

MATHEMATICS INSTRUCTIONAL PACKET

Products, quotients and scientific notation



Grade 8 • NC.8.EE.4

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.4 | 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

Perform multiplication and division with numbers expressed in scientific notation to solve real-world problems, including problems where both decimal and scientific notation are used.

Learning targets

Multiply quantities written in scientific notation.

Divide scientific-notation quantities and interpret units.

Solve problems mixing decimal and scientific notation.

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

Integer exponent rules, decimal operations, scientific notation and units.

Materials and pacing

Pencil, optional calculator for checking; unit labels on every contextual conclusion.

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

A hypothetical sensor records 2.4×10^5 readings, each occupying 0.00032 MB. Write $0.00032 = 3.2 \times 10^{-4}$. Multiply: $(2.4 \times 3.2) \times 10^{5+(-4)} = 7.68 \times 10^1 = 76.8$ MB. Check: about 200,000 readings $\times$ 0.0003 MB is about 60 MB, a plausible scale.

Coordinate coefficients, powers and units

Coefficients	2.4×3.2	$\rightarrow$	7.68
Powers of ten	$10^5 \times 10^{-4}$	$\rightarrow$	10^1
Units	readings $\times$ MB/reading	$\rightarrow$	MB

Join the three results: 7.68×10^1 MB = 76.8 MB. Reading units cancel because the amount per reading is multiplied by the number of readings. Reverse the operation to check: total MB $\div$ MB per reading returns the reading count.

TEACHER GUIDE

Reasoning anchor

For products, multiply coefficients and add exponents. For quotients, divide coefficients and subtract the divisor's exponent. Normalize the final coefficient into $[1, 10)$.

A decimal factor can be rewritten before applying these rules. Carry units through: quantity $\times$ amount per quantity gives a total; total $\div$ amount per group gives groups.

Ask before accepting an answer

Do the units cancel or combine as intended? Did you subtract a negative exponent correctly? Is the final coefficient normalized? Does a rough estimate support the scale?

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**First quantity + unit** $\times$ or $\div$ **Second quantity + unit** $\rightarrow$ **Result + unit****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: Multiply quantities in scientific notation.

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

Calculate $(2.6 \times 10^5)(3.5 \times 10^{-4})$. Show the exponent rule, normalize your answer and estimate its scale.

Teacher solution and discussion

Coefficient product 9.1; exponent sum 1. Result 9.1×10^1 . For example, round coefficients to 3 and 4: estimated product 1.2×10^2 , consistent with the result’s scale.

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: Check a multi-step calculation.

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

A hypothetical instrument makes 2.4×10^5 readings per hour, each using 3.2×10^{-4} joules. Find energy for 0.5 hour. State the operation order, scientific notation result and units.

Teacher solution and discussion

Readings/hour $\times$ joules/reading $\times$ hours gives joules. $(2.4 \times 3.2 \times 0.5) \times 10^1 = 3.84 \times 10^1$ joules. Multiplication may be regrouped without changing the result.

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: Interpret a quotient in context.

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 hypothetical strip has length 6.3×10^{-7} meters. A reference segment is 2100 meters. How many reference-segment lengths fit in the strip, allowing fractions? Write the decimal reference in scientific notation, divide and interpret.

Teacher solution and discussion

The reference is 2.1×10^3 m. Quotient = $(6.3/2.1) \times 10^{-10} = 3 \times 10^{-10}$ reference lengths. The result is a ratio, not meters.

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: Interpret a quotient in context.

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

A hypothetical strip has length 4.8×10^8 meters. A reference segment is 16000 meters. How many reference-segment lengths fit in the strip, allowing fractions? Write the decimal reference in scientific notation, divide and interpret.

Teacher solution and discussion

The reference is 1.6×10^4 m. Quotient = $(4.8/1.6) \times 10^4 = 3 \times 10^4$ reference lengths. The result is a ratio, not meters.

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: Interpret a quotient in context.

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 hypothetical strip has length 7.2×10^{-5} meters. A reference segment is 0.0024 meters. How many reference-segment lengths fit in the strip, allowing fractions? Write the decimal reference in scientific notation, divide and interpret.

Teacher solution and discussion

The reference is 2.4×10^{-3} m. Quotient = $(7.2/2.4) \times 10^{-2} = 3 \times 10^{-2}$ reference lengths. The result is a ratio, not meters.

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: Interpret a quotient in context.

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

A hypothetical strip has length 3.5×10^6 meters. A reference segment is 0.042 meters. How many reference-segment lengths fit in the strip, allowing fractions? Write the decimal reference in scientific notation, divide and interpret. Round any nonterminating coefficient to 6 significant digits.

Teacher solution and discussion

The reference is 4.2×10^{-2} m. Quotient = $(3.5/4.2) \times 10^8 \approx 8.33333 \times 10^7$ reference lengths. The result is a ratio, not meters.

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: Combine decimal and scientific notation.

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

A hypothetical process uses 8.4×10^{-8} liters per cycle. A trial runs for 0.012 of a cycle. Find the liters used, showing both a decimal calculation and a scientific-notation calculation.

Teacher solution and discussion

$0.012 = 1.2 \times 10^{-2}$. Product = $10.08 \times 10^{-10} = 1.008 \times 10^{-9}$ liters. In decimals, $0.000000084 \times 0.012 = 0.000000001008$ liters.

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 • Multiply quantities in scientific notation.**Compute $(2.4 \times 10^5)(3.2 \times 10^{-4})$ and give scientific notation.**

A. 1.536×10^2

B. 3.75×10^0

C. 8×10^0

D. 7.68×10^1

Reasoning notes: _____

M02 • Divide quantities in scientific notation.**Compute $(2.4 \times 10^5) \div (3.2 \times 10^{-4})$.**

A. 7.68×10^9

B. 5.76×10^9

C. 3.75×10^8

D. 7.5×10^8

Reasoning notes: _____

OPEN / PERFORMANCE TASK

001 • Warm-up

Target: Multiply quantities in scientific notation.

Calculate $(2.6 \times 10^5)(3.5 \times 10^{-4})$. Show the exponent rule, normalize your answer and estimate its scale.

Representation / calculation

Explanation / check / conclusion

OPEN / PERFORMANCE TASK

002 • Warm-up

Target: Divide quantities in scientific notation.

Calculate $(4.8 \times 10^5) \div (3.2 \times 10^{-3})$. Explain the subtraction of exponents and verify by multiplication.

Representation / calculation

Explanation / check / conclusion

TEACHER GUIDE

Multiple-choice worked keys

M01 • Multiply quantities in scientific notation.

D. 7.68×10^1 . Multiply coefficients: $2.4 \times 3.2 = 7.68$. Add exponents: $5 + (-4) = 1$. Normalize to 7.68×10^1 .

Option checks: A: comes from a coefficient calculation that multiplies the coefficient product by 2, with power 10^1 ; with any nonterminating coefficient rounded to 6 significant digits. It differs from the required operation. B: comes from a coefficient calculation that divides the first coefficient by twice the second, with power 10^1 ; with any nonterminating coefficient rounded to 6 significant digits. It differs from the required operation. C: comes from a coefficient calculation that subtracts the smaller coefficient from the larger, with power 10^1 ; with any nonterminating coefficient rounded to 6 significant digits. It differs from the required operation. D: satisfies the required calculation.

M02 • Divide quantities in scientific notation.

D. 7.5×10^8 . Coefficient quotient $3/4$; exponent difference $5 - (-4) = 9$. Normalize: 7.5×10^8 .

Option checks: A: comes from a coefficient calculation that multiplies the coefficients, with power 10^9 ; with any nonterminating coefficient rounded to 6 significant digits. It differs from the required operation. B: comes from a coefficient calculation that squares the first coefficient, with power 10^9 ; with any nonterminating coefficient rounded to 6 significant digits. It differs from the required operation. C: comes from a coefficient calculation that divides the first coefficient by twice the second, with power 10^9 ; with any nonterminating coefficient rounded to 6 significant digits. It differs from the required operation. D: satisfies the required calculation.

TEACHER GUIDE

Open-task worked keys

001 • Multiply quantities in scientific notation.

Coefficient product 9.1; exponent sum 1. Result 9.1×10^1 . For example, round coefficients to 3 and 4: estimated product 1.2×10^2 , consistent with the result's scale.

002 • Divide quantities in scientific notation.

$(4.8/3.2) \times 10^8 = 1.5 \times 10^8$. Multiplying this quotient by 3.2×10^{-3} returns 4.8×10^5 .