

TEACHER AND STUDENT RESOURCE

Reading Features in Context



NC Math 1 • NC.M1.F-IF.4

Interpreting functions in context

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-IF.4 | NC Math 1 mathematics

This sample contains 21 complete selected pages from the 106-page resource, plus this sample contents page. Original printed page numbers are retained. Gaps are intentional.

Included original pages: 1-16, 37-38, 67, 82-83

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) 37

O02: sample PDF page(s) 19; original page(s) 38

Selected teacher prompts and keys: original page(s) 67, 82-83

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 key features of graphs, tables, and verbal descriptions in context to describe functions that arise in applications relating two quantities, including: intercepts; intervals where the function is increasing, decreasing, positive, or negative; and maximums and minimums.

T1 Interpret intercepts using the quantities and units in a context.

T2 Describe intervals of increase, decrease and constant output.

T3 Interpret positive, zero and negative outputs in context.

T4 Identify maximum and minimum values and when they occur.

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, M05, M10, M12, M17, M18, M25, O01, O05, O10, O12, O17, O18, O25

T2: M04, M09, M13, M14, M21, M22, M30, O04, O09, O13, O14, O21, O30

T3: M02, M07, M11, M16, M26, M29, O02, O07, O11, O16, O22, O26, O29

T4: M03, M06, M08, M15, M19, M20, M23, M24, M27, M28, O03, O06, O08, O15, O19, O20, O23, O24, O27, O28

SESSION TARGETS

Plan short learning sequences

Session 1: intercepts and context

Use T1 with M01–M04 and O01–O04. Learners interpret ordered pairs with units and separate observed values from inferred values. Start with O01; use O02 to check sign language.

Session 2: change and sign

Use T2 and T3 with selected M05–M13 and O05–O13. Model O05, co-construct a sign/trend explanation for O11, and distinguish a negative value from a decrease.

Session 3: extrema and evidence

Use T4 with M14–M23 and O14–O23. Learners compare all endpoints and turning points, identify plateau times, and explain limits of sampled tables.

Session 4: targeted transfer

Choose M24–M27 and O24–O27 from prior evidence, then collect one M28–M30 and one O28–O30 independently. Revisit the specific target shown by the learner's first response.

Select a small subset at each meeting; the full bank supports reuse and responsive grouping over multiple sessions. Targets describe the mathematics, not a required daily item count.

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

Read ordered pairs, labeled axes, signed numbers and units. Distinguish time from the quantity measured and change in output from the output itself.

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.

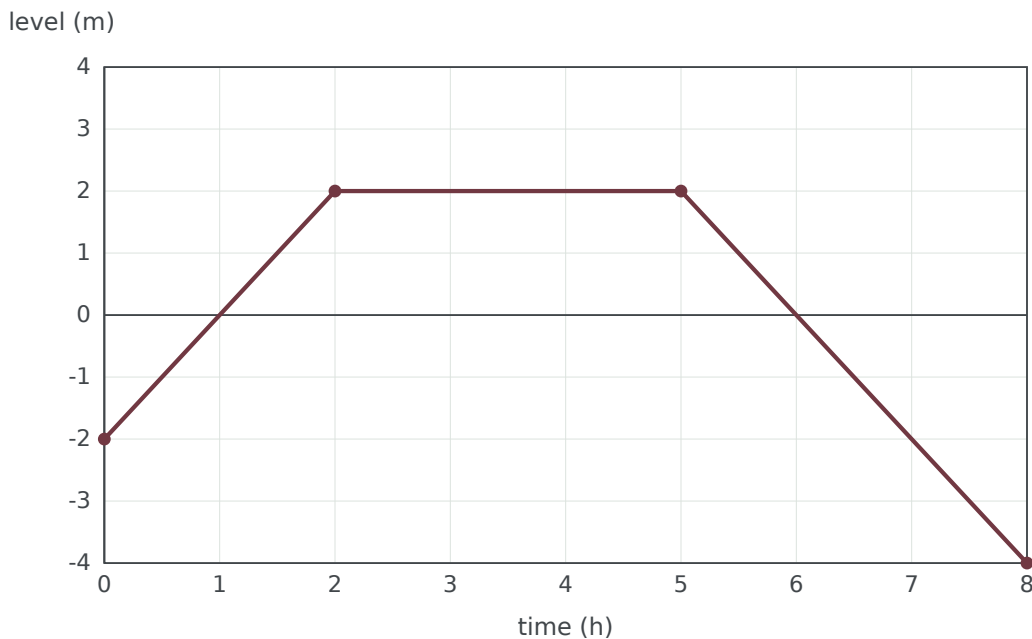
Review convention

For strict signs use > 0 or < 0 , excluding zero crossings. Include an endpoint when its value has the stated sign. Trend intervals name the spans between turning points; equivalent open-interval notation for these spans is accepted. A table gives only listed observations unless the prompt explicitly supplies an in-between model. A joined graph represents all points on its segments.

TEACHER MODEL

A changing reservoir level

The graph shows water level y , in meters above or below a reference mark, during 8 hours. Straight segments are part of the model. Interpret its intercepts, trends, signs and extreme values.



The vertical intercept $(0, -2)$ means the level starts 2 m below the mark. The level equals the mark at $t = 1$ and $t = 6$ h. It increases from 0 to 2 h, is constant from 2 to 5 h, then decreases from 5 to 8 h. It is above the mark for $1 < t < 6$, below it for $0 \leq t < 1$ and $6 < t \leq 8$. Its maximum is 2 m at every time from 2 through 5 h; its minimum is -4 m at 8 h. A negative level is a position below the reference, not a negative amount of water.

VISUAL READING GUIDE

Connect the representation to context

Intercept: ask which quantity is zero and interpret the other coordinate with units.

Trend: read left to right; rising, falling or horizontal is about change.

Sign: compare output with zero; positive means above the horizontal axis, negative below.

Extrema: compare all allowed points, including endpoints and plateaus. Name both the value and every time that attains it.

Tables: report recorded values unless an in-between model is explicitly supplied.

A level below a reference is meaningful; a negative water volume is not.

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 intercepts using the quantities and units in a 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.

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 tank’s volume is shown. State both intercepts and interpret each with units. Explain why the model stops at its last point.

Teacher solution and discussion

The vertical intercept $(0, 18)$ means 18 L initially. The horizontal intercept $(6, 0)$ means the tank is empty after 6 min. The model stops there because continued draining cannot produce a negative volume.

Evidence and response

Look for a claim tied to allowed inputs, attained outputs, units or graph features. If a learner only names an answer, ask which values or parts of the graph support it. If input and output or sign and trend are confused, ask the learner to read one ordered pair with both units, then compare another pair. Revisit the allowed domain before collecting 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: Interpret intercepts using the quantities and units in a context.

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 a shop’s net profit P in dollars for x items sold. Interpret the intercepts and identify the whole-number sales counts with positive profit within the displayed domain.

Teacher solution and discussion

The vertical intercept $(0, -30)$ means a \$30 loss before any sale. The horizontal intercept $(6, 0)$ means 6 sales break even. Positive profit occurs for $x > 6$, so the allowed whole-number counts are 7, 8, 9 and 10.

Evidence and response

Look for a claim tied to allowed inputs, attained outputs, units or graph features. If a learner only names an answer, ask which values or parts of the graph support it. If input and output or sign and trend are confused, ask the learner to read one ordered pair with both units, then compare another pair. Revisit the allowed domain before collecting 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: Describe intervals of increase, decrease and constant output.

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 table gives a robot’s distance y (m) from its charger at times x (s). Compare consecutive recorded outputs: where do the recorded outputs rise, fall or tie? Can you conclude the robot waited between the tied readings?

Input x	0	2	5	7	9
Output y	3	8	8	1	6

Teacher solution and discussion

The recorded distances rise from 0 to 2 s (3 to 8 m), tie from 2 to 5 s (8 m), fall from 5 to 7 s (8 to 1 m), and rise from 7 to 9 s (1 to 6 m). The robot could move and return to the same distance between 2 and 5 s; a table alone does not prove it waited.

Evidence and response

Look for a claim tied to allowed inputs, attained outputs, units or graph features. If a learner only names an answer, ask which values or parts of the graph support it. If input and output or sign and trend are confused, ask the learner to read one ordered pair with both units, then compare another pair. Revisit the allowed domain before collecting 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: Describe intervals of increase, decrease and constant output.

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 scooter begins 4 km from a station, moves steadily to 10 km away by minute 12, stays 10 km away until minute 18, and returns steadily to the station by minute 30. Describe all trend intervals. Does constant distance necessarily imply the scooter is parked?

Teacher solution and discussion

Increasing distance: 0–12 min. Constant distance: 12–18 min. Decreasing distance: 18–30 min. Constant distance alone allows movement along a path of constant distance from the station, so it does not logically require parking.

Evidence and response

Look for a claim tied to allowed inputs, attained outputs, units or graph features. If a learner only names an answer, ask which values or parts of the graph support it. If input and output or sign and trend are confused, ask the learner to read one ordered pair with both units, then compare another pair. Revisit the allowed domain before collecting 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 • T4: Identify maximum and minimum values and when they occur.

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 models a signed sensor reading. Give its maximum and minimum with times. Then identify all intervals of increase and decrease.

Teacher solution and discussion

Maximum: 7 units at 2 s. Minimum: -3 units at 7 s. The reading increases from 0 to 2 s, decreases from 2 to 7 s, and increases from 7 to 9 s. The local starting/ending values do not replace the global extremes.

Evidence and response

Look for a claim tied to allowed inputs, attained outputs, units or graph features. If a learner only names an answer, ask which values or parts of the graph support it. If input and output or sign and trend are confused, ask the learner to read one ordered pair with both units, then compare another pair. Revisit the allowed domain before collecting 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 • T4: Identify maximum and minimum values and when they occur.

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 quantities and restrictions, then use a fresh item to check transfer without the prior cue.

Core task

The table gives distance y (m) from a door at times x (s). Find the closest and farthest recorded positions, with times and units. Then explain which coordinate answers “when.”

Input x	0	3	8	12
Output y	9	4	15	6

Teacher solution and discussion

Closest: 4 m at 3 s. Farthest: 15 m at 8 s. The input coordinate x is time and answers “when”; the output coordinate y is distance and answers “how far.”

Evidence and response

Look for a claim tied to allowed inputs, attained outputs, units or graph features. If a learner only names an answer, ask which values or parts of the graph support it. If input and output or sign and trend are confused, ask the learner to read one ordered pair with both units, then compare another pair. Revisit the allowed domain before collecting 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: Identify maximum and minimum values and when they occur.

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

The graph shows lake level relative to a reference. Identify both extremes, every horizontal intercept, and the time intervals when the level is below the reference.

Teacher solution and discussion

Minimum -4 m at day 2; maximum 4 m at day 6. Zero crossings: day 0 and day 4. Below reference for $0 < t < 4$. The starting zero is excluded. On the rising segment from (2, -4) to (6, 4), the midpoint at day 4 has level zero.

Evidence and response

Look for a claim tied to allowed inputs, attained outputs, units or graph features. If a learner only names an answer, ask which values or parts of the graph support it. If input and output or sign and trend are confused, ask the learner to read one ordered pair with both units, then compare another pair. Revisit the allowed domain before collecting a fresh response. A selected option alone does not identify a unique misconception.

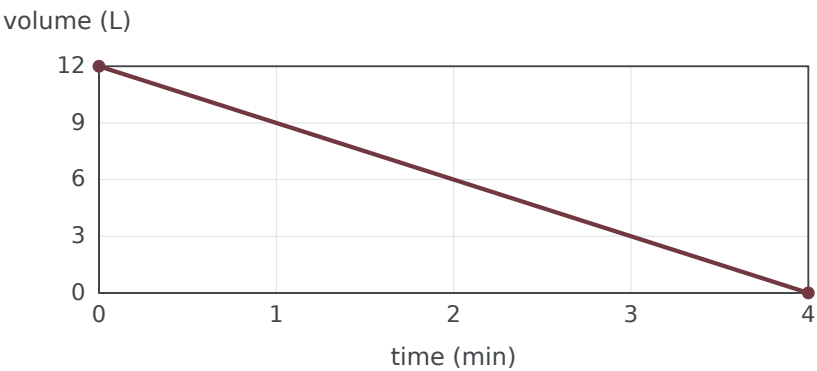
Closure: Ask learners to state one feature they verified and one check they used. Use the worked key for M28 to compare all alternatives after evidence is collected.

MULTIPLE-CHOICE BANK

M01 / M02 • Select and justify

M01 | Warm-up | T1

A tank is modeled by the graph. What does the vertical intercept mean?



- A. The tank starts with 12 L.
- B. The tank empties after 12 min.
- C. The tank holds 4 L initially.
- D. The tank gains 12 L each minute.

Reasoning: _____

M02 | Warm-up | T3

The table lists air temperature y ($^{\circ}\text{C}$) at time x (h). At which listed times is it above freezing?

Input x	0	2	4	6
Output y	-3	0	5	2

- A. 4 and 6 h
- B. Only 4 h
- C. 0 and 2 h
- D. 2, 4 and 6 h

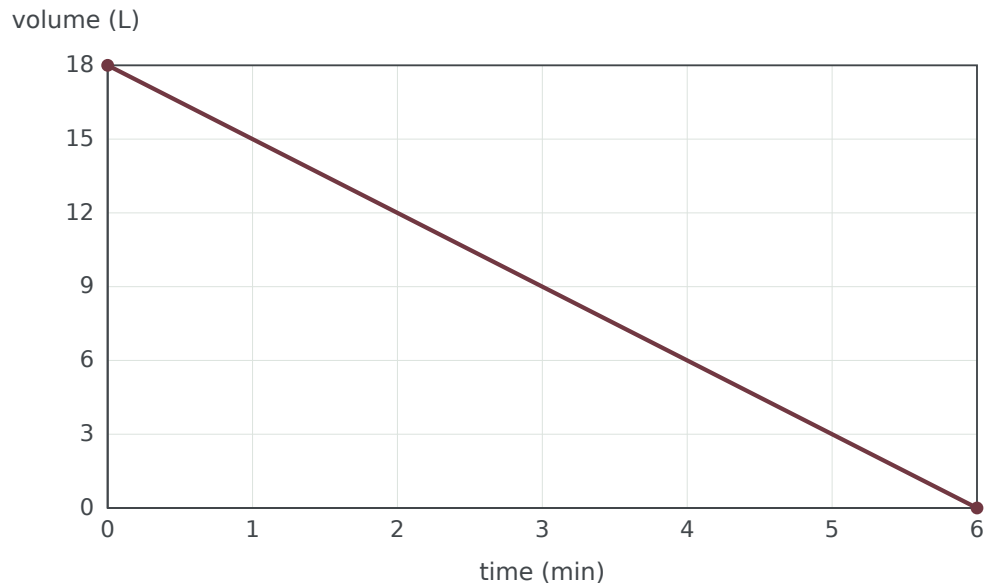
Reasoning: _____

WARM-UP

001 • Show your reasoning

T1: Interpret intercepts using the quantities and units in a context.

A tank's volume is shown. State both intercepts and interpret each with units. Explain why the model stops at its last point.



Representation / calculation

Explanation / check

WARM-UP

002 • Show your reasoning

T3: Interpret positive, zero and negative outputs in context.

The table records air temperature y ($^{\circ}\text{C}$) at time x (h). Classify each listed time as above, at or below freezing. Explain one limit of what this table tells you.

Input x	0	1	3	6	7
Output y	-5	-1	0	4	-2

Representation / calculation

Explanation / check

WORKED TEACHER KEYS

M01 / M02**M01 • T1: Interpret intercepts using the quantities and units in a context.****Answer: A. The tank starts with 12 L.**

At $t = 0$, $V = 12$. Thus the vertical intercept $(0, 12)$ records 12 L initially.

Check each alternative

- A. At time 0 the graph is at 12 L.
- B. The horizontal intercept is at 4 min.
- C. 4 is the emptying time, not initial volume.
- D. The amount falls, at 3 L/min.

M02 • T3: Interpret positive, zero and negative outputs in context.**Answer: A. 4 and 6 h**

Compare each listed output with 0. Only $y(4) = 5$ and $y(6) = 2$ are positive.

Check each alternative

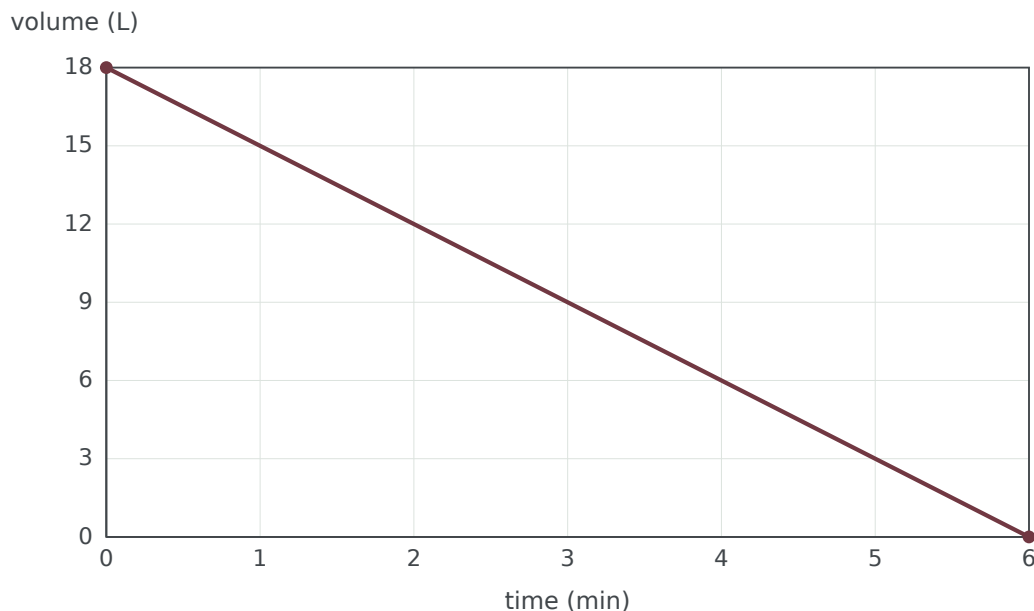
- A. 5 and 2 are both greater than zero.
- B. 2 °C at 6 h is also above freezing.
- C. Both temperatures are nonpositive.
- D. At 2 h the temperature is exactly 0 °C.

WORKED TEACHER KEYS

001

001 • T1: Interpret intercepts using the quantities and units in a context.

The vertical intercept $(0, 18)$ means 18 L initially. The horizontal intercept $(6, 0)$ means the tank is empty after 6 min. The model stops there because continued draining cannot produce a negative volume.

**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 / 003**002 • T3: Interpret positive, zero and negative outputs in context.**

Above freezing: 6 h (4 °C). At freezing: 3 h (0 °C). Below: 0, 1 and 7 h (-5, -1 and -2 °C). The table does not determine all intervening temperatures or exactly when unlisted zero crossings occur.

003 • T4: Identify maximum and minimum values and when they occur.

The maximum is 28 cm for every time $4 \leq t \leq 6$ weeks. The minimum is 12 cm at $t = 0$ only. The later 20 cm length is not the global minimum because the vine started shorter.