# Accelerated 6 · Unit 7 · Assessment Guide

*Rational Numbers*

*For the Parent or Teacher — What to look for*

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*Unit 7 extends number sense to negatives — and is the first true bridge to algebra. The DEEP idea: −a is the additive inverse, |a| is the distance from 0. Common errors: treating negative signs as random labels rather than as 'opposite direction.'*

## Part A — Quick Computations

- −7+12 = 5. −4·5 = −20. −8 − (−3) = −5. |−6| = 6.
- Common errors: −8 − (−3) = −11 (subtracts 3 instead of adding); −4·5 = +20 (forgets sign).

## Problem 1 — Order, absolute values

- Order: −2.5, −1, −¾, 0, ¼, 1.5.
- Same |·|: NONE in this list (intentional — students may guess). If they say '−1 and 1' they're inventing numbers.
- ★ Strong catches that NO pair has the same absolute value in this list (or correctly notes that 1.5 and −1.5 WOULD — if there were a −1.5).
- Weak: orders correctly but invents a same-abs-value pair.

## Problem 2 — True/false claims

- (a) T. −10 IS less than −5 (further left on number line).
- (b) F. |−10| = 10 > 5 = |−5|.
- (c) T. The opposite of a negative is positive.
- (d) T.
- (e) F. |x| = 7 has TWO solutions: x = 7 and x = −7.
- ★ Strong: explains (e) with both solutions. Most students miss this.
- Watch (a) vs (b) — same numbers, opposite truth values. Catches students who think '−10 is bigger than −5 because 10 > 5.'

## Problem 3 — Add/subtract rational numbers

- (a) 5. (b) −1. (c) 8. (d) −7. (e) 0.
- Strong: number-line reasoning for (a) and (c) (start at −7, move 12 right; start at 5, move 'opposite of −3' = 3 right).
- Watch (e): 0 − (−7) − 7 = 7 − 7 = 0. Common mistake: 0 + 7 + 7 = 14.

## Problem 4 — Subtract-a-negative = add

- All three: 5−(−3)=8. 0−(−10)=10. −2−(−6)=4.
- ★ Strong: 'subtracting a negative means going in the OPPOSITE direction of the subtracted number, which is the positive direction.'
- Strong+: connects to 'opposite of opposite' = same.
- Weak: agrees with Diego procedurally without semantic explanation.

## Problem 5 — Plot rectangle ABCD

- ABCD is a RECTANGLE (4 right angles, 4 sides parallel to axes).
- Dimensions: width = 4 (from −2 to 2), height = 4 (from −1 to 3). Area = 16.

- Reflection of A(2,3) across y-axis: (−2, 3) — same as B.
- Strong: uses |coordinate difference| to find side lengths (not 'I counted dots').
- ★ Strong+: notes that ABCD has a square shape since width = height = 4.

### Problem 6 — Reflections

- Across x-axis: (−4, −2) [flip y-sign].
- Across y-axis: (4, 2) [flip x-sign].
- Across both (180° rotation): (4, −2).
- ★ Strong: sees that 'flip x: change sign of x; flip y: change sign of y; rotate 180°: change both signs.'
- Weak: gets one right and the others wrong (often confuses which axis flips which coordinate).

### Problem 7 — Multiply/divide rational numbers

- (a) 20. (b) −1/4. (c) −3. (d) 4. (e) −1. (f) 16.
- Strong: gets the sign right BEFORE the magnitude.
- Watch: (a) might be −20 (carries a single negative); (e) and (f) often confused.

### Problem 8 — Even/odd powers of negative

- $(-2)^1 = -2$. $(-2)^2 = 4$. $(-2)^3 = -8$. $(-2)^4 = 16$.
- ★ Strong: counts the factors of −1: 'each (−2) = (−1)·2, so $(-2)^n = (-1)^n \cdot 2^n$. (−1) to an even power is 1, to odd is −1.'
- ★ Strong+: generalizes that any negative real number to even/odd power follows this rule.
- Weak: tests the rule but only with one example, doesn't generalize.

### Problem 9 — Bigger |·| means bigger number?

- Han is sometimes right.
- Supports: 7 vs 3 → |7|=7 > |3|=3, and 7 > 3. ✓
- Refutes: −7 vs 3 → |−7|=7 > |3|=3, but −7 < 3. ✗
- ★ Han's rule works ONLY when both numbers are non-negative (or both non-positive).
- Strong: articulates the qualification crisply.

### Problem 10 — Sea-level diver

- Expression: −3 + (−2) + 4 + (−6) = −7. Final depth = 7 m below surface (or −7 m).
- Strong: number-line drawn, with starting point 0 and ending at −7.
- Weak: adds magnitudes (3+2+4+6 = 15) without signs.
- Strong+: distinguishes 'depth' (positive number, 7 m) from 'position' (signed, −7 m).

*— end —*