Grade 7 Math · Lesson 5 — The Quote Formula

Writing and Simplifying Expressions · 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 5 (The Event Planner), by Dr. Gene A Constant.
- **Free tool:** Math Jeopardy (a quiz game show with a Grade 7 board), free, no login, plays in the browser: globalsovereignuniversity.org/math-jeopardy.
- **Free class:** Lesson 5 of the free Grade 7 Mathematics class: globalsovereignuniversity.org/grade-7-math-class#lesson-5.
- **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 5. Set out a few cups and spoons, or any two kinds of small objects, in two piles.

Why this lesson

Expressions are how a planner writes one rule that works for any number of guests. The distributive property and combining like terms are the two moves that keep those rules short and correct.

What the learner will be able to do

- Write an expression from a word rule
- Use the distributive property to expand an expression
- Combine like terms
- Factor out the greatest common factor
- Tell whether two expressions are equivalent

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)

"Make two piles: 3 cups and 5 spoons, then 2 cups and 4 spoons. Push them together. How do you write the total without counting each one again?"

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 Rule Becomes an Expression (Section 5.1) together: Rule: the sound system costs $5 to set up plus $2 for every hour it runs. The part that never changes is the constant: 5. The part that changes is 2 for each hour h: 2h. The expression is 5 + 2h (or 2h + 5). Then read Packing Party Bags (Section 5.2) together: Each party bag has 3 balloons (b) and 2 stickers (s): 3b + 2s. For 4 bags, multiply the whole bag by 4: 4(3b + 2s). Distribute: 4 × 3b + 4 × 2s. The total is 12b + 8s.

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

3 · The Talk (8 min)

1. What makes two terms “like terms”? 2. Why does 4(x + 3) equal 4x + 12 and not 4x + 3? 3. How can you check that a factored expression is right?

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

- Q1: The same variable to the same power, such as 3x and 5x. Numbers alone are like terms with each other.
- Q2: The 4 multiplies everything inside the parentheses, so both x and 3 are multiplied by 4.
- Q3: Distribute it back out. 6(3r + 4p) gives 18r + 24p, the expression you started with.

4 · Solo Climb (12 min)

Five problems on your own, with your work shown.
1. Write an expression: five less than three times the number of tables (t).
2. A dance floor is 5 yards wide and x + 4 yards long. Distribute to write its area: 5(x + 4).
3. The north tent has 5x chairs and 3y lanterns. The south tent has 2x chairs and 4y lanterns. Write one simplified expression for the total.
4. The planner starts with (12x + 20) napkins and uses (4x + 5). Write a simplified expression for what is left.
5. Two rooms use 3(2x + 1) and 2(4x + 3) gallons of punch. Distribute and combine to find the total.

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. An old pump turned 60% of its fuel into useful power. A new one turns 75%. What is the increase in percentage points? In percent?
2. A $64 jacket is on sale for $48. What is the percent off?

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)

“Multiply the outside number by every term inside. Only like terms can be combined.” · Homework: Write a price rule for something you do, such as “$3 to start plus $2 for every dog walked.” Test it for 1, 4 and 10 dogs.

The badge moment: finishing all five steps earns the Bronze ring of this lesson’s badge, The Formula Maker. 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

- Multiplying only the first term: 4(x + 3) is 4x + 12, not 4x + 3.
- Combining unlike terms, such as 3x + 5y into 8xy.
- Dropping the minus sign when you distribute a negative: −4(m − 2) is −4m + 8.

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 writes 4(x + 3) as 4x + 3. Help them see why the 4 multiplies both terms, without giving the answer.”

Adapt It and Measure It

Differentiation

- Struggling: use real objects for each variable, such as cups for x and spoons for y.
- Ahead: write a price rule for a family business idea and test it for several cases.
- Large co-op: each team writes a rule for one part of an event and the group combines them.
- Reluctant: let the child write a rule for their allowance or chores.

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 5 BADGE — The Formula Maker · 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. 3t − 5
2. 5x + 20
3. 7x + 7y
4. 8x + 15
5. 14x + 9

Keep It Fresh: 1. 15 percentage points; a 25% increase (15 ÷ 60) · 2. 25%

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 5 (The Event Planner).

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