison to transformation-based proof.

1

LESSON 11

Define congruent figures as figures that align exactly after rigid transformations.

2

LESSON 12

Test polygon congruence using transformations and corresponding parts.

3

EVIDENCE

Compare area, perimeter, side order, and angles without treating any one shortcut as sufficient.

A mirror image can still be congruent when reflection is part of the sequence.

Lesson 13: correspondence beyond vertices

Students test curved figures and track distances between corresponding points.

1

CORRESPOND

Match vertices, edge points, and interior features under the same transformation.

2

CURVED FIGURES

Apply congruence reasoning to ovals and other figures with curved boundaries.

3

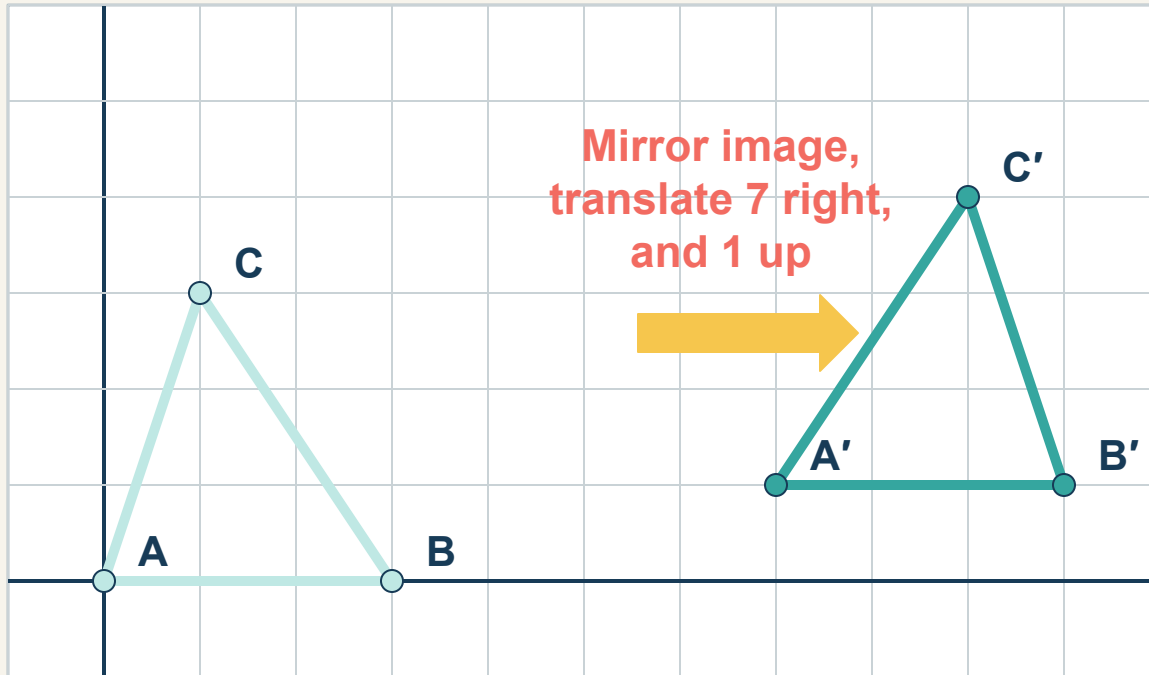
INTERNAL DISTANCE

Compare distances between corresponding features, not only overall width and height.

Every point in one congruent figure has one corresponding point in the other.

Congruent figures match exactly

A sequence of rigid transformations can place one figure directly on the other.



EXACT FIT

Every point aligns

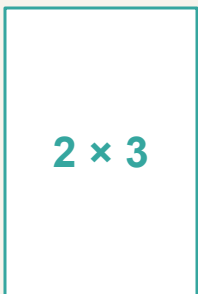
CONCLUSION

$$\triangle ABC \cong \triangle A'B'C'$$

Area and perimeter do not prove congruence

Equal area or equal perimeter can occur in figures with different shapes.

R



$$A = 6$$
$$P = 10$$

B



$$A = 6$$
$$P = 14$$

D



$$A = 4$$
$$P = 10$$

TEST

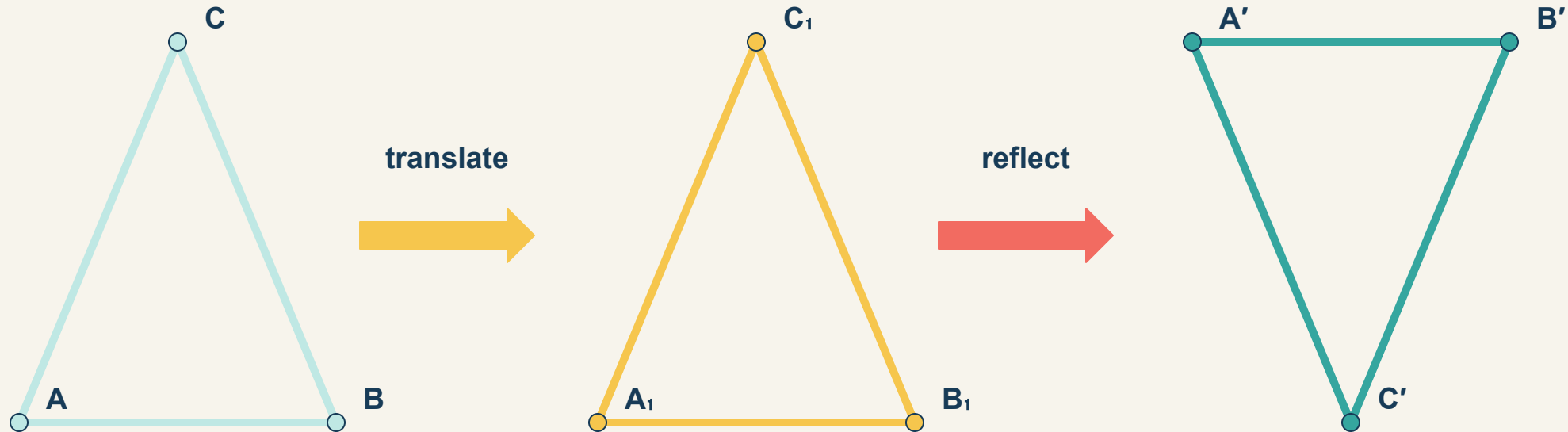
Can one
figure align
exactly with
the other?

R and B: same area, different perimeter

R and D: same perimeter, different area

Rigid transformations prove congruence

Describe moves that align all points of one figure with the other.



A complete sequence that aligns every point proves congruence.

One mismatch disproves congruence

A different corresponding length, angle, order, or internal distance is enough.

1

SIDE LENGTH

A corresponding side has a different length.

2

SIDE ORDER

Lengths cannot match in order around the polygons.

3

ANGLE

Corresponding angles have different measures.

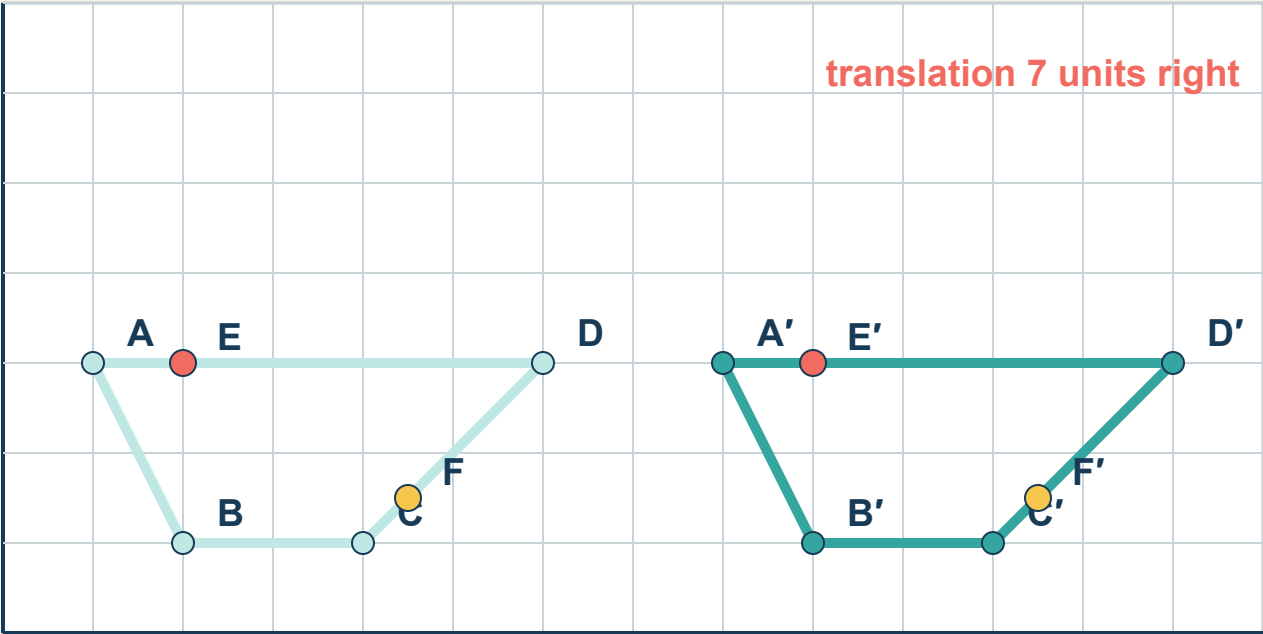
4

INTERNAL DISTANCE

Corresponding features are spaced differently.

Correspondence includes every point

Vertices, points on edges, and interior features all follow the same transformation.

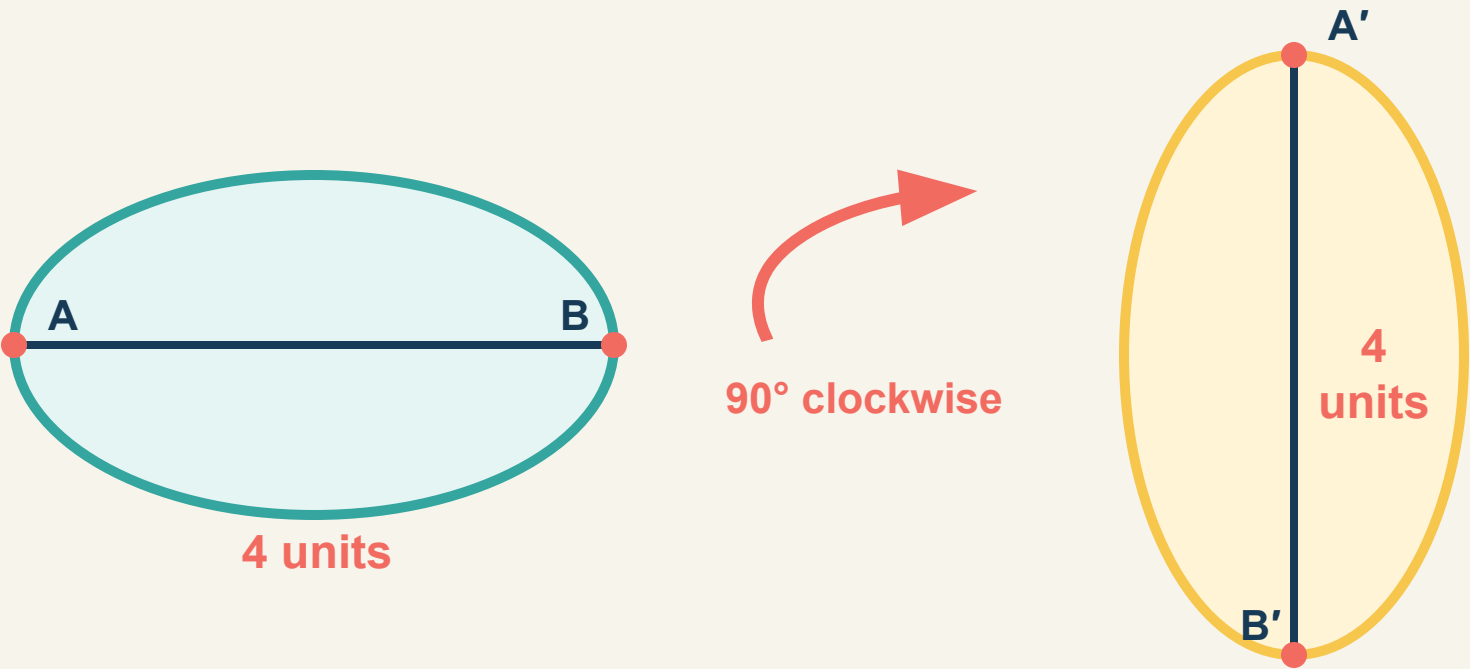


CORRESPONDENCE

$E \leftrightarrow E'$ and $F \leftrightarrow F'$

Curved figures can be congruent

Rotation, translation, and reflection apply to figures with curved boundaries.



**SAME
TRANSFORMATION**
**Curved
boundaries and
corresponding
distances match**

Example 1 — Try it first

Compare rectangles R, B, and D using area, perimeter, and congruence.

R



B



D



YOUR TURN

Which pair shares area?

Which pair shares perimeter?

Are any congruent?

Example 1 — Step 1: Find area

Calculate the area of each rectangle.

R



$$A = 6$$

B



$$A = 6$$

D



$$A = 4$$

STEP 1

Areas:

$$R: 2 \times 3 = 6$$

$$B: 1 \times 6 = 6$$

$$D: 1 \times 4 = 4$$

Example 1 — Step 2: Find perimeter

Calculate the perimeter of each rectangle.

R



$$A = 6$$
$$P = 10$$

B



$$A = 6$$
$$P = 14$$

D



$$A = 4$$
$$P = 10$$

STEP 2

Perimeters:

$$R: 2(2 + 3) = 10$$

$$B: 2(1 + 6) = 14$$

$$D: 2(1 + 4) = 10$$

Example 1 — Solution

Equal area or perimeter alone does not guarantee congruence.

R



$$A = 6$$
$$P = 10$$

B



$$A = 6$$
$$P = 14$$

D



$$A = 4$$
$$P = 10$$

R and B: same area, different perimeter

R and D: same perimeter, different area

SOLUTION

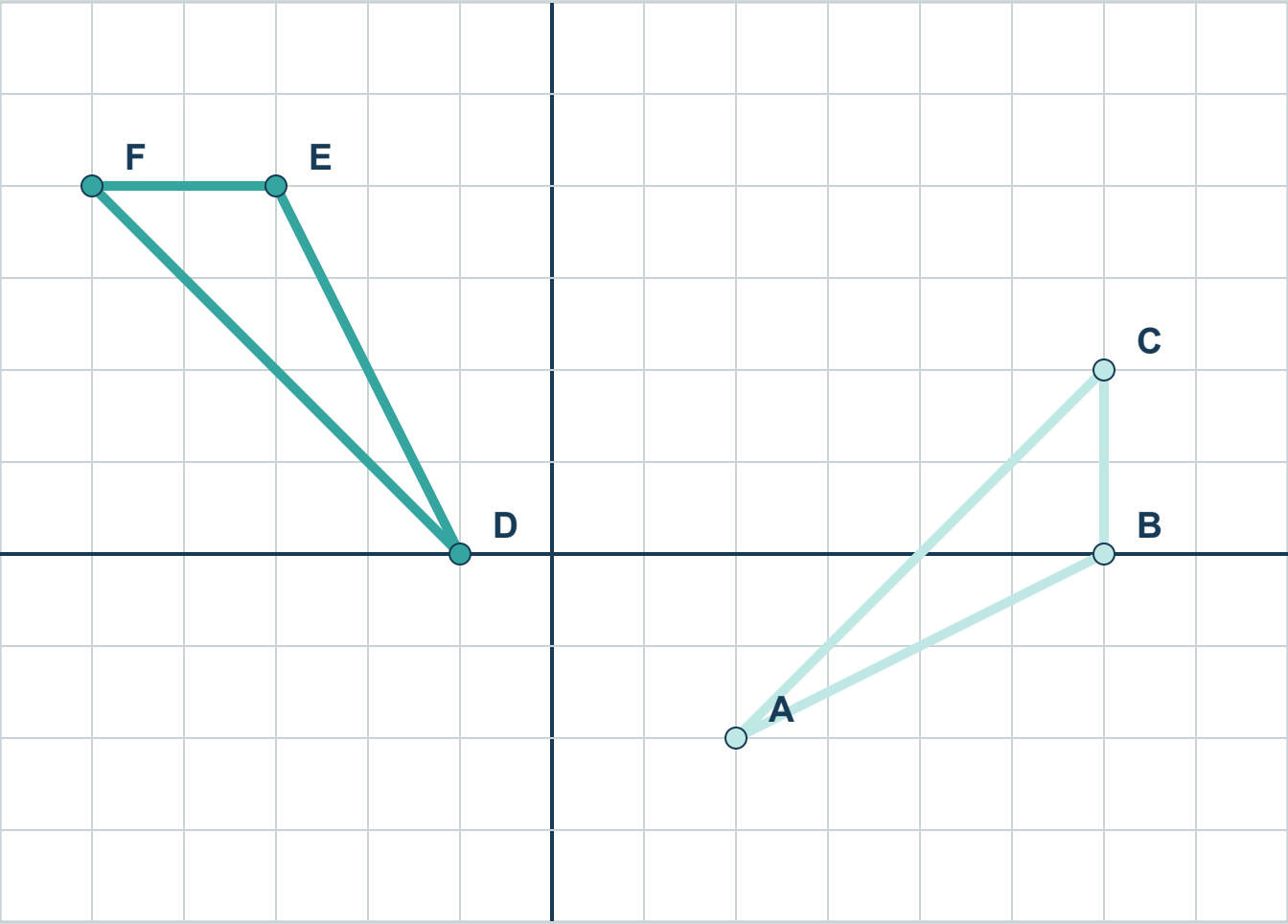
R and B share area.

**R and D share
perimeter.**

**No pair is
congruent.**

Example 2 — Try it first

Decide whether triangles ABC and DEF are congruent.

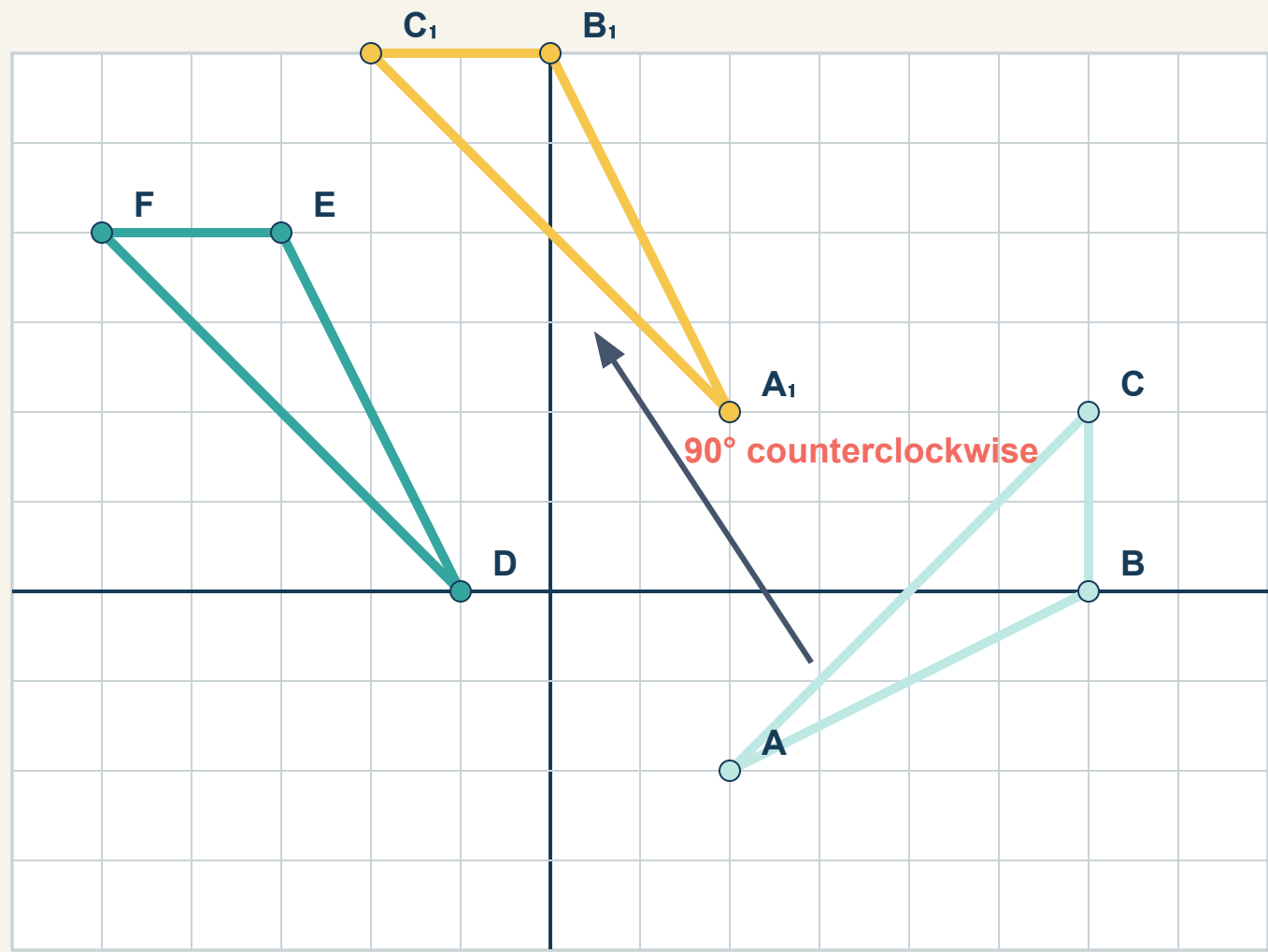


YOUR TURN

ABC: A(2, -2), B(6, 0), C(6, 2)
DEF: D(-1, 0), E(-3, 4), F(-5, 4)

Example 2 — Step 1: Rotate

Rotate triangle ABC 90° counterclockwise about the origin.

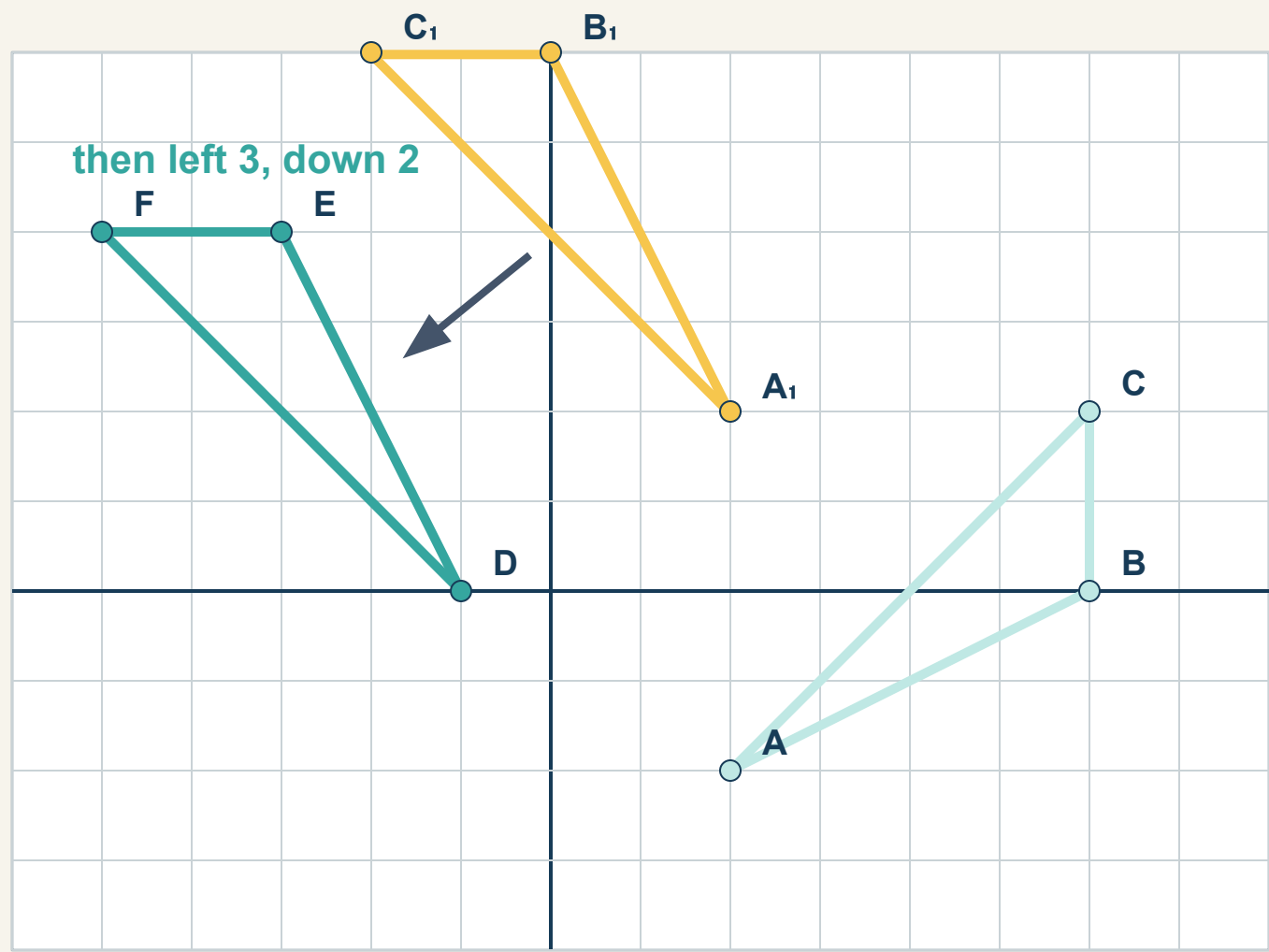


STEP 1

Rotate 90° CCW:
 $A_1(2,2)$, $B_1(0,6)$, $C_1(-2,6)$

Example 2 — Step 2: Translate

Translate the rotated image 3 units left and 2 units down.

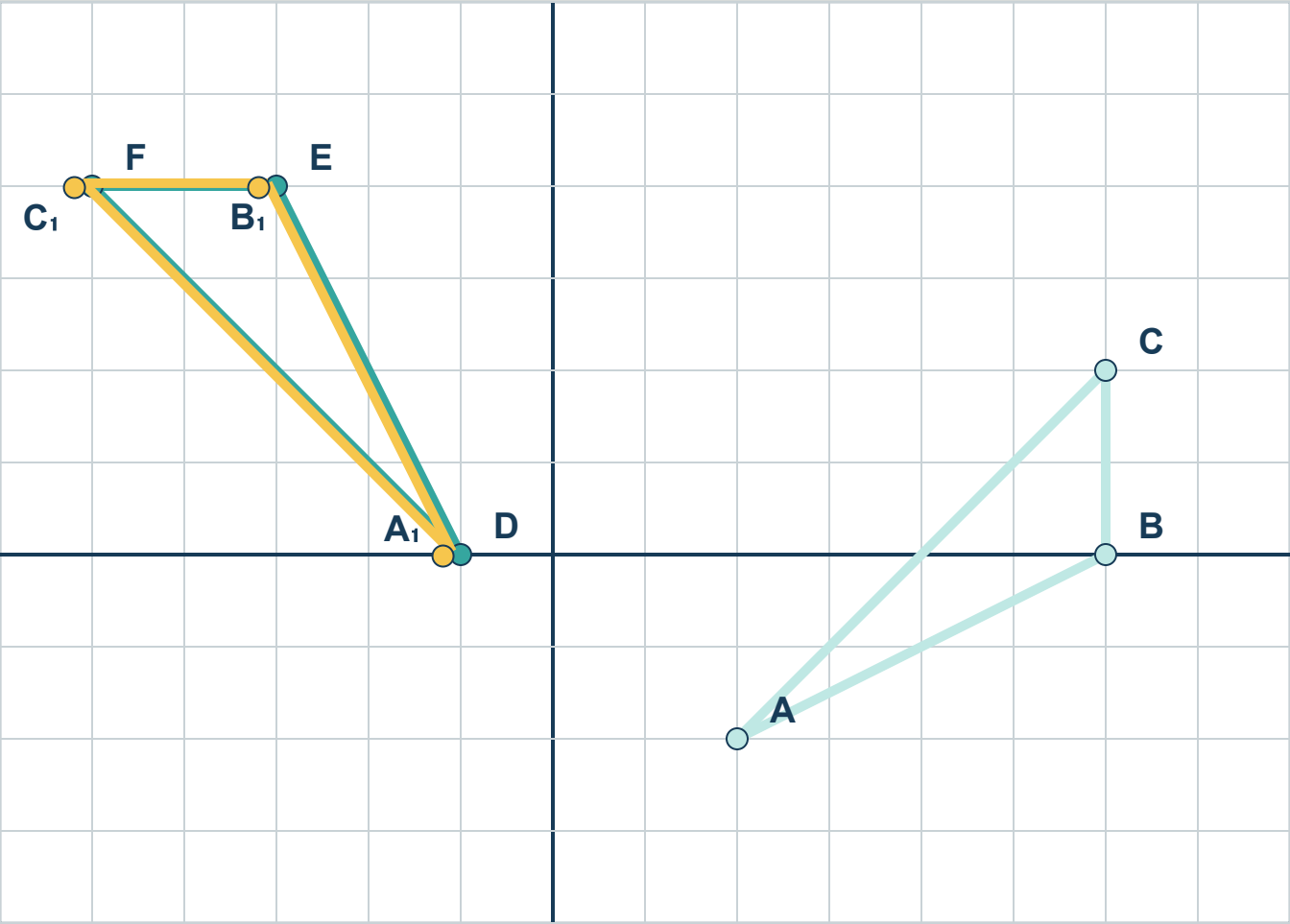


STEP 2

Translate left 3, down 2:
 $D(-1,0)$, $E(-3,4)$, $F(-5,4)$

Example 2 — Solution

The sequence maps A to D, B to E, and C to F.

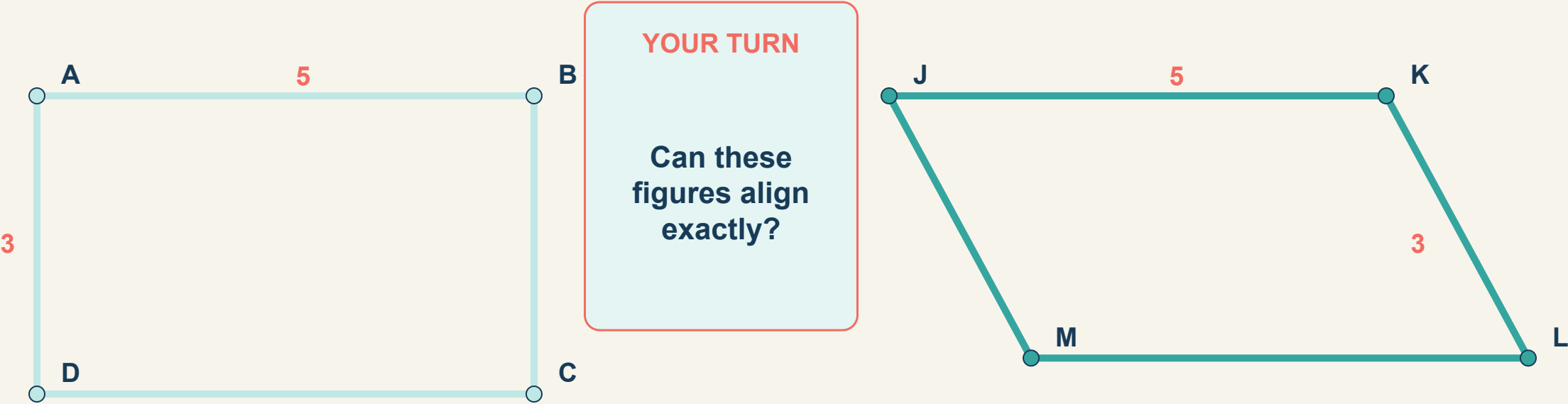


SOLUTION

The sequence aligns every vertex.
 $\triangle ABC \cong \triangle DEF$

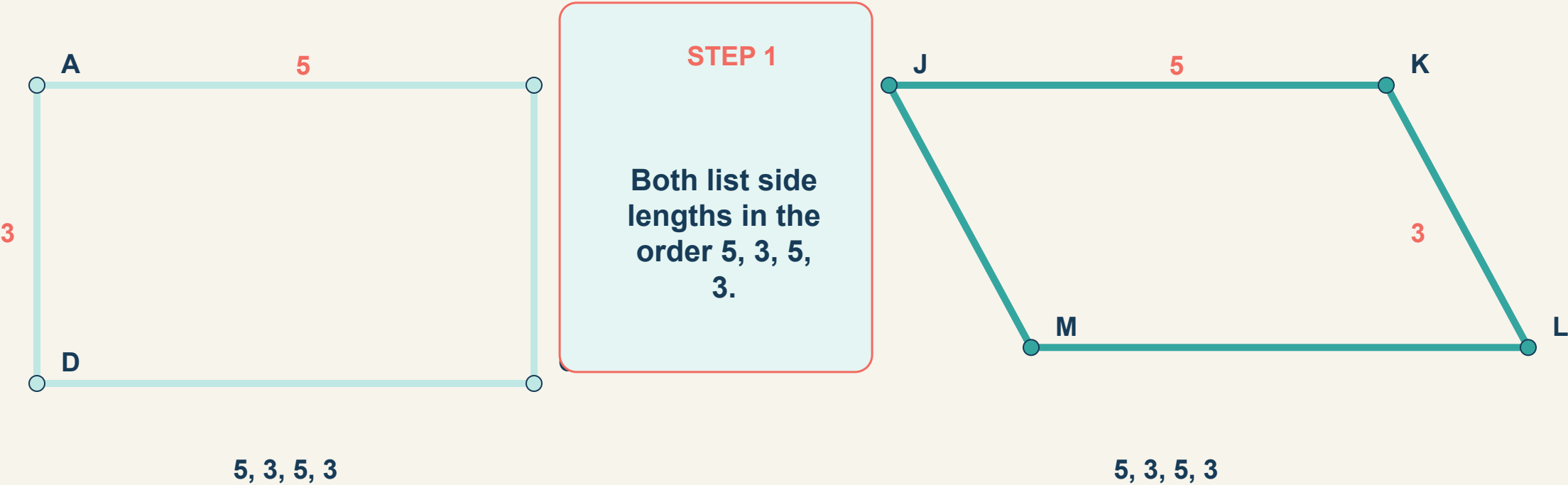
Example 3 — Try it first

A rectangle and parallelogram have side lengths 5, 3, 5, 3. Are they congruent?



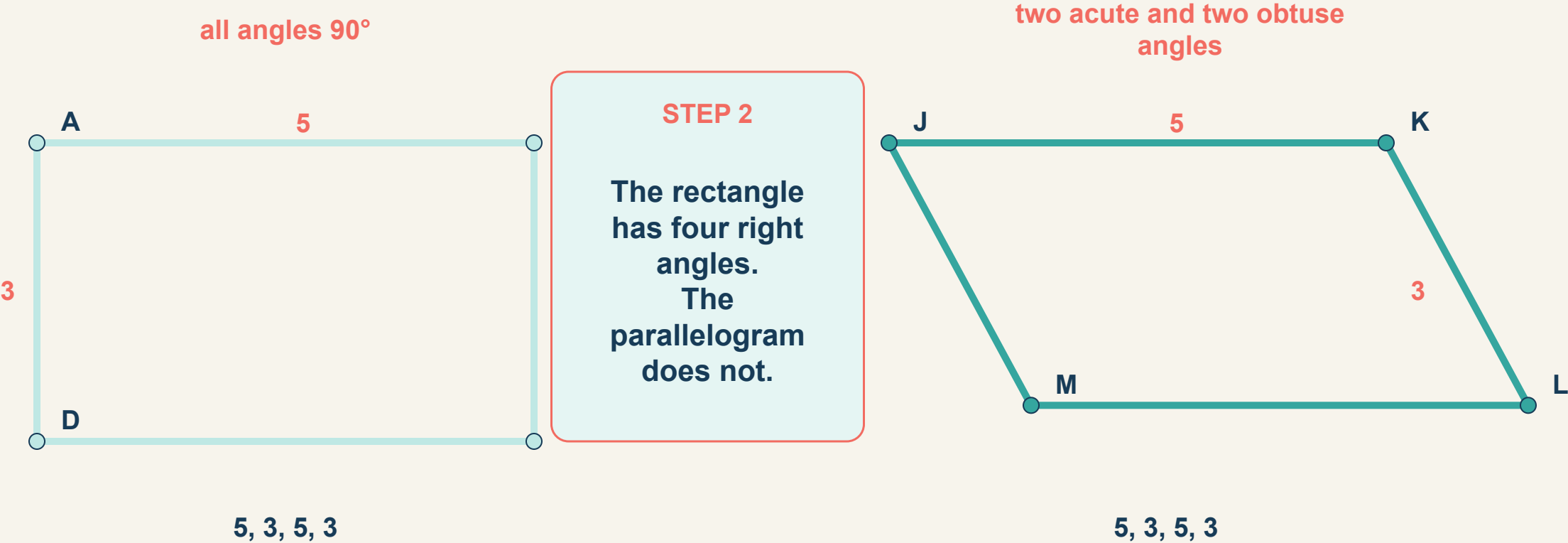
Example 3 — Step 1: Match side lengths

The corresponding side lengths can be listed in the same order.



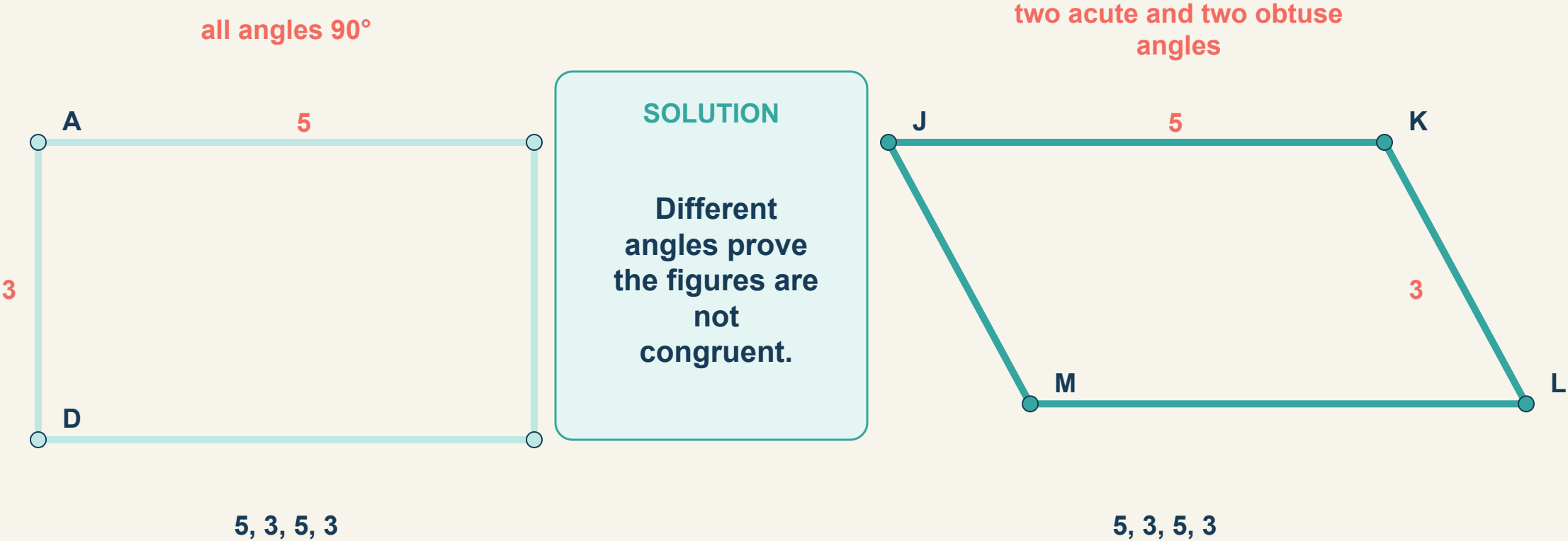
Example 3 — Step 2: Compare angles

Rigid transformations preserve angle measure.



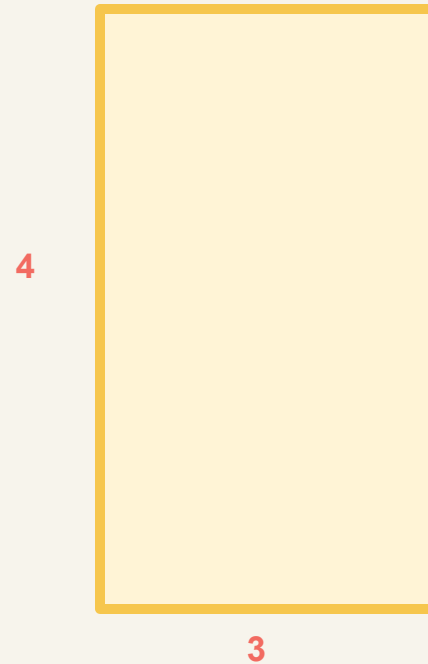
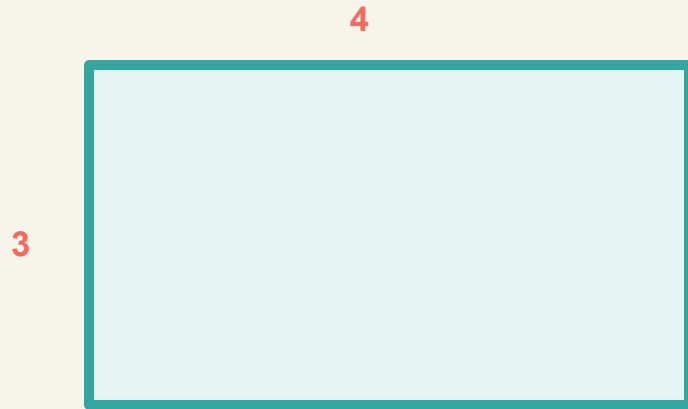
Example 3 — Solution

Different corresponding angles prove the figures are not congruent.



Example 4 — Try it first

Decide whether the two rectangles are congruent and justify your answer.

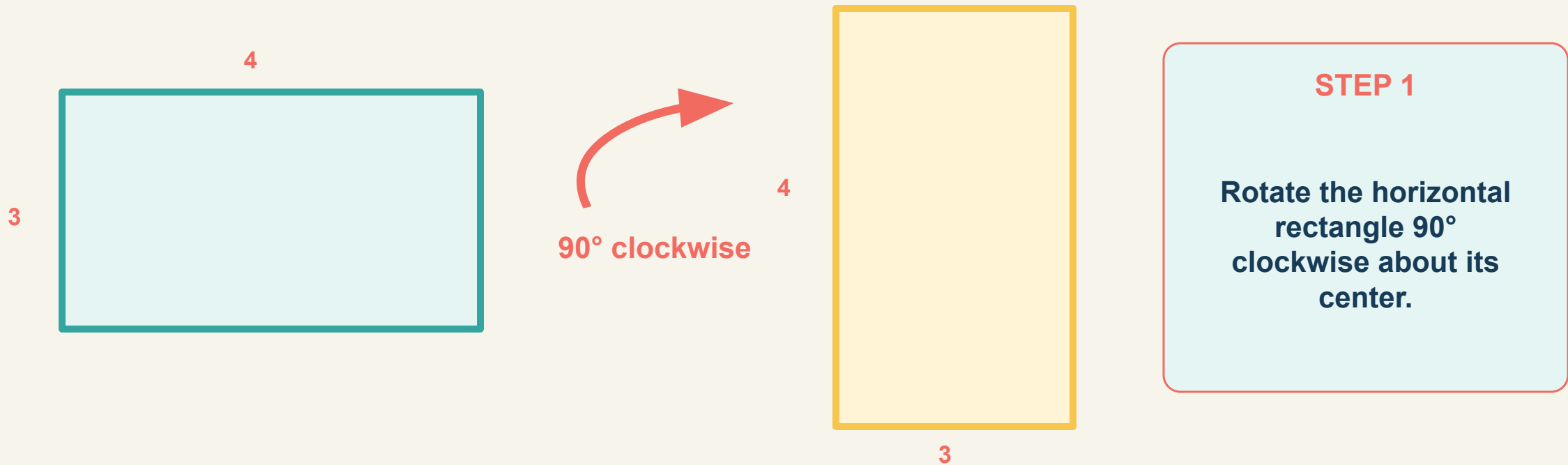


YOUR TURN

**Could one rectangle
align exactly with the
other?**

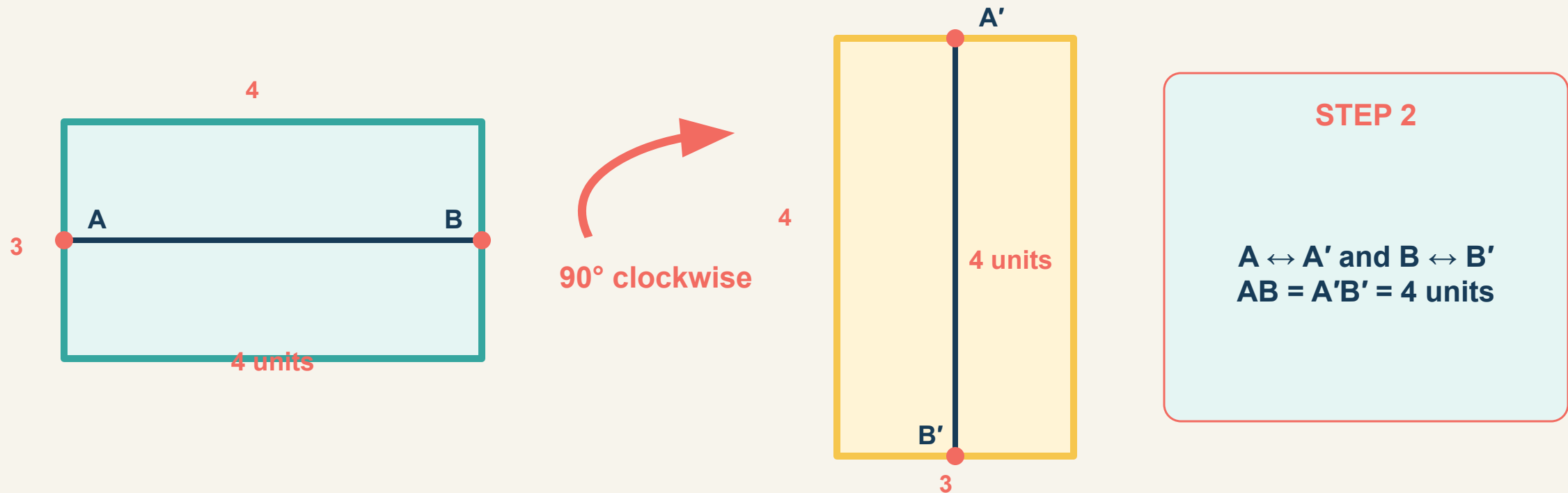
Example 4 — Step 1: Identify the move

A 90° rotation changes orientation without changing size or shape.



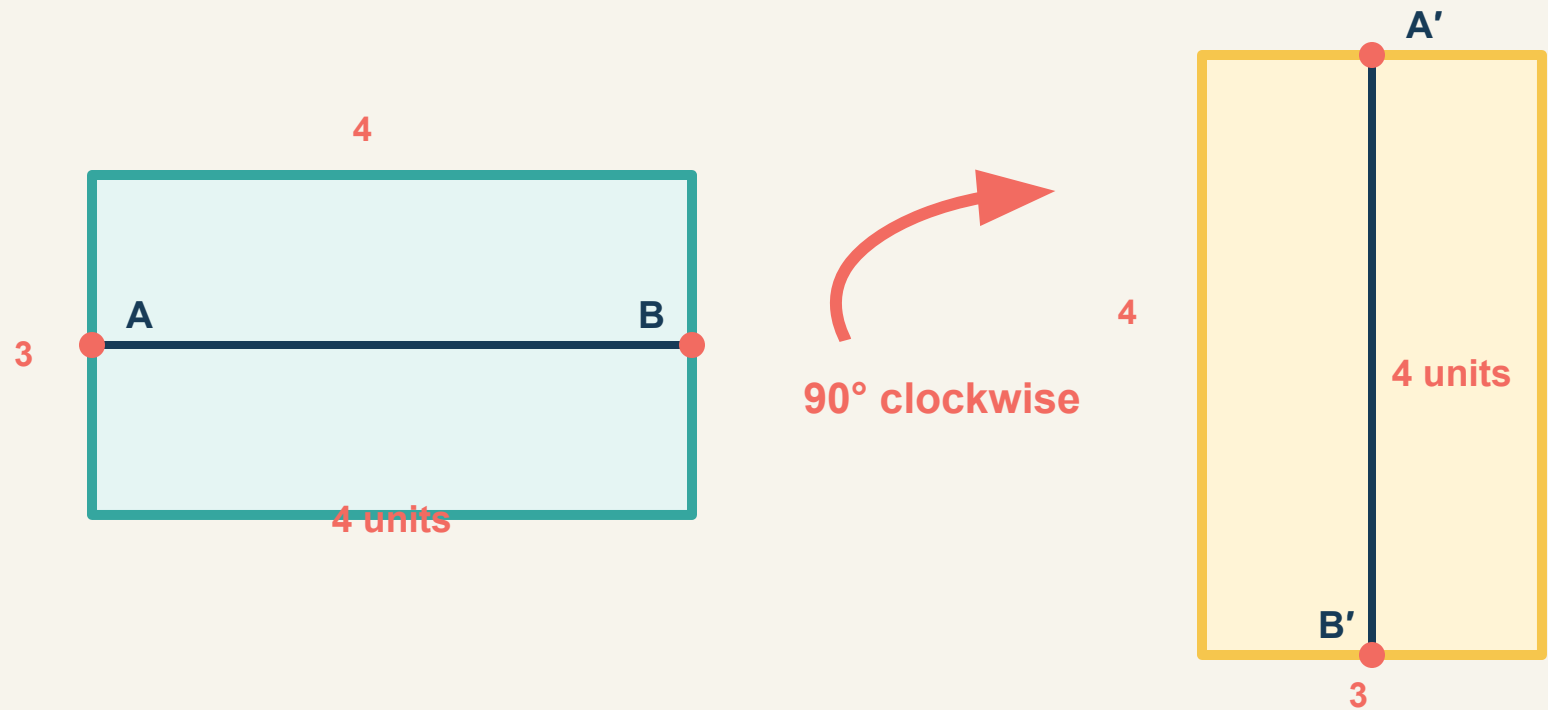
Example 4 — Step 2: Match points

Corresponding points on opposite sides remain the same distance apart.



Example 4 — Solution

The rotated rectangles are congruent, and corresponding distances are equal.



SOLUTION

The 90° rotation aligns the rectangles. They are congruent.

Common mistakes to avoid

Use exact correspondence and transformation evidence.

A

Same area means congruent

Different shapes can have equal area.

B

Same perimeter means congruent

Different shapes can have equal perimeter.

C

Mirror images cannot match

A reflection can align mirror images.

D

Checking only the vertices

Curves and interior features must correspond too.

Takeaway + exit ticket

Congruence means exact alignment under rigid transformations.

1

PROVE

Name the kind of evidence that proves two figures are congruent.

2

DISPROVE

Two quadrilaterals have the same side lengths but different corresponding angles. Are they congruent?

**Answers: a sequence of rigid transformations that aligns all points;
no, different corresponding angles disprove congruence.**



THANK YOU

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