

Task Model 1	<b>Prompt Features:</b> Distinguish between functions and non- functions based on recognizing that each element of the domain				
Response Type:	maps to exactly one element of the range.				
Multiple Choice,					
multiple correct	Stimulus Guidelines: The student is prompted to select which of				
response	a set of relations represented with equations determines one				
	variable as a function of the other variable. Equations should be				
DOK Level 1	based on equations that students are familiar with in their work in algebra and coordinate geometry.				
F-IF.1					
Understand that a	TM1b				
function from one set	Stimulus: The student is presented with a set of equations				
(called the domain) to	representing a variety of functions and non-functions. Equations				
another set (called the	may be linear, quadratic, polynomials, or absolute value. Students				
range) assigns to each	may graph or perform algebraic manipulations to check.				
element of the domain					
exactly one element of	Example Stem: The equation of any line in the coordinate plane				
the range. If <i>f</i> is a	can be written in the form $Ax + By = C$ where A, B, and C are real				
function and x is an	numbers. Select <b>all</b> of the equations below that define y as a				
element of its domain,	function of x.				
then <i>f(x)</i> denotes the output of <i>f</i>	A. $3x - 4y = -2$				
corresponding to the	B. $-9x + 0y = 78$				
input $x$ . The graph of $f$	C. $0x + 56y = -11$				
is the graph of the					
equation $y = I(x)$ .	$D_{x} - 12x - 65y = 0$				
Evidence Required:	<b>Rubric:</b> (1 point) The student correctly selects all options that				
1 The student	represent v as a function of x (e.g., A, C, D).				
understands that a					
function from one set	<b>Response Type:</b> Multiple Choice, multiple correct response				
(the domain) to	······································				
another set (the range)					
assigns to each element					
of the domain exactly					
one element of the					
range (e.g., distinguish					
between functions and					
non-functions).					
Tools: Calculator					
Version 3 Update:					
TM1a retired and					
revised TM1b.					
ICVISEU INITD.					



Task Model 1	Prompt Features: Distinguish between functions and non-					
	functions based on recognizing that each element of the domain					
Response Type:	mans to exactly one element of the range					
Multiple Choice	haps to exactly one element of the range.					
Multiple Choice,						
multiple correct	Stimulus Guidelines: The student is prompted to select which					
response	statements are true or false, given the domain and range of a					
-	function					
DOK Level 2	<ul> <li>There should be no fewer than four and no more than six</li> </ul>					
DOR Level 2	• There should be no rewer than four and no more than six					
	answer choices.					
F-IF.A.1	<ul> <li>Item difficulty can be adjusted by varying the information</li> </ul>					
Understand that a	about the domain and range of the function					
function from one set	about the domain and range of the function.					
(called the domain) to						
	TM1c					
another set (called the	Stimulus: The student is presented with the domain and range of					
range) assigns to each	a function $f(x)$ , as well as two given values of the function.					
element of the domain						
exactly one element of	Evenuela Chemi 1.					
the range. If f is a	Example Stem 1:					
	The height in meters, h, of a model rocket above the ground is					
function and x is an	given t seconds after launch by the equation					
element of its domain,	, , ,					
then $f(x)$ denotes the	$b = -5t^2 + 40t$					
output of f	$\frac{1}{1} = \frac{1}{2} \left( \frac{1}{1} + 0 \right)$					
corresponding to the	where $0 \le t \le 8$ and $0 \le h(t) \le 80$					
in a start of f						
input x. The graph of r	Select <b>all</b> of the statements below that are true.					
is the graph of the						
equation $y = f(x)$ .	A  b(0) = 0					
	$P_{\rm b}(10) = 100$					
Evidence Required:	B. $H(10) = -100$					
1 The student	C. The height of the rocket is 0 meters after 8 seconds from the					
1. The student	launch.					
understands that a	D. The rocket reaches a height of 320 feet.					
function from one set						
(the domain) to	Example Stem 2:					
another set (the range)						
assigns to each element	A function, <i>i</i> , has domain $-10 \le x \le 20$ and range					
assigns to each element	$-40 \le f(x) \le -10.$					
of the domain exactly						
one element of the	f(1) = -13					
range (e.g., distinguish	f(-10) = -40					
between functions and						
pon-functions)						
non-runctions).	Select each statement that <b>must be false</b> about $f(x)$ .					
Tools: Calculator	A. $f(1) = 13$					
	$B_{f}(-9) = 88$					
Version 3 Update:	$C_{\rm f}({\rm F}) = 40$					
New example stem 1	C. $f(3) = -40$					
new example stern I	D. $f(0) = 0$					
	E. $f(-15) = -20$					
	Rubric: (1 point) The student correctly selects all valid options					
	based on the stem (e.g., A, C; A, B, D, F).					
	Response Type: Multiple Choice, multiple correct response					



Task Model 1	<b>Prompt Features:</b> Distinguish between functions and non-							
Response Type: Matching Table	maps to exactly one element of the range.							
DOK Level 1	<ul> <li><b>Stimulus Guidelines:</b> the student is presented with several data tables and prompted to select which might represent functions.</li> <li>The tables should contain no fewer than four and no more</li> </ul>							
F-IF.1 Understand that a function from one set (called the domain) to	<ul> <li>The tables should contain no rewer than four and no more than six pairs of data values.</li> <li>Item difficulty can be adjusted by varying the size of the tables and the complexity of the data in the tables.</li> </ul>							
another set (called the range) assigns to each element of the domain	TM1d Stimulus: The student is present	ed with three or	four data tables.					
exactly one element of the range. If $f$ is a function and $x$ is an element of its domain, then $f(x)$ denotes the output of $f$	<b>Example Stem:</b> Some students are studying graphs of functions $y = f(x)$ and other equations. Each table contains some points on a particular graph. Decide whether each set of points <b>might be</b> on the graph of a function or <b>cannot be</b> on the graph of a function.							
corresponding to the		Yes	No					
input x. The graph of f is the graph of the equation $y = f(x)$		These points <b>might be</b>	These points cannot be					
<b>Evidence Required:</b> 1. The student understands that a	A. <u>x 0 1 1 4 4</u> <u>y 0 3 4 3 0</u>							
function from one set	B.							
(the domain) to another set (the range) assigns to each element	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$							
of the domain exactly	C.							
one element of the range (e.g., distinguish	x -2 0 1 3 4							
non-functions).								
Tools: Calculator	<b>Rubric:</b> (1 point) The student cor statement (e.g. NYY).	rectly identifies t	he true					

Response Type: Matching Table



Task Model 1	<b>Prompt Features:</b> Distinguish between functions and non-functions based on recognizing that each element of the domain maps to exactly one
Response Type: Matching Table	element of the range.
-	Stimulus Guidelines: The student is presented with a graph in a real-
DOK Level 2	world or mathematical context and asked if it represents the graph of a function.
F-TF Δ 1	• Graphs throughout should be properly identified [e.g. $v = f(x)$ ]
Understand that a	
function from one	• Graph may be scatterplots, linear, quadratic, rational, or piece-wise
function from one	functions.
set (called the	• Item difficulty can be adjusted by varying the type of functions and
domain) to another	non-functions represented by the graphs.
set (called the	
range) assigns to	TM1o
each element of the	<b>Stimulue:</b> The student is presented with a graph, and asked whether it
domain exactly one	Sumulus: The student is presented with a graph, and asked whether it
element of the	represents the graph of a function.
range If $f$ is a	
function and v is an	<b>Example Stem:</b> The graphs below show different information about the
alomont of its	weather in a large city in the U.S. for one week in May.
demain then f(y)	
domain, then $I(x)$	
denotes the output	Graph A
of f corresponding	<b>f</b>
to the input x. The	
graph of <i>f</i> is the	
graph of the	
equation $y = f(x)$ .	
	₩ 40
Evidence	
Required:	E 20 Low Temperature
1. The student	
understands that a	
function from one	1234567
set (the domain) to	<u></u>
another set (the	A. First 7 Days of May
range) assigns to	
each element of the	Graph B
domain exactly one	
element of the	<u>م</u> 3.5
distinguish hotwoon	ē 3.0
functions and non-	ž 2.0
runctions).	
Tools: Calculator	
version 3 Update:	1 2 3 4 5 6 7
Added new IM1e,	
IMIT, and IMIG.	B. FIRST / Days of May



### Task Model 1

Response Type: Matching Table

#### DOK Level 2

### F-IF.A.1

Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x)denotes the output of *f* corresponding to the input *x*. The graph of *f* is the graph of the equation y = f(x).

#### Evidence Required:

1. The student understands that a function from one set (the domain) to another set (the range) assigns to each element of the domain exactly one element of the range (e.g., distinguish between functions and nonfunctions).

### Tools: Calculator

Version 3 Update: Added new TM1e, TM1f, and TM1g.



Determine whether each graph represents the given quantity as a function of time.

	True	False
Graph A represents temperature as a function of time.		
Graph B represents amount of accumulated		
precipitation as a function of time.		
Graph C represents the solar intensity as a function of		
time.		

Rubric: (1 point) The student chooses the correct responses (FTT).

Response Type: Matching Table



Task Model 1	<b>Prompt Features:</b> Distinguish between functions and non-functions based on recognizing that each element of the domain maps to exactly one															
Response Type: Multiple Choice,	element of the range.															
single correct response	<b>Stimulus Guidelines:</b> The student is presented with a graph in a real- world or mathematical context and asked if it represents the graph of a															
DOK Level 1	• G	<ul> <li>Graphs throughout should be properly identified [e.g., y = f(x)].</li> </ul>														
<b>F-IF.A.1</b> Understand that a function from one set (called the domain) to another	• G fu • It	nctions em diffi on-funct	cult	y ca s re	n t pre	be a sen	idjust ited b	ed by y the	vary grap	ying t ohs.	he ty	/pe	of fur	nctio	ons	and
set (called the range) assigns to each element of the	TM1f Stimulus represen	<b>s:</b> The s ts the g	tud rap	ent h of	is p a f	ores	sented	d with	a gi	raph,	and	ask	ed wł	neth	ier i	t
element of the range. If <i>f</i> is a	<b>Example</b> average	e <b>Stem</b> neight a	<b>1:</b> <sup>-</sup> and	The weig	sca ght	of	rplot 15 dif	repres ferent	ents : dog	s the g bree	relat eds.	ions	ship b	etw	een	the
function and x is an element of its domain, then $f(x)$	16	Ave	rag	еH	eig	ht	and \	Neigh	t of	15 D	ogE	Bre	eds			
denotes the output of <i>f</i> corresponding																
to the input $x$ . The graph of $f$ is the	ୀ : ଜ	0										•	•	_		
graph of the equation $y = f(x)$ .	punod	0								•••						
Evidence Required:	/eight (									:						
1. The student understands that a	2	0				_		• •						_		
set (the domain) to another set (the		_ <b>•</b>		•												
range) assigns to each element of the		Ŭ10			16			22			28			34		
domain exactly one element of the range (e.g.	Height (inches)															
distinguish between functions and non-	Heigh (inches	<b>t</b> 10.25	27	25	25	17	21.5	16.5	25	10.5	26	25	20.5	14	26	30.5
functions). <b>Tools:</b> Calculator	Weigh (pounds	t 7	60	85	62	25	50	20	67	9.5	100	67	45	15	82	125
Version 3 Update: Added new TM1e, TM1f, and TM1g.																





Task Model 1

Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x)denotes the output of *f* corresponding to the input *x*. The graph of *f* is the graph of the equation y = f(x).

#### Evidence Required:

1. The student understands that a function from one set (the domain) to another set (the range) assigns to each element of the domain exactly one element of the range (e.g., distinguish between functions and nonfunctions). **Tools:** Calculator

**Version 3 Update:** Added new TM1e, TM1f, and TM1g.



Which statement best describes the relationship displayed by the scatterplot and line of best fit?

A. Both the scatterplot and the line of best fit represent a function.

B. The scatterplot represents a function but the line of best fit does not.

C. The line of best fit represents a function but the scatterplot does not.

D. Neither represents a function.

**Example Stem 2:** Three different parabolas, each defined by a different equation, are shown in the coordinate plane.



Which graph represents y as a function of x? A. Graph A

- B. Graph B
  - C. Graph C
  - D. None of the graphs

Rubric: (1 point) The student chooses the correct response (e.g., C, A).

Response Type: Multiple Choice, single correct response



Task Model 1			с					
Response Type: Matching Table	<b>Prompt Features:</b> Distinguish between functions and non-functions based on recognizing that each element of the domain maps to exactly one element of the range.							
DOK Level 1 F-IF.A.1 Understand that a	TM1g Stimulus: The student is prompted to select which represented with equations determines one variable other variable.	n of a se e as a fu	t of relations nction of the					
function from one set (called the domain) to another set (called the	<b>Example Stem:</b> The height in meters, <i>h</i> , of a model rocket above the ground is given <i>t</i> seconds after launch by the equation							
range) assigns to	$h = -5t^2 + 40t$							
domain exactly one element of the	Given this information, indicate whether each state	ment is	true or false.					
range. If <i>f</i> is a		True	False					
function and x is an	The height of the rocket is a function of time							
element of its	The field of the focket is a function of the height							
domain then f(x)	The time since launch is a function of the height.							
domain, then $I(X)$								
denotes the output								
of f corresponding	<b>Rubric:</b> (1 point) The student chooses the correct r	response	es (T, F).					
to the input <i>x</i> . The								
graph of <i>f</i> is the	Response Type: Matching Table							
graph of the								
equation $v = f(x)$ .								
<b>Evidence</b> <b>Required:</b> 1. The student understands that a function from one set (the domain) to another set (the range) assigns to each element of the domain exactly one element of the range (e.g., distinguish between functions and non- functions).								
Tools: Calculator								
Version 3 Update: Added new TM1e, TM1f, and TM1g.								



Task Model 3	<b>Prompt Features:</b> The student understands that the graph of <i>f</i> is				
	the graph of the equation $y = f(x)$ .				
Response Type:					
Grapning	Stimulus Guidelines:				
DOK Level 2	functions graphed.				
<b>F-IF.1</b> Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If <i>f</i> is a function and <i>x</i> is an element of its domain, then $f(x)$ denotes the output of <i>f</i> corresponding to the input <i>x</i> . The graph of <i>f</i> is the graph of the equation $y = f(x)$ .	<b>TM3</b> <b>Stimulus:</b> The student is presented with one or two functions and directed to use the "Add Point" tool to plot points that lie on those functions. If two functions are used, the item may be worth two points. <b>Example Stem:</b> The graphs of $y = g(x)$ and $y = f(x)$ are shown. Use the "Add Point" tool to add a point that will satisfy each given condition. • A point on the graph of $g$ where $x=0$ . • A point on the graph of $g$ where $f(x) > g(x)$ . • A point on the graph of $f$ where $f(x) = 0$ .				
<b>Evidence Required:</b> 3. The student understands that the graph of <i>f</i> is the graph of the equation $y =$ f(x).	y = g(x) $3$				
Tools: None					
Version 3 Update: Retired TM2 and Evidence Required statement 2. Accessibility Note: Graphing items are not currently able to be	y = f(x) -233444555				
number of items developed to this TM.					



## Task Model 3

Response Type: Graphing

## DOK Level 2

## F-IF.1

Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If *f* is a function and x is an element of its domain, then f(x) denotes the output of *f* corresponding to the input x. The graph of f is the graph of the equation y = f(x).

## **Evidence Required:**

3. The student understands that the graph of *f* is the graph of the equation y = f(x).

### Tools: None

Version 3 Update: Retired TM2 and Evidence Required statement 2.

### Accessibility Note:

Graphing items are not currently able to be Brailled. Minimize the number of items developed to this TM.

## **Rubric:**

(2 points) The student correctly plots points defined by the conditions (e.g., A: The *y*-intercept of *g*; B: Any point on the graph of *g* sitting under the graph of *f*; C: Any of the three points where the graph of *f* crosses the *x*-axis).

(1 point) The student correctly plots two of the three points defined by the conditions.



## Response Type: Graphing

**Source:** Adapted from Illustrative Mathematics



Task Model 4	<b>Prompt Features:</b> The student recognizes that sequences are						
Bosnonso Tyrnol	functions whose domain is a subset of the integers.						
Response Type:	Stimulus Cuidelines						
single correct	Stimulus Guidelines:						
response	<ul> <li>The domain of each function should be a subset of integers.</li> <li>Difficulty level can be altered by varying the complexity of the sequence.</li> </ul>						
DOK Level 1							
	TM4						
F-IF.3 Recognize that sequences are	<b>Stimulus:</b> The student is presented with five terms of a sequence.						
functions, sometimes	Example Stem:						
defined recursively,	Consider a sequence whose first five terms are						
whose domain is a	6, 12, 24, 48, 96.						
subset of the integers.							
For example, the	Select the function, with domain $n = \{1, 2, 3, 4, 5\}$ , that defines						
Fibonacci sequence is	this sequence.						
defined recursively by							
f(0) = f(1) = 1, f(n+1)	A. $f(n) = 6n$						
$= f(n) + f(n-1)$ for $n \ge 1$ .	B. $f(n) = 6(n-1)$						
	C. $f(n) = 6n^2$						
Evidence Required:	D. $f(n) = 6(2)^{n-1}$						
4. The student							
recognizes that	<b>Dubuic</b> (1 naint) The student connectly identifies the equation of						
sequences are functions	<b>Rubric:</b> (1 point) The student correctly identifies the equation of the function defined by the sequence (e.g., D)						
subset of the integers	the function defined by the sequence (e.g., D).						
subset of the integers.	Response Type: Multiple Choice, single correct response						
Tools: None							
Version 3 Update:							
Revised example stem							
for TM4.							