

TEACHER AND STUDENT RESOURCE

Comparing Linear Functions



Grade 8 • NC.8.F.2

Functions

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.8.F.2 | Eighth Grade mathematics

This sample contains 20 complete selected pages from the 120-page resource, plus this sample contents page. Original printed page numbers are retained. Gaps are intentional.

Included original pages: 1-14, 39-40, 69-70, 93-94

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) 39

O02: sample PDF page(s) 17; original page(s) 40

Selected teacher prompts and keys: original page(s) 69-70, 93-94

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

Compare properties of two linear functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

T1 Compare rates of change across different representations.

T2 Compare initial values across different representations.

T3 Compare outputs and relationships across different representations.

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, M06, M11, M16, M21, M26, O01, O06, O11, O16, O21, O26

T2: M02, M07, M12, M17, M22, M27, O02, O07, O12, O17, O22, O27

T3: M03, M04, M05, M08, M09, M10, M13, M14, M15, M18, M19, M20, M23, M24, M25, M28, M29, M30, O03, O04, O05, O08, O09, O10, O13, O14, O15, O18, O19, O20, O23, O24, O25, O28, O29, O30

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

Check ordered pairs, input/output order, reading numbered scales, signed-number arithmetic, and the meaning of horizontal and vertical axes. Teach these separately before collecting independent 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

A finite table describes only its displayed domain unless a broader rule or linear model is explicitly given. Do not infer a unique future rule from a short list of values.

TEACHER MODEL

An equation and a table

A has equation $y = 2x + 1$. B is linear.

Table (columns correspond):

Input x	0	2	4
Output y	4	6	8

Compare their initial values, rates and outputs at $x = 3$.

A has rate 2 and initial value 1. For B, $(6 - 4)/(2 - 0) = 1$ and y at $x = 0$ is 4, so B has equation $y = x + 4$. B starts 3 higher, but A grows 1 more per input unit. At $x = 3$, $A = 7$ and $B = 7$. A larger initial value does not always mean larger outputs at every input.

REUSABLE REASONING GUIDE

Represent, justify, interpret

Name: _____ Date: _____

Givens and input/output meaning**Representation and calculation****Justification or check****Conclusion, domain and units**

WARM-UP

Teaching script

Core: 001 • T1: Compare rates of change across different representations.

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 input and output represent? What evidence supports your claim?”

Core task

A: the output begins at 3 when $x = 0$ and decreases by 1 for every increase of 1 in x . B is the straight segment shown in the graph. Both functions have domain $0 \leq x \leq 4$. Determine both rates of change. Which is greater, and by how much? Show how you obtained each rate from its representation.

Teacher solution and discussion

A is $y = -x + 3$ with rate -1 and initial value 3. B is $y = x + 3$ with rate 1 and initial value 3. The greater rate is 1, belonging to B, and the difference is 2. Use $\Delta y/\Delta x$ for a graph or table; interpret the signed change, not just its magnitude.

Evidence and response

Look for a claim tied to specific inputs, outputs, changes or graph features. If a learner only names an answer, ask which values or parts of the graph support it. If axes are reversed, reteach input/output order with one pair, 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: Compare outputs and relationships across different representations.

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: $y = -x + 3$. B is linear. Table (columns correspond):

Input x	0	2	4
Output y	2	4	6

Both functions have domain $0 \leq x \leq 4$. Find whether the outputs ever agree in the given domain. Show your equation and explain what your result means for the two representations.

Teacher solution and discussion

A is $y = -x + 3$ with rate -1 and initial value 3 . B is $y = x + 2$ with rate 1 and initial value 2 . Solve $(-2)x = -1$; $x = 0.5$. This input is in $0 \leq x \leq 4$, and both outputs equal 2.5 ; the graphs meet there.

Evidence and response

Look for a claim tied to specific inputs, outputs, changes or graph features. If a learner only names an answer, ask which values or parts of the graph support it. If axes are reversed, reteach input/output order with one pair, 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 outputs and relationships across different representations.

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: $y = x + 6$. B: the output begins at -1 when $x = 0$ and decreases by 2 for every increase of 1 in x . Both functions have domain $0 \leq x \leq 4$. A learner claims that the function with the greater rate must have the greater output at every input in the domain. Test the claim for these two functions using their initial values and outputs at $x = 4$. Explain.

Teacher solution and discussion

A is $y = x + 6$ with rate 1 and initial value 6. B is $y = -2x - 1$ with rate -2 and initial value -1. At $x = 4$, $A = 10$ and $B = -9$. A has the greater rate. It has greater output throughout this domain because its output difference is positive at both endpoints and linear. A greater rate alone does not establish the ordering of outputs; initial value also matters.

Evidence and response

Look for a claim tied to specific inputs, outputs, changes or graph features. If a learner only names an answer, ask which values or parts of the graph support it. If axes are reversed, reteach input/output order with one pair, 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: Compare outputs and relationships across different representations.

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 is the straight segment shown in the graph. B: $y = x + 3$. Both functions have domain $0 \leq x \leq 4$. A learner claims that the function with the greater rate must have the greater output at every input in the domain. Test the claim for these two functions using their initial values and outputs at $x = 4$. Explain.

Teacher solution and discussion

A is $y = -2x + 1$ with rate -2 and initial value 1 . B is $y = x + 3$ with rate 1 and initial value 3 . At $x = 4$, $A = -7$ and $B = 7$. B has the greater rate. It has greater output throughout this domain because its output difference is positive at both endpoints and linear. A greater rate alone does not establish the ordering of outputs; initial value also matters.

Evidence and response

Look for a claim tied to specific inputs, outputs, changes or graph features. If a learner only names an answer, ask which values or parts of the graph support it. If axes are reversed, reteach input/output order with one pair, 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 outputs and relationships across different representations.

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: the output begins at 7 when $x = 0$ and increases by 2 for every increase of 1 in x . B is the straight segment shown in the graph. Both functions have domain $0 \leq x \leq 4$. A learner claims that the function with the greater rate must have the greater output at every input in the domain. Test the claim for these two functions using their initial values and outputs at $x = 4$. Explain.

Teacher solution and discussion

A is $y = 2x + 7$ with rate 2 and initial value 7. B is $y = -x$ with rate -1 and initial value 0. At $x = 4$, $A = 15$ and $B = -4$. A has the greater rate. It has greater output throughout this domain because its output difference is positive at both endpoints and linear. A greater rate alone does not establish the ordering of outputs; initial value also matters.

Evidence and response

Look for a claim tied to specific inputs, outputs, changes or graph features. If a learner only names an answer, ask which values or parts of the graph support it. If axes are reversed, reteach input/output order with one pair, 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: O24 • T3: Compare outputs and relationships across different representations.

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.

Display student page O24, including its graph when present. Start with the learner's prior evidence. Rebuild one representation with explicit input/output labels, then use a fresh item to check transfer without the prior cue.

Core task

A is linear. Table (columns correspond):

Input x	0	2	4
Output y	3	1	-1

B: the output begins at -2 when $x = 0$ and decreases by 2 for every increase of 1 in x . Both functions have domain $0 \leq x \leq 4$. A learner claims that the function with the greater rate must have the greater output at every input in the domain. Test the claim for these two functions using their initial values and outputs at $x = 4$. Explain.

Teacher solution and discussion

A is $y = -x + 3$ with rate -1 and initial value 3. B is $y = -2x - 2$ with rate -2 and initial value -2. At $x = 4$, $A = -1$ and $B = -10$. A has the greater rate. It has greater output throughout this domain because its output difference is positive at both endpoints and linear. A greater rate alone does not establish the ordering of outputs; initial value also matters.

Evidence and response

Look for a claim tied to specific inputs, outputs, changes or graph features. If a learner only names an answer, ask which values or parts of the graph support it. If axes are reversed, reteach input/output order with one pair, 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 • T3: Compare outputs and relationships across different representations.

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 is the straight segment shown in the graph. B is linear. Table (columns correspond):

Input x	0	2	4
Output y	1	-1	-3

Both functions have domain $0 \leq x \leq 4$. Build a comparison table at inputs 0, 1, 2, 3 and 4. State where A has the greater output among these five inputs and justify.

Teacher solution and discussion

A is $y = -2x + 1$ with rate -2 and initial value 1. B is $y = -x + 1$ with rate -1 and initial value 1. Comparison table:

Input x	0	1	2	3	4
Output A	1	-1	-3	-5	-7
Output B	1	0	-1	-2	-3

A is not greater at any of these five inputs. Compare corresponding outputs at the same input; equality is not “greater.”

Evidence and response

Look for a claim tied to specific inputs, outputs, changes or graph features. If a learner only names an answer, ask which values or parts of the graph support it. If axes are reversed, reteach input/output order with one pair, 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: $y = x + 1$. B is linear. Table (columns correspond):

Input x	0	2	4
Output y	4	2	0

Both functions have domain $0 \leq x \leq 4$. What is the rate of A minus the rate of B?

- A. -2
- B. 2
- C. 1
- D. 4

Reasoning: _____

M02 | Warm-up | T2

A is linear. Table (columns correspond):

Input x	0	2	4
Output y	2	4	6

B: the output begins at 5 when $x = 0$ and decreases by 1 for every increase of 1 in x . Both functions have domain $0 \leq x \leq 4$. What is the initial value of A minus the initial value of B?

- A. -3
- B. -7
- C. -1
- D. -4

Reasoning: _____

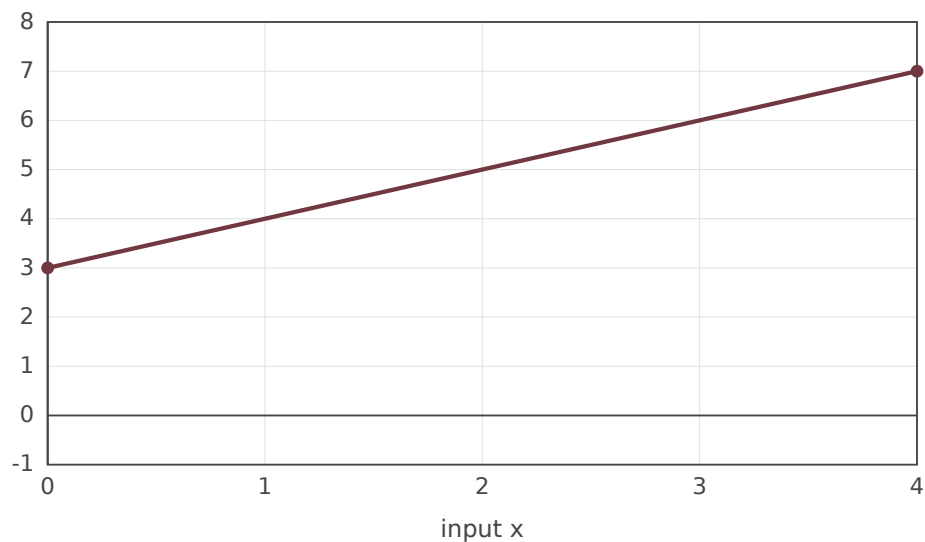
WARM-UP

001 • Show your reasoning

T1: Compare rates of change across different representations.

A: the output begins at 3 when $x = 0$ and decreases by 1 for every increase of 1 in x . **B** is the straight segment shown in the graph. Both functions have domain $0 \leq x \leq 4$. Determine both rates of change. Which is greater, and by how much? Show how you obtained each rate from its representation.

B: output y



Representation / calculation

Explanation / check

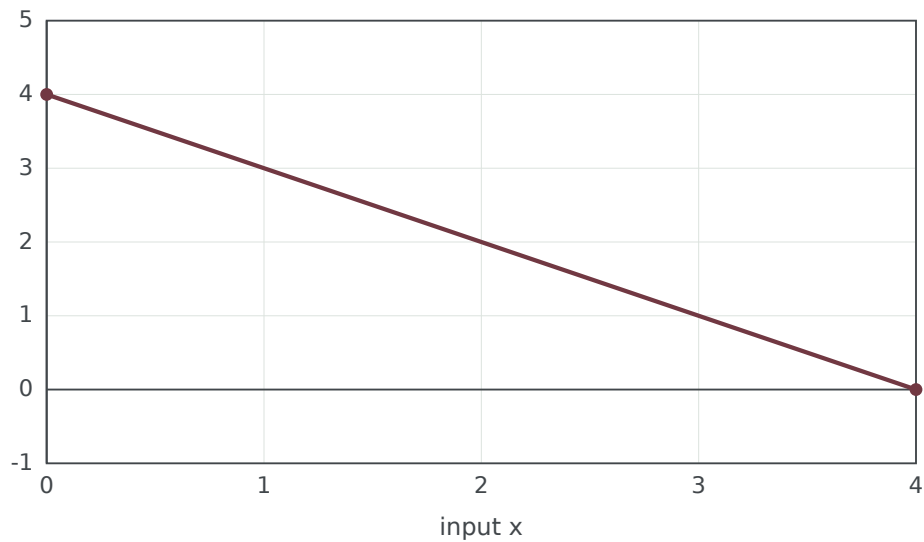
WARM-UP

002 • Show your reasoning

T2: Compare initial values across different representations.

A is the straight segment shown in the graph. B: $y = x + 4$. Both functions have domain $0 \leq x \leq 4$. Determine both initial values. Which starts higher and by how much? Explain how the representations show $x = 0$.

A: output y



Representation / calculation

Explanation / check

WORKED TEACHER KEYS

M01**M01 • T1: Compare rates of change across different representations.****Answer: B. 2**

A has rate 1; B has rate -1. For a table or graph, use change in y divided by change in x. The difference is $1 - (-1) = 2$.

Check each alternative

A. The requested comparison equals 2, not -2; substituting or recomputing from both representations rejects this value.

B. A has rate 1; B has rate -1. For a table or graph, use change in y divided by change in x. The difference is $1 - (-1) = 2$.

C. The requested comparison equals 2, not 1; substituting or recomputing from both representations rejects this value.

D. The requested comparison equals 2, not 4; substituting or recomputing from both representations rejects this value.

Evidence to assess

Assess accurate representation, a valid justification, and a conclusion consistent with the domain and units. Accept equivalent reasoning or another construction meeting every condition. An answer alone does not establish a unique misconception.

WORKED TEACHER KEYS

M02 / M03**M02 • T2: Compare initial values across different representations.****Answer: A. -3**

The initial value is the output at $x = 0$. A starts at 2; B starts at 5. Their difference is $2 - (5) = -3$.

Check each alternative

A. The initial value is the output at $x = 0$. A starts at 2; B starts at 5. Their difference is $2 - (5) = -3$.

B. The requested comparison equals -3, not -7; substituting or recomputing from both representations rejects this value.

C. The requested comparison equals -3, not -1; substituting or recomputing from both representations rejects this value.

D. The requested comparison equals -3, not -4; substituting or recomputing from both representations rejects this value.

M03 • T3: Compare outputs and relationships across different representations.**Answer: D. 3**

Write A as $y = x + 1$ and B as $y = -x + 4$. At $x = 3$, $A = 4$ and $B = 1$. $A - B = 3$.

Check each alternative

A. The requested comparison equals 3, not -2; substituting or recomputing from both representations rejects this value.

B. The requested comparison equals 3, not 2; substituting or recomputing from both representations rejects this value.

C. The requested comparison equals 3, not 0; substituting or recomputing from both representations rejects this value.

D. Write A as $y = x + 1$ and B as $y = -x + 4$. At $x = 3$, $A = 4$ and $B = 1$. $A - B = 3$.

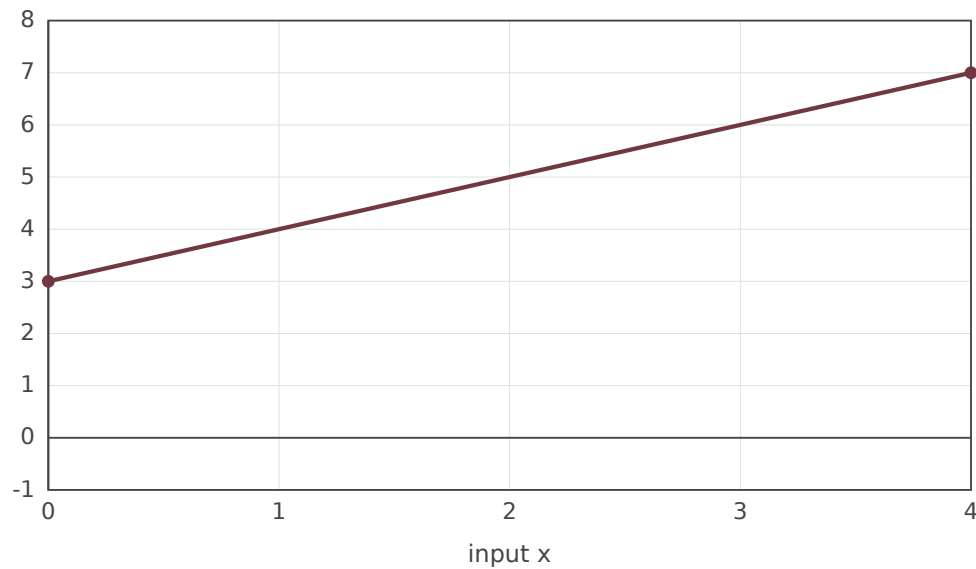
WORKED TEACHER KEYS

001

001 • T1: Compare rates of change across different representations.

A is $y = -x + 3$ with rate -1 and initial value 3 . B is $y = x + 3$ with rate 1 and initial value 3 . The greater rate is 1 , belonging to B, and the difference is 2 . Use $\Delta y/\Delta x$ for a graph or table; interpret the signed change, not just its magnitude.

B: output y

**Evidence to assess**

Assess accurate representation, a valid justification, and a conclusion consistent with the domain and units. Accept equivalent reasoning or another construction meeting every condition. An answer alone does not establish a unique misconception.

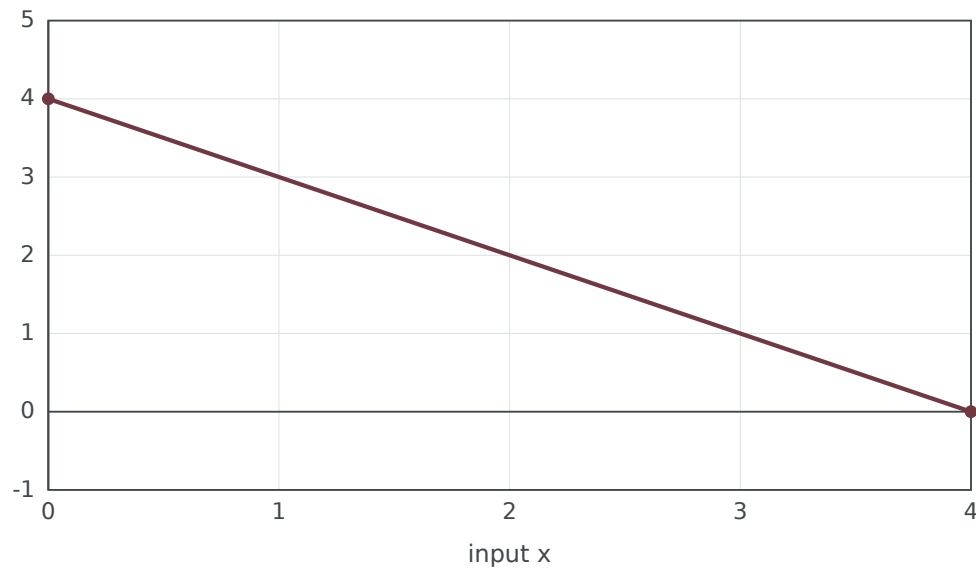
WORKED TEACHER KEYS

002

002 • T2: Compare initial values across different representations.

A is $y = -x + 4$ with rate -1 and initial value 4. B is $y = x + 4$ with rate 1 and initial value 4. Their initial values are equal. The initial value is the y-coordinate at $x = 0$, the constant term, or the verbally stated starting value.

A: output y

**Evidence to assess**

Assess accurate representation, a valid justification, and a conclusion consistent with the domain and units. Accept equivalent reasoning or another construction meeting every condition. An answer alone does not establish a unique misconception.