

Grade 7 - Solving Real-World Problems with Rational Numbers - Lesson

Common Core 7.NS.A.3 · maths-pdf.fr/en/

Rational numbers describe gains and losses, heights and depths, and parts of a whole in everyday situations. To solve a real-world problem, name each quantity with its sign, choose add, subtract, multiply, or divide for each step, and compute with the sign rules. Then check that the answer makes sense in the story.

Grade 7 · Common Core State Standards: **7.NS.A.3**

Key facts

- Positive and negative numbers show opposite directions, such as gains and losses.
- The change from a to b is $b - a$; the distance between them is $|b - a|$.
- Fraction bars mean division, so a complex fraction is a division problem.
- Convert fractions and decimals to one form before combining them.
- Check every answer with an estimate and the correct units.

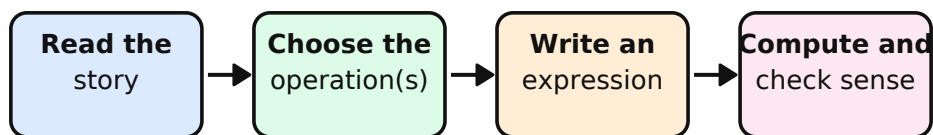
How do you choose the operation?

Real problems hide the math in a story. Decide first whether quantities are being **combined** (add), **compared** (subtract), put into **equal groups** (multiply), or **shared** (divide).

Clue	Operation
rose, gained, deposit	add a positive
fell, lost, withdrawal	add a negative
how far apart	subtract, then absolute value
per, each, equal groups	divide
times as much, repeated	multiply

Clue words help, but always check the story.

How do you solve a multistep problem?



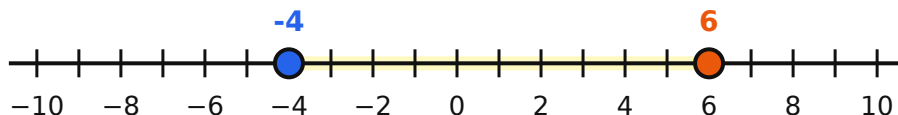
Work through the story one step at a time.

1. Read the story and name each quantity with its sign.
2. Choose an operation for each step.
3. Write one expression, and compute carefully with the sign rules.
4. Decide whether the answer is reasonable and write it with units.

Signed quantities

Positive numbers show gains, deposits, and heights above sea level. Negative numbers show losses, withdrawals, and depths below sea level. Zero is the starting point.

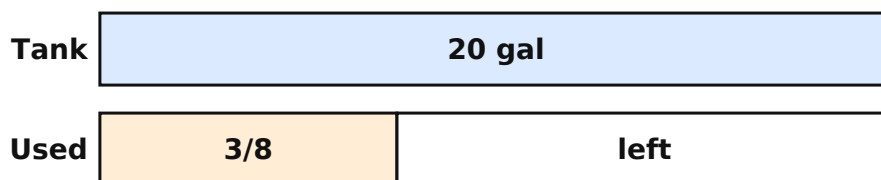
Example. At sunrise it is -4°F . By noon it is 6°F . The change is $6 - (-4) = 10$ degrees.



A temperature that goes from -4°F to 6°F changes by $6 - (-4) = 10$ degrees.

How do you work with fractions and decimals in the same problem?

Pick one form and stay with it. You can change fractions to decimals when the denominator is 2, 4, 5, 8, or 10. Use fractions when the decimal repeats, for example $\frac{1}{3}$.



Three eighths of a 20-gallon tank is used.

In the tank picture, $\frac{3}{8}$ of 20 gallons is $20 \times \frac{3}{8} = 7.5$ gallons. The rest is $20 - 7.5 = 12.5$ gallons.

What is a complex fraction?

A complex fraction has a fraction in the numerator or denominator. Treat the fraction bar as division: $(\frac{3}{4}) \div (\frac{5}{8}) = \frac{3}{4} \times \frac{8}{5} = \frac{6}{5}$.

Percent and ratio ideas also appear here. A store that is losing $\frac{1}{4}$ of its \$480 weekly budget has a change of $-\frac{1}{4} \times 480 = -120$ dollars, which is a loss. Writing the amount with its sign keeps the story clear from start to finish.

Always check the answer against a simple estimate. If a diver starts at 0 feet and goes down, the final depth must be negative, and if the answer is positive you made a sign mistake.

Questions about solving real-world problems with rational numbers

How do you decide whether to add or subtract in a story?

Add when quantities combine, such as a deposit and a balance. Subtract to find a change or a difference between two values. Check the sign of each quantity.

How do you find the change in temperature?

Subtract the starting temperature from the ending temperature. From -4°F to 6°F , the change is $6 - (-4) = 10$ degrees.

When should I use fractions instead of decimals?

Use fractions when the decimal repeats, such as $\frac{1}{3}$. Use decimals when denominators are 2, 4, 5, 8, or 10, because they terminate.

What does a negative answer mean?

It depends on the story: a loss, a debt, a drop, or a location below sea level. Always state the meaning with units.

How can I check a rational number answer?

Estimate with simple numbers, check the sign, and make sure the units match the question. Then substitute your answer back into the story.