Congruent Figures

Applications and design

Name _____ **Date** _____ **Score** _____ / 6

QUICK REVIEW

Congruent figures have equal corresponding lengths and angles and can be matched by rigid motions. In $\triangle ABC \cong \triangle DEF$, the order pairs $A \leftrightarrow D$, $B \leftrightarrow E$, $C \leftrightarrow F$; thus $AB = DE$ and $\angle B = \angle E$. Similar figures can have scale factor $k \neq 1$, so equal shape alone does not establish congruence. Compare every stated correspondence, not just appearance.

Worked example

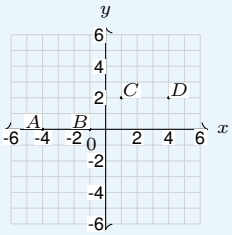
Segment AB has $A(-4, 0), B(-1, 0)$. Segment CD has $C(1, 2), D(4, 2)$. Show congruence using one translation.

1. The required change from A to C is $(1 + 4, 2 - 0) = (5, 2)$.

2. The same vector sends $B(-1, 0)$ to $(-1 + 5, 0 + 2) = (4, 2) = D$.

3. Both segments have length 3 units. One rigid motion matches both endpoints, so the segments are congruent.

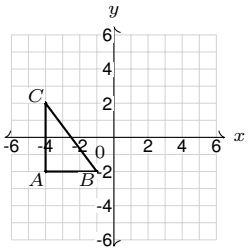
Answer: $(x, y) \mapsto (x + 5, y + 2)$; $AB \cong CD$.



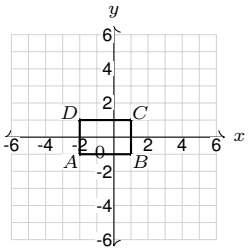
Practice Problems

Show your thinking.

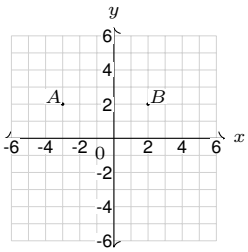
1. A window panel is triangle ABC. Make a congruent panel by translating right 5. List its vertices.



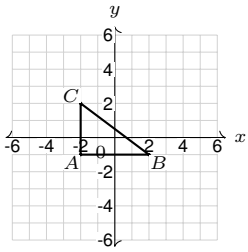
2. A garden tile has the shown 3 by 2 dimensions. A catalog offers 2 by 3 and 2 by 4 tiles. Which fits congruently, allowing rotation?



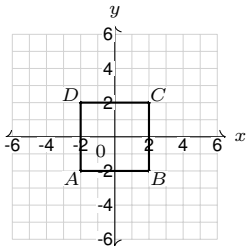
3. A mirrored sign uses AB and its x-axis reflection. Find the reflected endpoints and total length of the two segments.



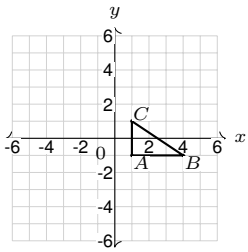
4. There are 4 congruent triangular patches total. The shown right triangle has perpendicular legs 4 and 3 cm. Find their total area.



5. A matching frame must be congruent to the shown square, with side $s + 1$ cm. Each grid unit is 1 cm. Find s and the frame perimeter.



6. A stamp designer rotates triangle ABC $90°$ counterclockwise about the origin. Find the copy vertices and decide whether resizing is needed.



Answer Key

1. $A\prime = (1, -2), B\prime = (4, -2), C\prime = (1, 2)$
2. The 2 by 3 tile.
3. $A\prime = (-3, -2), B\prime = (2, -2)$; total 10 units.
4. 24 cm^2
5. $s = 3$; perimeter 16 cm.
6. $A\prime = (1, 1), B\prime = (1, 4), C\prime = (-1, 1)$; no resizing.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. Apply $(x + 5, y)$ to A and B: $(-4 + 5, -2) = (1, -2)$ and $(-1 + 5, -2) = (4, -2)$.

2. For C, $(-4 + 5, 2) = (1, 2)$. The legs stay 3 and 4 units.

3. Join $(1, -2), (4, -2), (1, 2)$. The translation right 5 creates a same-size panel without flipping its orientation.

Problem 2

1. The original side lengths are $1 - (-2) = 3$ and $1 - (-1) = 2$.

2. Rotating the 2 by 3 tile matches 3 to 3 and 2 to 2; all angles are 90°.

3. The 2 by 4 choice has $4 \neq 3$, so it cannot fit congruently. Rotation may swap horizontal and vertical roles.

Problem 3

1. Reflecting changes $y = 2$ to -2: $A\prime = (-3, -2)$ and $B\prime = (2, -2)$.

2. The first segment has length $2 - (-3) = 5$ units. Its congruent reflection also measures 5.

3. The two segments require $5 + 5 = 10$ units of material; no connector between them is included.

Problem 4

1. The grid confirms base $2 - (-2) = 4$ and height $2 - (-1) = 3$; these sides are perpendicular.

2. One patch has area $\frac{1}{2}(4)(3) = 6$ cm^2. Congruent copies have the same area.

3. Four nonoverlapping patches cover $4(6) = 24$ cm^2. Area equality alone would not prove congruence, but it follows here.

Problem 5

1. The original square side is $2 - (-2) = 4$ cm. Congruence requires $s + 1 = 4$.

2. Subtract 1 to obtain $s = 3$; substitute to check $3 + 1 = 4$ cm.

3. The matching frame perimeter is $4(4) = 16$ cm. The variable is not itself the side length.

Problem 6

1. Use $(-y, x)$: $A(1, -1) \mapsto (1, 1)$ and $B(4, -1) \mapsto (1, 4)$.

2. The third vertex maps as $C(1, 1) \mapsto (-1, 1)$. Original legs $3, 2$ become legs $3, 2$.

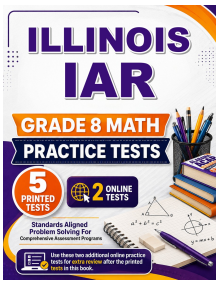
3. The legs remain 3 and 2 with a 90° included angle. The copy is congruent, so no resizing is needed.

TESTINAR

Keep Building Grade 8 Math Skills

Choose the practice book matched to your state assessment and turn worksheet practice into a complete test-prep plan.

All Grade 8 books



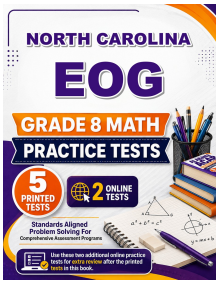
ILLINOIS IAR

5 Full-Length Math Practice Tests

Build Grade 8 accuracy, confidence, and test stamina with 5 printable practice tests.

Printable eBook • Instant PDF access

View eBook



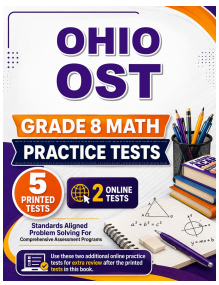
NORTH CAROLINA EOG

5 Full-Length Math Practice Tests

Build Grade 8 accuracy, confidence, and test stamina with 5 printable practice tests.

Printable eBook • Instant PDF access

View eBook



OHIO OST

5 Full-Length Math Practice Tests

Build Grade 8 accuracy, confidence, and test stamina with 5 printable practice tests.

Printable eBook • Instant PDF access

View eBook

Need a different state?
Testinar has Grade 8 math practice books for state assessments across the country.

TESTINAR.COM/GRADES/8