

TEACHER AND STUDENT RESOURCE

Expressions Tell a Contextual Story



NC Math 3 • NC.M3.A-SSE.1

Seeing Structure in Expressions

Seven instructional sections with 30 multiple-choice and 30 open or performance tasks, teaching scripts, original mathematical visuals, generous workspaces, and worked keys.

Free sample | Contents

NC.M3.A-SSE.1 | NC Math 3 mathematics

This sample contains 20 complete selected pages from the 97-page resource, plus this sample contents page. Original printed page numbers are retained. Gaps are intentional.

Included original pages: 1-16, 31-32, 61, 78

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, 78

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.

ALIGNMENT

Standard and learning targets

Interpret expressions that represent a quantity in terms of its context.

- a. Identify and interpret parts of a piecewise, absolute value, polynomial, exponential and rational expressions including terms, factors, coefficients, and exponents.
- b. Interpret expressions composed of multiple parts by viewing one or more of their parts as a single entity to give meaning in terms of a context.

T1 Objective a: Interpret polynomial terms, factors, coefficients and whole quantities in context.

T2 Objective a: Interpret target, distance and scaling in absolute-value expressions.

T3 Objectives a and b: Interpret exponential coefficients, multipliers and grouped exponents.

T4 Objectives a and b: Interpret rational numerators, denominators, units and whole ratios.

T5 Objectives a and b: Interpret piecewise branches, conditions and accumulated charges.

T6 Objective b: Treat grouped expressions as single contextual entities and explain their combination.

Each item names its own target. The bank supports multiple sessions; do not assign all 60 tasks in one sitting.

NAVIGATION

Choose evidence deliberately

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

T1: M01, M02, M07, M12, M17, O01, O02, O09, O16, O23

T2: M03, M11, M21, M27, O03, O12, O21, O28

T3: M04, M09, M14, M20, M24, O04, O08, O13, O19, O25

T4: M06, M10, M16, M19, M26, M29, O06, O10, O20, O24, O29

T5: M05, M13, M18, M23, M30, O05, O11, O17, O22, O26

T6: M08, M15, M22, M25, M28, O07, O14, O15, O18, O27, O30

DAILY LEARNING TARGETS

A multi-session teaching path

Session 1: Give symbols quantities and units

Learning target: Identify parts across polynomial, absolute-value and exponential forms.

Learning target: Interpret one complete group before expanding it.

Use selected Warm-up and I Do tasks. Ask for annotated expressions and a context check, not only a computed answer.

Session 2: Compare groups, intervals and units

Learning target: Interpret rational ratios and piecewise branches.

Learning target: Explain why a plausible alternative expression changes the policy or quantity.

Select We Do and Collaborative tasks across all five expression types. Preserve each learner's initial interpretation.

Session 3: Construct, critique and transfer

Learning target: Build a context or expression with explicit grouping.

Learning target: Use boundary and unit checks to assess an interpretation.

Use Independent items, targeted reteach and fresh exit evidence. Different correct contexts are acceptable when all structural conditions are met.

PLANNING

Materials, access and pacing

Materials

Pencils, erasers, straightedge, student pages, and optional graph paper. A calculator may support arithmetic after a learner states the intended relationship. No device or paid software is required.

Prerequisites

Evaluate expressions, identify operations and parentheses, interpret units, use percent multipliers, and read inequality symbols and absolute value.

Pacing

Use a short diagnostic warm-up, a model and shared task in one session; collaborative and independent reasoning in later sessions; then targeted reteaching and an exit task. Select two to four tasks at a time based on evidence. Each section's full bank is reusable, not mandatory in one lesson.

Neutral access

Read directions aloud without interpreting the graph, enlarge a page, supply a writing or pointing response method, and allow a learner to dictate an explanation. Keep axes, units, data and mathematical demand unchanged.

Separate instruction from evidence

Keep the learner's first response. Record answer-supplying cues separately from access supports. A completed teacher graph or worked key is for discussion after independent work, never a student construction template.

Review convention

Contexts, prices, measurements and populations are invented for mathematical instruction. Interpret quantities and units before simplifying. A coefficient need not describe the whole function's rate. A branch formula applies only on its stated interval. When a task asks for a context or construction, the key gives one valid example; accept any example satisfying every condition.

TEACHER MODEL

Name the entire quantity before simplifying

A party of n people pays a \$150 room fee, \$9 per person for food, and a late-start penalty of \$4 per hour away from target start time $t=6$. Explain $A(n,t)=[150+9n+4|t-6|]/n$ as an average charge, and evaluate it at $n=5, t=8$.

The absolute-value group is the number of hours from the target. Multiplying by 4 gives the total penalty; $9n$ gives total food cost. The entire numerator is the party's total cost, and n is the number sharing it. At $n=5, t=8$, the numerator is $150+45+8=203$ dollars, so the average is \$40.60 per person. In the equivalent form $150/n+9+4|t-6|/n$, the room and penalty are shared while food remains \$9 per person.

VISUAL ANCHOR

Read from the inside out

$$A(n,t)=[150+9n+4|t-6|]/n$$

$|t-6|$: hours from target $\rightarrow 4|t-6|$: total penalty dollars

$150+9n+4|t-6|$: total party cost, one numerator entity

Divide by n people $\rightarrow$ average dollars per person

Grouping identifies which quantity an operation acts on. Units provide an independent check.

REUSABLE REASONING GUIDE

Represent, justify, interpret

Name: _____ Date: _____

Givens, quantities and restrictions**Representation and calculation****Justification or check****Conclusion, domain and units**

WARM-UP

Teaching script

Core: 001 • T1: Objective a: Interpret polynomial terms, factors, coefficients and whole quantities in context.

Optional bank: M01–M04; O01–O04. Select tasks across more than one meeting if needed.

Suggested discussion/work time: 5–8 minutes. Adjust for access and evidence; this is not a speed criterion.

Ask learners to annotate each quantity with units. In O01, cover the computed answers until the class has identified fixed cost, rate, count and variable cost. Check the meaning of $q=0$: a fixed charge can remain even when no items are produced.

Core task

A workshop's cost is $C(q)=50+8q$ dollars for a whole-number item count $q \geq 0$. Annotate the constant, coefficient, variable and variable term with their meanings and units. Evaluate $C(0)$ and $C(10)$ to test your interpretation.

Teacher solution and discussion

The variable q counts items. The constant 50 is a fixed cost in dollars, the coefficient 8 is dollars per item, and the term $8q$ is the variable production cost in dollars. $C(0)=50$ records fixed cost even with no output. $C(10)=50+80=130$ dollars; ten items add \$80, not \$8, to the fixed charge.

Evidence and response

Name all four parts, carry consistent units and connect both evaluations to the story. Ask the learner to point to the calculation or representation supporting the claim. A selected option alone does not identify a unique misconception.

Closure: Ask learners to state one feature they verified and one check they used. Use the worked key for M01 to compare all alternatives after evidence is collected.

I DO

Teaching script

Core: 005 • T5: Objectives a and b: Interpret piecewise branches, conditions and accumulated charges.

Optional bank: M05–M08; O05–O08. Select tasks across more than one meeting if needed.

Suggested discussion/work time: 10–12 minutes. Adjust for access and evidence; this is not a speed criterion.

Model O05 by drawing a completed first-tier bill of \$720 and a separate overtime block. Ask why $h-40$, rather than h , belongs in that second block. Think aloud about units: dollars per hour multiplied by extra hours produces overtime dollars. Then check the boundary at $h=40$.

Core task

Weekly pay is $W(h)=18h$ for $0 \leq h \leq 40$ and $W(h)=720+27(h-40)$ for $h > 40$. Explain 720, 27 and $h-40$ as contextual quantities. Find pay for 40 and 41 hours and explain why the second rule does not pay \$27 for every hour.

Teacher solution and discussion

The first 40 hours earn $18 \cdot 40 = \$720$. The coefficient 27 is the overtime hourly rate and $h-40$ counts overtime hours only. $W(40)=720$ using the first branch; $W(41)=720+27 \cdot 1=747$. Paying 27h would retroactively apply the overtime rate to the first 40 hours, which is not this policy.

Evidence and response

Interpret the completed tier, extra-hours entity and rate; select the boundary branch and verify both pay values. Ask the learner to point to the calculation or representation supporting the claim. A selected option alone does not identify a unique misconception.

Closure: Ask learners to state one feature they verified and one check they used. Use the worked key for M05 to compare all alternatives after evidence is collected.

WE DO

Teaching script

Core: 009 • T1: Objective a: Interpret polynomial terms, factors, coefficients and whole quantities in context.

Optional bank: M09–M13; O09–O13. Select tasks across more than one meeting if needed.

Suggested discussion/work time: 10–15 minutes. Adjust for access and evidence; this is not a speed criterion.

Use O09 to connect every factor product to a labeled area region before combining like terms. Follow with a rational or piecewise task so learners see that a group can be an area, total cost, count or completed tier. Ask what the group means before asking which operation comes next.

Core task

A rectangular tile array has side lengths $n+2$ and $n+5$. Use a labeled partition to explain the expression $(n+2)(n+5)=n^2+7n+10$. Identify the four small areas before combining like terms, and interpret the combined $7n$.

Teacher solution and discussion

Partition one side into n and 2 and the other into n and 5 . The four areas are n^2 , $5n$, $2n$ and 10 . Their sum is $n^2+5n+2n+10=n^2+7n+10$. The term $7n$ combines two rectangular strips, not a single side of length $7n$. The constant 10 is the 2 -by- 5 corner. Length units multiply to area units.

Evidence and response

Connect each product to a region and explain the combined term as area, not length. Ask the learner to point to the calculation or representation supporting the claim. A selected option alone does not identify a unique misconception.

Closure: Ask learners to state one feature they verified and one check they used. Use the worked key for M09 to compare all alternatives after evidence is collected.

COLLABORATIVE PRACTICE

Teaching script

Core: O14 • T6: Objective b: Treat grouped expressions as single contextual entities and explain their combination.

Optional bank: M14–M18; O14–O18. Select tasks across more than one meeting if needed.

Suggested discussion/work time: 15–20 minutes. Adjust for access and evidence; this is not a speed criterion.

Use O14 as an interpretation debate. One partner writes a story for each expression, another checks units, and another tests $n=4$. Resolve whether \$8 is a whole-group fee or an individual charge using the parentheses, not by voting for a preferred story.

Core task

Two planners write $C(n)=120/n+8$ and $D(n)=(120+8)/n$ for a group expense. Write a plausible story for each and explain exactly where they disagree about the \$8. Evaluate both for $n=4$ and interpret the difference.

Teacher solution and discussion

For C, a fixed \$120 fee is shared among n people and each person also pays an \$8 individual charge. For D, the group shares both a \$120 fee and one additional \$8 fee. $C(4)=30+8=\$38$ per person; $D(4)=128/4=\$32$ per person. The difference is \$6 per person because C charges each person \$8 while D shares a single \$8 among four people, making that portion \$2 each.

Evidence and response

Use grouping to distinguish one group fee from a per-person fee and explain the numerical difference. Ask the learner to point to the calculation or representation supporting the claim. A selected option alone does not identify a unique misconception.

Closure: Ask learners to state one feature they verified and one check they used. Use the worked key for M14 to compare all alternatives after evidence is collected.

INDEPENDENT PRACTICE

Teaching script

Core: O19 • T3: Objectives a and b: Interpret exponential coefficients, multipliers and grouped exponents.

Optional bank: M19–M23; O19–O23. Select tasks across more than one meeting if needed.

Suggested discussion/work time: 15–20 minutes. Adjust for access and evidence; this is not a speed criterion.

In O19, require the learner to distinguish the 20-degree baseline from the decaying 80-degree excess. Do not prompt that distinction during the first response. Collect the explanation, reference-time evaluation and one-period check as separate evidence.

Core task

A cooling model for a metal object is $T(t) = 80(0.75)^{(t-1)} + 20$ degrees, with t in hours and $t \geq 1$. Interpret 20, 80, 0.75 and $t-1$. Evaluate $T(1)$ and $T(2)$, and explain which quantity decays by 25% each hour.

Teacher solution and discussion

The 20-degree term is the surrounding temperature baseline. At $t=1$ the object is 80 degrees above that baseline, so $T(1)=100$. The exponent $t-1$ counts hours since that reference time, and 0.75 retains 75% of the temperature difference each hour. $T(2)=80 \cdot 0.75 + 20 = 80$. The excess $T-20$ decays by 25%, not the entire temperature reading. The model approaches 20 rather than 0.

Evidence and response

Distinguish the baseline from the decaying excess and locate the shifted reference time. Ask the learner to point to the calculation or representation supporting the claim. A selected option alone does not identify a unique misconception.

Closure: Ask learners to state one feature they verified and one check they used. Use the worked key for M19 to compare all alternatives after evidence is collected.

SMALL-GROUP RETEACH

Teaching script

Core: O24 • T4: Objectives a and b: Interpret rational numerators, denominators, units and whole ratios.

Optional bank: M24–M27; O24–O27. Select tasks across more than one meeting if needed.

Suggested discussion/work time: 10–15 minutes. Adjust for access and evidence; this is not a speed criterion.

Choose the error that actually appeared. O24 isolates a denominator’s whole time quantity, O25 distinguishes a multiplier from a repeated added rate, O26 makes interval ownership explicit, and O27 combines distance, total cost and sharing. After support, use a different expression type for transfer.

Core task

A job takes t total hours, including 2 hours of setup, and produces 60 units during the remaining time. Interpret $R(t)=60/(t-2)$, give its units and contextual domain, and evaluate $R(5)$. Explain why $t=2$ and $t<2$ are not meaningful inputs.

Teacher solution and discussion

The group $t-2$ is productive hours after setup. Dividing 60 units by that time gives units per productive hour. The domain is $t>2$; at $t=2$ the denominator is zero, and below 2 the model would claim negative productive time. $R(5)=60/3=20$ units per productive hour. It is not the rate averaged over all five hours, which would be 12 units per total hour.

Evidence and response

Interpret the entire denominator, distinguish productive from total time and enforce a positive-time domain. Ask the learner to point to the calculation or representation supporting the claim. A selected option alone does not identify a unique misconception.

Closure: Ask learners to state one feature they verified and one check they used. Use the worked key for M24 to compare all alternatives after evidence is collected.

EXIT TICKET

Teaching script

Core: O28 • T2: Objective a: Interpret target, distance and scaling in absolute-value expressions.

Optional bank: M28–M30; O28–O30. Select tasks across more than one meeting if needed.

Suggested discussion/work time: 5–8 minutes. Adjust for access and evidence; this is not a speed criterion.

Use O28 for a compact context construction, O29 for two different counting roles, or O30 for a nested-expression explanation. Require labels and one numeric check. A correct final value without meanings and units does not establish the interpretation objectives.

Core task

A penalty expression is $5+2|x-3|$. Invent a brief context consistent with it and identify the target, fixed charge, deviation and rate. Give two different inputs with the same penalty and explain why they match.

Teacher solution and discussion

One context: a delivery costs a \$5 base fee plus \$2 per hour away from a target arrival time $x=3$ on a local clock. The target is 3, deviation is $|x-3|$, rate is \$2 per hour and fixed charge is \$5. Inputs $x=1$ and $x=5$ both have deviation 2 and penalty $5+2\cdot 2=\$9$. Other coherent units and symmetric input pairs are acceptable.

Evidence and response

Construct a coherent context for all parts and use equal distances to justify equal outputs. Ask the learner to point to the calculation or representation supporting the claim. A selected option alone does not identify a unique misconception.

Closure: Ask learners to state one feature they verified and one check they used. Use the worked key for M28 to compare all alternatives after evidence is collected.

MULTIPLE-CHOICE BANK

M01 / M02 • Select and justify**M01 | Warm-up | T1**

A field-trip fee is $C(p)=12+4p$ dollars for p participants. What does the coefficient 4 represent?

- A. \$4 for the whole trip
- B. \$4 per participant
- C. A 4% increase
- D. 4 participants

Reasoning: _____

M02 | Warm-up | T1

A rectangle's area is $A(x)=x(x+5)$, where x is its shorter side in meters. What does the factor $x+5$ represent?

- A. A five-square-meter area increase.
- B. The perimeter, in meters.
- C. The entire area, in square meters.
- D. The longer side, in meters.

Reasoning: _____

WARM-UP

001 • Show your reasoning

T1: Objective a: Interpret polynomial terms, factors, coefficients and whole quantities in context.

A workshop's cost is $C(q)=50+8q$ dollars for a whole-number item count $q \geq 0$. Annotate the constant, coefficient, variable and variable term with their meanings and units. Evaluate $C(0)$ and $C(10)$ to test your interpretation.

Representation / calculation

Explanation / check

WARM-UP

002 • Show your reasoning

T1: Objective a: Interpret polynomial terms, factors, coefficients and whole quantities in context.

Write two different one-sentence purchasing stories: one modeled by $F(n)=4n+25$ and one by $G(n)=25n+4$. Define n and interpret the two coefficients in each story. Explain why swapping 4 and 25 changes the meaning even though the same numbers appear.

Representation / calculation

Explanation / check

WORKED TEACHER KEYS

M01 / M02

M01 • T1: Objective a: Interpret polynomial terms, factors, coefficients and whole quantities in context.

Answer: B. \$4 per participant

The term $4p$ is dollars per participant times the number of participants. The coefficient 4 is the per-participant charge; 12 is the fixed trip fee.

Check each alternative

- A. That would be a fixed term rather than a coefficient multiplying p .
- B. Correct. The term $4p$ is dollars per participant times the number of participants. The coefficient 4 is the per-participant charge; 12 is the fixed trip fee.
- C. No percentage multiplier appears in this linear term.
- D. The coefficient converts a participant count into dollars.

Evidence to assess

State the rate with units and distinguish it from the fixed term.

M02 • T1: Objective a: Interpret polynomial terms, factors, coefficients and whole quantities in context.

Answer: D. The longer side, in meters.

The two factors are side lengths x and $x+5$. Their product has square-meter units. Treating $x+5$ as one entity identifies the entire longer side, not just the extra 5 meters.

Check each alternative

- A. The 5 adds length to a side; its area effect is $5x$.
- B. The perimeter is $2x+2(x+5)$, not $x+5$.
- C. The whole product, not one factor, gives area.
- D. Correct. The two factors are side lengths x and $x+5$. Their product has square-meter units. Treating $x+5$ as one entity identifies the entire longer side, not just the extra 5 meters.

Evidence to assess

Name the grouped factor as a length and connect the product to area units.

WORKED TEACHER KEYS

001 / 002**001 • T1: Objective a: Interpret polynomial terms, factors, coefficients and whole quantities in context.**

The variable q counts items. The constant 50 is a fixed cost in dollars, the coefficient 8 is dollars per item, and the term $8q$ is the variable production cost in dollars. $C(0)=50$ records fixed cost even with no output. $C(10)=50+80=130$ dollars; ten items add \$80, not \$8, to the fixed charge.

Evidence to assess

Name all four parts, carry consistent units and connect both evaluations to the story.

002 • T1: Objective a: Interpret polynomial terms, factors, coefficients and whole quantities in context.

One F story: buying n notebooks at \$4 each plus a one-time \$25 delivery charge costs $4n+25$ dollars. Here 4 is dollars per notebook and 25 is a fixed dollar fee. One G story: buying n art kits at \$25 each plus a one-time \$4 delivery charge costs $25n+4$ dollars. The number multiplying n is a per-unit rate; the added constant is charged once. Other stories with these roles and consistent units are valid.

Evidence to assess

Construct two contexts with correctly assigned variable rate and fixed amount, not simply substitute numbers.