

Integer Exponent Reasoning



Grade 8 | NC.8.EE.1

Teacher scripts, original models and student organizers
30 multiple-choice + 30 open/performance tasks
Worked keys and individual evidence records

Current NC standards for 2026-27 and 2027-28. Select tasks across several sessions. This resource bank is not one test.

Free sample | Contents

NC.8.EE.1 | Eighth Grade mathematics

This sample contains 20 complete selected pages from the 93-page resource, plus this sample contents page. Original printed page numbers are retained. Gaps are intentional.

Included original pages: 1-16, 31-32, 61, 76

Representative activities

M01: sample PDF page(s) 17; original page(s) 16

M02: sample PDF page(s) 17; original page(s) 16

O01: sample PDF page(s) 18; original page(s) 31

O02: sample PDF page(s) 19; original page(s) 32

Selected teacher prompts and keys: original page(s) 61, 76

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 scope

Develop and apply the properties of integer exponents to generate equivalent numerical expressions.

Domain: EXPRESSIONS AND EQUATIONS

Cluster: Work with radicals and integer exponents.

Current NC wording and numerical limits are retained. Adopted 2026 revisions beginning in 2028-29 are not substituted.

TEACHER GUIDE

Targets and evidence

Product: Develop and apply the product rule for integer exponents.

Evidence: M02, M08, M15, M22, M23, O15, O18, O19, O27, O28

Quotient: Develop and apply the quotient rule for integer exponents.

Evidence: M11, M14, M18, M19, M28, O01, O07, O08, O11, O25

Power: Develop and apply the power-of-a-power rule.

Evidence: M09, M16, M20, M21, M29, O05, O10, O13, O21, O26

Zero: Explain zero and negative integer exponents and their restrictions.

Evidence: M01, M06, M12, M25, M26, O02, O03, O09, O16, O29

Distribute: Develop and apply powers of products or quotients.

Evidence: M03, M07, M13, M27, M30, O04, O12, O14, O20, O24

Sign: Evaluate powers with signed bases and explain parentheses.

Evidence: M04, M05, M10, M17, M24, O06, O17, O22, O23, O30

MP2: connect quantities and symbols. MP3: justify claims. MP6: attend to signs, notation and precision. Open tasks collect actual reasoning, calculations and representations.

TEACHER GUIDE

Plan and navigation

Use four sessions of about 25-35 minutes: warm-up/model; shared/partner work; independent work; reteach/exit. Select one M and one O item per section first, using targets to match prior learning. The remaining bank supports later practice and conferences, not a single 60-item test.

Warm-up: M01-M04 and O01-O04

I Do: M05-M08 and O05-O08

We Do: M09-M13 and O09-O13

Collaborative practice: M14-M18 and O14-O18

Independent practice: M19-M23 and O19-O23

Small-group reteach: M24-M27 and O24-O27

Exit ticket: M28-M30 and O28-O30

Contents: standard/targets; planning/access; worked model; anchor/organizer; seven scripts; 15 choice pages; 30 open pages; worked keys; rubric; evidence record; sources. Print only selected student pages. Keep teacher examples and keys separate.

TEACHER GUIDE

Preparation and access

Prerequisites: integer arithmetic, multiplication, division, fractions and operation order. Check these separately before teaching the selected target.

Materials: pencil, ruler and supplied blank organizers. For approximation, a calculator may check a bound after the learner records the reasoning; it is not a substitute for explaining the bound. No special manipulatives are needed.

Access: neutral read-aloud, enlargement, high contrast, AAC/signing and dictated explanations. A scribe records student-directed steps exactly. Do not score handwriting, decoding or accent. Record calculator use and other access supports separately.

Answer-supplying cues include classifying the decimal for a learner, supplying a property, giving the rounding direction, or naming the missing equation solution. Preserve the first response and record later supported responses separately.

Differentiate by first using small perfect powers, simple fractions and explicit factors. Then change the representation or ask for a counterexample. Do not replace a required construction, calculation or justification with recognition.

N/O means unobserved, inaccessible or insufficient evidence. Zero is for observed interpretable incorrect work. These instructional ratings are not official mastery cutoffs. All instructional contexts and numerical data are invented.

WORKED TEACHER MODEL

Think aloud and connect

Say: " $2^3 \times 2^2$ contains five factors of 2, so it equals 2^5 . Dividing 2^2 by 2^5 cancels two factors and leaves $1/2^3 = 2^{-3}$. Dividing equal nonzero powers gives $2^3/2^3 = 1 = 2^0$. This does not define 0^0 : the cancellation argument would divide by zero. A negative exponent requires a nonzero base. $(3^2)^3$ has three groups of two factors, so it equals 3^6 . For $(2/3)^{-2}$, invert the fraction then square: $(3/2)^2 = 9/4$. Finally, $(-3)^2 = 9$ but $-3^2 = -9$: the second expression negates the square of 3."

Teacher prompt: Which definition or inverse operation verifies each step?

TEACHER GUIDE

Anchor: definitions and checks

For $a \neq 0$ and integer m, n : $a^m \times a^n = a^{m+n}$; $a^m \div a^n = a^{m-n}$.

$(a^m)^n = a^{mn}$; $(ab)^n = a^n b^n$; $(a/b)^n = a^n/b^n$ wherever all expressions are defined.
For a quotient $b \neq 0$, and negative powers also require nonzero bases.

$a^0 = 1$ for $a \neq 0$; $a^{-n} = 1/a^n$ for nonzero a and positive integer n . Zero to a positive integer power is 0; 0^0 and negative powers of 0 are not defined here.

Parentheses determine the base: $(-a)^2$ and $-a^2$ have different meanings. Exponent properties do not replace operation order.

Ask the learner to supply the mathematical decision. Read symbols neutrally and distinguish exact values from estimates.

REPRODUCIBLE STUDENT TOOL

Reasoning organizer

Name: _____ Date: _____ Item: _____

Given information / requested decision or value**Representation / definitions / equivalent steps****Answer / precision / all solutions when requested****Check / why the conclusion follows**

TEACHER GUIDE

Warm-up teaching script

Start with M01 and O01; save the rest through 04 for later. Target: Develop and apply the quotient rule for integer exponents.

Launch | 2 minutes

Say: "What is known exactly, and what are you asked to determine? Restate the question before calculating." Read symbols neutrally. Do not identify the correct classification, property or sign.

Teach or elicit | 5-7 minutes

Say: "Show a definition, equivalent expression or power check that supports your answer." During shared practice invite individual steps; during independent and exit work collect first responses without supplying a method.

Probe the selected task | 3-5 minutes

Use O01. Teacher solution: Divide like bases by subtracting exponents: $2 - 3 = -1$. Thus $4^2 \div 4^3 = 4^{-1} = 1/4$. Cancelling equal nonzero factors gives the same result.

Respond | 3-5 minutes

If a learner relies only on a display or remembered rule, return to the relevant anchor. Use a different small example, then retry a fresh bank item. Record any supplied classification, property, sign or bound as a cue, not neutral access.

Close | 2 minutes

Each partner first records a solution independently, then compares the reasoning. Early finishers change one value or condition and test whether the method still works. Record the first response, access supports, cues, and a next step. Exit evidence guides later teaching; no speed threshold applies.

TEACHER GUIDE

I Do teaching script

Start with M05 and O05; save the rest through 08 for later. Target: Develop and apply the power-of-a-power rule.

Launch | 2 minutes

Say: "What is known exactly, and what are you asked to determine? Restate the question before calculating." Read symbols neutrally. Do not identify the correct classification, property or sign.

Teach or elicit | 5-7 minutes

Read the worked teacher model aloud, pausing after each equality or bound. Ask the learner to name what makes the next step valid. Keep this example separate from the student response.

Probe the selected task | 3-5 minutes

Use O05. Teacher solution: A power of a power multiplies exponents: $(-2) \times 3 = -6$. So $(5^{-2})^3 = 5^{-6} = 1/15625$. There are 3 copies of $1/5^2$.

Respond | 3-5 minutes

If a learner relies only on a display or remembered rule, return to the relevant anchor. Use a different small example, then retry a fresh bank item. Record any supplied classification, property, sign or bound as a cue, not neutral access.

Close | 2 minutes

Each partner first records a solution independently, then compares the reasoning. Early finishers change one value or condition and test whether the method still works. Record the first response, access supports, cues, and a next step. Exit evidence guides later teaching; no speed threshold applies.

TEACHER GUIDE

We Do teaching script

Start with M09 and O09; save the rest through 13 for later. Target: Explain zero and negative integer exponents and their restrictions.

Launch | 2 minutes

Say: "What is known exactly, and what are you asked to determine? Restate the question before calculating." Read symbols neutrally. Do not identify the correct classification, property or sign.

Teach or elicit | 5-7 minutes

Say: "Show a definition, equivalent expression or power check that supports your answer." During shared practice invite individual steps; during independent and exit work collect first responses without supplying a method.

Probe the selected task | 3-5 minutes

Use O09. Teacher solution: $2^0 = 1$ because 2 is nonzero. Also $4^{-2} = 1/16$. Add to get $17/16$. The zero exponent does not mean multiplying the base by zero.

Respond | 3-5 minutes

If a learner relies only on a display or remembered rule, return to the relevant anchor. Use a different small example, then retry a fresh bank item. Record any supplied classification, property, sign or bound as a cue, not neutral access.

Close | 2 minutes

Each partner first records a solution independently, then compares the reasoning. Early finishers change one value or condition and test whether the method still works. Record the first response, access supports, cues, and a next step. Exit evidence guides later teaching; no speed threshold applies.

TEACHER GUIDE

Collaborative practice teaching script

Start with M14 and O14; save the rest through 18 for later. Target: Develop and apply powers of products or quotients.

Launch | 2 minutes

Say: "What is known exactly, and what are you asked to determine? Restate the question before calculating." Read symbols neutrally. Do not identify the correct classification, property or sign.

Teach or elicit | 5-7 minutes

Say: "Show a definition, equivalent expression or power check that supports your answer." During shared practice invite individual steps; during independent and exit work collect first responses without supplying a method.

Probe the selected task | 3-5 minutes

Use O14. Teacher solution: A negative exponent takes the reciprocal: $(4/3)^{-2} = (3/4)^2 = 9/16 = 9/16$. Both numerator and denominator are nonzero here.

Respond | 3-5 minutes

If a learner relies only on a display or remembered rule, return to the relevant anchor. Use a different small example, then retry a fresh bank item. Record any supplied classification, property, sign or bound as a cue, not neutral access.

Close | 2 minutes

Each partner first records a solution independently, then compares the reasoning. Early finishers change one value or condition and test whether the method still works. Record the first response, access supports, cues, and a next step. Exit evidence guides later teaching; no speed threshold applies.

TEACHER GUIDE

Independent practice teaching script

Start with M19 and O19; save the rest through 23 for later. Target: Develop and apply the product rule for integer exponents.

Launch | 2 minutes

Say: "What is known exactly, and what are you asked to determine? Restate the question before calculating." Read symbols neutrally. Do not identify the correct classification, property or sign.

Teach or elicit | 5-7 minutes

Say: "Show a definition, equivalent expression or power check that supports your answer." During shared practice invite individual steps; during independent and exit work collect first responses without supplying a method.

Probe the selected task | 3-5 minutes

Use O19. Teacher solution: Same base: add exponents $3 + (-2) = 1$. Thus $4^3 \times 4^{-2} = 4^1 = 4$. Negative exponents mean reciprocals; the base 4 is nonzero.

Respond | 3-5 minutes

If a learner relies only on a display or remembered rule, return to the relevant anchor. Use a different small example, then retry a fresh bank item. Record any supplied classification, property, sign or bound as a cue, not neutral access.

Close | 2 minutes

Each partner first records a solution independently, then compares the reasoning. Early finishers change one value or condition and test whether the method still works. Record the first response, access supports, cues, and a next step. Exit evidence guides later teaching; no speed threshold applies.

TEACHER GUIDE

Small-group reteach teaching script

Start with M24 and O24; save the rest through 27 for later. Target: Develop and apply powers of products or quotients.

Launch | 2 minutes

Say: "What is known exactly, and what are you asked to determine? Restate the question before calculating." Read symbols neutrally. Do not identify the correct classification, property or sign.

Teach or elicit | 5-7 minutes

Say: "Show a definition, equivalent expression or power check that supports your answer." During shared practice invite individual steps; during independent and exit work collect first responses without supplying a method.

Probe the selected task | 3-5 minutes

Use O24. Teacher solution: Apply the power of a product: $(3 \times 5)^{-2} = 3^{-2} \times 5^{-2} = (1/9) \times (1/25) = 1/225$. Alternatively multiply the bases first to obtain $15^{-2} = 1/225$. Both bases are nonzero.

Respond | 3-5 minutes

If a learner relies only on a display or remembered rule, return to the relevant anchor. Use a different small example, then retry a fresh bank item. Record any supplied classification, property, sign or bound as a cue, not neutral access.

Close | 2 minutes

Each partner first records a solution independently, then compares the reasoning. Early finishers change one value or condition and test whether the method still works. Record the first response, access supports, cues, and a next step. Exit evidence guides later teaching; no speed threshold applies.

TEACHER GUIDE

Exit ticket teaching script

Start with M28 and O28; save the rest through 30 for later. Target: Develop and apply the product rule for integer exponents.

Launch | 2 minutes

Say: "What is known exactly, and what are you asked to determine? Restate the question before calculating." Read symbols neutrally. Do not identify the correct classification, property or sign.

Teach or elicit | 5-7 minutes

Say: "Show a definition, equivalent expression or power check that supports your answer." During shared practice invite individual steps; during independent and exit work collect first responses without supplying a method.

Probe the selected task | 3-5 minutes

Use O28. Teacher solution: Same base: add exponents $4 + (-2) = 2$. Thus $2^4 \times 2^{-2} = 2^2 = 4$. Negative exponents mean reciprocals; the base 2 is nonzero.

Respond | 3-5 minutes

If a learner relies only on a display or remembered rule, return to the relevant anchor. Use a different small example, then retry a fresh bank item. Record any supplied classification, property, sign or bound as a cue, not neutral access.

Close | 2 minutes

Each partner first records a solution independently, then compares the reasoning. Early finishers change one value or condition and test whether the method still works. Record the first response, access supports, cues, and a next step. Exit evidence guides later teaching; no speed threshold applies.

STUDENT CHOICE

Choice practice 1-2

M01 | Evaluate $2^0 + 5^{-2}$ exactly.

- A. 26
- B. 626/625
- C. 26/25
- D. 6

Reasoning notes: _____

M02 | Evaluate $4^4 \times 4^{-2}$ exactly.

- A. 1/16
- B. 16
- C. 256
- D. 4

Reasoning notes: _____

STUDENT PERFORMANCE

001 | Warm-up

Target: Develop and apply the quotient rule for integer exponents.

Evaluate $4^2 \div 4^3$ exactly. Show cancellation and the exponent subtraction. Explain the nonzero-base restriction.

Definitions / equations / calculations / requested diagram

Answer / justification / check

STUDENT PERFORMANCE

002 | Warm-up

Target: Explain zero and negative integer exponents and their restrictions.

Evaluate $3^0 + 3^{-2}$ exactly. Justify the zero power by dividing equal powers. Write the other term as a reciprocal and add exactly. State why this argument does not define 0^0 .

Definitions / equations / calculations / requested diagram

Answer / justification / check

TEACHER ONLY

M worked keys 1-2

M01: C. 26/25

Target: Explain zero and negative integer exponents and their restrictions.

$2^0 = 1$ because 2 is nonzero. Also $5^{-2} = 1/25$. Add to get 26/25. The zero exponent does not mean multiplying the base by zero.

Option checks: 26: It differs from the verified answer by 624/25; compare the first non-equivalent step. The choice alone does not diagnose a unique error. 626/625: It differs from the verified answer by -24/625; compare the first non-equivalent step. The choice alone does not diagnose a unique error. 6: It differs from the verified answer by 124/25; compare the first non-equivalent step. The choice alone does not diagnose a unique error.

M02: B. 16

Target: Develop and apply the product rule for integer exponents.

Same base: add exponents $4 + (-2) = 2$. Thus $4^4 \times 4^{-2} = 4^2 = 16$. Negative exponents mean reciprocals; the base 4 is nonzero.

Option checks: 1/16: It differs from the verified answer by -255/16; compare the first non-equivalent step. The choice alone does not diagnose a unique error. 256: It differs from the verified answer by 240; compare the first non-equivalent step. The choice alone does not diagnose a unique error. 4: It differs from the verified answer by -12; compare the first non-equivalent step. The choice alone does not diagnose a unique error.

TEACHER ONLY

O worked keys 1-2

001: 1/4

Target: Develop and apply the quotient rule for integer exponents.

Divide like bases by subtracting exponents: $2 - 3 = -1$. Thus $4^2 \div 4^3 = 4^{-1} = 1/4$. Cancelling equal nonzero factors gives the same result.

Accept equivalent exact forms and valid explanations. Assess the requested process as well as the final result. A final number or label alone is incomplete when justification is requested.

002: 10/9

Target: Explain zero and negative integer exponents and their restrictions.

$3^0 = 1$ because 3 is nonzero. Also $3^{-2} = 1/9$. Add to get 10/9. The zero exponent does not mean multiplying the base by zero.

Accept equivalent exact forms and valid explanations. Assess the requested process as well as the final result. A final number or label alone is incomplete when justification is requested.