

Task Model 1

Response Type:
Equation/Numeric

DOK Level 2

8.F.B.4

Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

Evidence Required:

1. The student constructs a function to model a linear relationship between two quantities.

Tools: Calculator

Prompt Features: The student is prompted to construct a linear function given a linear relationship between two quantities.

Stimulus Guidelines:

- Tables should be labeled.
- Graph scale should contain only integers.
- Context should be familiar to students 13 to 15 years old.
- Item difficulty can be adjusted via these example methods:
 - Slopes can be positive or negative.
 - Axes scales can be varied, including having different scales on each axis.
 - Table values can be integers, fractions, or decimals.
 - Graphs can include intercepts clearly plotted or any other points that are clearly marked.
 - Proportional relationship with positive rate of change given.
 - Linear relationship with positive or negative rate of change given.
 - Linear relationship where student must find the rate of change.

TM1

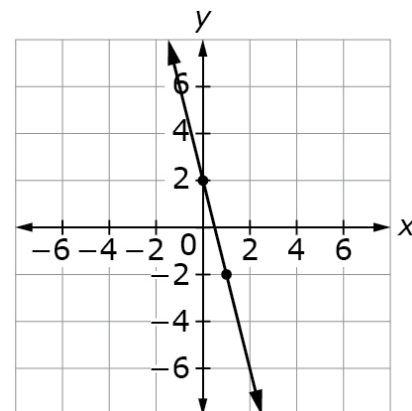
Stimulus: The student is presented with a table of input and output values, a graph, or a verbal statement that represents a linear function.

Example Stem 1: This table of values represents a linear function.

x	y
2	-6
3	-6.5
8	-9

Enter an equation in the form $y = mx + b$ that represents the function.

Example Stem 2: This graph represents a linear function.



Enter an equation in the form $y = mx + b$ that represents the function.

<p>Task Model 1</p> <p>Response Type: Equation/Numeric</p> <p>DOK Level 2</p> <p>8.F.B.4 Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.</p> <p>Evidence Required: 1. The student constructs a function to model a linear relationship between two quantities.</p> <p>Tools: Calculator</p>	<p>Example Stem 3: A swimming pool with 1600 gallons of water is emptied at a constant rate of 300 gallons every 2 hours.</p> <p>Enter an equation in the form $y = mx + b$ that represents the amount of water y, in gallons, remaining in the pool after x hours.</p> <p>Rubric: (1 point) Student enters the correct equation (e.g., $y = -0.5x - 5$; $y = -4x + 2$; $y = -150x + 1600$).</p> <p>Response Type: Equation/Numeric</p>
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<p>Task Model 2</p> <p>Response Type: Equation/Numeric</p> <p>DOK Level 1</p> <p>8.F.B.4 Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.</p> <p>Evidence Required: 2. The student determines the rate of change and initial value of a function, either from a description of a relationship or from two (x, y) values, including reading the rate of change and/or the value of the function from a table or a graph.</p> <p>Tools: Calculator</p>	<p>Prompt Features: The student is prompted to determine the rate of change or the initial value given a representation of a linear function as a table or graph.</p> <p>Stimulus Guidelines:</p> <ul style="list-style-type: none"> • Tables and graphs must be labeled. • Graph scale should contain only integers. • Item difficulty can be adjusted via these example methods: <ul style="list-style-type: none"> Rate of change: <ul style="list-style-type: none"> ○ Input values increase by 1 unit on table or graph. Table values are whole numbers or integers. ○ Input values increase by multiples of 2, 3, or 5 on table or graph. ○ Table values are rational numbers. Values in decimal form should have only one digit after the decimal point. ○ Input values do not increase by the same number of units each time. Table values are integers. Initial value: <ul style="list-style-type: none"> ○ Table starts with an input value of 0. ○ Table does not show an input value of 0 Input values increase by 1 or by multiples of 2, 3, or 5 units on table or graph. Table values are rational numbers. ○ Values in decimals form should have only one digit after the decimal place. ○ Table does not show an input value of 0. Input values do not increase by the same number of units each time. Table values are integers. <p>TM2</p> <p>Stimulus: The student is presented with a table of values or a graph and asked to determine the rate of change or initial value.</p> <p>Example Stem 1: In this table, y is a linear function of x.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>x</th> <th>y</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>50</td> </tr> <tr> <td>2</td> <td>40</td> </tr> <tr> <td>4</td> <td>30</td> </tr> <tr> <td>6</td> <td>20</td> </tr> </tbody> </table> <p>Enter the rate of change of this function.</p> <p>Rubric: (1 point) The student enters the correct rate of change (e.g., -5).</p> <p>Response Type: Equation/Numeric</p>	x	y	0	50	2	40	4	30	6	20
x	y										
0	50										
2	40										
4	30										
6	20										

Task Model 2

Response Type:
Equation/Numeric

DOK Level 1

8.F.B.4

Construct a function to model a linear relationship between two quantities.

Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

Evidence Required:

2. The student determines the rate of change and initial value of a function, either from a description of a relationship or from two (x, y) values, including reading the rate of change and/or the value of the function from a table or a graph.

Tools: Calculator

Example Stem 2: This table shows water level in a tank as a linear function of time.

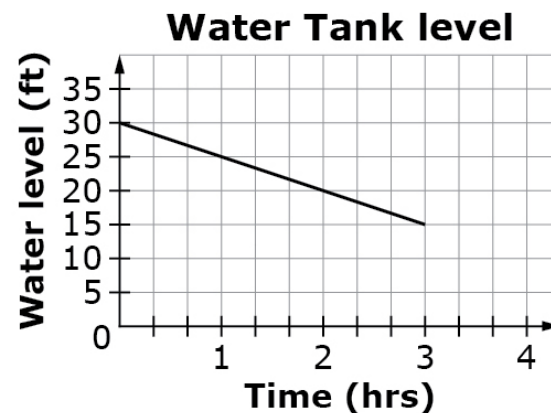
Time (hr)	Water Level (ft)
0	50
2	40
4	30
6	20

Enter the rate of change of the water level, in feet per hour.

Rubric: (1 point) The student enters the correct rate of change (e.g., -5).

Response Type: Equation/Numeric

Example Stem 3: This graph shows water level in a tank as a linear function of time.



Enter the initial water level, in feet, of the water tank.

Rubric: (1 point) The student enters the correct initial value (e.g., 30).

Note: Without other information that points to a specific value on the graph, allow for a range of responses (e.g., 29.5-30.5).

Response Type: Equation/Numeric

<p>Task Model 3</p> <p>Response Type: Matching Tables</p> <p>DOK Level 2</p> <p>8.F.B.4 Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.</p> <p>Evidence Required: 3. The student interprets the rate of change and the initial value of a linear function in terms of the situation it models, its graph, or a table of values.</p> <p>Tools: Calculator</p>	<p>Prompt Features: The student is prompted to determine true statements regarding the rate of change and the initial value from a representation of the function using a table, graph, or verbal statement.</p> <p>Stimulus Guidelines:</p> <ul style="list-style-type: none"> • Tables and graphs must be labeled. • Graph scale should contain only integers. • Item difficulty can be adjusted via these example methods: <ul style="list-style-type: none"> Rate of change: <ul style="list-style-type: none"> ○ Input values increase by 1 unit on table or graph. Table values are whole numbers or integers. ○ Input values increase by multiples of 2, 3, or 5 on table or graph. ○ Table values are rational numbers. Values in decimal form should have only one digit after the decimal point. ○ Input values do not increase by the same number of units each time. Table values are integers. Initial value: <ul style="list-style-type: none"> ○ Table starts with an input value of 0. ○ Table does not show an input value of 0 Input values increase by 1 or by multiples of 2, 3, or 5 units on table or graph. Table values are rational numbers. ○ Values in decimals form should have only one digit after the decimal place. ○ Table does not show an input value of 0. Input values do not increase by the same number of units each time. Table values are integers. <p>TM3</p> <p>Stimulus: The student is presented with a graph, table, or verbal description of a linear function.</p> <p>Example Stem: A swimming pool containing 1600 gallons of water is emptied at a constant rate of 300 gallons every 2 hours.</p> <p>Determine whether each statement about the amount of water in the pool is true. Select True or False for each statement.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Statement</th> <th style="text-align: center;">True</th> <th style="text-align: center;">False</th> </tr> </thead> <tbody> <tr> <td>The initial amount of water in the pool is 1600 gallons.</td> <td style="width: 50px;"></td> <td style="width: 50px;"></td> </tr> <tr> <td>The amount of water in the pool decreases by 150 gallons every 1 hour.</td> <td></td> <td></td> </tr> <tr> <td>The amount of water in the pool at 3 hours is 450 gallons.</td> <td></td> <td></td> </tr> </tbody> </table> <p>Rubric: (1 point) Student determines each statement as being either true or false (e.g., T, T, F).</p> <p>Response Type: Matching Tables</p>	Statement	True	False	The initial amount of water in the pool is 1600 gallons.			The amount of water in the pool decreases by 150 gallons every 1 hour.			The amount of water in the pool at 3 hours is 450 gallons.		
Statement	True	False											
The initial amount of water in the pool is 1600 gallons.													
The amount of water in the pool decreases by 150 gallons every 1 hour.													
The amount of water in the pool at 3 hours is 450 gallons.													

Task Model 4

Response Type:
Matching Tables

DOK Level 2

8.F.B.5
Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

Evidence Required:
4. The student qualitatively describes the functional relationship between two quantities by analyzing a graph (e.g., whether the function is increasing or decreasing, whether the graph is linear or nonlinear).

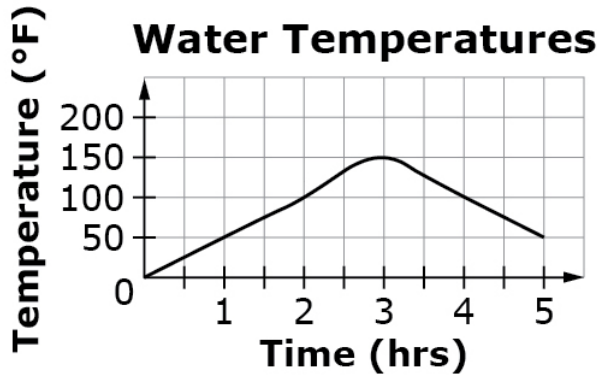
Tools: Calculator

Prompt Features: The student is prompted to determine true statements that qualitatively describe the functional relationship between two quantities.

- Stimulus Guidelines:**
- Tables and graphs must be labeled.
 - Functions should have constant, decreasing, and/or increasing segments.
 - Context should be familiar to students 13 to 15 years old.

TM4
Stimulus: The student is presented with a graph of a function which contains linear and/or nonlinear segments.

Example Stem: This graph shows the water temperature as a function of time.



Based on the graph, determine whether each statement is true. Select True or False for each statement.

Statement	True	False
The water temperature is increasing between hour 1 and hour 2.		
The water temperature is increasing between hour 3 and hour 4.		
The water temperature is constant between hour 0 and hour 1.		

Rubric: (1 point) Student determines each statement as being either true or false (e.g., T, F, F). Each statement is a sentence describing the behavior of the function.

Response Type: Matching Tables

Task Model 5

Response Type:
Multiple Choice,
single correct
response

DOK Level 2

8.F.B.5

Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

Evidence

Required:

5. The student draws a graph that exhibits the qualitative features of a function that has been described in writing.

Tools: Calculator

Prompt Features: The student is prompted to identify a graph or statements about a graph that match a given qualitative description.

Stimulus Guidelines:

- Graph can contain increasing, decreasing, and constant linear and nonlinear segments.
- Context should be familiar to students 13 to 15 years old.
- Item difficulty can be adjusted via these example methods:
 - Student verbally describes the qualitative features exhibited on a graph.
 - Student identifies a graph that exhibits the features of a function that has been described verbally with three or more qualitative statements.

TM5a

Stimulus: The student is presented with a description of a context or a graph of a function.

Example Stem: John is riding his bike.

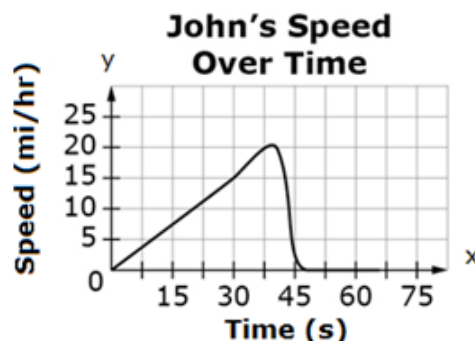
- He increases his speed for 30 seconds.
- He stays approximately the same speed for the next 20 seconds.
- He slows down to a stop during the last 15 seconds.

Select the graph that best represents John’s speed over time.

A.



B.



Task Model 5

Response Type:
Multiple Choice,
single correct
response

DOK Level 2

8.F.B.5

Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

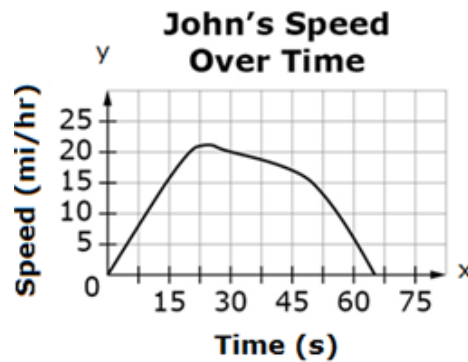
Evidence

Required:

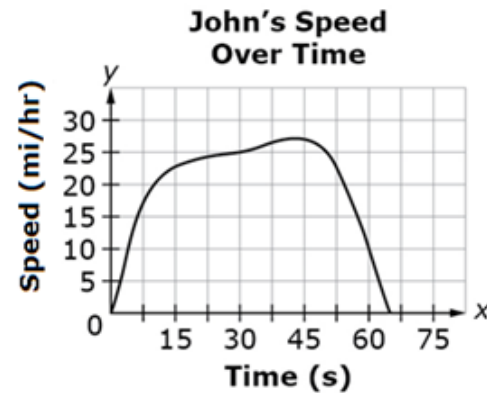
5. The student draws a graph that exhibits the qualitative features of a function that has been described in writing.

Tools: Calculator

C.




D.



Answer Choices: Each answer choice should be a graph that matches the verbal description. Distractors should be incorrect graphs that do not match the verbal description.

Rubric: (1 point) The student selects the correct graph that represents John's speed over time (e.g., A).

Response Type: Multiple Choice, single correct response

<p>Task Model 5</p> <p>Response Type: Graphing</p> <p>DOK Level 1</p> <p>8.F.B.5 Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.</p> <p>Evidence Statement: 5. The student draws a graph that exhibits the qualitative features of a function that has been described in writing.</p> <p>Tools: Calculator</p> <p>Accessibility Note: Graphing items are not currently able to be Brailled. Minimize the number of items developed to this TM.</p>	<p>Prompt Features: The student is prompted to create a graph that has given characteristics such as increasing, decreasing, or constant segments.</p> <p>Stimulus Guidelines:</p> <ul style="list-style-type: none"> • Context can contain increasing, decreasing, and constant linear and nonlinear segments and should be familiar to students 13 to 15 years old. • Item difficulty can be adjusted via these example methods: <ul style="list-style-type: none"> ○ Three or more qualitative statements ○ Requires particular ordered pairs to be plotted. <p>TM5b Stimulus: The student is presented with a blank grid with x- and y-axes labeled and the description of the context.</p> <p>Example Stem: John is riding his bike.</p> <ul style="list-style-type: none"> • He increases his speed for 30 seconds. • He stays at the same speed for the next 20 seconds. • He slows down to a stop during the last 15 seconds. <p>Use the Connect Line tool to draw a graph that represents John’s speed over time.</p> <p>Interaction: The student uses Add Point and Connect Line tools to plot points in the coordinate plane and connects the points with lines. Delete tool will also be provided.</p> <p>Rubric: (1 point) The student correctly draws a graph that represents the relationship (e.g., see below).</p> <div style="text-align: center;"> <p>John’s Speed Over Time</p>  </div> <p>Response Type: Graphing</p>
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