

# Accelerated 6 • Unit 6 • Assessment Guide

## Percent Increase and Decrease

For the Parent or Teacher — What to look for

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Unit 6 is the percent-change unit. The deepest idea: percent changes COMPOUND MULTIPLICATIVELY, not additively. A 50% up then 50% down does NOT return to start. Students who treat percents like 'integers attached to a sign' will fail every nontrivial problem here.

### Part A — Percent computation

- $50 + 10\%$  of 50 = 55.  $80 - 25\%$  of 80 = 60.  $\$40 \cdot 1.05 = \$42$ .  $100 - 0.10 = 10$ .
- Strong: instant, with explanation if asked ('25% is one-fourth').

### Problem 1 — Jacket up then back down

- $\$60 \rightarrow \$75$  is a 25% INCREASE ( $\$15 / \$60$ ).
- $\$75 \rightarrow \$60$  is a 20% DECREASE ( $\$15 / \$75$ ).
- ★ The dollar change is the same; the BASE is different (60 vs. 75), so the percentages differ.
- Strong: clear explanation that 'percent change uses the starting value as the base.'
- Weak: claims both are the same; or doesn't notice the asymmetry.

### Problem 2 — Same \$10 different percents

- Diego:  $\$10 / \$40 = 25\%$ . Sara:  $\$10 / \$200 = 5\%$ .
- Strong: 'Diego's bank grew more in PROPORTION; same absolute amount can be very different relatively.'
- Weak: declares them 'equal because they're both \$10.'

### Problem 3 — Tax two ways

- Tax = \$1.92, Total = \$25.92.
- Direct:  $\$24 \cdot 1.08 = \$25.92$ .
- ★ Strong: explains 'multiplying by 1.08 = multiplying by 1 (original) plus 0.08 (tax) all in one step.'
- Weak: gets the answers but can't articulate why 1.08 works.

### Problem 4 — Reverse: discount to find original

- $0.70 \cdot \text{original} = \$42 \rightarrow \text{original} = \$60$ .
- ★ Han is WRONG.  $\$42 + \$12.60$  (30% of \$42) = \$54.60, NOT \$60.
- Strong: identifies that the 30% should be of the ORIGINAL, not of the sale price. Articulates the inverse problem clearly.
- ★ This is THE most diagnostic question for percent change.

### Problem 5 — Tip before vs. after tax

- Tip on \$48 = \$9.60.
- After-tax amount =  $\$48 \cdot 1.07 = \$51.36$ .
- Tip on after-tax =  $\$10.272 \approx \$10.27$ .
- Difference: \$0.67.
- Strong: comments that 'tipping on tax means tipping the server for the government's cut — and the difference is the 20% of the tax.'

- Weak: gets the numbers right but doesn't comment substantively.

### Problem 6 — $2\frac{1}{2}$ cups for 12 cookies → 30

- Per cookie:  $2.5/12 \approx 0.2083$  cups. For 30:  $30 \cdot 0.2083 \approx 6.25$  cups.
- Scaling:  $30/12 = 2.5 \rightarrow 2.5 \cdot 2.5 = 6.25$  cups.
- ★ Both methods MUST yield 6.25 cups.
- Strong: two clearly different approaches; both yield 6.25.

### Problem 7 — +50% then -50%

- \$100 → \$150 → \$75. FINAL = 75% of START.
- ★ Key idea:  $(1.5)(0.5) = 0.75$ , not 1.
- Strong: explains that the 50% decrease is taken from the larger amount (\$150), so the dollar loss exceeds the gain.
- Strong+: generalizes  $(1+p)(1-p) = 1 - p^2$ . For  $p = 50\%$ ,  $1 - 0.25 = 0.75$ . Connects to Problem 9 on Unit 2.
- Weak: agrees that final equals start; or computes correctly but doesn't articulate the multiplicative reason.

### Problem 8 — Salary +5% then -5%

- \$40,000 → \$42,000 → \$39,900.
- $(1.05)(0.95) = 0.9975 \rightarrow$  final = 99.75% of start.
- ★ Strong: realizes salary is NOT back to original; explains via multiplicative compounding.
- ★ Strong+: generalizes that this is a SMALLER loss than the 50/50 case (Problem 7) because  $(1+p)(1-p) = 1 - p^2$  is closer to 1 when  $p$  is small.
- Weak: gets the same wrong intuition Han had — that  $\pm 5\%$  cancel.

### Problem 9 — Asymmetric percents

- \$80 → \$100 = +25%.
- \$100 → \$80 = -20%.
- ★ The same DOLLAR change (\$20) but different percentages because the bases differ.
- Generalization: if  $A \rightarrow B$  is  $+p\%$ , then  $B \rightarrow A$  is  $-p/(1+p) \cdot 100\%$ . Worth a student showing the general formula even informally.
- Strong: articulates the asymmetry crisply.
- Weak: claims +25%, -25% — most common misconception.

### Problem 10 — Mai: 10% three times = 30%?

- \$100 → \$110 → \$121 → \$133.10.
- Single 30% would give: \$130.
- Difference: \$3.10 (the compounding bonus).
- ★ Mai is WRONG. Three 10% growths multiply:  $(1.1)^3 = 1.331 \neq 1.30$ .
- Strong: explains compounding — 'the SECOND year's 10% is on a bigger base, so it adds more dollars.'
- ★ Foreshadows exponential growth — a Grade 7/Algebra 1 topic. Accelerated students should see this seed.