Grade 7 Math · Lesson 1 — The Year-End Ledger

Adding and Subtracting Integers · ages 11 to 14 · 45 minutes · the workbook, one screen, this page, a pencil and paper

At a Glance

- **The book:** 7th Grade Math Workbook: Real-World Problem Solving, Chapter 1 (The Bookkeeper), by Dr. Gene A Constant.
- **Free tool:** Budget Builder (money coming in and going out of a real budget), free, no login, plays in the browser: globalsovereignuniversity.org/budget-builder.
- **Free class:** Lesson 1 of the free Grade 7 Mathematics class: globalsovereignuniversity.org/grade-7-math-class#lesson-1.
- **Ages and time:** Grade 7 · ages 11 to 14 · 45 minutes.
- **Prep (5 min):** read the Teaching Creed and have the workbook open to Chapter 1. Draw a number line from −10 to 10 on a strip of paper and set out a coin or button.

Why this lesson

Every ledger, bank account and thermometer runs on signed numbers. A child who can walk a coin below zero on a number line can keep honest books for life, and every later chapter that uses negatives stands on this one.

What the learner will be able to do

- Use positive and negative numbers to stand for gains and losses
- Find the absolute value of a number
- Add and subtract integers
- Work multi-step problems with three or more gains and losses
- Find a net result and explain what it means

The 45-Minute Climb

How to read this: the gold box in each step is your lesson, word for word. Run it as written. The notes beneath are optional support. "The group" means your family; "host" means you.

1 · The Hook (5 min)

"Draw a number line on a strip of paper from −10 to 10. Put a coin on 4. Walk it back 9 steps. Where does it land, and what does that number mean if the coin is your money?"

Say it like this: let your child do it with real objects if you can, then ask how they know their answer is right before you check it.

2 · Work It Together (15 min)

Open the workbook to the worked example A Temperature Drops Below Zero (Section 1.1) together: Start at the noon temperature: 8°F. A storm drops it 23°F, so subtract: 8 − 23. 23 is bigger than 8, so the answer crosses below zero: 8 − 23 = −15. The temperature is now −15°F. Then read Paying Down a Debt (Section 1.2) together: A member owes the storehouse $60, so the balance is −60. She earns $45 doing guard duty on the harvest. Add: −60 + 45. The signs are different: 60 − 45 = 15. The negative number had the larger absolute value, so the answer is negative: −15. She still owes $15.

Read each step aloud and let your child say the next step before you read it. Then play one round of Budget Builder.

3 · The Talk (8 min)

1. Why does subtracting a negative number make the answer bigger? 2. When you add a positive and a negative number, how do you know the sign of the answer? 3. What does a net result of −$100 tell the board?

You are not fishing for one right answer. You are listening for understanding:

- Q1: Subtracting means taking away. Taking away a debt or a loss leaves you better off, so 3 − (−5) is the same as 3 + 5.
- Q2: Look at which number is farther from zero. The answer takes the sign of the number with the larger absolute value.
- Q3: That after every gain and loss is counted, the accounts together owe $100.

4 · Solo Climb (12 min)

Five problems on your own, with your work shown.
1. A survey crew starts at the co-op office, 250 feet above sea level, and walks down 315 feet into a canyon to check a spring. What is their elevation now?
2. The co-op needs 500 fence posts and has 320, a shortfall of −180. A delivery brings 95 posts. What is the new shortfall?
3. A member owes −$80 for winter supplies. He works extra shifts and earns $55. The co-op board then forgives $15 of what he still owes. What is his final balance?
4. The co-op has 84 cows. It sells 6, a neighbor gives it 12, and 4 are sold at auction. How many cows does it have now?
5. The town has 300 people. In one year 14 move away, 8 babies are born and 22 new people move in. What is the population now?

Why solo: a test, a job and real life ask you to work alone. Five problems rehearse exactly that. The answers are at the end of this plan.

Keep It Fresh (5 min, the next day)

Two review problems from the book's Extra Practice.
1. A solar battery is at 100%. A cloudy week drains 45%, a sunny day adds 18% and a night of heavy use drains 30%. What is the charge now?
2. A diver is at −28 feet and rises 11 feet. Where is she now?

Ready to move on? Four of the five Solo Climb problems right, with work shown, means this skill is solid. If not, reread the worked examples together and try two more problems from the chapter before the next lesson. Short review of old skills keeps them from fading.

5 · The Takeaway (5 min)

"A negative number is a loss, a debt or a drop. To subtract, add the opposite." · Homework: Keep a one-week ledger of your own: allowance or chores paid in as positive numbers, anything spent as negative. Add the column at the end of the week and say what the net result means.

The badge moment: finishing all five steps earns the Bronze ring of this lesson's badge, The Honest Ledger. Mark it on the Climber's Passport now; the homework is how Silver and Gold are earned during the week.

Common Mistakes to Watch For

- Losing the sign: writing 8 when the answer is −8.
- Subtracting a negative as if it were positive: 3 − (−5) is 8, not −2.
- Adding the size of the numbers when the signs are different, instead of subtracting.

The Teaching Creed

You are not the expert; the book and the method are. Your job is to ask "how do you know?" one more time than feels natural, and to celebrate wrong answers out loud. In here, a wrong answer is where the lesson lives.

GENO, GSU's free tutor, can explain any step a second way, any hour, in 83 languages, with no login: globalsovereignuniversity.org/free-tutor. A prompt for the host: Ask GENO: "My child keeps getting 3 − (−5) wrong. Help them see why subtracting a negative is the same as adding, without giving the answer."

Adapt It and Measure It

Differentiation

- Struggling: walk the coin on the number line for every problem before writing anything.
- Ahead: keep a week-long ledger of family money in and out and find the net result.
- Large co-op: give each team a different month of the co-op's books to balance.
- Reluctant: let the child track the temperature outside each morning and evening for a week.

Evidence of learning (no exam)

Look for three things. Tried: finished all five Solo Climb problems with work shown. Noticed: can name the mistake in Common Mistakes that they almost made. Changed: the next day, solves one new problem from the same chapter without help. Those three words are the whole rubric, and they match the badge tiers below.

Gamify It — The Campus Climb

Every GSU lesson is one badge on the Climber's Passport, earned at four depths: Bronze, Silver, Gold and Platinum.

LESSON 1 BADGE — The Honest Ledger · Bronze — The Climb: finished the 45-minute lesson, all five steps. · Silver — The Try: did the homework and explained it to the host. · Gold — The Proof: completed the chapter's Action Report in the workbook with every answer checked against the Answer Key. · Platinum — The Teacher: ran this lesson as host for someone else. The harvest of a teacher is teachers.

Answers for the Host

1. −65 feet, which is 65 feet below sea level (250 − 315)
2. −85 posts (−180 + 95)
3. −$10, he still owes $10 (−80 + 55 = −25; −25 + 15 = −10)
4. 86 cows (84 − 6 + 12 − 4)
5. 316 people (300 − 14 + 8 + 22)

Keep It Fresh: 1. 43% (100 − 45 + 18 − 30) · 2. −17 feet

Every answer above comes from the workbook's own Answer Key. The book behind this lesson: 7th Grade Math Workbook: Real-World Problem Solving, Chapter 1 (The Bookkeeper).

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