

TEACHER AND STUDENT RESOURCE

Functions: One Output for Each Input



Grade 8 • NC.8.F.1

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.1 | Eighth Grade mathematics

This sample contains 18 complete selected pages from the 109-page resource, plus this sample contents page. Original printed page numbers are retained. Gaps are intentional.

Included original pages: 1-14, 38-39, 68, 83

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) 38

O02: sample PDF page(s) 17; original page(s) 39

Selected teacher prompts and keys: original page(s) 68, 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

Understand that a function is a rule that assigns to each input exactly one output.

- Recognize functions when graphed as the set of ordered pairs consisting of an input and exactly one corresponding output.
- Recognize functions given a table of values or a set of ordered pairs.

T1 Interpret a function rule and its stated input domain.

T2 Analyze functions represented by tables or ordered pairs.

T3 Analyze functions represented by plotted ordered pairs.

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: M04, M08, M10, M14, M18, M20, M24, M28, M30, O05, O08, O09, O15, O18, O19, O25, O28, O29

T2: M01, M02, M06, M07, M11, M12, M16, M17, M21, M22, M26, M27, O01, O02, O10, O11, O12, O20, O21, O22, O30

T3: M03, M05, M09, M13, M15, M19, M23, M25, M29, O03, O04, O06, O07, O13, O14, O16, O17, O23, O24, O26, O27

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.

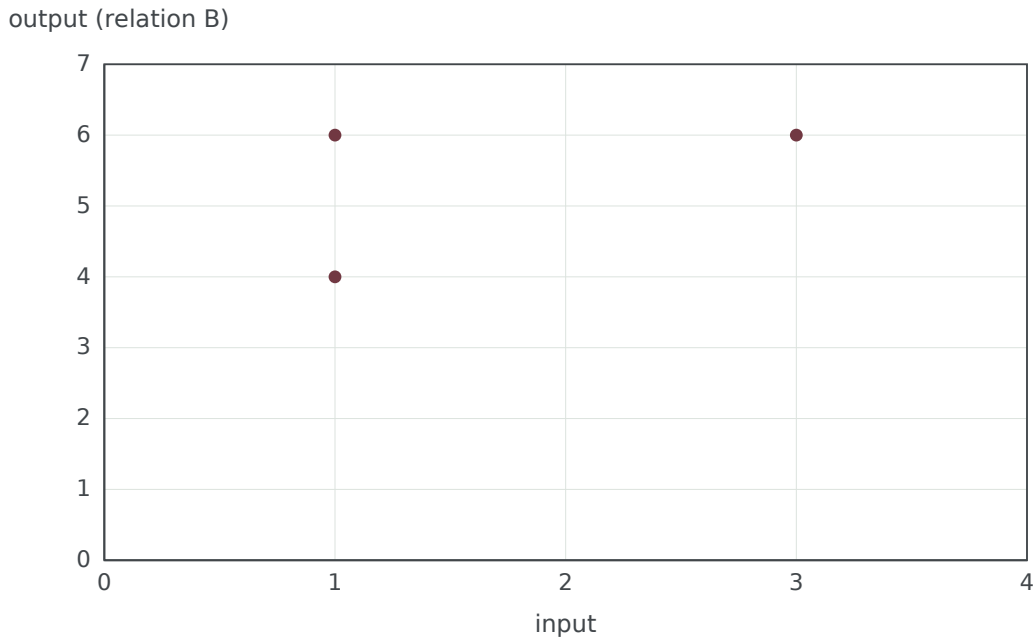
Review convention

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

Repeated output or repeated input?

Compare $A = \{(1, 4), (2, 4), (3, 6)\}$ and $B = \{(1, 4), (1, 6), (3, 6)\}$. Each relation has domain $\{1, 2, 3\}$ for A and $\{1, 3\}$ for B.



A is a function: each of its three inputs has one output. Inputs 1 and 2 may share output 4. B is not a function: input 1 is paired with both 4 and 6. On a graph of B, a vertical line at $x = 1$ passes through two plotted points. The rule is about outputs per input, not inputs per output. Repeating an identical ordered pair would not add a second output.

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 • T2: Analyze functions represented by tables or ordered pairs.

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

Determine whether $\{(-1, 2), (0, 2), (1, -3)\}$ is a function on its listed input domain. Explain how repeated outputs affect your decision.

Teacher solution and discussion

It is a function: inputs -1, 0 and 1 each appear with exactly one output. Output 2 is shared by two inputs, which is permitted.

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: Interpret a function rule and its stated input domain.

Optional bank: M05–M08; 005–008. 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 005, 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 function has rule $y = 2x + 1$ and domain $\{-2, 0, 2\}$. Build its complete input-output table, list its ordered pairs and explain why the rule is a function.

Teacher solution and discussion

Evaluate each input: Table (columns correspond):

Input x	-2	0	2
Output y	-3	1	5

Ordered pairs are $\{(-2, -3), (0, 1), (2, 5)\}$. Each of the three inputs receives exactly one output. The domain is the three listed inputs, not all real numbers.

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: Interpret a function rule and its stated input domain.

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

On inputs {0, 1, 3}, Rule A sends x to $x + 1$; Rule B sends x to either $x + 1$ or $x + 2$, with both outputs included. Make both tables and compare whether each is a function.

Teacher solution and discussion

Rule A

Input x

Output y

0	1	3
1	2	4

Rule B

Input x

Output y

0	0	1	1	3	3
1	2	2	3	4	5

A is a function: each input has one output. B is not a function: each input has two distinct outputs.

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: Analyze functions represented by plotted ordered pairs.

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

Use the plotted relation to explain whether it is a function. Identify the exact evidence, then describe one point removal that changes its status.

Teacher solution and discussion

It is not a function because input 2 has outputs 1 and 4. Remove (2, 1) or (2, 4); either leaves two inputs, each with one output.

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 • T1: Interpret a function rule and its stated input domain.

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

On inputs {0, 1, 4}, Rule A sends x to $x + 2$; Rule B sends x to either $x + 2$ or $x + 3$, with both outputs included. Make both tables and compare whether each is a function.

Teacher solution and discussion

Rule A

Input x

Output y

0	1	4
2	3	6

Rule B

Input x

Output y

0	0	1	1	4	4
2	3	3	4	6	7

A is a function: each input has one output. B is not a function: each input has two distinct outputs.

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: Analyze functions represented by plotted ordered pairs.

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

Use the plotted relation to explain whether it is a function. Identify the exact evidence, then describe one point removal that changes its status.

Teacher solution and discussion

It is not a function because input 3 has outputs 1 and 4. Remove (3, 1) or (3, 4); either leaves two inputs, each with one output.

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 • T1: Interpret a function rule and its stated input domain.

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 machine triples each input in domain $\{0, 1, 5\}$. Jo says the output for input 6 is 18. Is that an output assigned by this function? Explain and list all allowed pairs.

Teacher solution and discussion

No. Input 6 is outside the stated domain. The complete relation is $\{(0, 0), (1, 3), (5, 15)\}$. The arithmetic 18 would apply to an extended rule, but that input was not included here.

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

The relation contains exactly these pairs: $\{(-1, 2), (0, 2), (1, 5)\}$. Which statement matches the data?

- A. It is a function; input 0 has only output 2.
- B. It is a function; input 0 has only output 5.
- C. It is not a function; input 0 has outputs 2 and 5.
- D. It is not a function; input 1 has outputs 2 and 5.

Reasoning: _____

M02 | Warm-up | T2

Table (columns correspond):

Input x	1	1	3
Output y	-2	3	4

Which conclusion is supported?

- A. A function: input 1 has only output -2.
- B. Not a function: input 3 has outputs 3 and 4.
- C. Not a function: input 1 has outputs -2 and 3.
- D. A function: input 1 has only output 3.

Reasoning: _____

WARM-UP

001 • Show your reasoning

T2: Analyze functions represented by tables or ordered pairs.

Determine whether $\{(-1, 2), (0, 2), (1, -3)\}$ is a function on its listed input domain. Explain how repeated outputs affect your decision.

Representation / calculation

Explanation / check

WARM-UP

002 • Show your reasoning

T2: Analyze functions represented by tables or ordered pairs.

Table (columns correspond):

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

Identify every input that breaks the function condition. Remove exactly one pair to obtain a function and explain.

Representation / calculation

Explanation / check

WORKED TEACHER KEYS

M01 / M02**M01 • T2: Analyze functions represented by tables or ordered pairs.****Answer: A. It is a function; input 0 has only output 2.**

The inputs -1, 0 and 1 are distinct and each has one output. In particular input 0 has output 2. Sharing output 2 is allowed.

Check each alternative

- A. The inputs -1, 0 and 1 are distinct and each has one output. In particular input 0 has output 2. Sharing output 2 is allowed.
- B. Input 0 has output 2, not 5.
- C. Input 0 has only output 2.
- D. Input 1 has only output 5.

M02 • T2: Analyze functions represented by tables or ordered pairs.**Answer: C. Not a function: input 1 has outputs -2 and 3.**

Input 1 has two distinct outputs, -2 and 3, so the relation is not a function.

Check each alternative

- A. Input 1 also has output 3.
- B. Input 3 has only output 4.
- C. Input 1 has two distinct outputs, -2 and 3, so the relation is not a function.
- D. Input 1 also has output -2.

WORKED TEACHER KEYS

001 / 002**001 • T2: Analyze functions represented by tables or ordered pairs.**

It is a function: inputs -1, 0 and 1 each appear with exactly one output. Output 2 is shared by two inputs, which is permitted.

002 • T2: Analyze functions represented by tables or ordered pairs.

Input 0 has outputs 3 and -2. Remove either (0, 3) or (0, -2); the remaining distinct inputs each have one output. Removing a pair with another input leaves the conflict.