Unit 6 · Congruence and Similarity Cheat Sheet

Unit 6 focus: translations, reflections, rotations and dilations on the coordinate plane

1 KEY VOCABULARY

transformation	A rule that moves or resizes a figure.	$A \to A'$
rigid motion	Translation, reflection or rotation: keeps size and shape.	same size
dilation	Enlarges or shrinks by a scale factor k.	$k = 2$
congruent	Same size and shape ($\cong$).	rigid motions only
similar	Same shape; sides proportional ($\sim$).	add a dilation

2 COORDINATE RULES

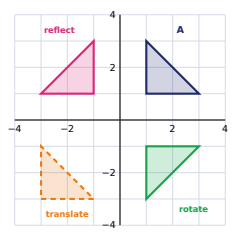
Transformation	Rule
translate a right, b up	$(x, y) \to (x + a, y + b)$
reflect over x-axis	$(x, y) \to (x, -y)$
reflect over y-axis	$(x, y) \to (-x, y)$
rotate 90° clockwise	$(x, y) \to (y, -x)$
rotate 90° counterclockwise	$(x, y) \to (-y, x)$
rotate 180°	$(x, y) \to (-x, -y)$
dilate by k (origin)	$(x, y) \to (kx, ky)$

3 RIGID MOTIONS

Apply the rule to every vertex. Lengths and angles stay the same.

Example: Triangle A: $(1, 1), (3, 1), (1, 3)$. Rotate 90° clockwise.
Rule $(y, -x)$**:** $(1, -1), (1, -3), (3, -1)$

Answer: the green triangle

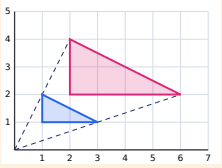


4 DILATIONS

Multiply every coordinate by k. $k > 1$ enlarges; $0 < k < 1$ shrinks. Angles stay the same; lengths multiply by k.

Example: Dilate $(1, 1), (3, 1), (1, 2)$ by $k = 2$.
Multiply: $(2, 2), (6, 2), (2, 4)$

Answer: similar, every side twice as long



5 SEQUENCES OF TRANSFORMATIONS

- Do the moves in order; the image of one step is the preimage of the next.
- Only rigid motions → the figures are **congruent**.
- Rigid motions and a dilation → the figures are **similar**.
- Example: $(2, 1)$ reflect over y-axis → $(-2, 1)$, then translate down 3 → $(-2, -2)$.

6 QUICK REMINDERS & COMMON MISTAKES

✔ Do remember

- Label images with primes: A', B', C'.
- Clockwise and counterclockwise give different images.
- Orientation flips after a reflection.

✘ Common mistakes

- Reflecting over the x-axis by changing x: change the sign of y
- Adding k in a dilation: multiply by k
- Calling a dilation congruent: it is similar

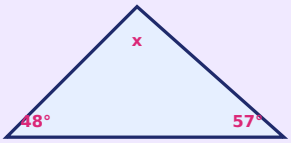
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More practice: congruence and similarity through transformations, triangle angles and parallel lines

1 TRIANGLE ANGLE SUM

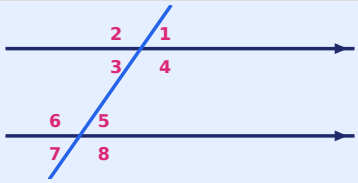
The three angles of every triangle add to 180°. An exterior angle equals the sum of the two remote interior angles.

Example: Angles 48°, 57° and x.
Equation: $48 + 57 + x = 180$
Answer: $x = 75^\circ$



2 PARALLEL LINES AND A TRANSVERSAL

Angle pair (diagram)	Relationship
corresponding: 1 & 5, 2 & 6	congruent
alternate interior: 3 & 5, 4 & 6	congruent
alternate exterior: 1 & 7, 2 & 8	congruent
same-side interior: 4 & 5, 3 & 6	add to 180°
vertical: 1 & 3	congruent



3 SOLVING WITH ANGLE PAIRS

Name the relationship, write the equation, solve.

Example: Alternate interior angles: $(3x + 10)^\circ$ and 70°.
Congruent: $3x + 10 = 70$
Solve: $3x = 60$
Answer: $x = 20$

4 SIMILAR TRIANGLES (AA)

Two pairs of congruent angles make triangles similar. Then corresponding sides are proportional.

Example: $\triangle ABC \sim \triangle DEF$, $AB = 4$, $BC = 6$, $DE = 10$. Find EF.
Proportion: $\frac{4}{10} = \frac{6}{x}$
Cross multiply: $4x = 60$
Answer: $EF = 15$

5 CONGRUENT OR SIMILAR?

Reflect, then translate	**congruent**
Rotate 180°, then dilate by $\frac{1}{2}$	**similar**
Two triangles with angles 40°, 60°, 80°	**similar (AA)**
Same angles and same side lengths	**congruent**

6 CHECK YOURSELF

- Did I apply the rule to **every** vertex?
- Did I use the right direction for the rotation?
- Do my triangle angles add to 180°?
- Did I match corresponding sides in the proportion?