

TEACHER AND STUDENT RESOURCE

Reading and Sketching Function Behavior



Grade 8 • NC.8.F.5

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.5 | Eighth Grade mathematics

This sample contains 19 complete selected pages from the 116-page resource, plus this sample contents page. Original printed page numbers are retained. Gaps are intentional.

Included original pages: 1-14, 39-40, 69, 84-85

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, 84-85

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

Qualitatively analyze the functional relationship between two quantities.

- Analyze a graph determining where the function is increasing or decreasing; linear or non-linear.
- Sketch a graph that exhibits the qualitative features of a real-world function.

T1 Describe where a graph increases, decreases or remains constant.

T2 Distinguish linear and nonlinear behavior on a stated interval.

T3 Sketch a real-world function with specified qualitative features.

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: M02, M04, M06, M08, M10, M12, M14, M16, M18, M20, M22, M24, M26, M28, M30, O01, O03, O05, O07, O09

T2: M01, M03, M05, M07, M09, M11, M13, M15, M17, M19, M21, M23, M25, M27, M29, O02, O04, O06, O08, O10

T3: O11, O12, O13, O14, O15, O16, O17, O18, O19, O20, O21, O22, O23, O24, O25, O26, O27, 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.

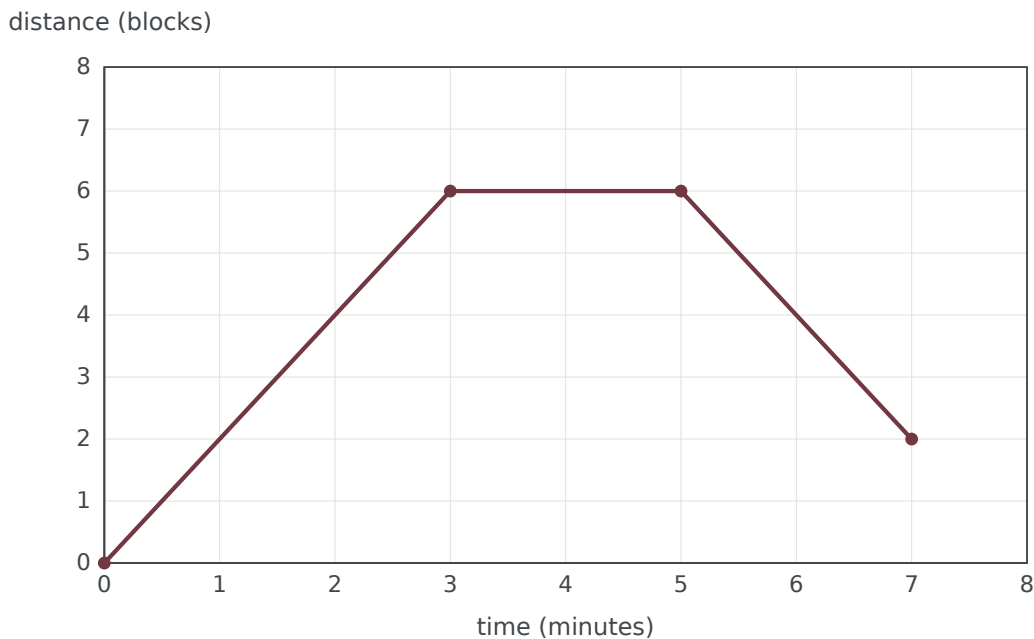
Review convention

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

A trip with a pause

A walker's distance from home rises steadily from 0 to 6 blocks during minutes 0-3, stays at 6 blocks during minutes 3-5, then falls steadily to 2 blocks at minute 7. Sketch and describe the graph.



Use time (minutes) horizontally and distance from home (blocks) vertically. Join $(0, 0)$, $(3, 6)$, $(5, 6)$, $(7, 2)$ with segments. Distance increases on 0-3, is constant on 3-5 and decreases on 5-7. Each piece is linear, including the horizontal piece, but the entire graph is nonlinear because its rate changes at minutes 3 and 5. A decreasing distance does not mean time runs backward.

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: Describe where a graph increases, decreases or remains constant.

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

The graph models water depth against time; units are arbitrary and consistent. Describe behavior over 0–2, 2–4 and 4–6. Decide whether the whole function is linear, and write a plausible story matching the graph. Distinguish straight pieces from the whole graph.

Teacher solution and discussion

0–2: increasing (rate 2); 2–4: constant (rate 0); 4–6: decreasing (rate -1). The entire graph is nonlinear because the rates change between pieces. One possible story: A tank fills steadily, its valve closes so the depth stays fixed, and then some water drains out. The story must match water depth against time. Each individual segment is linear; a horizontal segment is also linear. The story is a possible interpretation, not proof of an unshown cause. Do not extend the model beyond input 6.

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 • T1: Describe where a graph increases, decreases or remains constant.

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

The graph models temperature against time; units are arbitrary and consistent. Describe behavior over 0–2, 2–4 and 4–6. Decide whether the whole function is linear, and write a plausible story matching the graph. Distinguish straight pieces from the whole graph.

Teacher solution and discussion

0–2: constant (rate 0); 2–4: constant (rate 0); 4–6: constant (rate 0). The entire graph is linear because all rates agree. One possible story: A room is held at the same temperature throughout the observation. The story must match temperature against time. Each individual segment is linear; a horizontal segment is also linear. The story is a possible interpretation, not proof of an unshown cause. Do not extend the model beyond input 6.

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 • T1: Describe where a graph increases, decreases or remains constant.

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 models water level against time; units are arbitrary and consistent. Describe behavior over 0–2, 2–4 and 4–6. Decide whether the whole function is linear, and write a plausible story matching the graph. Distinguish straight pieces from the whole graph.

Teacher solution and discussion

0–2: increasing (rate 1.5); 2–4: decreasing (rate -0.5); 4–6: increasing (rate 1.5). The entire graph is nonlinear because the rates change between pieces. One possible story: Water is added to a basin, some drains out, and then more is added. The story must match water level against time. Each individual segment is linear; a horizontal segment is also linear. The story is a possible interpretation, not proof of an unshown cause. Do not extend the model beyond input 6.

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: Sketch a real-world function with specified qualitative features.

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

Water drains from a container. Its volume decreases throughout, rapidly at first and then more slowly. Sketch a nonlinear graph. Sketch a graph over 0–6 on the blank grid. Label both axes. Choose reasonable numerical heights; exact values are not prescribed. Explain the intervals of change and whether the entire graph is linear.

Teacher solution and discussion

One acceptable graph uses points $\{(0, 9), (1, 6), (2, 4), (3, 2.7), (4, 1.8), (5, 1.2), (6, 0.8)\}$. It decreases with successively less steep slopes. The entire graph is nonlinear: its rate changes. Accept different numerical scales that preserve every stated qualitative feature, the starting condition and a single output at each time. Curved versions of the progressively changing-rate examples are also valid. Axis labels and an explanation are required.

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: Sketch a real-world function with specified qualitative features.

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 lift rises at a steady rate for 2 seconds, continues rising more slowly for 2 seconds, and then stops for 2 seconds. Sketch a graph over 0–6 on the blank grid. Label both axes. Choose reasonable numerical heights; exact values are not prescribed. Explain the intervals of change and whether the entire graph is linear.

Teacher solution and discussion

One acceptable graph uses points $\{(0, 0), (2, 6), (4, 8), (6, 8)\}$. It increases steeply, increases less steeply, then is constant. The entire graph is nonlinear: its rate changes. Accept different numerical scales that preserve every stated qualitative feature, the starting condition and a single output at each time. Curved versions of the progressively changing-rate examples are also valid. Axis labels and an explanation are required.

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: Sketch a real-world function with specified qualitative features.

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

Water drains from a container. Its volume decreases throughout, rapidly at first and then more slowly. Sketch a nonlinear graph. Sketch a graph over 0–9 on the blank grid. Label both axes. Choose reasonable numerical heights; exact values are not prescribed. Explain the intervals of change and whether the entire graph is linear.

Teacher solution and discussion

One acceptable graph uses points $\{(0.0, 9), (1.5, 6), (3.0, 4), (4.5, 2.7), (6.0, 1.8), (7.5, 1.2), (9.0, 0.8)\}$. It decreases with successively less steep slopes. The entire graph is nonlinear: its rate changes. Accept different numerical scales that preserve every stated qualitative feature, the starting condition and a single output at each time. Curved versions of the progressively changing-rate examples are also valid. Axis labels and an explanation are required.

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: 028 • T3: Sketch a real-world function with specified qualitative features.

Optional bank: M28–M30; 028–030. 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 028, 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 full ribbon is cut at a constant rate. Its remaining length decreases steadily but stays positive during the observation. Sketch a graph over 0–9 on the blank grid. Label both axes. Choose reasonable numerical heights; exact values are not prescribed. Explain the intervals of change and whether the entire graph is linear.

Teacher solution and discussion

One acceptable graph uses points $\{(0.0, 9), (9.0, 3)\}$. It decreases at one constant rate and remains positive. The entire graph is linear: its rate is constant. Accept different numerical scales that preserve every stated qualitative feature, the starting condition and a single output at each time. Curved versions of the progressively changing-rate examples are also valid. Axis labels and an explanation are required.

Evidence and response

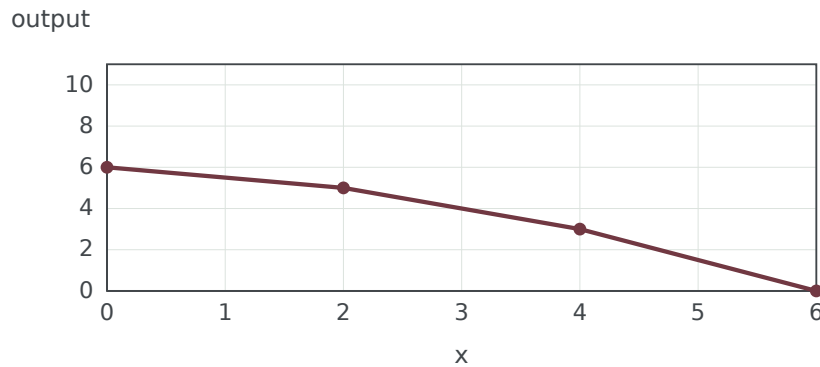
Look for a claim tied to specific inputs, outputs, changes or graph features. If a learner only names an answer, ask which values or parts of the graph support it. If axes are reversed, reteach input/output order with one pair, then collect a fresh response. A selected option alone does not identify 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 | T2**

Over the entire displayed interval $0 \leq x \leq 6$, how does the function behave?

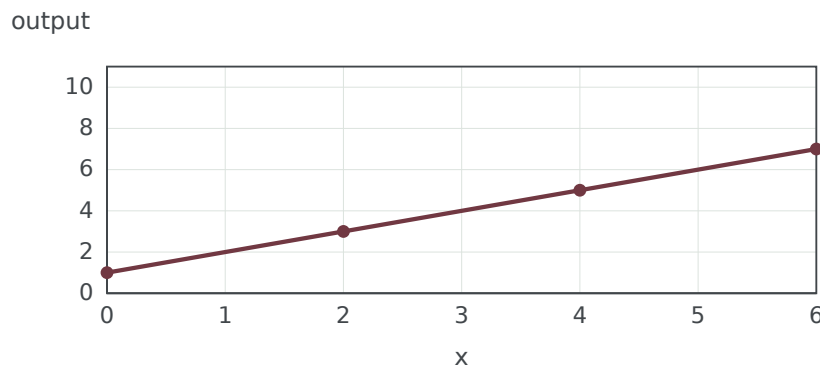


- A. Decreasing and nonlinear.
- B. Increasing and linear.
- C. Decreasing and linear.
- D. Increasing and nonlinear.

Reasoning: _____

M02 | Warm-up | T1

Over the entire displayed interval $0 \leq x \leq 6$, how does the function behave?



- A. Decreasing and nonlinear.
- B. Increasing and nonlinear.
- C. Increasing and linear.
- D. Decreasing and linear.

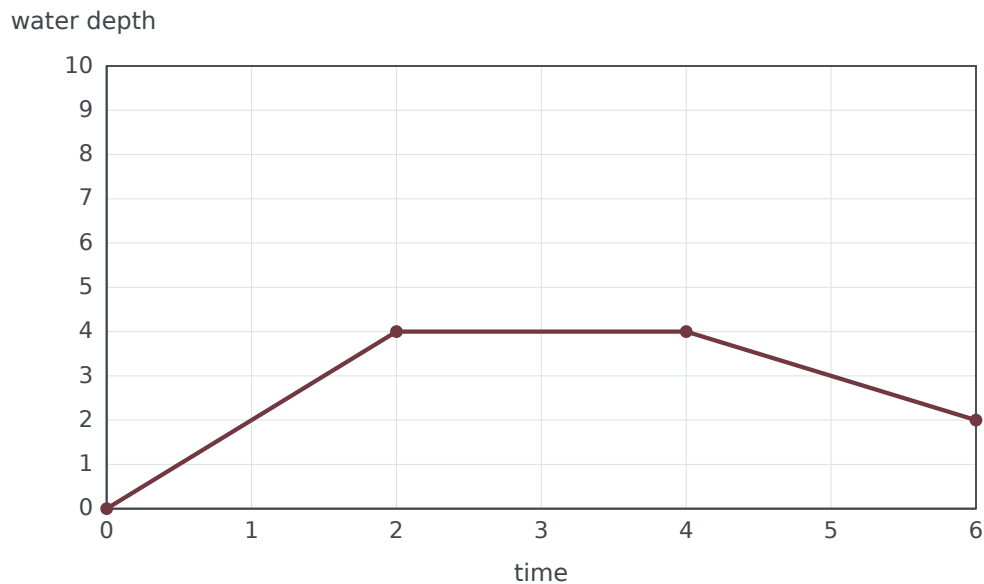
Reasoning: _____

WARM-UP

001 • Show your reasoning

T1: Describe where a graph increases, decreases or remains constant.

The graph models water depth against time; units are arbitrary and consistent. Describe behavior over 0-2, 2-4 and 4-6. Decide whether the whole function is linear, and write a plausible story matching the graph. Distinguish straight pieces from the whole graph.



Representation / calculation

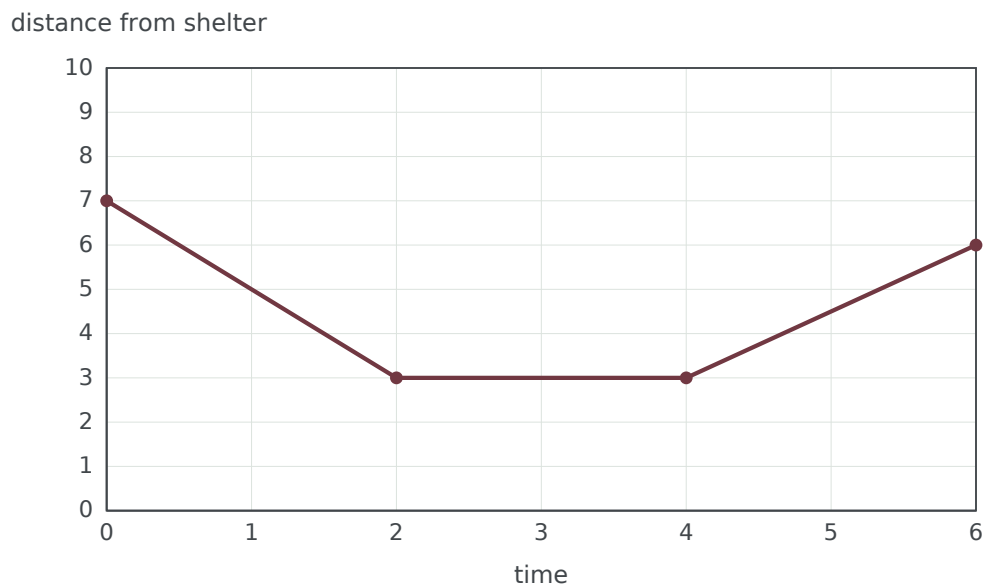
Explanation / check

WARM-UP

002 • Show your reasoning

T2: Distinguish linear and nonlinear behavior on a stated interval.

The graph models distance from shelter against time; units are arbitrary and consistent. Describe behavior over 0-2, 2-4 and 4-6. Decide whether the whole function is linear, and write a plausible story matching the graph. Distinguish straight pieces from the whole graph.



Representation / calculation

Explanation / check

WORKED TEACHER KEYS

M01 / M02**M01 • T2: Distinguish linear and nonlinear behavior on a stated interval.****Answer: A. Decreasing and nonlinear.**

The consecutive rates are -0.5, -1, -1.5. All are negative, so outputs decrease. The rates change, so the entire graph is nonlinear even though each small segment is straight.

Check each alternative

- A. Correct. The direction agrees; the linear/nonlinear classification agrees.
- B. Incorrect. The direction is reversed; the linear/nonlinear classification disagrees with the changing or constant rate.
- C. Incorrect. The direction agrees; the linear/nonlinear classification disagrees with the changing or constant rate.
- D. Incorrect. The direction is reversed; the linear/nonlinear classification agrees.

M02 • T1: Describe where a graph increases, decreases or remains constant.**Answer: C. Increasing and linear.**

The consecutive rates are 1, 1, 1. All are positive, so outputs increase. The rates agree and the segments form one line, so the function is linear.

Check each alternative

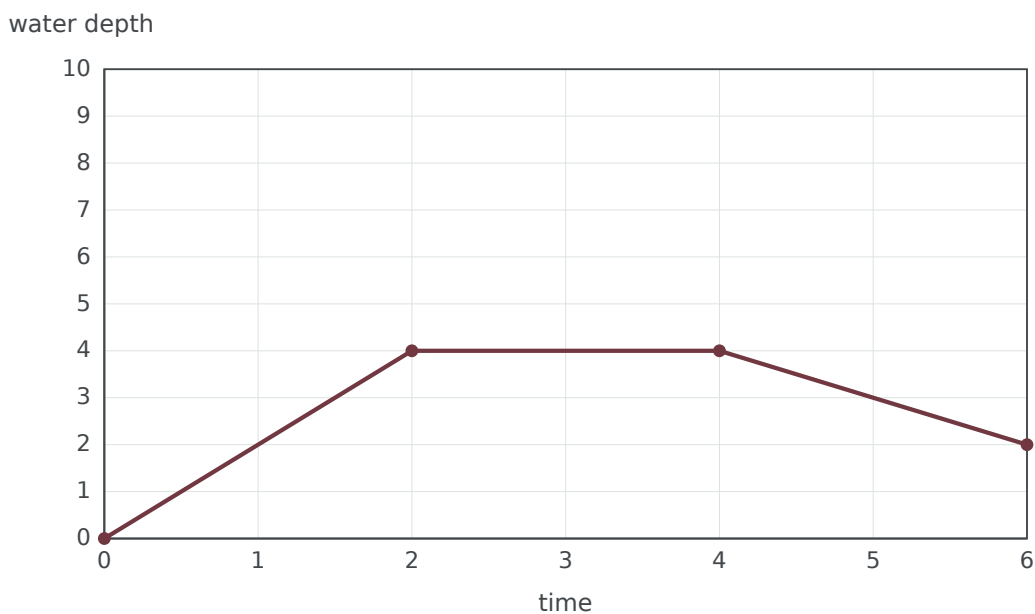
- A. Incorrect. The direction is reversed; the linear/nonlinear classification disagrees with the changing or constant rate.
- B. Incorrect. The direction agrees; the linear/nonlinear classification disagrees with the changing or constant rate.
- C. Correct. The direction agrees; the linear/nonlinear classification agrees.
- D. Incorrect. The direction is reversed; the linear/nonlinear classification agrees.

WORKED TEACHER KEYS

001

001 • T1: Describe where a graph increases, decreases or remains constant.

0–2: increasing (rate 2); 2–4: constant (rate 0); 4–6: decreasing (rate -1). The entire graph is nonlinear because the rates change between pieces. One possible story: A tank fills steadily, its valve closes so the depth stays fixed, and then some water drains out. The story must match water depth against time. Each individual segment is linear; a horizontal segment is also linear. The story is a possible interpretation, not proof of an unshown cause. Do not extend the model beyond input 6.

**Evidence to assess**

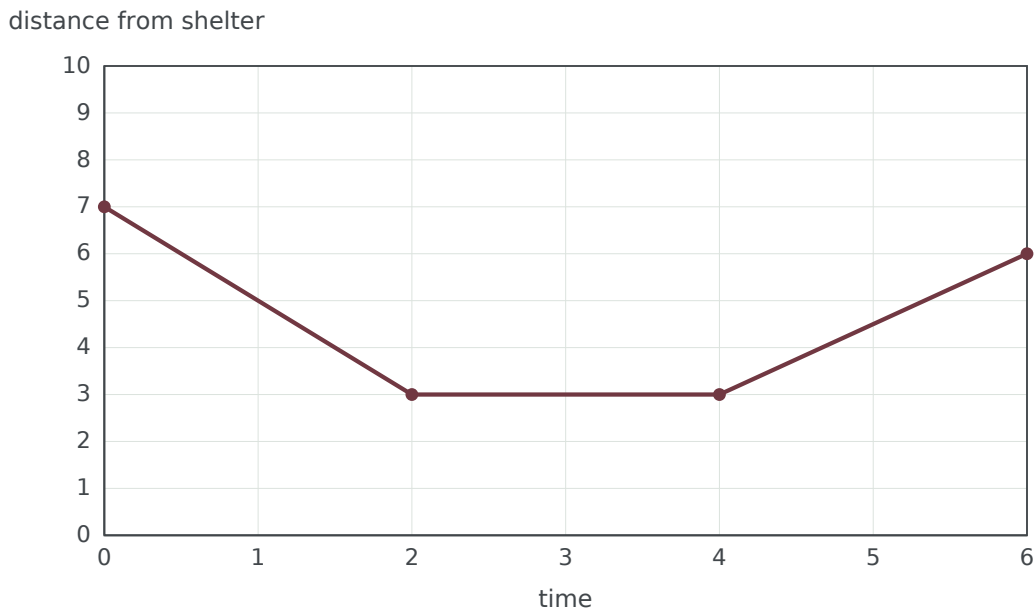
Assess accurate representation, a valid justification, and a conclusion consistent with the domain and units. Accept equivalent reasoning or another construction meeting every condition. An answer alone does not establish a unique misconception.

WORKED TEACHER KEYS

002

002 • T2: Distinguish linear and nonlinear behavior on a stated interval.

0–2: decreasing (rate -2); 2–4: constant (rate 0); 4–6: increasing (rate 1.5). The entire graph is nonlinear because the rates change between pieces. One possible story: A person moves toward a shelter, stops, and then moves away from it. The story must match distance from shelter against time. Each individual segment is linear; a horizontal segment is also linear. The story is a possible interpretation, not proof of an unshown cause. Do not extend the model beyond input 6.

**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.