UNIT 1 — INTEGERS

1.1.4 Notes — Word Problems

Accessible Student Reference

Learning Target: I can use integer operations to represent and solve real-world problems.

1. Translating Words into Integer Operations

In a word problem, first identify the starting value, the direction of change, and the operation that connects the quantities. Increases and gains are represented with positive values; decreases and losses are represented with negative values.

Subtraction and a Negative Sign

A subtraction symbol tells you to perform an operation. A negative sign is part of a number and tells its direction or value. These can appear together. For example, 5 − (negative 3) means subtract negative 3, which is the same as 5 + 3.

2. Addition and Subtraction in Context

Use addition when a quantity changes from a starting value. Use subtraction to find the difference between two values. Pay attention to wording such as higher, lower, rose, fell, gained, or lost.

Temperature Example

Milwaukee begins at negative 4 degrees Fahrenheit and the temperature rises 11 degrees. Represent the rise as positive 11: negative 4 + 11 = 7. The noon temperature is 7 degrees Fahrenheit.

Comparing Two Values

Nome is negative 31 degrees and Toronto is negative 14 degrees. To find how much lower Nome is, find the distance between the temperatures: negative 14 − (negative 31) = 17. Nome is 17 degrees lower.

Altitude Example

Checkpoint 3 is at negative 177 feet and a hill rises 495 feet above it. Add the change to the starting altitude: negative 177 + 495 = 318. The hill is at 318 feet.

3. Multiplication and Division in Context

Use multiplication when the same change happens repeatedly. Use division when a total change is shared equally across a number of equal time periods or groups.

Rate of Change Example

A pool loses 24 gallons over 4 minutes at a constant rate. The total change is negative 24 gallons. Negative 24 ÷ 4 = negative 6, so the amount of water changes by negative 6 gallons each minute.

Repeated Change Example

A pond gains 10 fish each day for 80 days. Positive 10 × 80 = positive 800. The total change is an increase of 800 fish.

Another Rate Example

A tram moves downward 21 meters in 7 seconds. Downward is negative, so negative 21 ÷ 7 = negative 3. Its elevation changes by negative 3 meters each second.

4. Checking a Word-Problem Answer

- Check the sign: does the answer represent an increase or decrease correctly?
- Check the operation: are you finding a new value, a difference, a repeated change, or a rate?
- Check the units: degrees, feet, dollars, gallons, members, and other units should remain attached to the answer.
- Check reasonableness: estimate whether the size of the answer makes sense in the situation.

Lesson Summary

- Translate increases as positive changes and decreases as negative changes.
- Distinguish the subtraction operation from the negative sign on a number.
- Use addition or subtraction for changes and differences.
- Use multiplication for repeated equal changes and division for equal rates or groups.
- Interpret the sign and units of the final answer in context.