

Grade 7 • Unit 6 • Assessment Guide

Expressions, Equations, and Inequalities

For the Parent or Teacher — What to look for

Unit 6 builds equation- and inequality-solving from tape diagrams and hanger diagrams. THE classic errors: distributing only to the first term ($5(x-3) = 5x - 3$ instead of $5x - 15$), forgetting to flip the inequality when dividing by a negative, and treating $3x + 6$ as the same as $3(x + 6)$. Watch for whether students can solve flexibly (two methods) and whether they understand WHY each step works.

Problem 1 — Tape diagram → equation

- Equation: $3(x + 2) = 21$ OR $3x + 6 = 21$.
- $x = 5$.
- ★ Strong: recognizes the parenthesized form because each rectangle has $(x+2)$. Weak: writes $3x + 2 = 21$.

Problem 2 — Two equation forms (with and without parens)

- (a) $3x + 16 = 40$. $x = \$8$. Socks each cost \$8.
- (b) $(m - 5)/4 = 7$, so $m = \$33$.
- ★ THE central Unit 6 distinction: 'spent then split' vs 'split then add.' Strong students recognize when parens are needed.
- Common error: writing $3x + 16/4 = 40$ — but order of operations gets wrong.

Problem 3 — Multi-step equations

- (a) $5x = 30$, $x = 6$.
- (b) Either $2x + 14 = 26$, $x = 6$; or $x + 7 = 13$, $x = 6$. BOTH methods work.
- (c) $-4x = 12$, $x = -3$. ★ Watch for missing sign.
- (d) $x - 6 = 15$, $x = 21$. ★ Multiply both sides by 3 first.
- Strong: clean 'do the same to both sides' work.

Problem 4 — Inequalities

- (a) $3x \leq 15$, $x \leq 5$. Graph: closed circle at 5, arrow LEFT.
- (b) ★ DIAGNOSTIC: dividing by -2 FLIPS the inequality. $x < -5$. Many students miss this.
- Strong: states 'flip when dividing by negative' as a rule and applies it.

Problem 5 — Han's savings inequality

- $24 + 11h \geq 90$, so $h \geq 6$. Need at least 6 hours.
- ★ Note: $11h \geq 66 \rightarrow h \geq 6$. Han must work at LEAST 6 hours.
- Strong: chooses $\geq$ correctly and rounds UP for whole hours.

Problem 6 — Equivalent expressions

- (a) $3x + 12 - 2x = x + 12$.
- (b) $-6x + 10 + 4x = -2x + 10$.
- (c) $5x - x + 8 = 4x + 8$. ★ Subtracting $(x - 8)$ means SUBTRACTING x and ADDING 8.
- (d) $3y - 1 + 3 = 3y + 2$.

- ★ Watch for sign errors when distributing a negative or subtracting a group. This is THE classic Unit 6 algebra trap.

Problem 7 — Tyler's distribution error

- Tyler distributed wrong: $5(x - 3) = 5x - 15$, not $5x - 3$.
- Correct: $5x - 15 = 25$, so $x = 8$.
- ★ THE Unit 6 archetypal error. The 5 must distribute to BOTH terms.

Problem 8 — Two methods for $3(2x + 5) = 27$

- Method 1: $6x + 15 = 27$, $6x = 12$, $x = 2$.
- Method 2: $2x + 5 = 9$, $2x = 4$, $x = 2$.
- ★ BOTH give $x = 2$. This is the deep lesson — multiple valid solution paths.
- Strong: explains which method is more efficient depending on the numbers (Method 2 works cleanly when right side divides by leading coefficient).

Problem 9 — Are $3x + 6$ and $3(x + 6)$ equivalent?

- NO. At $x = 2$: $3x + 6 = 12$. $3(x + 6) = 3(8) = 24$.
- $3(x + 6) = 3x + 18$.
- ★ The diagnostic: do students remember that the 3 distributes to BOTH terms?
- Strong: explicit distribution. Weak: 'looks similar so probably equal.'

Problem 10 — Story for $2x + 8 = 30$

- Many valid stories. E.g., 'Two equal-priced shirts plus \$8 in tax cost \$30. Each shirt cost x dollars, so $x = \$11$.'
- Strong: equation matches story structure (two of something + a fixed amount = total).
- Weak: random numbers, no story logic, or x represents the wrong thing.

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