Accelerated 7 • Unit 2 • Assessment Guide

Scale Drawings, Similarity, and Slope

For the Parent or Teacher — What to look for

Unit 2 is the heart of grade 7/8 proportional reasoning. The big shift: scaling extends from scaled copies (grade 7) to formal dilations (grade 8) and ultimately to slope as an invariant of similar triangles. Watch how flexibly students move between these representations.

Problem 1 — Scale factor and ratios

- (a) Yes — scale factor 2.5 (since 3*2.5=7.5, 4*2.5=10, 5*2.5=12.5).
- (b) Perimeter ratio = 2.5 (linear). Area ratio = 6.25 = 2.5 squared.
- THE diagnostic question for the unit. Students who say area scales by 2.5 (not 6.25) are still thinking 1-dimensionally.

Problem 2 — Working backwards from area

- Scale factor = 5 (since 5 squared = 25). Some students will say 25, missing the square root.
- Strong: explains that since area scales by the SQUARE of the linear scale factor, factor = sqrt(25) = 5.

Problem 3 — Soccer field scale drawing

- (a) Actual: 110 m by 70 m (22*5 = 110; 14*5 = 70).
- (b) Area: 22*14 = 308 cm^2 on drawing; actual area = 110*70 = 7700 m^2.
- Alternative: 308 cm^2 * 25 m^2/cm^2 = 7700 m^2. The conversion factor for area is the SQUARE of the linear conversion factor.
- Diagnostic: does the student get 308*5 = 1540 m^2 (WRONG — used linear factor for area)?

Problem 4 — Composition of dilations

- (a) After dilation factor 2 at origin: P(0,0), Q(4,0), R(0,6).
- (b) After second dilation factor 1.5 at P (still (0,0)): P(0,0), Q(6,0), R(0,9).
- (c) Single dilation factor 3 (since 2*1.5 = 3) centered at origin (both centers happen to be the origin).
- Strong: notices composition of dilations at same center MULTIPLIES factors. Generalizes to algebra of dilations.
- Weak: adds the factors (3.5) or applies each to one coordinate only.

Problem 5 — Same angles, different side lengths

- Similar (same angles -> similar). NOT congruent (different side lengths). Scale factor 2.5.
- Critical to distinguish similarity from congruence. Many students conflate these.
- Strong: identifies that all corresponding sides will have ratio 2.5.

Problem 6 — Similar triangles on a line -> constant slope

- Slope = (7-1)/(3-0) = 2. Any point (x, 2x+1) works as third point.
- The PROOF (similar triangles): drop a vertical from each pair of points to form right triangles with the horizontal axis. These right triangles all share the angle at the line plus the right angle, so they're similar by AA. Similar triangles have proportional sides, so rise/run is constant.
- Strong: draws the triangles. Weak: just says 'because it's a line, slope is constant' without using similar triangles.

Problem 7 — Computing slopes; meaning

- (a) (17-5)/(8-2) = 12/6 = 2.
- (b) (-4-4)/(5-(-3)) = -8/8 = -1.
- (c) Slope = 60 (miles per hour). Units are critical: miles per hour.
- Diagnostic on (c): does the student attach UNITS to slope? Slope is a rate, meaningful only with units in context.

Problem 8 — Similarity of regular shapes

- Andre is right — all circles are similar (any two are related by a dilation centered at the corresponding center).
- Clare is right — all squares are similar (same angles, same side ratios = 1). NOT all rectangles: a 1x2 and a 1x3 rectangle have different proportions.
- Strong students reason about what's needed for similarity: equal angles + proportional sides.

Problem 9 — Point on a line with given slope

- Many answers. Strong: uses slope -3 = rise/run; from (1, 4) move 1 right, 3 down -> (2, 1). OR uses equation y = -3x + 7 to find another point.
- The justification matters: how do they KNOW the new point is on the line? Reference to similar triangles or the equation both count.
- Weak: picks a random point and claims it's on the line without checking.

Problem 10 — Enlarging a photo

- (a) k = 3 (since area scales by k squared, and 9 = 3 squared).
- (b) New dimensions: 12 by 9.
- (c) Diagonal scales by k = 3 (it's a length, like the sides). So diagonal multiplies by 3.
- Strong: distinguishes which quantities scale linearly (sides, diagonals, perimeters) versus by k^2 (areas).

Problem 11 — One shared angle + side ratio

- NOT necessarily similar — having ONE pair of equal angles is not sufficient for similarity.
- Counterexample: an obtuse triangle and an acute triangle could share a 30° angle but be very different shapes.
- Strong: sketches two triangles with one matching angle but different other angles.
- This catches students who think "shared angle + ratio = similar" — they need two matching angles (AA) OR all sides proportional (SSS) OR SAS.

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