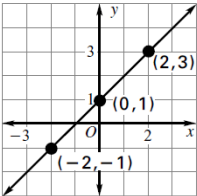


GLE 0806.3.4 (F.8.2, F.8.3) Translate among verbal, tabular, graphical and algebraic representations of linear functions.

Knowledge and Skills	Checks for Understanding & Guiding Question(s)	Resources & Instructional Practices	Assessments	Differentiated Instruction	Technology & Additional Web-based Resources
<p>Weeks 1-3</p> <p>SPI 0806.3.4 (F.8.2, F.8.3) Translate between various representations of a linear function.</p> <p>Representations of Linear Functions Linear Functions Graph Match Activity includes activity cards</p> <p>Matching Linear Functions, Graphs, and Tables Match Equation with Graph</p> <p>Vocabulary Variable, algebra, algebraic expression, coordinate plane, origin, y-axis, x-axis, quadrants, ordered pair, x-coordinate, y-coordinate, relation, domain, range, sequence term, arithmetic sequence, common difference, geometric sequence, linear, linear equation</p>	<p>0806.3.13 (EE.8.8.b) Represent situations and solve real-world problems using symbolic algebra.</p> <p>Guiding Question(s)</p> <p>What are the algebraic skills used to rewrite linear equations in various forms?</p>	<p>Glencoe TN Math Connects Course 3</p> <p>Ch. 5 Lessons 1A p.268, 1B p. 270, 1C p. 275, 2A p. 281, 2B p. 282, 2C p.287, 2C p. 292</p> <p>CCSS Extra Lesson 5: Compare Properties of Functions pp. 785-790 (Electronic TE CCSS Link)</p> <p>Routines/Activities</p> <ul style="list-style-type: none"> 5-Minute Check Spiral Review pp. 280, 291, 297 H.O.T. Problems pp. 274, 280, 286, 291, 297 Test Practice Questions pp. 274, 280, 286, 291, 297 PSI Problem Solving Investigation, p. 268 Chapter Study Guide & Review pp.326-329 Hands-On Activity Tools & Resources, pp. 6, 7, 20, 30, 23, 300; Variables and Expressions p. 132 Quick Review Math Handbook, pp. 182, 252-256, 288-290, 291 Foldables Chapter Resource Masters 	<ul style="list-style-type: none"> Are You Ready for the Chapter? pp. 266 Stop and Reflect pp. 280, 297, 311, 325 Self Check Quiz Mid-Chapter Check p. 298 Lesson Quizzes (CRM) Practice Chapter Test p. 330 Preparing for Standardized Tests p. 331 Test Practice p. 332 Chapter Test CRM Mastering TCAP Workbook practice by SPI <p>TCAP Practice:</p> <p>Which equation is shown on the graph below?</p>  <p> A $y = x - 1$ C $y = x + 1$ B $y = \frac{1}{2}x + 2$ D $y = 2x - 3$ </p>	<p>Intervention:</p> <ul style="list-style-type: none"> Stanford Math (90 minutes/week) Reteach Masters (Chapter Resource Masters) Response to Intervention(TE) p. 266A Differentiated Instruction Options (TE) p.267c, 281c, 299c, 314c Quick Checks (TE) pp.269, 274, 280, 286, 291, 297, 305, 311, 319, 323 Destination Math <p>Enrichment:</p> <ul style="list-style-type: none"> Stanford Math (90 minutes/week) Enrichment Masters (Chapter Resource Masters) Differentiated Instruction Options (TE) p.267c, 281c, 299c, 314C Quick Checks (TE) pp.269, 274, 280, 286, 291, 297, 305, 311, 319, 323 .Destination Math 	<p>Teachers Edition CD</p> <p>Graphing Calculators</p> <p>Destination Math</p> <p>Examview Pro</p> <p>Stanford Math Browser</p> <p>Publishers Website: http://connectED.mcgraw-hill.com</p> <p>NCTM Website: http://illuminations.nctm.org www.internet4classrooms.com www.tnelc.org www.education.ti.com</p> <p>Interactive Manipulatives: http://nlvm.usu.edu/</p> <p>STEM Resources: http://www.stemsources.com</p> <p>Informational Math Site (Power Points/Games) http://jcschools.net/index.html http://softschools.com www.brightstorm.com http://exchange.smarttech.com www.discoveryeducation.com www.insidemathematics.org</p>

First Nine Weeks Instructional Map

DRAFT

Subject Pre-algebra Grade 8

GLE 0806.3.4 (F.8.2, F.8.3) Translate among verbal, tabular, graphical and algebraic representations of linear functions.

GLE 0806.3.6 Compare and contrast linear and nonlinear functions.

Knowledge and Skills	Checks for Understanding & Guiding Question(s)	Resources & Instructional Practice	Assessments	Differentiated Instruction	Technology & Additional Web-based Resources
<p>Weeks 1-3 SPI 0806.3.6 (EE.8.8.a) Analyze the graph of a linear function to find solutions and intercepts.</p> <p>SPI 0806.3.7 Identify, compare and contrast functions as linear or nonlinear. Distance, Rate and Time Word Problems w/Answers Graphing non-linear functions Graphing Equations - Nonlinear Functions Lesson included handouts Linear versus Nonlinear Futures Channel: Linear Equations and Functions Contains several activities with video clips of skill applications</p> <p>Vocabulary Function, function table, independent variable, dependent variable, linear function, continuous data, discrete data, nonlinear function, quadratic function, cubic function, exponential function</p>	<p>0806.3.13 (EE.8.8.b) Represent situations and solve real-world problems using symbolic algebra.</p> <p>0806.3.12 Understand how rates of change of nonlinear functions contrast with constant rates of change of linear functions. Rate of Change: Connecting Slope to Real Life</p> <p>0806.3.10 Distinguish quadratic and exponential functions as nonlinear using a graph and/or a table of values. Exponential Functions Lesson plan Graphing Exponential Functions Quizzes you must register to access quizzes Comparing Linear and Nonlinear Functions Nonlinear Functions - Using Tables ppt Linear Equations Lesson Lesson plan with activities Exploring Linear, Exponential and Quadratic Functions</p> <p>Guiding Question(s): How do you solve problems involving rate/distance/time</p> <p>What information is needed to determine if a function is linear or nonlinear?</p>	<p>Glencoe TN Math Connects Course 3 Ch. 5 Lessons 3A p. 299, 3B p.300, 3C p. 306, 4A p.314, 4B p.320, 4C p.324</p> <p>Routines/Activities</p> <ul style="list-style-type: none"> 5-Minute Check Spiral Review pp. 305, 311, 319 H.O.T. Problems pp. 304, 310, 318, 322 Test Practice Questions pp. 305, 311, 319, 323 PSI Problem Solving Investigation Chapter Study Guide & Review pp.326-329 Hands-On Activity Tools & Resources, p. 20 Quick Review Math Handbook, pp. 292-293 Foldables Chapter Resource Masters 	<ul style="list-style-type: none"> Are You Ready for the Chapter? pp. 266 Stop and Reflect pp. 280, 297, 311, 325 Self Check Quiz Mid-Chapter Check p. 298 Lesson Quizzes (CRM) Practice Chapter Test p. 330 Preparing for Standardized Tests p. 331 Test Practice p. 332 Chapter Test CRM Mastering TCAP Workbook practice by SPI <p>Sample TCAP Question(s) SPI 0806.1.1 Sample TCAP Questions SPI 0806.3.7 Sample TCAP Questions SPI 0806.3.5 Sample TCAP Questions SPI 0806.3.7</p> <ol style="list-style-type: none"> Which function is nonlinear? A. $F(x) = 5$ B. $F(x) = 3x$ C. $F(x) = 5x^2 - 2$ D. $F(x) = -2x + 3$ Given $4x + 2y^3 = 5 + y$ Which term identifies this equation as nonlinear? A. $4x$ B. $2y^3$ C. 5 D. y 	<p>Intervention:</p> <ul style="list-style-type: none"> Stanford Math (90 minutes/week) Reteach Masters (Chapter Resource Masters) Response to Intervention(TE) p. 266A Differentiated Instruction Options (TE) p.267c, 281c, 299c, 314c Quick Checks (TE) pp.269, 274, 280, 286, 291, 297, 305, 311, 319, 323 Destination Math <p>Enrichment:</p> <ul style="list-style-type: none"> Stanford Math (90 minutes/week) Enrichment Masters (Chapter Resource Masters) Differentiated Instruction Options (TE) p.267c, 281c, 299c, 314C Quick Checks (TE) pp.269, 274, 280, 286, 291, 297, 305, 311, 319, 323 .Destination Math 	<p>Teachers Edition CD Graphing Calculators Destination Math Examview Pro Stanford Math Browser Publishers Website: http://connectED.mcgraw-hill.com NCTM Website: http://illuminations.nctm.org www.internet4classrooms.com www.tnelc.org www.education.ti.com Interactive Manipulatives: http://nlvm.usu.edu/ STEM Resources: http://www.stemsources.com Informational Math Site (Power Points/Games) http://jc-schools.net/index.html http://softschools.com www.brightstorm.com http://exchange.smarttech.com www.discoveryeducation.com www.insidemathematics.org</p>

First Nine Weeks Instructional Map

DRAFT

Subject Pre-algebra Grade 8

GLE 0806.3.4 (F.8.2, F.8.3) Translate among verbal, tabular, graphical and algebraic representations of linear functions. GLE 0806.3.5 (F.8.4) Use slope to analyze situations and solve problems.

Knowledge and Skills	Checks for Understanding & Guiding Question(s)	Resources & Instructional Practices	Assessments	Differentiated Instruction	Technology & Additional Web-based Resources
<p>Weeks 4-6</p> <p>SPI 0806.3.4 (F.8.2, F.8.3) Translate between various representations of a linear function. Representations of Linear Functions Representations of Linear Functions Lesson Download lesson Math Readiness Project: Linear Functions choose appropriate activity</p> <p>SPI 0806.3.5 (F.8.4, F.8.5) Determine the slope of a line from an equation, two given points, a table or a graph. Determine Slope from a Graph</p> <p>SPI 0806.3.6 (EE.8.8.a) Analyze the graph of a linear function to find solutions and intercepts. Solutions and Intercepts of Linear Functions NCTM Illuminations: Growth Rate Graphing Functions Graphing tutorials for various functions</p> <p>Vocabulary Linear relationship, constant rate of change, slope, rise, run, qualitative graph, direct variation, constant of variation, slope-intercept form, y-intercept, boundary, half-plane, standard form, x-intercept</p>	<p>0806.3.6 (F.8.4) Identify x- and y-intercepts and slope of linear equations from an equation, graph or table. Using the X and Y Intercept to Graph Linear Equations Finding the X and Y Intercept to Graph Equations Linear Equations includes 10 lessons</p> <p>0806.3.7 Analyze situations and solve problems involving constant rate of change Linear versus Nonlinear Lesson plan with materials and strategies</p> <p>0806.3.8 Recognize a proportion as a special case of a linear equation and understand that the constant of proportionality is the slope, and the resulting graph is a line through the origin. Arcademic Skill Builders - Dirt Bike Proportions Game</p> <p>Guiding Question(s): How can you determine the slope of a line from an equation, two given points or a graph?</p> <p>How does slope represent the relationship between two variables?</p> <p>What is the importance of using the slope and y-intercept to graph and write a linear equation?</p>	<p>Glencoe Math TN Connects Course 3 Ch. 6 Lessons 1A p. 337, 1 B p. 343, 1C p. 344, 1D p. 350, 1E p. 351, 2A p. 357, 2B p. 363, 2C p. 367</p> <p>Routines/Activities</p> <ul style="list-style-type: none"> • 5-Minute Check • Spiral Review pp. 356, 366 • H.O.T. Problems pp. 342, 348, 355, 361, 366 • Test Practice p. 34, 349, 356, 362, 366 • PSI Problem Solving Investigation • Chapter Study Guide & Review pp.384-387 • Hands-On Activity Tools & Resources, p. 20; Writing Linear Equations, p. 135 • Quick Review Math Handbook, pp. 279, 295-298, 306-307, 298-304, 299 • Foldables • Chapter Resource Masters <p>Qualitative Graphs This set of problems involves qualitative graphs, representations that focus on the important general features of a situation. Discuss them with students. TI Classroom Activities: Identifying Qualitative Graphs How to Find the Slope of a Line You may use the lesson as a whole group activity.</p>	<ul style="list-style-type: none"> • Are You Ready for the Chapter? P. 336 • Stop and Reflect pp. 356, 368, 379 • Self Check Quiz • Mid-Chapter Check p. 369 • Lesson Quizzes (CRM) • Practice Chapter Test p. 388 • Preparing for Standardized Tests p. 389 • Test Practice p. 390 • Chapter Test CRM • Mastering TCAP Workbook practice by SPI <p>Linear and Non-Linear Equations Online quiz for review Sample TCAP Questions SPI 0806.1.2</p> <p>Graphing Linear Functions Practice Problems You may review the problems provided for lesson openers or whole group dialogue. Sample TCAP Questions SPI 0806.3.4 Sample TCAP Questions SPI 0806.3.6</p>	<p>Intervention:</p> <ul style="list-style-type: none"> • Stanford Math (90 minutes/week) • Reteach Masters (Chapter Resource Masters) • Response to Intervention(TE) p. 336A • Differentiated Instruction Options (TE) p.337c, 357c, 370c • Quick Checks (TE) pp.342, 349, 356, 362, 366, 371, 377, 381 • Destination Math <p>Enrichment:</p> <ul style="list-style-type: none"> • Stanford Math (90 minutes/week) • Enrichment Masters (Chapter Resource Masters) • Differentiated Instruction Options (TE) p.337c, 357c, 370c • Quick Checks (TE) pp.342, 349, 356, 362, 366, 371, 377, 381 • .Destination Math 	<p>Teachers Edition CD Graphing Calculators Destination Math Examview Pro Stanford Math Browser Publishers Website: http://connectED.mcgraw-hill.com NCTM Website: http://illuminations.nctm.org www.internet4classrooms.com www.tnelc.org www.education.ti.com Interactive Manipulatives: http://nlvm.usu.edu/ STEM Resources: http://www.stemsources.com Informational Math Site (Power Points/Games) http://jc-schools.net/index.html http://softschools.com www.brightstorm.com http://exchange.smarttech.com www.discoveryeducation.com www.insidemathematics.org</p>

Common Core Focus Standards

The remainder of this quarter will address the Expressions and Equations and Function CCSS focus standards for grade 8 mathematics. In preparation for the CRA assessments tasks and lessons have been included to better engage students.

Expressions and Equations

Understand the connections between proportional relationships, lines, and linear equations.

- 8.EE.5. Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. *For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.*
- 8.EE.6. Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b .

Functions

Define, evaluate, and compare functions.

- 8.F.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.
- 8.F.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.*
- 8.F.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.*

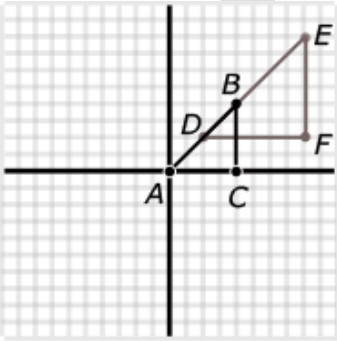
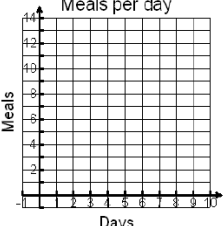
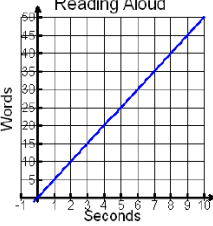
Expressions and Equations (EE)

Understand the connections between proportional relationships, lines, and linear equations

<u>Standards</u>	<u>Mathematical Practices</u>	<u>Explanations and Examples</u>	<u>Instructional Resources</u>												
<p>Students are expected to:</p>															
<p>8.EE.5. Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. <i>For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.</i></p>	<p>8.MP.1. Make sense of problems and persevere in solving them.</p> <p>8.MP.2. Reason abstractly and quantitatively.</p> <p>8.MP.3. Construct viable arguments and critique the reasoning of others.</p> <p>8.MP.4. Model with mathematics.</p> <p>8.MP.5. Use appropriate tools strategically.</p> <p>8.MP.6. Attend to precision.</p> <p>8.MP.7. Look for and make use of structure.</p> <p>8.MP.8. Look for and express regularity in repeated reasoning.</p>	<p>Using graphs of experiences that are familiar to students increases accessibility and supports understanding and interpretation of proportional relationship. Students are expected to both sketch and interpret graphs.</p> <p>Example:</p> <ul style="list-style-type: none"> Compare the scenarios to determine which represents a greater speed. Include a description of each scenario including the unit rates in your explanation. <div style="display: flex; justify-content: space-around;"> <div data-bbox="827 727 1115 1117"> <p>Scenario 1:</p> <table border="1"> <caption>Data for Scenario 1</caption> <thead> <tr> <th>Time (hours)</th> <th>Distance (miles)</th> </tr> </thead> <tbody> <tr><td>1</td><td>60</td></tr> <tr><td>2</td><td>120</td></tr> <tr><td>3</td><td>180</td></tr> <tr><td>4</td><td>240</td></tr> <tr><td>5</td><td>300</td></tr> </tbody> </table> </div> <div data-bbox="1357 727 1612 860"> <p>Scenario 2:</p> <p>$y = 50x$ x is time in hours y is distance in miles</p> </div> </div>	Time (hours)	Distance (miles)	1	60	2	120	3	180	4	240	5	300	<p>Math Connects CCSS Extra Lessons (8.EE) Lesson 4: Investigating Linear Equations p. 784 (Located in Electronic TE CCSS Link)</p> <p>Graphical Representation of Time and Distance Lines and Linear Equations Lesson</p> <p>Bike Ride: Apprentice Level Task</p> <p>Journey: Apprentice Level Task</p> <p>Shelves: Apprentice Level Task</p> <p>Cog Railway</p>
Time (hours)	Distance (miles)														
1	60														
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Expressions and Equations (EE)

Understand the connections between proportional relationships, lines, and linear equations

<u>Standards</u>	<u>Mathematical Practices</u>	<u>Explanations and Examples</u>	<u>Instructional Resources</u>																				
<p>Students are expected to:</p>																							
<p>8.EE.6. Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.</p>		<p>Example:</p> <ul style="list-style-type: none"> Explain why $\triangle ACB$ is similar to $\triangle DFE$, and deduce that \overline{AB} has the same slope as \overline{BE}. Express each line as an equation. 	<p>Youtube Lesson: Similar Triangles and Slope Bike Ride: Apprentice Level Task Journey: Apprentice Level Task Shelves: Apprentice Level Task</p>																				
<p>Slope and y intercept equations in Graphs, Tables, Stories, Equations</p>																							
<p>1. Table</p> <table border="1"> <thead> <tr> <th>x (days)</th> <th>y(meals)</th> </tr> </thead> <tbody> <tr><td>0</td><td>0</td></tr> <tr><td>1</td><td>3</td></tr> <tr><td>2</td><td>6</td></tr> <tr><td>3</td><td>9</td></tr> <tr><td>4</td><td>12</td></tr> </tbody> </table>	x (days)	y(meals)	0	0	1	3	2	6	3	9	4	12	<p>Make the Graph</p> 	<p>2. Fill in the table</p> <table border="1"> <thead> <tr> <th>x ()</th> <th>y()</th> </tr> </thead> <tbody> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </tbody> </table>	x ()	y()							<p>Graph</p> 
x (days)	y(meals)																						
0	0																						
1	3																						
2	6																						
3	9																						
4	12																						
x ()	y()																						
<p>The rate of change (slope) is: 3 meals/1 day The start point is: 0 (zero) The equation is: $y = 3x$</p>	<p>What is the story</p>	<p>What is the rate of change (slope)? What is the start point?(constant) What is the equation?</p>	<p>What is the story?</p>																				

Functions
Define, evaluate, and compare functions.

Standards

Students are expected to:

8.F.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.1

Explanations and Examples

What is a function?

Three main parts of a function:

Input, Relationship, Output:

Example: $y = 3x$

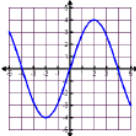
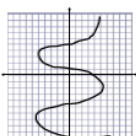
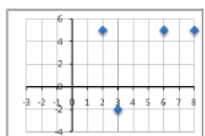
Input (x)	Relationship	Output (y)
1	times 3	3
4	times 3	12
10	times 3	30

Function Names: Functions can be named anything. In books, we most frequently see f or g as names. Examples:

- $f(x) = 3x$ means "a function f with input (x) " and "you multiply the input by 3" for the output
- $g(x) = 2x + 1$ means "a function g with input (x) " and "you multiply the input by 2 and add 1" for the output
- $h(x) = x^2$ means "a function h with input (x) " and "you square the input" to get the output
- Sometimes there is no function name and you will see $y = 3x$, as in the table above. There is still input, output, and a relationship that assigns each input. Remember x is just the variable-name for the input—it could be q or r or m etc.

Formal Definition of a Function: A function relates each element of an input set with exactly one element of an output set.

- "...each element..." means that every element in x (input) is related to a unique element in y (output)
- "...exactly one..." means that the function will not output more than 1 result for a given input. You can have ONLY ONE Y VALUE for each

This is NOT a function (two points with y values for the same x value)	This is a function— (only one y value for each x value) USE VERTICAL LINE TEST*	This is NOT a function (two points with y values for the same x value) USE VERTICAL LINE TEST*	This is a function— (only one y value for each x value) (functions can also be discrete—not continuous)
<p>$\{(7, 12), (6, 9), (7, 8), (4, 11)\}$</p> <p>$\{(-2, 5), (-2, 6), (-2, 7)\}$</p>			

*The vertical line test is only useful when graphing on a Cartesian plane. In other words graphing parametrically, in polar form etc. the vertical line test does not hold for

(Definition of Function: www.mathisfun.com/sets/function.html)

Instructional Resources

[Interpreting Distance-Time Graphs Lesson](#)

[Graphical Representation of Time and Distance](#)

[Linear Graphs](#)

[Functions: Short Tasks](#)

8.F.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.*

Function Representations: Stories, Tables, Graphs, Equations

NOTE: In the study of Functions, students must represent the functions using different representations (tables, graphs, equations) and be able to work interchangeably among those representations. They will need to...

- Describe increasing/decreasing patterns
- Compare rates of change from the same or different representations
- Write equations from real life situations, from data, from graphs
- Create functions from real life examples—use all forms of representations

The definitive assessment item for Functions in 8th grade math: “Describe a situation from real life which involves a mathematical function. Then create the table, graph, equation and prediction.”

1. Inform students from the beginning about this final assessment item.
2. Students should have extensive experience with real life problem situations (please refer to [suggested lessons or assessment tasks on the wordpress site http://middlemathccss.wordpress.com/8th-grade-math/](http://middlemathccss.wordpress.com/8th-grade-math/)).

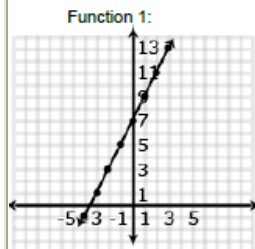
Other Instructional examples:

1. Write an equation describing the following situations:
 - Jane has \$20. She saves \$1.50 each week. How much money does she have in any given week?
 - Kris has edited 200 pages so far in his career. He can edit 8 pages per day. How many pages will he have edited in the future?
 - Leah is at her neighbor’s house 2 miles from her house. She runs toward her house at a rate of 1/10 of a mile each minute. How far is she from her house at any given time? When will she reach her house?
2. Describe the following situations as increasing or decreasing, and linear or nonlinear.
 - Mike has \$25. He saves \$11 each week.
 - Nettie has \$2. She doubles her money each week.
 - Paul has \$100. He spends \$5 each day.

A mathematical look at increasing and decreasing functions: http://apcentral.collegeboard.com/apc/members/repository/ap03_adaptation_calca_29895.pdf (Honors as written, adaptable for regular.)

Math Connects CCSS Extra Lessons
Lesson 5: Compare Properties of Functions
p. 785
(Located in Electronic TE CCSS Link)
[Lines and Linear Equations Lesson](#)
[Function Machines](#)
[Battery Charging](#)
[Equations from a table](#)

Compare the two linear functions listed below and determine which equation represents a greater rate of change.



Function 2:
The function whose input x and output y are related by
 $y = 3x + 7$

Compare the two linear functions listed below and determine which has a negative slope.

Function 1: Gift Card

Samantha starts with \$20 on a gift card for the book store. She spends \$3.50 per week to buy a magazine. Let y be the amount remaining as a function of the number of weeks.

x	y
0	20
1	16.50
2	13.00
3	9.50
4	6.00

Function 2:

The school bookstore rents graphing calculators for \$5 per month. It also collects a non-refundable fee of \$10.00 for the school year. Write the rule for the total cost (c) of renting a calculator as a function of the number of months (m).

Solution:

Function 1 is an example of a function whose graph has negative slope. Samantha starts with \$20 and spends money each week. The amount of money left on the gift card decreases each week. The graph has a negative slope of -3.5, which is the amount the gift card balance decreases with Samantha's weekly magazine purchase. Function 2 is an example of a function whose graph has positive slope. Students pay a yearly nonrefundable fee for renting the calculator and pay \$5 for each month they rent the calculator. This function has a positive slope of 5 which is the amount of the monthly rental fee. An equation for Example 2 could be $c = 5m + 10$.

8.F.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.*

Determine which of the functions listed below are linear and which are not linear and explain your reasoning.

- o $y = -2x^2 + 3$ non linear
- o $y = 2x$ linear
- o $A = \pi r^2$ non linear
- o $y = 0.25 + 0.5(x - 2)$ linear

- [Video: \$y=mx+b\$](#)
- [Purplemath: The meaning of slope](#)
- [Linear Functions and Equations](#)
- [Slope and Intercept](#)
- [Learner.org: Linear Functions](#)
- [Linear vs. Non-linear Functions Worksheet](#)
- [Linear vs Nonlinear](#)



Common Core State Standards Crosswalk Correlations

F.8.1 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. (Function notation is not required in Grade)

F.8.2 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.

F.8.3 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.

F.8.4 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.

F.8.5 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.

EE.8.8 Analyze and solve pairs of simultaneous linear equations.

EE.8.8.a Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.

EE.8.8.b Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. For example, $3x + 2y = 5$ and $3x + 2y = 6$ have no solution because $3x + 2y$ cannot simultaneously be 5 and 6.

G.8.1 Verify experimentally the properties of rotations, reflections, and translations:
 -- a. Lines are taken to lines, and line segments to line segments of the same length.
 -- b. Angles are taken to angles of the same measure.
 -- c. Parallel lines are taken to parallel lines.

G.8.2 Understand congruence and similarity using physical models, transparencies, or geometry software. Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.