

TEACHER AND STUDENT RESOURCE

Choose and Justify Function Models



NC Math 1 • NC.M1.F-LE.1

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.1 | 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

Identify situations that can be modeled with linear and exponential functions, and justify the most appropriate model for a situation based on the rate of change over equal intervals.

T1 Analyze equal-interval changes in observed values.

T2 Analyze repeated change in quantitative relationships.

T3 Compare candidate models and recognize insufficient evidence.

T4 Interpret rate evidence from graphs, tables and situations.

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, M03, O03, M06, O06, M11, O11, M13, O13, M16, O16, M21, O21, M23, O23, M26, O26

T2: M02, O02, M04, O04, M05, O05, M12, O12, M14, O14, M15, O15, M22, O22, M24, O24, M25, O25

T3: M07, O07, M09, O09, M10, O10, M17, O17, M19, O19, M20, O20, M27, O27, M29, O29, M30, O30

T4: M08, O08, M18, O18, M28, O28

DAILY LEARNING TARGETS

A multi-session teaching path

Session 1: Notice and represent

Learning target: Analyze equal-interval changes in observed values.

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: Analyze repeated change in quantitative relationships.

Learning target: Compare candidate models and recognize insufficient evidence.

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

Session 3: Apply and revisit

Learning target: Interpret rate evidence from graphs, tables and situations.

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.

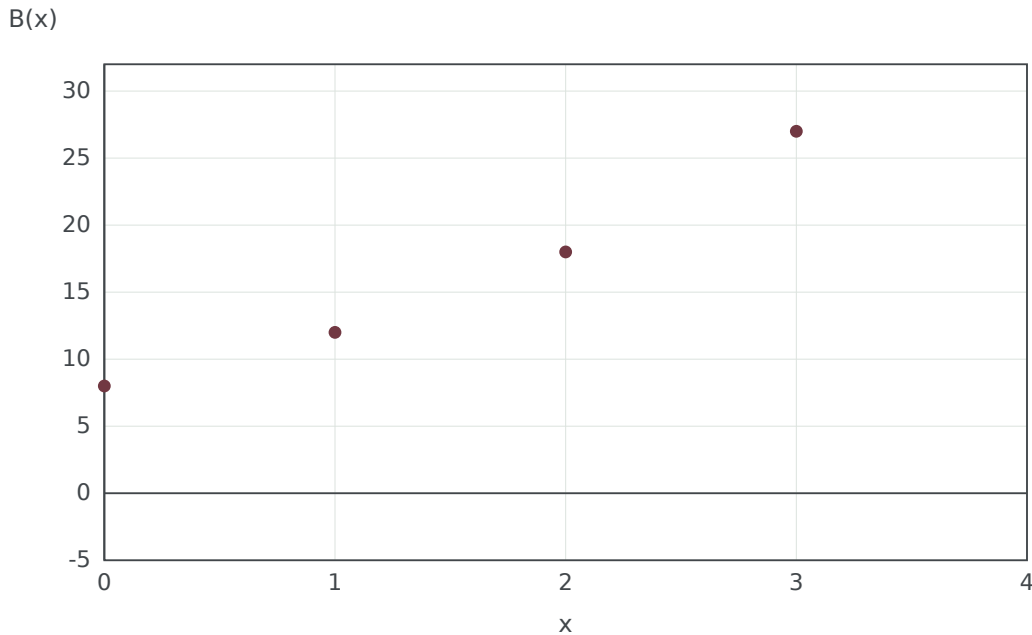
Review convention

Use equal input intervals when comparing changes. Constant absolute change supports a linear model; constant multiplicative change supports an exponential model. A finite table supports a candidate model but cannot guarantee all future observations. A nonzero constant function can be described as linear with slope 0 and as $a \cdot 1^x$; do not force a unique choice in that case.

TEACHER MODEL

Equal intervals are the comparison unit

Compare the tables A: 8, 13, 18, 23 and B: 8, 12, 18, 27 at $x=0,1,2,3$. Which model family is supported for each?



A has differences 5,5,5, supporting $A(x)=8+5x$. B has ratios $12/8=18/12=27/18=3/2$, supporting $B(x)=8(3/2)^x$. B's differences 4,6,9 are not constant. These are candidate models under the given repeated-change assumptions, not proof that finite observations force one arbitrary function.

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: Analyze equal-interval changes in observed values.

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

Compare differences and ratios over equal input intervals. Justify a linear or exponential model and write a rule. Explain the limits of a prediction beyond this table.

Input x	0	1	2	3
Output y	17	22	27	32

Teacher solution and discussion

The input interval is 1. Differences are 5, 5, 5. Ratios are $22/17$, $27/22$, $32/27$. Constant differences support $y=17+(5)x$. Future predictions assume this pattern continues; finite observations alone do not prove it.

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 • T2: Analyze repeated change in quantitative relationships.

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 display model starts at 200 units and loses 20% of its current reading per day. Justify the family, give a function, and compute days 0,1,2 exactly.

Teacher solution and discussion

Each day retains 80%, multiplier $4/5$. $D(n)=200 \cdot (4/5)^n$. Days 0,1,2 are 200, 160, 128 units. The ratios are constant; the losses are not a fixed number of units. This is exponential decay.

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 • T3: Compare candidate models and recognize insufficient evidence.

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

A learner compares raw differences to reject a linear model. Check the claim using per-unit rates and build a model if justified.

Input x	0	2	5
Output y	5	11	20

Teacher solution and discussion

Raw changes 6 and 9 occur over 2 and 3 input units. Rates are $6/2=3$ and $9/3=3$. A linear model $y=5+3x$ fits all three points. Equal rates, not equal raw changes across unequal gaps, are the relevant test.

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 • T2: Analyze repeated change in quantitative relationships.

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

Compare differences and ratios over equal input intervals. Justify a linear or exponential model and write a rule. Explain the limits of a prediction beyond this table.

Input x	0	2	4	6
Output y	21	63	189	567

Teacher solution and discussion

The input interval is 2. Differences are 42, 126, 378. Ratios are 3, 3, 3. Constant ratios support $y=21 \cdot 3^{x/2}$. Future predictions assume this pattern continues; finite observations alone do not prove it.

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 • T3: Compare candidate models and recognize insufficient evidence.

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

A learner compares raw differences to reject a linear model. Check the claim using per-unit rates and build a model if justified.

Input x	0	2	5
Output y	6	12	21

Teacher solution and discussion

Raw changes 6 and 9 occur over 2 and 3 input units. Rates are $6/2=3$ and $9/3=3$. A linear model $y=6+3x$ fits all three points. Equal rates, not equal raw changes across unequal gaps, are the relevant test.

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 • T2: Analyze repeated change in quantitative relationships.

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

Compare differences and ratios over equal input intervals. Justify a linear or exponential model and write a rule. Explain the limits of a prediction beyond this table.

Input x	0	2	4	6
Output y	25	100	400	1600

Teacher solution and discussion

The input interval is 2. Differences are 75, 300, 1200. Ratios are 4, 4, 4. Constant ratios support $y=25\cdot4^{x/2}$. Future predictions assume this pattern continues; finite observations alone do not prove it.

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: Interpret rate evidence from graphs, tables and situations.

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

Read the plotted observations. Compare equal-interval changes, justify a model family, and write a rule for $0 \leq x \leq 3$.

Teacher solution and discussion

The values are 13, 9, 5, 1. Each unit interval changes y by -4 ; $y(0)=13$. Thus $y=13 - 4x$, a linear model on the stated interval.

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****Which model claim is supported by this table?**

Input x	0	1	2	3
Output y	10	13	16	19

- A. Linear because all outputs are positive.
- B. Exponential: each interval multiplies by 3.
- C. Linear: each 1-unit interval adds 3.
- D. No model is possible because the outputs change.

Reasoning: _____

M02 | Warm-up | T2**Which model claim is supported by this table?**

Input x	0	1	2	3
Output y	10	20	40	80

- A. No model is possible because the outputs change.
- B. Linear because all outputs are positive.
- C. Linear: each interval adds 2.
- D. Exponential: each 1-unit interval multiplies by 2.

Reasoning: _____

WARM-UP

001 • Show your reasoning

T1: Analyze equal-interval changes in observed values.

Compare differences and ratios over equal input intervals. Justify a linear or exponential model and write a rule. Explain the limits of a prediction beyond this table.

Input x	0	1	2	3
Output y	17	22	27	32

Representation / calculation

Explanation / check

WARM-UP

002 • Show your reasoning

T2: Analyze repeated change in quantitative relationships.

Compare differences and ratios over equal input intervals. Justify a linear or exponential model and write a rule. Explain the limits of a prediction beyond this table.

Input x	0	1	2	3
Output y	17	34	68	136

Representation / calculation

Explanation / check

WORKED TEACHER KEYS

M01 / M02**M01 • T1: Analyze equal-interval changes in observed values.****Answer: C. Linear: each 1-unit interval adds 3.**

Input intervals all equal 1. Differences are 3, 3, 3. Ratios are $13/10$, $16/13$, $19/16$. Linear: each 1-unit interval adds 3.

Check each alternative

- A. Sign alone does not determine a model family.
- B. This treats an additive change as a multiplier.
- C. The repeated equal-interval change matches this claim.
- D. Changing outputs can follow a well-defined function.

M02 • T2: Analyze repeated change in quantitative relationships.**Answer: D. Exponential: each 1-unit interval multiplies by 2.**

Input intervals all equal 1. Differences are 10, 20, 40. Ratios are 2, 2, 2. Exponential: each 1-unit interval multiplies by 2.

Check each alternative

- A. Changing outputs can follow a well-defined function.
- B. Sign alone does not determine a model family.
- C. This treats a multiplier as an additive change.
- D. The repeated equal-interval change matches this claim.

WORKED TEACHER KEYS

001 / 002**001 • T1: Analyze equal-interval changes in observed values.**

The input interval is 1. Differences are 5, 5, 5. Ratios are $22/17$, $27/22$, $32/27$. Constant differences support $y=17+(5)x$. Future predictions assume this pattern continues; finite observations alone do not prove it.

002 • T2: Analyze repeated change in quantitative relationships.

The input interval is 1. Differences are 17, 34, 68. Ratios are 2, 2, 2. Constant ratios support $y=17 \cdot 2^{x/1}$. Future predictions assume this pattern continues; finite observations alone do not prove it.