

# Grade Six Chapter 9 - Algebra: Relationships Between Variables

## Overview & Support

### Standards:

- Represent and analyze quantitative relationships between dependent and independent variables.**
- 6.EE.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. *For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation  $d = 65t$  to represent the relationship between distance and time.*

### Suggested Routines:

- discuss relationships of equations, tables, graphs
- Framework pg.36-37  
<http://blogs.egusd.net/mathgen/files/2015/09/Grade-6-13p8rai.pdf>
- Online Resources
  - Personal Math Trainer (PMT)
  - Math on the Spot
- Illustrative Mathematics  
<https://tasks.illustrativemathematics.org/content-standards/6>

### Manipulatives:

algebra tiles for reteach

### Vocabulary:

coordinate plane / quadrants      coordinate / independent variable      formula / distance formula

function equation      linear equation      ordered pair

X- Y-coordinate / dependent variable

### Strategies for Chapter:

- identify parts of equations including dependent variable, independent variable, and function or pattern
- make input/output tables
- write equations from word situations
- graph linear equations

### Color Coding:

**Green (G)** - The lesson accurately reflects the Framework standard(s).

**Yellow (Y)** - This lesson includes notes to refer to while planning the lesson.

**Red (R)** - This lesson does not accurately reflect the Framework standard(s). Skip the lesson.

### Essential Question:

**How can you show relationships between variables?**

<http://blogs.egusd.net/mathgen>

Revised May 2019

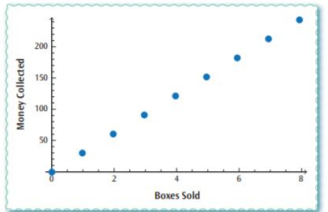
## Lesson-by-Lesson Overview:

| Lesson #, Standard     | Title                               | Materials | Vocab                                                                         | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
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| 9.0                    | Show What You Know                  |           |                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>9.1 G</b><br>6.EE.9 | Independent and Dependent Variables |           | Independent variable (x), dependent variable (y), Function equation, function | <p><b>From the Framework:</b> <i>"In grade six, students investigate the relationship between two variables, beginning with the distinction between dependent and independent variables (6.EE.9). The independent variable is the variable that can be changed; the dependent variable is the variable that is affected by the change in the independent variable."</i></p> <p>Explain that there are situations in which the value of one variable determines the value of another variable.</p> <ol style="list-style-type: none"> <li>1. <b>Y</b> is dependent on x and the changes made to x. Y is the output</li> <li>2. <b>X</b> is the independent variable or the output</li> </ol> |
| <b>9.2 G</b><br>6.EE.9 | Equations and Tables                |           |                                                                               | <p>Identify and label equation parts.</p> <p>Understand the context of the problem to identify the independent variable (y).</p> <p>Create or complete input/output tables. Tables may be two columns as shown in the text <b>or Framework</b>. Students should identify the pattern (function). Tables may include a third column to show the function (operational pattern).</p> <p>Additional activities can be found on <b>Illustrative Mathematics</b> under the Expressions and Equations domain, then Cluster C</p>                                                                                                                                                                  |

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|  |  |  |  | <p>6.EE.A Apply and extend previous understandings of arithmetic to algebraic expressions.</p> <p>6.EE.B Reason about and solve one-variable equations and inequalities.</p> <p>6.EE.C Represent and analyze quantitative relationships between dependent and independent variables.</p> <p><a href="https://tasks.illustrativemathematics.org/content-standards/6">https://tasks.illustrativemathematics.org/content-standards/6</a></p> |
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| <p><b>9.3</b><br/><b>G</b><br/>6.EE.9</p> | <p>Problem Solving:<br/>Analyze Relationships</p> |  |  | <p>Problem Solving - Students use table data to use patterns and relationships for word problems.</p> <p>Students analyze situations, write equations, and solve them.</p> |
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### Mid-Chapter Checkpoint

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| <p><b>9.4</b><br/><b>G</b><br/>6.EE.9</p> | <p>Graph Relationships</p> | <p>Graph paper</p> | <p>Coordinate plane,<br/>increments,<br/>Ordered pairs,<br/>X-coordinate,<br/>y-coordinate</p> | <p><b>Use table data to identify ordered pairs and line graphs.</b></p> <p><b>Value of the output depends on the value of the input.</b></p> <p>Input is commonly represented by the variable X and is associated with the horizontal axis of the coordinate plane.</p> <p>The output is commonly represented by the variable y and is associated with the vertical axis of the coordinate plane.</p> <div style="border: 1px solid gray; padding: 5px;"> <p>b. Students may derive the equation <math>m = 30b</math>, representing the fact that when <math>b</math> boxes are sold at \$30 per box, then the total amount of money collected is <math>30b</math> dollars. In this case, the independent variable is the number of boxes sold, <math>b</math>, and the money collected is the dependent variable. This equation certainly is a valid way to make sense of the problem, in that the amount of money collected depends on the number of boxes sold.</p> <p>However, if one has fund-raising goals, then it would be natural to think of the relationship as <math>b = \frac{m}{30}</math>, in the sense that the number of boxes needed to be sold depends on the fund-raising target.</p> <p>c. If we graph the relationship as <math>(b, m)</math>, then we obtain the graph shown, which illustrates the relationship <math>m = 30b</math>. (In grade seven, students will more fully explore graphs of proportional relationships such as this one.)</p> <p>d. Using the equation derived in solution b, <math>m = 30b</math>, we use 100 for the value of <math>b</math> and find the amount of money collected will be \$3000.</p> </div>  <p>Adapted from Illustrative Mathematics 2013c.</p> <p>Increments may be different on the x axis compared to the y axis when the situation logically calls for it.</p> |
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| <p><b>9.5</b></p> | <p>Equations and Graphs</p> |  | <p>Linear equation.</p> | <p>Equations with two variables in this lesson have an infinite number of solutions. In</p> |
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| <p><b>Y</b><br/>6.EE.9</p> |  |  | <p>Formula,<br/>Distance<br/>formula</p> | <p>certain situations this is indicated by lines with arrows at each end. The context must be considered, for example, the graph for #7 should not have an arrow pointing below zero because you can't bake a negative number of bread loaves in a negative amount of time.</p> <p>An equation states the relationship between the variables, whereas a graph shows many solutions to the equation.</p> <p>Option: Teach translating equations into graphs on day 1 and graphs to equations on day 2. When teaching graphs to equations, the graphs should also have a context, as in #8.</p> |
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### Chapter 9 Test

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| <p><b>Reteach Options</b></p> | <p>Reteach standards from this unit to help meet students' need. Some ideas for reteach activities are listed below:</p> <ul style="list-style-type: none"> <li>● Math centers or math games focused on unit standards</li> <li>● Small group instruction focused on a single standard</li> <li>● Whole group instruction focused on a single standard</li> <br/> <li>● My Favorite No – Rewrite student work with an error and work as a class to identify positives in the work and areas that need to be revised</li> <li>● Select 1 – 3 problems to resolve in their groups and discuss whole class. We want new learning to occur on this day that helps students over misconceptions.</li> <li>● Complete the "Performance Task" from Go Math! In the Assessment Book in small groups. Share strategies and discuss whole class.</li> <li>● Use the Reteach activities based on standards that need intervention.</li> </ul> |
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