Congruent Figures

Models and mappings

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

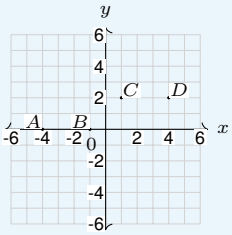
Segment AB has $A(-4, 0), B(-1, 0)$. Segment CD has $C(1, 2), D(4, 2)$. Show congruence using one translation.

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.

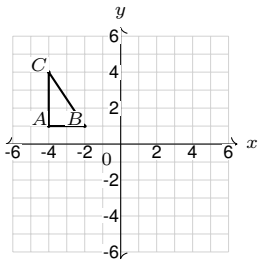
Answer: $(x, y) \mapsto (x + 5, y + 2)$; $AB \cong CD$.



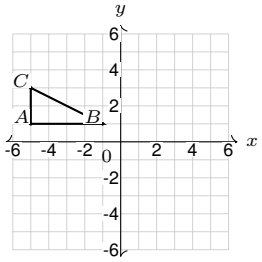
Practice Problems

Show your thinking.

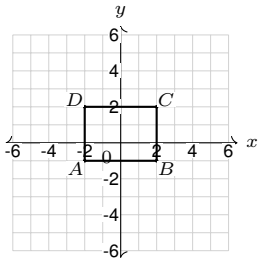
1. Triangle ABC is reflected in the y-axis to form DEF, in that order. Find D, E, F and state whether the triangles are congruent.



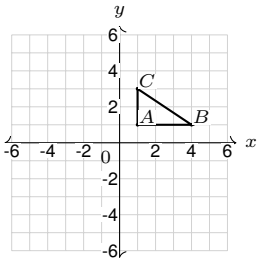
2. $\triangle ABC \cong \triangle DEF$ in the stated order. The plotted $AB = 4$. If $DE = 2x + 1$, find x.



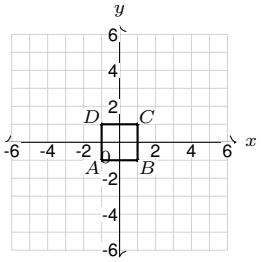
3. Rectangle $ABCD$ has vertices shown. A congruent rectangle has a corresponding horizontal side w. Find w and both perimeters.



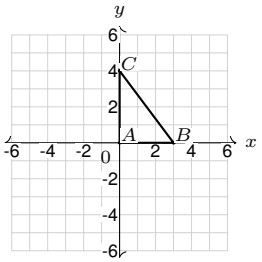
4. Rotate the shown right triangle $180°$ about the origin. Give its image and explain congruence.



5. Compare square $ABCD$ with a square of side 4. Are they congruent or only similar? Give a length check.



6. $\triangle ABC \cong \triangle RST$. Here $\angle A = 90°$ and $\angle B$ rounds to $53°$. Find $\angle S$ and $\angle T$ to the nearest degree.



Answer Key

1. $D = (4, 1), E = (2, 1), F = (4, 4)$; congruent.
2. $x = 1.5$
3. $w = 4$; both perimeters are 14.
4. $A\prime = (-1, -1), B\prime = (-4, -1), C\prime = (-1, -3)$; congruent.
5. Only similar; scale factor 2.
6. $\angle S \approx 53^\circ,\ \angle T \approx 37^\circ$

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. Apply $(-x, y)$: $A(-4, 1) \mapsto (4, 1)$ and $B(-2, 1) \mapsto (2, 1)$.
2. The third vertex is $C(-4, 4) \mapsto (4, 4)$. The legs remain 2 and 3 units.
3. The matched legs $2, 3$ and included 90° angle stay equal. Reflection proves congruence despite opposite orientations.

Problem 2

1. The congruence order pairs AB with DE, so $DE = AB = |-1 - (-5)| = 4$.
2. Substitute $2x + 1 = 4$, then subtract 1: $2x = 3$. Dividing by 2 gives $x = 1.5$.
3. Check $2(1.5) + 1 = 4$, which matches the corresponding side, not a different edge.

Problem 3

1. The horizontal length is $2 - (-2) = 4$ and the vertical length is $2 - (-1) = 3$.
2. Congruence gives $w = 4$. The original perimeter is $2(4 + 3) = 14$ units.
3. All corresponding sides are equal, so the second perimeter is also 14 units, regardless of its position.

Problem 4

1. Negating coordinates gives $(1, 1) \mapsto (-1, -1)$ and $(4, 1) \mapsto (-4, -1)$.
2. The third point is $(1, 3) \mapsto (-1, -3)$. The perpendicular legs remain 3 and 2 units.
3. The 180° rotation preserves the legs $3, 2$ and all angles, so its triangle is congruent to the original.

Problem 5

1. The plotted square has side $1 - (-1) = 2$ units; its vertical side is also 2.
2. The ratio to the new square is $4/2 = 2$, rather than the congruence ratio 1.
3. All square angles are 90°, so the squares are similar, but unequal corresponding sides prevent congruence.

Problem 6

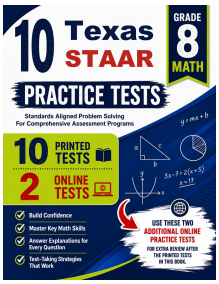
1. The order pairs B with S, so $\angle S = \angle B \approx 53^\circ$ to the nearest degree.
2. The complementary source angle rounds to $180^\circ - 90^\circ - 53^\circ = 37^\circ$.
3. Because C pairs with T, $\angle T \approx 37^\circ$. Congruent triangles have equal exact angles, hence matching rounded measures 53° and 37°.

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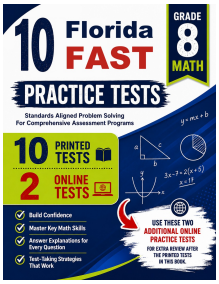
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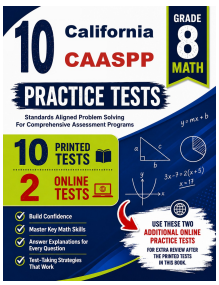
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