Accelerated 7 · Unit 9 · Assessment Guide

Putting It All Together

For the Parent or Teacher — What to look for

Unit 9 is review and synthesis. It pulls together rigid transformations, similarity, slope, linear equations, exponents, scientific notation, Pythagorean theorem, and functions. Use this to assess Algebra 1 readiness: structural thinking, multi-step modeling, scientific notation fluency, and the ability to JUSTIFY answers.

Problem 1 — Tessellation by angles

- Equilateral triangle: 60° angles, 6 fit around a vertex (6*60 = 360). Tessellates.
- Regular pentagon: 108° angles, 3 fit around a vertex (3*108 = 324 < 360) but 4 don't fit (4*108 = 432 > 360). Does not tessellate.
- Strong: uses interior angle sum formula (n-2)*180/n. Weak: just says "because they don't fit" without calculating.

Problem 2 — Tessellation and a transformation

- Any correct tessellation acceptable.
- Identifies SPECIFIC mapping (e.g., "translate one square right by 1 unit" or "rotate hexagon by 60° about its center").
- Diagnostic: PRECISE language about which transformation, how far, in what direction or about what point.
- Weak: vague ("they're just moved").

Problem 3 — Pizza profit model

- (a) Profit P = 7.50n - 1.75n - 1200 = 5.75n - 1200, where n = # of pizzas.
- (b) 5.75n - 1200 = 400 -> 5.75n = 1600 -> n ≈ 278.3 pizzas. Round UP to 279.
- (c) 279 ≤ 300, so YES, the target is reachable.
- Strong: keeps track of UNITS (dollars, pizzas) throughout. Recognizes that you can't sell a fractional pizza.
- Weak: forgets the rent or ingredient cost in setting up.

Problem 4 — Cylindrical tank

- (a) V = pi(144)(30) = 4320pi cm^3 ≈ 13572 cm^3 ≈ 13.6 L.
- (b) 13572 / 350 ≈ 38.8 customers. Round DOWN to 38 (can't half-serve).
- Diagnostic: do they convert UNITS correctly (cm^3 to mL = same; cm^3 to L = divide by 1000)?

Problem 5 — Catch-up race

- (a) A: dA = 50t. B: dB = 65(t - 1) (B starts 1 hour later).
- (b) 50t = 65(t-1) -> 50t = 65t - 65 -> 15t = 65 -> t = 13/3 ≈ 4.33 hours.
- (c) Distance: 50 * (13/3) = 650/3 ≈ 217 miles.
- Strong: handles the t - 1 (head start). Weak: writes B's distance as 65t (forgets head start).

Problem 6 — Multi-step solving

- (a) 8x - 4 = 3x + 6 + x -> 8x - 4 = 4x + 6 -> 4x = 10 -> x = 2.5.
- (b) -6x - 8 + 5x = -x + 8 -> -x - 8 = -x + 8 -> -8 = 8 -> NO SOLUTION.

- Diagnostic on (b): student must recognize when the x terms cancel and the constants are unequal -> no solution.
- Algebra 1 readiness: strong students CHECK by substituting back.

Problem 7 — World population line

- Length: 8 * 10^9 * 0.5 m = 4 * 10^9 m = 4 * 10^6 km = 4,000,000 km.
- Earth's circumference: ~40,000 km. So the line is 100x the circumference!
- Strong: uses scientific notation throughout. Recognizes the comparison gives a STRIKING result.
- Weak: doesn't convert m to km, or doesn't compute the ratio.

Problem 8 — Temperature predictions

- (a) Slope: temperature decreases as latitude increases (negative slope).
- (b) Slope = (70-80)/(50-40) = -10/10 = -1 °F per degree latitude.
- (c) At 35°, line gives 85°F. Confidence: depends on how typical 35° is in the data. Extrapolating to 35° (within typical US latitudes) is reasonable; extrapolating to, say, 0° latitude would not be.
- This combines scatter plot interpretation, slope, and informed extrapolation — multiple grade 7/8 skills.

Problem 9 — Two topics, one connection

- Many valid answers. Strong examples:
- Similar triangles ↔ Slope: similar triangles on a line guarantee constant slope.
- Pythagorean theorem ↔ Distance formula: the formula is just Pythagoras on a coordinate plane.
- Rigid transformations ↔ Congruence: congruence DEFINED via rigid motions.
- Diagnostic: does the student see math as a CONNECTED whole, or as separate units?

Problem 10 — Two lines, intersection

- 2x + 3 = (1/3)x - 1 -> (5/3)x = -4 -> x = -12/5 = -2.4. y = 2(-2.4) + 3 = -1.8. Intersection (-2.4, -1.8).
- Lines aren't parallel because they have different slopes (2 vs 1/3).
- Strong: recognizes slope difference as the reason for intersection.
- Weak: doesn't recognize slope difference, or makes arithmetic errors.

Problem 11 — Rules vs reasoning

- Strong answers acknowledge BOTH dimensions.
- Rules: exponent rules, slope formula, Pythagorean theorem (as a formula).
- Reasoning: WHY the rules work (e.g., Pythagorean theorem proven by area; exponent rules from repeated multiplication; congruence via rigid motions).
- This is a metacognitive question. A strong response shows the student is aware of the DIFFERENCE between memorizing and understanding.

Problem 12 — Teach a younger student

- Any clear, accurate explanation acceptable. Look for:
- Choice of an appropriate topic (not too advanced for the audience).
- Use of an example or analogy.
- No conceptual errors.
- A strong explanation shows the student has internalized the topic well enough to RESTATE it — the deepest test of understanding.

— end —