Comic Mysteries With One-Step Equations

Teacher		**Class**	Grade 6
Subject	Math	**Topic**	Solving one-step equations
Date		**Room**	
Lesson length	60 minutes	**Country**	United States

Students learn to write and solve x + p = q and px = q with fractions and decimals. They draw comic stories, trade them, and solve with a check.

Curriculum links

- write one-variable, one-step equations and inequalities to represent constraints or conditions within problems [1]
- write corresponding real-world problems given one-variable, one-step equations or inequalities [1]
- model and solve one-variable, one-step equations and inequalities that represent problems, including geometric concepts [1]

Learning objectives

- Students will write x + p = q and px = q from real-world stories.
- Students will solve one-step equations with nonnegative fractions and decimals.
- Students will check solutions by substitution to confirm a true statement.

Success criteria

- I can write an equation for a story.
- I can solve in one step using the inverse operation.
- I can check by putting the answer back in.

What students already know

Show x + 3 = 8. Ask: What number plus 3 makes 8? How do you undo adding 3? Listen for 5 and subtract.

Key words

equation	Two equal amounts joined by = [5]
variable	A letter, like x, for a number you do not know yet [3]
inverse operation	Opposite move that undoes another move, like add and subtract [3]
substitution	Putting a number in place of x to test both sides [13]

Materials

- slides and projector with sound
- printed comic strip template, one per student
- pencils and colored pencils
- mini-whiteboards and markers
- printed Worksheet Task B (Practice questions: Solve these one-step equations step by step.)
- printed exit slips from Slide 12

Before the lesson

- Print comic strip template with 3 panels per story, one copy per student plus spares
- Print Worksheet Task B, one per pair, and printed exit slips
- Test Slide 6 Video clip 3 (0:00–5:00) and Slide 8 Video clip 4 (0:00–5:00) with sound
- Set out pencils, colored pencils, mini-whiteboards, and post inverse pairs on board

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Lesson outline

0–10 min **Starter** 10 min · Whole class

Hook interest with real stories and connect missing numbers to equations.

YOU DO

1. Show Slide 1 and say the hook, then preview that students will make comics to trade.
2. Show Slide 4 cards for money, drinks, and length and read the short story lines aloud.
3. Show Slide 5 question and have partners discuss how to find the start without guessing.
4. Collect ideas and restate them as equations x + 5 = 12 and 3x = 4.5 for nonnegative numbers [12].

STUDENTS DO

1. Listen to the hook and look at the money, drinks, and length cards.
2. Pair-share ideas for the student with some dollars who got $5 more and now has $12.
3. Show a first guess for the equation on mini-whiteboards.

Say: Turn this boring equation into a three-panel mystery someone would want to read. Today we will find missing numbers in real stories about money and measures. Then you will draw your own comics and your partner will solve them.

Ask: A student had some dollars, got $5 more, and now has $12. What equation fits? (x + 5 = 12, where x is the starting dollars.) · Three bottles hold 4.5 liters in all. What equation fits if each bottle holds the same? (3x = 4.5, where x is liters in one bottle.)

Check understanding: Scan whiteboards for x + 5 = 12 and 3x = 4.5. If many miss the form, model one more with a bar before moving on.

Support: Point to the board labels x is start, +5 is change, 12 is total and let students repeat the story.
Stretch: Ask what changes if amounts are $4.25 and $12.00 or 2/3 yard and 2 yards.

Use: Slides 1, 4-5

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10–22 min **Teaching** 12 min · Whole class

Model how subtraction undoes addition to solve x + p = q and check.

YOU DO

1. Show Slide 3 to compare x + p = q as something added and px = q as multiplication.
2. Teach Slide 7 words and stress inverse as the opposite that undoes [3].
3. Play Slide 6 Video clip 3 (0:00–5:00) and pause to note both sides stay balanced [10].
4. Model x + 2.5 = 7 step by step and check by substitution back into the original [5].

STUDENTS DO

1. Watch, listen for why we subtract, and copy the model steps.
2. Choral respond for the inverse of adding 2.5.
3. Verify the check 4.5 + 2.5 = 7 with a calculator if needed.

Say: An equation is like scales in balance, so both sides must match [5]. To free x when something is added, we do the opposite that undoes it [3]. We subtract the same number from both sides to keep it balanced [10].

Worked example: Solve x + 2.5 = 7. Subtract 2.5 from both sides: x + 2.5 - 2.5 = 7 - 2.5, so x = 4.5. Check: 4.5 + 2.5 = 7, which is true [13].

Ask: Why do we subtract 2.5 from both sides, not just one side? (To keep both sides equal and balanced; same thing to both sides [10].) · How do we know x = 4.5 is correct? (Substitute 4.5 for x; both sides simplify to 7, a true statement [13].)

Check understanding: Thumbs up or down: does 4.5 + 2.5 = 7 prove it? Reteach balance with a bar if unsure.

Support: Start with whole numbers under 10, like x + 3 = 8, using a bar model [5]. **Stretch:** Ask students to predict the step for x + 1.5 = 4.5 without solving yet.

Use: Slides 3, 6-7, Video clip 3 (0:00–5:00)

22–32 min **Guided practice** 10 min · Whole class

Model and practice together how division undoes multiplication in px = q.

YOU DO

1. Show Slide 10 photo and link equal amounts on both sides to both sides of an equation.
2. Play Slide 8 Video clip 4 (0:00–5:00), pausing for fractions and decimals as p and q.
3. Model 3x = 12 by dividing both sides by 3 so both sides remain equal [10].
4. Hand out Worksheet Task B and guide two problems, requiring a substitution check each time [5].

STUDENTS DO

1. Solve two Task B problems with the teacher, writing one division step.
2. Swap and verify each answer by substitution that it makes a true statement [13].
3. Hold up answers and explain the inverse used.

Say: When x is multiplied by p, the opposite that undoes it is division [3]. We divide both sides by the same number, and we cannot divide by 0 [10]. One-step equations may use fractions or decimals, so the same rule still works [10].

Worked example: Solve 3x = 12. Divide both sides by 3: 3x / 3 = 12 / 3, so x = 4. Check: 3 x 4 = 12, true. For drinks: 3x = 4.5, so x = 4.5 / 3 = 1.5 liters per bottle. Check: 3 x 1.5 = 4.5.

Ask: What is the inverse of multiplying by 3? (Dividing by 3 [3].) · If 3x = 4.5, why is x = 1.5 and not 1.5x? (Dividing both sides by 3 isolates x; 4.5 divided by 3 is 1.5 and 3 x 1.5 = 4.5.)

Check understanding: Check Task B lines for divide-by-3 on both sides and correct check. Re-model with a multiplication table if errors persist.

Support: Give a multiplication table and only whole-number answers like 2x = 10 at first [10]. **Stretch:** Give 4x = 1/2 and 2.5x = 10 and ask for the one division step and check.

Use: Slide 8, Video clip 4 (0:00–5:00), Slide 10, Worksheet Task B

32–52 min **Main activity** 20 min · Pairs

Write and solve real comic stories for both equation forms and verify.

YOU DO

1. Show Slide 9 task: each write 2 stories, one x + p = q, one px = q with decimals or fractions.
2. Give the sentence frames and the money and fraction requirements, then hand out templates.
3. Circulate as pairs draw three panels with a role like the shopkeeper or a student and write the matching equation [1].
4. Manage the swap so partners solve with one inverse step and check by putting the answer back [5].

STUDENTS DO

1. Draw two 3-panel comics, label x, p, and q, and write the matching equation under each.
2. Swap papers and solve the partner story with one subtraction or division step.
3. Write the check by substitution and return the comic with true or not true noted [13].

Say: Pick your numbers first, then turn them into a three-panel mystery. One story must be x + p = q and one must be px = q with nonnegative numbers [12]. After the swap, solve in one step and prove it works.

Worked example: Story: The shopkeeper tale: a customer paid x plus $3.25 tax and spent $10.00 in all. Equation: x + 3.25 = 10.00. Solve: subtract 3.25 from both sides, x = 6.75, so $6.75. Check: 6.75 + 3.25 = 10.00.

Ask: How does your picture show x + p = q? (Started with x, added p, now have q; removing p from both sides leaves x [1].) · How do you prove your partner answer is right? (Substitute the number for x and simplify both sides to see if it is true [13].)

Check understanding: Collect one pair per table to read equation, step, and check aloud; fix missing both-sides steps on the spot.

Support: Provide sentence frames: Started with x, added p, now have q. What is x [1]. **Stretch:** Require one story to use money with cents, like x + $3.25 = $10.00, and one to use a fraction.

Use: Slide 9

52–60 min **Plenary** 8 min · On their own

Review both forms and confirm students can solve and write correctly.

YOU DO

1. Show Slide 11 mystery and have the class read the check aloud together.
2. Show Slide 12 exit and clarify the three jobs: solve with check, write a story, ask a question.
3. Collect exit slips and sort quickly into got it and need help piles.
4. Restate the two forms and their undos: subtraction undoes addition, division undoes multiplication [3].

STUDENTS DO

1. Verify the cups check with a partner in 30 seconds.
2. Complete the exit slip on their own with equation, step, and check shown.
3. Stack comics and exits and note one remaining question if any.

Say: You wrote one-variable equations for real conditions and solved them in one step [1]. Good checks put the answer back and show both sides match. Finish your exit slip on your own so I can see your thinking.

Worked example: A mix needs 2 1/2 cups total. A student already added 3/4 cup. How much more is needed? 3/4 + x = 2 1/2, so x = 1 3/4 cups. Check: 3/4 + 1 3/4 = 2 1/2.

Ask: For x + 4.5 = 9, what is the one step? (Subtract 4.5 from both sides; x = 4.5.) · What real story could 4x = 20 tell? (Any equal-groups story, like 4 packs cost $20.00 in all; each pack is $5.00.)

Check understanding: Read all exit slips for correct x = 4.5 with check and sensible 4x = 20 story; pull small group tomorrow if checks missing.

Support: Allow a calculator and a template: left side = __, right side = __, true or false [13]. **Stretch:** Ask for a second story for 4x = 20 using liters or inches with a fraction or decimal.

Use: Slides 11-12

Common mistakes

Mistake	How to spot it	How to fix it
Doing the inverse to only one side, breaking balance	Left side shows -p but right side unchanged, or divide only x	Redo with same operation on both sides to keep both sides equal [10]; use balance picture [5].
Using the wrong inverse for px = q, like subtracting p instead of dividing	For 3x = 12 writes x = 9	Name the inverse pair: multiplication-division [3]; test by substitution to see 3 x 9 is not 12 [13].
Skipping the check or mis-adding decimals and fractions	Answer does not make both sides match when substituted	Substitute the number for x and simplify both sides to decide true or false [13]; one-step work may use fractions or decimals [10].

Support

- Start with whole numbers under 10, like x + 3 = 8, and sentence frames for stories
- Give multiplication table, calculator, and substitution template with left side and right side blanks

Stretch

- Require one money story with cents like x + $3.25 = $10.00 and one fraction story
- Add fraction and decimal cards like 4x = 1/2 and 2.5x = 10 with full checks

For the LSE or teaching assistant

Sit with target pairs during comic writing to prompt frames, then during swap to enforce one inverse step and a written substitution check.

Check for understanding

Question	Answer
Solve: x + 4.5 = 9. Show your check.	x = 4.5; check 4.5 + 4.5 = 9.
Write a real story for 4x = 20.	Example: 4 equal packs cost $20.00 total; each pack costs $5.00.
I claim x = 3 solves x + 2.5 = 5.5. Agree or disagree? Prove it.	Agree; 3 + 2.5 = 5.5, both sides match, true.

Homework

Write one x + p = q story from home life and solve it with a substitution check.

Sources

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