

MATHEMATICS INSTRUCTIONAL PACKET

Equations, inequalities and solution sets



Grade 8 • NC.8.EE.7

Teacher guide • 30 multiple-choice tasks • 30 open and performance tasks • worked keys • observation tools

A reusable bank for instruction across multiple sessions. Select a purposeful subset each day; this is not a single-sitting test.

Free sample | Contents

NC.8.EE.7 | Eighth Grade mathematics

This sample contains 18 complete selected pages from the 91-page resource, plus this sample contents page. Original printed page numbers are retained. Gaps are intentional.

Included original pages: 1-14, 29-30, 59, 74

Representative activities

M01: sample PDF page(s) 15; original page(s) 14

M02: sample PDF page(s) 15; original page(s) 14

O01: sample PDF page(s) 16; original page(s) 29

O02: sample PDF page(s) 17; original page(s) 30

Selected teacher prompts and keys: original page(s) 59, 74

Using this sample

Read the preparation and access guidance before using a selected activity.

Keep teacher keys and private preparation pages separate from student copies.

Use the original resource contents to see the scope of the complete packet.

Complete paid download

The complete resource includes the full PDF task bank and teaching materials.

TEACHER GUIDE

Standard and learning targets

Solve real-world and mathematical problems by writing and solving equations and inequalities in one variable.

- Recognize linear equations in one variable as having one solution, infinitely many solutions, or no solutions.
- Solve linear equations and inequalities including multi-step equations and inequalities with the same variable on both sides.

Learning targets

Write and solve one-variable equations in context.

Classify equations by their solution sets.

Solve multi-step equations and inequalities with variables on both sides.

Represent and interpret inequality solution sets.

The seven sections move from activation to independent evidence. Each task states its own target. Recognition tasks complement, but do not replace, the open performances.

TEACHER GUIDE

Plan the learning

Prerequisites

Distributive property, equivalent expressions, signed rational arithmetic and number-line order.

Materials and pacing

Pencil, straightedge, optional calculator for checks; blank number lines are provided.

Use 3–5 sessions as needed: launch and model; guided and collaborative reasoning; independent transfer; targeted reteaching and exit evidence. Each section offers a bank, not a requirement to complete every item at once.

Access and differentiation

Read directions aloud, enlarge print, allow a scribe for dictated reasoning, or provide an accessible graphing surface. Keep the mathematical demand unchanged. Permit a calculator when computation is not the intended evidence; record its use. Preserve an independent first response before giving a worked example.

For extension, ask students to create a related case with a changed outcome and prove why it changes. For reteaching, return to the specific representation or operation that broke down, then use a fresh item.

Allocation in EACH bank: warm-up 01–04; I Do 05–08; We Do 09–13; collaborative 14–18; independent 19–23; small-group 24–27; exit 28–30.

TEACHER GUIDE

Worked teacher model

Solve $3(2x - 1) = 4x + 9$. Distribute: $6x - 3 = 4x + 9$. Subtract $4x$: $2x - 3 = 9$. Add 3: $2x = 12$. Divide by 2: $x = 6$. Check: $3(12 - 1) = 33$ and $24 + 9 = 33$.

Solve $5 - 2x > x + 11$. Subtract x and 5: $-3x > 6$. Divide by -3 and reverse the comparison: $x < -2$. The endpoint is open. Test $x = -3$: $11 > 8$ is true. The endpoint -2 gives equality and is excluded.

TEACHER GUIDE

Reasoning anchor

Equivalent equations keep the same solutions by doing the same legal operation to both sides. After simplifying, $ax = b$ with $a \neq 0$ has one solution. A true constant statement has every real number as a solution; a false constant statement has no solution.

For inequalities, dividing or multiplying by a negative number reverses order. Open endpoints represent strict inequalities; closed endpoints include equality. Distinguish the real-number solution set from a contextual restriction such as nonnegative whole numbers.

Ask before accepting an answer

Does substitution satisfy the ORIGINAL statement? Did distribution reach every term? Did a negative division reverse the inequality? Is a boundary included? Does the context restrict the allowed numbers?

Instructional decision

Ask the learner to explain one decisive step. A selected option alone does not establish a unique misconception. Use the worked option checks to choose a follow-up question, not to label a learner.

STUDENT REPRODUCIBLE

Reusable reasoning organizer

Name: _____ Date: _____

Givens, quantities and units**Representation or calculation****Justification and check****Conclusion in the problem context**

TEACHER GUIDE

Warm-up teaching script

Bank: M01–M04 and O01–O04. Core task: O01. Suggested focus: 10–20 minutes; adjust for evidence.

Target: Solve and check a one-variable equation.

Say: “Show what each symbol and quantity represents before calculating.” Allow a private attempt, then compare two explanations. Ask which prior idea makes the first step legal. Keep the first attempt as baseline evidence.

Core task to use

Solve $7x - 4 = 3x + 8$. Show equivalent steps and check the original equation.

Teacher solution and discussion

Subtract $3x$ and add 4: $4x = 12$. Thus $x = 3$. Both original sides equal 17.

Evidence and response

Look for the representation, justified steps and contextual conclusion requested here. If an error appears, ask “Which statement can we check directly?” Have the student test it using the original givens. After discussion, use another item from this section and record independent versus supported evidence separately.

Closure: “What made your conclusion reasonable, and what would you check on a new problem?”

TEACHER GUIDE

I Do teaching script

Bank: M05–M08 and O05–O08. Core task: O05. Suggested focus: 10–20 minutes; adjust for evidence.

Target: Solve an inequality with a negative coefficient.

Say: “Watch me represent the givens and explain each change.” Work the core problem below aloud, including its check. Pause before the final conclusion and ask students to predict its size or form. Have students annotate why each step preserves the situation.

Core task to use

Solve $-3x + 4 \leq 2x - 16$. Graph the real-number solution set on the blank number line. Label the boundary, inclusion and direction; check one included and one excluded value.

Teacher solution and discussion

$-5x \leq -20$, so $x \geq 4$. Closed endpoint at 4, shading right. Boundary gives equality. 5 satisfies the original inequality; 3 does not.

Evidence and response

Look for the representation, justified steps and contextual conclusion requested here. If an error appears, ask “Which statement can we check directly?” Have the student test it using the original givens. After discussion, use another item from this section and record independent versus supported evidence separately.

Closure: “What made your conclusion reasonable, and what would you check on a new problem?”

TEACHER GUIDE

We Do teaching script

Bank: M09–M13 and O09–O13. Core task: O09. Suggested focus: 10–20 minutes; adjust for evidence.

Target: Evaluate an inequality solution using a counterexample.

Say: “You choose the next step; I will record and question it.” Invite two approaches to the core task. Ask the class to test a disputed step with the original quantities, then complete another task without copying the model.

Core task to use

A learner solves $-2x + 3 \geq x - 6$ and writes $x \geq 3$. Evaluate that conclusion. Show the correct transformations and use a counterexample to test the learner’s set.

Teacher solution and discussion

$-3x \geq -9$ gives $x \leq 3$ after division by -3 . The learner did not reverse order. Their included value $x=4$ fails: left -5 is less than right -2 .

Evidence and response

Look for the representation, justified steps and contextual conclusion requested here. If an error appears, ask “Which statement can we check directly?” Have the student test it using the original givens. After discussion, use another item from this section and record independent versus supported evidence separately.

Closure: “What made your conclusion reasonable, and what would you check on a new problem?”

TEACHER GUIDE

Collaborative practice teaching script

Bank: M14–M18 and O14–O18. Core task: O14. Suggested focus: 10–20 minutes; adjust for evidence.

Target: Solve and check a one-variable equation.

Assign partners as solver and verifier, then switch roles. Say: “The verifier must use the original problem, not just repeat the solver’s steps.” Compare representations and require a shared explanation of any disagreement before moving on.

Core task to use

Solve $x/4 - 1 = x/8 + 3$. Show how a common multiplier clears the denominators and check.

Teacher solution and discussion

Multiply by 8: $2x - 8 = x + 24$. $x = 32$. Substitution gives 7 on both sides.

Evidence and response

Look for the representation, justified steps and contextual conclusion requested here. If an error appears, ask “Which statement can we check directly?” Have the student test it using the original givens. After discussion, use another item from this section and record independent versus supported evidence separately.

Closure: “What made your conclusion reasonable, and what would you check on a new problem?”

TEACHER GUIDE

Independent practice teaching script

Bank: M19–M23 and O19–O23. Core task: O19. Suggested focus: 10–20 minutes; adjust for evidence.

Target: Evaluate an inequality solution using a counterexample.

Give a quiet first attempt without answer-supplying hints. Say: “Choose a representation, show your reasoning and check your conclusion.” Record what students can produce independently, then discuss after collecting first responses.

Core task to use

A learner solves $-2x + 3 \geq x - 9$ and writes $x \geq 4$. Evaluate that conclusion. Show the correct transformations and use a counterexample to test the learner’s set.

Teacher solution and discussion

$-3x \geq -12$ gives $x \leq 4$ after division by -3 . The learner did not reverse order. Their included value $x=5$ fails: left -7 is less than right -4 .

Evidence and response

Look for the representation, justified steps and contextual conclusion requested here. If an error appears, ask “Which statement can we check directly?” Have the student test it using the original givens. After discussion, use another item from this section and record independent versus supported evidence separately.

Closure: “What made your conclusion reasonable, and what would you check on a new problem?”

TEACHER GUIDE

Small-group reteach teaching script

Bank: M24–M27 and O24–O27. Core task: O24. Suggested focus: 10–20 minutes; adjust for evidence.

Target: Solve and check a one-variable equation.

Use earlier evidence to select a precise gap. Say: “Let us make the meaning visible, then reconnect it to symbols.” Contrast a valid step with one proposed by a learner; test both. Give a fresh bank item after the supported model and label that evidence separately.

Core task to use

Solve $x/5 - 1 = x/10 + 3$. Show how a common multiplier clears the denominators and check.

Teacher solution and discussion

Multiply by 10: $2x - 10 = x + 30$. $x = 40$. Substitution gives 7 on both sides.

Evidence and response

Look for the representation, justified steps and contextual conclusion requested here. If an error appears, ask “Which statement can we check directly?” Have the student test it using the original givens. After discussion, use another item from this section and record independent versus supported evidence separately.

Closure: “What made your conclusion reasonable, and what would you check on a new problem?”

TEACHER GUIDE

Exit ticket teaching script

Bank: M28–M30 and O28–O30. Core task: O28. Suggested focus: 10–20 minutes; adjust for evidence.

Target: Interpret a contextual inequality.

Ask for an individual response and a short check. Say: “Explain why your result fits the original problem.” Collect the work before discussing answers. Use the result to select the next lesson, rather than treating one item as a final mastery judgment.

Core task to use

You have \$46. After a \$9 fee, each kit costs \$5. Write an inequality, solve it over the reals, and state the greatest whole number of kits. Explain why rounding up is not allowed.

Teacher solution and discussion

$9 + 5k \leq 46$. Thus $k \leq 7.4$ over the reals. Nonnegative whole-number kits have maximum 7; 8 kits exceed the budget by \$3.

Evidence and response

Look for the representation, justified steps and contextual conclusion requested here. If an error appears, ask “Which statement can we check directly?” Have the student test it using the original givens. After discussion, use another item from this section and record independent versus supported evidence separately.

Closure: “What made your conclusion reasonable, and what would you check on a new problem?”

STUDENT BANK

Multiple-choice tasks

M01 • Solve and check a one-variable equation.**Solve $5x + 3 = 3x + 7$.**

A. $x = 2$

B. $x = 8$

C. $x = 4$

D. $x = 6$

Reasoning notes: _____

M02 • Solve and check a one-variable equation.**Solve $2(3x - 1) = 3x + 4$.**

A. $x = -1$

B. $x = -6$

C. $x = 2$

D. $x = 3$

Reasoning notes: _____

OPEN / PERFORMANCE TASK

001 • Warm-up

Target: Solve and check a one-variable equation.

Solve $7x - 4 = 3x + 8$. Show equivalent steps and check the original equation.

Representation / calculation

Explanation / check / conclusion

OPEN / PERFORMANCE TASK

002 • Warm-up

Target: Solve and check a one-variable equation.

Solve $4(2x - 3) = 5x$. Explain why distribution applies to both terms and check.

Representation / calculation

Explanation / check / conclusion

TEACHER GUIDE

Multiple-choice worked keys

M01 • Solve and check a one-variable equation.

A. $x = 2$. Subtract $3x$ and 3 : $2x = 4$; $x = 2$. Both sides at $x=2$ equal 13 .

Option checks: A: substitution gives 13 on the left and 13 on the right; equal, so valid. B: substitution gives 43 on the left and 31 on the right; unequal, so invalid. C: substitution gives 23 on the left and 19 on the right; unequal, so invalid. D: substitution gives 33 on the left and 25 on the right; unequal, so invalid.

M02 • Solve and check a one-variable equation.

C. $x = 2$. Distribute: $6x - 2 = 3x + 4$. Then $3x = 6$, so $x = 2$.

Option checks: A: substitution gives -8 on the left and 1 on the right; unequal, so invalid. B: substitution gives -38 on the left and -14 on the right; unequal, so invalid. C: substitution gives 10 on the left and 10 on the right; equal, so valid. D: substitution gives 16 on the left and 13 on the right; unequal, so invalid.

TEACHER GUIDE

Open-task worked keys

001 • Solve and check a one-variable equation.

Subtract $3x$ and add 4: $4x = 12$. Thus $x = 3$. Both original sides equal 17.

002 • Solve and check a one-variable equation.

$8x - 12 = 5x$. Subtract $5x$ and add 12: $3x = 12$. $x = 4$. Both sides equal 20.