

Rational Problem Solving



Grade 7 | Expressions and Equations NC.7.EE.3

Seven teaching sections • 30 choice + 30 open/performance tasks
Detailed scripts, models, student workspaces, worked keys and evidence records

A reusable resource bank for several sessions. Select tasks to fit evidence and instruction; the full bank is not one sitting. Current standards are used; revisions adopted in 2026 begin in 2028-29.

Free sample | Contents

NC.7.EE.3 | Seventh 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

Exact standard and coverage

NC.7.EE.3 | Solve multi-step real-world and mathematical problems posed with rational numbers in algebraic expressions.

Apply properties of operations to calculate with positive and negative numbers in any form.

Convert between different forms of a number and equivalent forms of the expression as appropriate.

The tasks preserve the official scope: multi-step rational-number expressions, positive and negative values, and conversion between forms.

TEACHER GUIDE

Targets and item navigation

Solve a multi-step rational problem, convert forms and interpret the result.

Items: M01, M02, M03, M04, M05, M06, M07, M08, M09, M10, M11, M12, M13, M14, M15, M16, M17, M18, M19, M20, M21, M22, M23, M24, M25, M26, M27, M28, M29, M30, O01, O02, O03, O04, O05, O06, O07, O08, O09, O10, O11, O12, O13, O14, O15, O16, O17, O18, O19, O20, O21, O22, O23, O24, O25, O26, O27, O28, O29, O30

Essential question: How can changing the form preserve the mathematics while revealing a relationship? MP2 connects quantities and symbols; MP3 critiques reasoning; MP4 models contexts; MP6 attends to signs, units and endpoints.

TEACHER GUIDE

Plan, materials and access

Suggested sequence: four 25-35 minute sessions. Session 1: warm-up and I Do. Session 2: We Do and collaborative work. Session 3: selected independent tasks. Session 4: reteach and exit. Each section initially uses its first M and O item; the remaining items support later practice or conferences.

Prerequisites: signed rational arithmetic, equal quantities, operation order, fractions/decimals/percent equivalence, and the meaning of a variable. Review prerequisites separately from scored evidence.

Materials: pencil, supplied workspaces and organizers, ruler for graphing. Optional paper strips or algebra tiles support instruction. No purchased manipulatives required. Adults handle cutting. Contexts and data are invented for instruction.

Access: neutral read-aloud, enlargement, high-contrast printing, AAC, signing or dictated explanations. A scribe follows the learner's exact mathematical directions. Do not supply an operation, coefficient, comparison direction, endpoint or equivalent form. Record cues separately from independent work.

Calculators may check a completed solution after the first response. If computation fluency is being observed, collect unaided evidence first; do not invent time limits or official mastery cutoffs. N/O means inaccessible, unobserved or insufficient evidence, not incorrect.

Vocabulary: coefficient, constant, term, equivalent, distribute, factor, integer GCF, rational, variable, equation, inequality, boundary and solution set. Teach only terms relevant to the packet.

WORKED TEACHER MODEL

Convert, compute, estimate

A balance b starts at -3.75 dollars. Three deposits d of $2\frac{1}{2}$ dollars arrive, then a 1.20 -dollar fee f is charged. $b + 3d - f = -3.75 + 3(2.5) - 1.20 = -3.75 + 7.50 - 1.20 = 2.55$ dollars. Convert $2\frac{1}{2}$ to 2.5 or $\frac{5}{2}$ without changing its value. Rough estimate: $-4 + 3(3) - 1 = 4$ dollars. The estimate suggests a small positive balance, but rounded deposits accumulate error; use the exact 2.55 dollars for the final result.

Anchor: quantities $\rightarrow$ expression $\rightarrow$ equivalent number forms

$$-3.75 = -15/4; 2.5 = 5/2; 1.20 = 6/5$$

Exact result and rough estimate answer different questions

Exact: $51/20 = 2.55$. Estimate: 4 . Explain the size and direction of rounding error before judging reasonableness.

STUDENT TOOL

Reusable reasoning organizer

Name: _____ Date: _____

Given quantities, units and variable meanings**Expression / equation / inequality and operation steps****Equivalent form / second method / graph or model****Context meaning / check / what the representation reveals**

TEACHER GUIDE

Warm-up script

Core: M01 and O01. Optional bank: M01-M04 / O01-O04. Select, do not assign all by default.

1-3 min | Launch

Say: "What quantities or like terms do you notice?" Read the core task neutrally. Ask learners to identify given values and units before calculating.

4-8 min | Model or elicit

Ask: "Show your first line and tell what it represents." In shared work, pause for a student-proposed step. During independent and exit work, do not correct or hint before recording the first response.

3-6 min | Examine evidence

Target: Solve a multi-step rational problem, convert forms and interpret the result. Listen for a reason that connects the operation or form to the quantities. A correct choice alone is incomplete evidence.

2-4 min | Respond to a gap

If number forms are mixed, ask the learner to write equivalent fractions or decimals before proceeding. Separate a rough rounded estimate from the exact calculation. Record the initial evidence first; use a different item after instruction.

1-3 min | Close

Each learner writes an individual explanation before partner discussion. Record the item, accuracy, reasoning and support. Extension: change one context quantity and predict how the result or relationship changes, then verify.

TEACHER GUIDE

I Do script

Core: M05 and O05. Optional bank: M05-M08 / O05-O08. Select, do not assign all by default.

1-3 min | Launch

Say: "Which property justifies the next line?" Read the core task neutrally. Ask learners to identify given values and units before calculating.

4-8 min | Model or elicit

Demonstrate the worked-model page line by line. Cover the next line and ask for a prediction. Name the property, compute, then check.

3-6 min | Examine evidence

Target: Solve a multi-step rational problem, convert forms and interpret the result. Listen for a reason that connects the operation or form to the quantities. A correct choice alone is incomplete evidence.

2-4 min | Respond to a gap

If number forms are mixed, ask the learner to write equivalent fractions or decimals before proceeding. Separate a rough rounded estimate from the exact calculation. Record the initial evidence first; use a different item after instruction.

1-3 min | Close

Each learner writes an individual explanation before partner discussion. Record the item, accuracy, reasoning and support. Extension: change one context quantity and predict how the result or relationship changes, then verify.

TEACHER GUIDE

We Do script

Core: M09 and O09. Optional bank: M09-M13 / O09-O13. Select, do not assign all by default.

1-3 min | Launch

Say: "What must stay equal as we transform the expression?" Read the core task neutrally. Ask learners to identify given values and units before calculating.

4-8 min | Model or elicit

Ask: "Show your first line and tell what it represents." In shared work, pause for a student-proposed step. During independent and exit work, do not correct or hint before recording the first response.

3-6 min | Examine evidence

Target: Solve a multi-step rational problem, convert forms and interpret the result. Listen for a reason that connects the operation or form to the quantities. A correct choice alone is incomplete evidence.

2-4 min | Respond to a gap

If number forms are mixed, ask the learner to write equivalent fractions or decimals before proceeding. Separate a rough rounded estimate from the exact calculation. Record the initial evidence first; use a different item after instruction.

1-3 min | Close

Each learner writes an individual explanation before partner discussion. Record the item, accuracy, reasoning and support. Extension: change one context quantity and predict how the result or relationship changes, then verify.

TEACHER GUIDE

Collaborative practice script

Core: M14 and O14. Optional bank: M14-M18 / O14-O18. Select, do not assign all by default.

1-3 min | Launch

Say: "How can your partner test your claim without copying it?" Read the core task neutrally. Ask learners to identify given values and units before calculating.

4-8 min | Model or elicit

Ask: "Show your first line and tell what it represents." In shared work, pause for a student-proposed step. During independent and exit work, do not correct or hint before recording the first response.

3-6 min | Examine evidence

Target: Solve a multi-step rational problem, convert forms and interpret the result. Listen for a reason that connects the operation or form to the quantities. A correct choice alone is incomplete evidence.

2-4 min | Respond to a gap

If number forms are mixed, ask the learner to write equivalent fractions or decimals before proceeding. Separate a rough rounded estimate from the exact calculation. Record the initial evidence first; use a different item after instruction.

1-3 min | Close

Each learner writes an individual explanation before partner discussion. Record the item, accuracy, reasoning and support. Extension: change one context quantity and predict how the result or relationship changes, then verify.

TEACHER GUIDE

Independent practice script

Core: M19 and O19. Optional bank: M19-M23 / O19-O23. Select, do not assign all by default.

1-3 min | Launch

Say: "What representation will make your reasoning visible?" Read the core task neutrally. Ask learners to identify given values and units before calculating.

4-8 min | Model or elicit

Ask: "Show your first line and tell what it represents." In shared work, pause for a student-proposed step. During independent and exit work, do not correct or hint before recording the first response.

3-6 min | Examine evidence

Target: Solve a multi-step rational problem, convert forms and interpret the result. Listen for a reason that connects the operation or form to the quantities. A correct choice alone is incomplete evidence.

2-4 min | Respond to a gap

If number forms are mixed, ask the learner to write equivalent fractions or decimals before proceeding. Separate a rough rounded estimate from the exact calculation. Record the initial evidence first; use a different item after instruction.

1-3 min | Close

Each learner writes an individual explanation before partner discussion. Record the item, accuracy, reasoning and support. Extension: change one context quantity and predict how the result or relationship changes, then verify.

TEACHER GUIDE

Small-group reteach script

Core: M24 and O24. Optional bank: M24-M27 / O24-O27. Select, do not assign all by default.

1-3 min | Launch

Say: "Where does the first incorrect transformation occur?" Read the core task neutrally. Ask learners to identify given values and units before calculating.

4-8 min | Model or elicit

Ask: "Show your first line and tell what it represents." In shared work, pause for a student-proposed step. During independent and exit work, do not correct or hint before recording the first response.

3-6 min | Examine evidence

Target: Solve a multi-step rational problem, convert forms and interpret the result. Listen for a reason that connects the operation or form to the quantities. A correct choice alone is incomplete evidence.

2-4 min | Respond to a gap

If number forms are mixed, ask the learner to write equivalent fractions or decimals before proceeding. Separate a rough rounded estimate from the exact calculation. Record the initial evidence first; use a different item after instruction.

1-3 min | Close

Each learner writes an individual explanation before partner discussion. Record the item, accuracy, reasoning and support. Extension: change one context quantity and predict how the result or relationship changes, then verify.

TEACHER GUIDE

Exit ticket script

Core: M28 and O28. Optional bank: M28-M30 / O28-O30. Select, do not assign all by default.

1-3 min | Launch

Say: "What can you explain independently about this relationship?" Read the core task neutrally. Ask learners to identify given values and units before calculating.

4-8 min | Model or elicit

Ask: "Show your first line and tell what it represents." In shared work, pause for a student-proposed step. During independent and exit work, do not correct or hint before recording the first response.

3-6 min | Examine evidence

Target: Solve a multi-step rational problem, convert forms and interpret the result. Listen for a reason that connects the operation or form to the quantities. A correct choice alone is incomplete evidence.

2-4 min | Respond to a gap

If number forms are mixed, ask the learner to write equivalent fractions or decimals before proceeding. Separate a rough rounded estimate from the exact calculation. Record the initial evidence first; use a different item after instruction.

1-3 min | Close

Each learner writes an individual explanation before partner discussion. Record the item, accuracy, reasoning and support. Extension: change one context quantity and predict how the result or relationship changes, then verify.

STUDENT CHOICE

Choice practice 1-2

M01 | A robot starts b meters east of a reference point and travels west w meters in each of 6 intervals. East is positive. Use $b - 6w$, with $b = 19/4$ meters and $w = 12/5$ meters per interval. What value results?

- A. $-203/20$
- B. $-193/20$
- C. $-183/20$
- D. $-163/20$

M02 | A shopper buys 4 notebooks costing p dollars each and uses a c -dollar coupon on the total. Use $4p - c$, with $p = 15/4$ dollars and $c = 2$ dollars. What value results?

- A. 13
- B. $25/2$
- C. $27/2$
- D. $21/2$

STUDENT PERFORMANCE

001 | Warm-up

Target: Solve a multi-step rational problem, convert forms and interpret the result.

A robot starts b meters east of a reference point and travels west w meters in each of 3 intervals. East is positive. Use $b - 3w$, with $b = 13/4$ meters and $w = 9/5$ meters per interval. What value results? Show at least two operation steps, convert one number to an equivalent fraction or decimal, and explain the result in context. Make a rough estimate using rounded inputs and compare with the exact result.

Representation / transformations / calculations

Explanation / second form or method / check

STUDENT PERFORMANCE

002 | Warm-up

Target: Solve a multi-step rational problem, convert forms and interpret the result.

A robot starts b meters east of a reference point and travels west w meters in each of 6 intervals. East is positive. Use $b - 6w$, with $b = 19/4$ meters and $w = 12/5$ meters per interval. What value results? Show at least two operation steps, convert one number to an equivalent fraction or decimal, and explain the result in context. Make a rough estimate using rounded inputs and compare with the exact result.

Representation / transformations / calculations

Explanation / second form or method / check

TEACHER ONLY

M worked keys 1-2

M01: B. -193/20

$19/4 - 6(12/5) = 19/4 - 72/5 = -193/20$ meters. Convert fractions to common denominators or terminating decimals without changing their values. Round b to 5, w to 2; estimate -7 meters. The exact value is -9.6500 approximately; the estimate uses rounded inputs and is not an exact equality.

Distractor checks: A: option minus exact value = $-1/2$. C: option minus exact value = $1/2$. D: option minus exact value = $3/2$. Ask for work before inferring a misconception.

M02: A. 13

$4(15/4) - 2 = 15 - 2 = 13$ dollars. Convert fractions to common denominators or terminating decimals without changing their values. Round p to 4 and c to 2; estimate $4 \times 4 - 2 = 14$ dollars. The exact value is 13.0000 approximately; the estimate uses rounded inputs and is not an exact equality.

Distractor checks: B: option minus exact value = $-1/2$. C: option minus exact value = $1/2$. D: option minus exact value = $-5/2$. Ask for work before inferring a misconception.

TEACHER ONLY

O worked keys 1-2

O01: -43/20

$13/4 - 3(9/5) = 13/4 - 27/5 = -43/20$ meters. Convert fractions to common denominators or terminating decimals without changing their values. Round b to 3, w to 2; estimate -3 meters. The exact value is -2.1500 approximately; the estimate uses rounded inputs and is not an exact equality.

Accept equivalent correct forms and valid alternative reasoning. Score the requested construction, transformation, model/graph and interpretation separately; a bare final value is incomplete evidence.

O02: -193/20

$19/4 - 6(12/5) = 19/4 - 72/5 = -193/20$ meters. Convert fractions to common denominators or terminating decimals without changing their values. Round b to 5, w to 2; estimate -7 meters. The exact value is -9.6500 approximately; the estimate uses rounded inputs and is not an exact equality.

Accept equivalent correct forms and valid alternative reasoning. Score the requested construction, transformation, model/graph and interpretation separately; a bare final value is incomplete evidence.