Unit 5 · Similarity Cheat Sheet

Unit 5 focus: scale factors, similar figures and proportions

1 KEY VOCABULARY

similar	Same shape, not necessarily the same size: $\sim$.	$\triangle ABC \sim \triangle DEF$
corresponding angles	Matching angles; they are congruent.	$\angle A \cong \angle D$
corresponding sides	Matching sides; they are proportional.	$\frac{AB}{DE} = \frac{BC}{EF}$
scale factor	The number each length is multiplied by.	$k = \frac{3}{2}$

2 SIMILARITY STATEMENTS

- The order of the letters tells which parts correspond: $ABCD \sim EFGH$ means $A \leftrightarrow E$, $B \leftrightarrow F$, ...
- Angles: $\angle A \cong \angle E$, $\angle B \cong \angle F$, ...
- Sides: $\frac{AB}{EF} = \frac{BC}{FG} = \frac{CD}{GH} = \frac{DA}{HE}$.

3 FINDING A SCALE FACTOR

Scale factor = image length ÷ original length (use corresponding sides).

Example: A side changes from 6 to 9.
Ratio: $\frac{9}{6} = \frac{3}{2}$

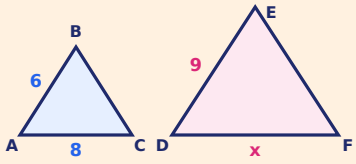
Answer: $k = \frac{3}{2}$ **(an enlargement)**

4 FINDING A MISSING SIDE

Set up a proportion with corresponding sides in the same order, then cross multiply.

Example: $\triangle ABC \sim \triangle DEF$: $\frac{6}{9} = \frac{8}{x}$
Cross multiply: $6x = 72$

Answer: $x = 12$



5 PERIMETER & AREA

If the scale factor is k	Ratio
perimeters	k
areas	k^2
volumes	k^3

Scale factor 3: perimeters $3:1$, areas $9:1$. A $4\ \text{in}^2$ figure becomes $36\ \text{in}^2$.

6 QUICK REMINDERS & COMMON MISTAKES

✔ Do remember

- Match corresponding sides in the same order.
- Keep small-to-large (or large-to-small) on both sides of the proportion.
- Areas scale by k^2.

✘ Common mistakes

- Mixing up the order of sides: follow the similarity statement
- Using k for areas: use k^2
- Assuming figures are similar: check AA, SAS~ or SSS~

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More practice: similarity criteria, dilations, area and indirect measurement

1 TRIANGLE SIMILARITY CRITERIA

Criterion	Needs
AA	two pairs of congruent angles
SAS~	two pairs of proportional sides and the included angles congruent
SSS~	all three pairs of sides proportional

2 SAS~ EXAMPLE

The included angles are congruent and the sides around them are proportional.

Example: $\angle A \cong \angle D = 60°$; $\frac{4}{6} = \frac{8}{x}$
Cross multiply: $4x = 48$
Answer: $x = 12$

3 SSS~ EXAMPLE

All three ratios must be equal.

Example: Sides 5, 7, 9 and 10, x, 18
Ratio: $\frac{5}{10} = \frac{9}{18} = \frac{1}{2}$
Solve: $\frac{7}{x} = \frac{1}{2}$
Answer: $x = 14$

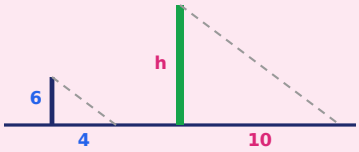
4 DILATIONS

- A dilation with scale factor k multiplies every length by k and keeps angles the same.
- $k > 1$: enlargement. $0 < k < 1$: reduction.
- Centered at the origin: $(x, y) \to (kx, ky)$.
- Sides 4, 6, 8 with $k = 3$ become 12, 18, 24.

5 INDIRECT MEASUREMENT

Similar triangles from shadows: object ÷ shadow is the same for both.

Example: A 6-ft person casts a 4-ft shadow; a tree casts a 10-ft shadow.
Proportion: $\frac{6}{4} = \frac{h}{10}$
Answer: $h = 15$ **ft**



6 CHECK YOURSELF

- Did I use corresponding sides in the same order?
- Is my scale factor image ÷ original?
- Did I square the scale factor for area?
- Does the answer make sense (bigger figure → bigger lengths)?