

TEACHER AND STUDENT RESOURCE

Interpret Function Parameters



NC Math 1 • NC.M1.F-LE.5

Building and Comparing Function Models

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.M1.F-LE.5 | NC Math 1 mathematics

This sample contains 19 complete selected pages from the 98-page resource, plus this sample contents page. Original printed page numbers are retained. Gaps are intentional.

Included original pages: 1-15, 33-34, 63, 78

Representative activities

M01: sample PDF page(s) 16; original page(s) 15

M02: sample PDF page(s) 16; original page(s) 15

O01: sample PDF page(s) 17; original page(s) 33

O02: sample PDF page(s) 18; original page(s) 34

Selected teacher prompts and keys: original page(s) 63, 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 the parameters a and b in a linear function $f(x) = ax + b$ or an exponential function $g(x) = ab^x$ in terms of a context.

T1 Interpret slope and initial value in contextual linear functions.

T2 Interpret initial value and growth factor in exponential functions.

T3 Distinguish a growth factor from a percent change with units.

T4 Explain parameter changes, time units and context restrictions.

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, O01, M02, O02, M09, M10, M11, O11, M12, O12, M19, M20, M21, O21, M22, O22, M29, M30

T2: M03, O03, O09, M13, O13, O19, M23, O23, O29

T3: M04, O04, M05, O05, M14, O14, M15, O15, M24, O24, M25, O25

T4: M06, O06, M07, O07, M08, O08, O10, M16, O16, M17, O17, M18, O18, O20, M26, O26, M27, O27, M28, O28, O30

DAILY LEARNING TARGETS

A multi-session teaching path

Session 1: Notice and represent

Learning target: Interpret slope and initial value in contextual linear functions.

Use M01–M04 and selected O01–O04 as a diagnostic. Model O05; ask learners to check its rule with the supplied data.

Session 2: Build and justify

Learning target: Interpret initial value and growth factor in exponential functions.

Learning target: Distinguish a growth factor from a percent change with units.

Choose from M09–M18 and O09–O18. Partners compare representations, check every given condition, and explain disagreements.

Session 3: Apply and revisit

Learning target: Explain parameter changes, time units and context restrictions.

Collect independent evidence from M19–M23 and O19–O23. Use M24–M27 and O24–O27 for fresh reteaching examples; select an exit task from each bank.

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. For the optional digital comparisons, use a school-approved graphing calculator or spreadsheet; no paid service or account is required. Enter the supplied rules and tables and record your own results.

Prerequisites

Check signed arithmetic, ratios, exponents and ordered pairs. Distinguish a quantity from its change. Review arithmetic and geometric patterns before scoring evidence.

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.

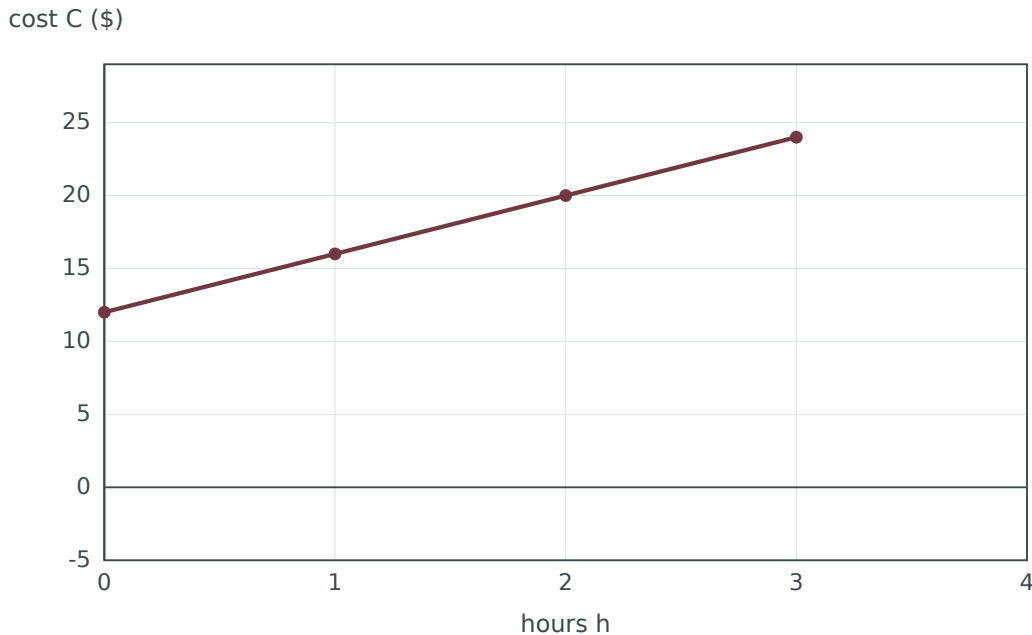
Review convention

In $f(x)=ax+b$, a is change in output per input unit and $b=f(0)$. In $g(x)=ab^x$, $a=g(0)$ and b is the dimensionless multiplier per input unit. For $b>1$, percent growth is $100(b-1)\%$; for $0<b<1$, percent decay is $100(1-b)\%$. Interpret $x=0$ relative to the stated starting time. Exponent notation is explicitly restored in the source statement.

TEACHER MODEL

The same letters play different roles

Compare taxi cost $C(h)=4h+12$ dollars and a population model $P(d)=12\cdot(3/2)^d$ individuals. Interpret both parameters in each rule.



For C, 4 means \$4 per hour and 12 means the \$12 fixed charge at $h=0$. For P, 12 is the initial population at $d=0$; $3/2$ is the daily factor, so each day adds 50% of the current population. The parameter a is slope in $ax+b$ but initial amount in ab^x . The model context, not the letter alone, determines meaning.

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: Interpret slope and initial value in contextual linear functions.

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.

Display student page O01, including its graph when present. Invite a first independent response before discussion. Ask, “What do the symbols represent? What evidence supports your claim?”

Core task

A workshop fee is $F(p) = 7p + 23$ dollars for p whole-number participants from 0 to 20. Interpret both parameters with units. Explain $F(0)$ and $F(p+1) - F(p)$.

Teacher solution and discussion

7 is dollars per additional participant; 23 is the fixed fee. $F(0) = 23$ dollars. $F(p+1) - F(p) = 7$ dollars for each added participant when both inputs are allowed. Participant count is discrete.

Evidence and response

Look for the stated initial condition, correct equal-interval change, and a model that matches every supplied observation. Ask learners to test their rule at two known inputs. If a learner adds where the situation multiplies, compare successive differences and ratios using actual data, then collect a fresh response. 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 • T3: Distinguish a growth factor from a percent change with units.

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.

Display student page O05, including its graph when present. Think aloud through the core task. Say, “I will identify the quantities first, then build a representation and check it against the stated domain.” Hide the worked key until after predictions.

Core task

A material model is $M(t) = 160 \cdot (3/4)^t$ grams at whole hours $t \geq 0$. Interpret a and b , state the percent decrease, and calculate how many grams are lost during the first hour and during the second.

Teacher solution and discussion

$a = 160$ g initially; $b = 3/4$ retains 75%, so the hourly decrease is 25%. $M(1) = 120$ g and $M(2) = 90$ g. Losses are 40 g and 30 g. A fixed percent does not mean a fixed number of grams.

Evidence and response

Look for the stated initial condition, correct equal-interval change, and a model that matches every supplied observation. Ask learners to test their rule at two known inputs. If a learner adds where the situation multiplies, compare successive differences and ratios using actual data, then collect a fresh response. 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 • T2: Interpret initial value and growth factor in exponential functions.

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.

Display student page O09, including its graph when present. Have learners propose the next step, then ask a partner to verify it using the original representation. Record more than one valid explanation.

Core task

The graph shows an exponential model of tips versus rounds. Read the initial amount and per-round multiplier, write its function, and interpret both parameters.

Teacher solution and discussion

At round 0 there are 8 tips. Consecutive ratios are 2, so $T(n)=8 \cdot 2^n$. The coefficient is the initial tip count; the base means the count doubles per round.

Evidence and response

Look for the stated initial condition, correct equal-interval change, and a model that matches every supplied observation. Ask learners to test their rule at two known inputs. If a learner adds where the situation multiplies, compare successive differences and ratios using actual data, then collect a fresh response. 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 • T3: Distinguish a growth factor from a percent change with units.

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.

Display student page O14, including its graph when present. Assign reader, representer, checker and explainer roles. Each learner first makes a private prediction; compare reasoning and resolve differences with the data.

Core task

A model gives $S(t) = 100 \cdot (13/10)^t$ units for whole days $t \geq 0$. Explain both parameters and the daily percent growth. Compute the first two daily increases and explain why they differ.

Teacher solution and discussion

$S(0) = 100$; each day multiplies by $13/10$, so daily growth is 30%. $S(1) = 130$; $S(2) = 169$. Increases are 30 and 39 units. The percent stays fixed while its current-amount base changes.

Evidence and response

Look for the stated initial condition, correct equal-interval change, and a model that matches every supplied observation. Ask learners to test their rule at two known inputs. If a learner adds where the situation multiplies, compare successive differences and ratios using actual data, then collect a fresh response. 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 • T2: Interpret initial value and growth factor in exponential functions.

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.

Display student page O19, including its graph when present. Provide the printed task and neutral access supports. Preserve the first independent response; do not point to the requested answer or select a method for the learner.

Core task

The graph shows an exponential model of tips versus rounds. Read the initial amount and per-round multiplier, write its function, and interpret both parameters.

Teacher solution and discussion

At round 0 there are 9 tips. Consecutive ratios are 2, so $T(n)=9 \cdot 2^n$. The coefficient is the initial tip count; the base means the count doubles per round.

Evidence and response

Look for the stated initial condition, correct equal-interval change, and a model that matches every supplied observation. Ask learners to test their rule at two known inputs. If a learner adds where the situation multiplies, compare successive differences and ratios using actual data, then collect a fresh response. 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: 024 • T3: Distinguish a growth factor from a percent change with units.

Optional bank: M24–M27; 024–027. 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.

Display student page 024, including its graph when present. Start with the learner’s prior evidence. Rebuild one representation with explicit terms and operations, then use a fresh item to check transfer without the prior cue.

Core task

A model gives $S(t)=120 \cdot (27/20)^t$ units for whole days $t \geq 0$. Explain both parameters and the daily percent growth. Compute the first two daily increases and explain why they differ.

Teacher solution and discussion

$S(0)=120$; each day multiplies by $27/20$, so daily growth is 35%. $S(1)=162$; $S(2)=2187/10$. Increases are 42 and $567/10$ units. The percent stays fixed while its current-amount base changes.

Evidence and response

Look for the stated initial condition, correct equal-interval change, and a model that matches every supplied observation. Ask learners to test their rule at two known inputs. If a learner adds where the situation multiplies, compare successive differences and ratios using actual data, then collect a fresh response. 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 • T4: Explain parameter changes, time units and context restrictions.

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.

Display student page O28, including its graph when present. Ask for a concise claim supported by the representation. Collect the response before sharing a solution; use it to choose the next instructional step.

Core task

A plant model is $P(w) = 120 \cdot 2^w$ units with w in weeks. Another teacher writes $P(d) = 120 \cdot 2^{d/7}$, with d in days. Explain both forms, their starting amount and the meaning of the factor 2. Verify the amount at day 14.

Teacher solution and discussion

Both start at 120. The factor 2 applies once per week or once per 7 days. Since $w = d/7$, the second formula represents the same model. At $d = 14$, exponent = 2 and amount = 480. The base 2 must not be called daily doubling in the day-based formula.

Evidence and response

Look for the stated initial condition, correct equal-interval change, and a model that matches every supplied observation. Ask learners to test their rule at two known inputs. If a learner adds where the situation multiplies, compare successive differences and ratios using actual data, then collect a fresh response. 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 bike rental costs $C(h)=3h+15$ dollars for $0 \leq h \leq 8$ hours. What does 3 represent?

- A. The cost increases \$3 for each extra hour.
- B. The initial charge is \$3.
- C. The rental lasts 3 hours.
- D. The cost is multiplied by 3 each hour.

Reasoning: _____

M02 | Warm-up | T1

A tank follows $V(t)=40-4t$ liters until empty, with t in minutes. Which interprets the linear coefficient a in $at+b$?

- A. $a=-4$ L/min: the volume falls by 4 liters per minute.
- B. $a=4$: the volume grows by that factor each minute.
- C. $a=-40$: the volume starts negative.
- D. $a=40$ L: it is the starting amount.

Reasoning: _____

WARM-UP

001 • Show your reasoning

T1: Interpret slope and initial value in contextual linear functions.

A workshop fee is $F(p)=7p+23$ dollars for p whole-number participants from 0 to 20. Interpret both parameters with units. Explain $F(0)$ and $F(p+1)-F(p)$.

Representation / calculation

Explanation / check

WARM-UP

002 • Show your reasoning

T1: Interpret slope and initial value in contextual linear functions.

A candle model is $H(t)=72-6t$ mm, for $0 \leq t \leq 12$ hours. Interpret both parameters and the time when the model ends. Explain why the negative coefficient is not a negative starting height.

Representation / calculation

Explanation / check

WORKED TEACHER KEYS

M01 / M02**M01 • T1: Interpret slope and initial value in contextual linear functions.****Answer: A. The cost increases \$3 for each extra hour.** $C(h+1) - C(h) = 3$. Thus the slope is \$3/hour; $C(0) = 15$ dollars is separate.**Check each alternative**

- A. The coefficient of hours is dollars per hour.
- B. The constant term, not the slope, is the initial charge.
- C. The coefficient is a rate, not a duration.
- D. The model adds a constant hourly amount.

M02 • T1: Interpret slope and initial value in contextual linear functions.**Answer: A. $a = -4$ L/min: the volume falls by 4 liters per minute.**Write $V(t) = -4t + 40$; $a = -4$ and $b = 40$. The slope is -4 L/min until V reaches 0.**Check each alternative**

- A. The sign and units identify the constant rate of loss.
- B. A negative linear coefficient is an additive loss rate.
- C. The initial volume is positive and equals the constant term.
- D. The starting amount is b , not a .

WORKED TEACHER KEYS

001 / 002**001 • T1: Interpret slope and initial value in contextual linear functions.**

7 is dollars per additional participant; 23 is the fixed fee. $F(0)=23$ dollars. $F(p+1)-F(p)=7$ dollars for each added participant when both inputs are allowed. Participant count is discrete.

002 • T1: Interpret slope and initial value in contextual linear functions.

The candle starts at 72 mm. The rate is -6 mm/hour, meaning a loss of 6 mm each hour. $H(t)=0$ at $t=72/6=12$ h. The negative sign describes change; $H(0)=72>0$.