

Task Model 1

Response Type:
Multiple Choice,
single correct
response

DOK Level 1

8.F.A.1

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

The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.

Evidence Required:

1. The student recognizes that a function is a rule that assigns to each input exactly one output.

Tools: Calculator

Prompt Features: The student identifies a function as a rule that assigns each input value to exactly one output value.

Stimulus Guidelines:

- Linear equations should be in either $y = mx + b$ where $b \neq 0$, or standard form.
- Equations may include exponents or absolute value.
- Tables and graphs must be labeled.
- In general, items should make clear which is the input variable and which is the output variable. One exception: it is permissible to talk about "the function $y = 2x + 3$." But it should not be assumed, for example, that values in a table have predefined roles as input or output.

TM1a

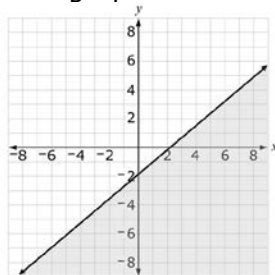
Stimulus: The student is presented with relations that may be functions and are represented as tables, graphs, and equations.

Example Stem: Which relation defines y as a function of x ?

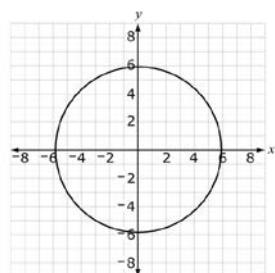
- A. The proportional relationship $y = 2.4x$.
- B. The table showing the age in years, x , and weight in pounds, y , of five dogs.

x	y
3	30
4	38
4	21
5	9
6	42

- C. The graph of an inequality as shown by the shaded region.



- D. The graph of $x^2 + y^2 = 36$ as shown.



Grade 8 Mathematics Item Specification C1 TE

<p>Task Model 1</p> <p>Response Type: Multiple Choice, multiple correct response</p> <p>DOK Level 1</p> <p>8.F.A.1 Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.</p> <p>Evidence Required: 1. The student recognizes that a function is a rule that assigns to each input exactly one output.</p> <p>Tools: Calculator</p> <p>Version 3 Update: Renamed TM1 as TM1a and added new TM1b</p>	<p>Rubric: (1 point) The student selects the relation that is a function (e.g., A).</p> <p>Response Type: Multiple Choice, single correct response</p> <p>Prompt Features: The student identifies a function as a rule that assigns each input value to exactly one output value.</p> <p>Stimulus Guidelines:</p> <ul style="list-style-type: none"> • Linear equations should be in either $y = mx + b$ where $b \neq 0$, or standard form. • Equations may include exponents or absolute value. • Tables and graphs must be labeled. • In general, items should make clear which is the input variable and which is the output variable. One exception: it is permissible to talk about "the function $y = 2x + 3$." But it should not be assumed, for example, that values in a table have predefined roles as input or output. <p>TM1b Stimulus: The student is presented with equations in two variables.</p> <p>Example Stem: Which equation defines p as a function of t?</p> <p>A. $p = 3t + 2$ B. $t = 3p + 2$ C. $p = 0t + 2$ D. $t = 0p + 2$</p> <p>Rubric: Student selects correct values (e.g., A, B, C).</p> <p>Response Type: Multiple Choice, multiple correct response</p>
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<p>Task Model 2</p> <p>Response Type: Multiple Choice, multiple correct response</p> <p>DOK Level 1</p> <p>8.F.A.1 Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.</p> <p>Evidence Required: 2. The student identifies or produces input and output pairs for given functions.</p> <p>Tools: Calculator</p>	<p>Prompt Features: The student identifies or produces input and output pairs for given functions.</p> <p>Stimulus Guidelines:</p> <ul style="list-style-type: none"> • Tables and graphs must be labeled. • Linear equations should be in either $y = mx + b$ where $b \neq 0$, or standard form. • Context should be familiar to 13 to 15yearolds. • Item difficulty can be adjusted via these example methods: <ul style="list-style-type: none"> ○ Elements in the ordered pair include integers or fractions. ○ Equations may include exponents or absolute value. <p>TM2 Stimulus: The student is presented with an equation or table that represents a function.</p> <p>Example Stem 1: Select all ordered pairs that correspond to input-output pairs for the function $y = -6x + 7$.</p> <p>A. (1, 1) B. (-1, 1) C. (-6, 7) D. (3, -11)</p> <p>Example Stem 2: A swimming pool had 30 gallons of water in it. Then water was added to the pool at a rate of 5 gallons per second.</p> <p>The function $y = 5t + 30$ describes the relationship between the number of gallons, y, and the number of seconds water was added, t.</p> <p>Select all of the ordered pairs that correspond to input-output pairs for the function.</p> <p>A. (45, 3) B. (3, 45) C. (0, 30) D. (30, 0)</p> <p>Answer Choices: The answer choices will include at least two correct input-output pairs. Incorrect options will include input-output pairs resulting from switching the variables and integer signs, and using the slope and y-intercept to form an input-output pair.</p> <p>Rubric: (1 point) The student selects all correct input-output pairs (e.g., A and D; B and C).</p> <p>Response Type: Multiple Choice, multiple correct response</p>
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<p>Task Model 3</p> <p>Response Type: Multiple Choice, single correct response</p> <p>DOK Level 2</p> <p>8.F.A.2 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). <i>For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.</i></p> <p>Evidence Required: 3. The student recognizes the same function written in different functional forms (algebraic, graphic, tabular, or verbal).</p> <p>Tools: Calculator</p> <p>Version 3 Update: Revised TM3 Example Stem 1.</p>	<p>Prompt Features: The student identifies the same function represented in different ways.</p> <p>Stimulus Guidelines:</p> <ul style="list-style-type: none"> • Context should be familiar for 13 to 15yearolds. • Tables and graphs must be labeled. • Item difficulty can be adjusted via this example method: <ul style="list-style-type: none"> ○ Representations in the answer choices are all equations, all tabular, all graphs, or verbal statements or a combination. <p>TM3 Stimulus: The student is presented with a function represented in algebraic, graphic, or tabular form.</p> <p>Example Stem 1: Consider the function represented by this table of values.</p> <table border="1" style="margin-left: 20px;"> <thead> <tr> <th><i>x</i></th> <th><i>y</i></th> </tr> </thead> <tbody> <tr> <td>-4</td> <td>-10</td> </tr> <tr> <td>-3</td> <td>-7</td> </tr> <tr> <td>-2</td> <td>-4</td> </tr> <tr> <td>-1</td> <td>-1</td> </tr> <tr> <td>0</td> <td>2</td> </tr> </tbody> </table> <p>Which function could have produced the values in the table?</p> <p>A. $y = -x - 14$ B. $y = -3x + 2$ C. $y = 3x - 22$ D. $y = 3x + 2$</p> <p>Rubric: (1 point) The student selects the correct answer choice (e.g., D).</p> <p>Response Type: Multiple Choice, single correct response</p> <p>Example Stem 2: A swimming pool has 30 gallons of water in it. Water is added to the pool at a rate of 5 gallons per second.</p> <p>Which equation models the relationship between W, the number of gallons of water, and t, the number of seconds water is being added to the swimming pool?</p> <p>A. $W = 30t + 5$ B. $W = 5t + 30$ C. $W = t + 35$ D. $W = 35t$</p> <p>Rubric: (1 point) The student selects the correct answer (e.g., B).</p> <p>Response Type: Multiple Choice, single correct response</p>	<i>x</i>	<i>y</i>	-4	-10	-3	-7	-2	-4	-1	-1	0	2
<i>x</i>	<i>y</i>												
-4	-10												
-3	-7												
-2	-4												
-1	-1												
0	2												

Task Model 4

Response Type:
Multiple choice,
single correct
response

DOK Level 2

8.F.A.2

Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.*

Evidence Required:

4. The student compares properties of two functions, each represented in a different way (algebraic, graphic, tabular, or verbal).

Tools: Calculator

Version 3 Update:

Changed the response format for TM4 from Equation/Numeric to Multiple choice, single correct response and removed example stem 2.

Prompt Features: The student identifies one or more correct comparisons between two functions represented in different ways.

Stimulus Guidelines:

- Comparisons can involve specific values, rates of change, intercepts, starting points, etc.
- Rates of change must be positive unless a specific, real-world context is used in a problem.
- Context should be familiar to students 13 to 15 years old.
- Linear equations should be in either $y = mx + b$ or standard form.
- Graphs may feature one quadrant or all four quadrants.
- Verbal descriptions are of linear functions or data.
- Item difficulty can be adjusted via these example methods:
 - One function is described verbally.
 - Function is given in algebraic form and compared to a function given in tabular, graph, or verbal form.
 - The property to compare is explicitly shown or described in the representation.
 - The property to compare is not explicitly shown or described in the representation.

TM4

Stimulus: The student is presented with linear functions represented in different ways.

Example Stem: Each relation shown defines y as a function of x . Which function has the greatest rate of change?

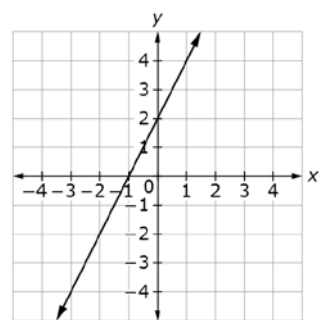
A. $y = \frac{7}{3}x + 4$

B. $y = 3x - 1$

C.

x	y
0	4
2	12
4	20
6	28

D.



Rubric: (1 point) The student identifies the correct function (e.g., C).

Response Type: Multiple choice, single correct response

Grade 8 Mathematics Item Specification C1 TE

Task Model 6

Response Type:
Matching Tables

DOK Level 2

8.F.A.3

Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. *For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points $(1, 1)$, $(2, 4)$ and $(3, 9)$, which are not on a straight line.*

Evidence Required:

6. The student recognizes and gives examples of functions that are not linear.

Tools: Calculator

Version 3 Update:
Retired TM5

Prompt Features: The student recognizes representations of nonlinear functions.

Stimulus Guidelines:

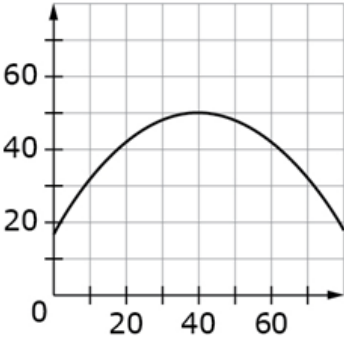
- Tables and graphs should be labeled.
- Tables should include 3–5 sets of values.
- Linear equations can be either $y = mx + b$, where $b \neq 0$, or $y = ax + by + c = 0$, where $a > 0$ and $c \neq 0$.
- Nonlinear functions can include the forms $y = x^2$, $y = |x|$, and $y = \sqrt{x}$ where $x > 0$.
- Item difficulty can be adjusted via these example methods:
 - Functions may be represented as tables or equations rather than graphs.

TM6

Stimulus: The student is presented with linear and nonlinear functions represented in different ways.

Example Stem: Several functions are represented in the table.

Determine whether each function could be linear.

Function	Could be linear	Cannot be linear												
$y = \frac{3}{4}x + 2$														
														
<table border="1"> <thead> <tr> <th>x</th> <th>y</th> </tr> </thead> <tbody> <tr> <td>-2</td> <td>5</td> </tr> <tr> <td>-1</td> <td>9</td> </tr> <tr> <td>0</td> <td>13</td> </tr> <tr> <td>1</td> <td>17</td> </tr> <tr> <td>2</td> <td>21</td> </tr> </tbody> </table>	x	y	-2	5	-1	9	0	13	1	17	2	21		
x	y													
-2	5													
-1	9													
0	13													
1	17													
2	21													

Rubric: (1 point) The student selects the correct box to identify whether the functions are linear or nonlinear (e.g., L, N, L).

Response Type: Matching Tables