

# Direct Variation

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## LESSON OVERVIEW

<b>Subject(s)</b>	Mathematics
<b>Topic or Unit of Study</b>	Algebra II (Honors)
<b>Grade/Level</b>	Grade 10
<b>Objective</b>	Students will be able to use the definition of direct variation to determine the constant of variation either from a table of values or an equation.
<b>Summary</b>	Students struggle with the different phrasing for this section. This lesson is designed to make all the different phrases accessible to students. The different phrases include: varies directly, direct variation, proportional, directly proportional.

## IMPLEMENTATION

<b>Learning Context</b>	Students have just learned about relations, functions, and linear equations.
<b>Teaching Strategies</b>	Direct Instruction
<b>Time Allotment</b>	1 class periods. 50 Mins. per class.
<b>Sample Student Products</b>	My worked out solutions for the two worksheet pages. Students are to show their work on a separate piece of paper and with as much detail as necessary (see my solutions).

### Attachments:

1. [Worked out Solutions WS181.pdf](#) Worked out solutions
2. [Worked out Solutions WS183.pdf](#) Worked out solutions

### Author's Comments & Reflections

The Common Core Standards aligned with this lesson are listed as 7th grade standards as opposed to Algebra II. This is the first year of Common Core, so the current students did not have these standards in 7th. Furthermore, the standards used in this lesson are aligned with the algebra II textbook which is aligned with the previous California State Standards for Algebra II.

This lesson does not emphasize graphing as graphing will be covered after linear modeling.

## PROCEDURE

### Anticipatory Set

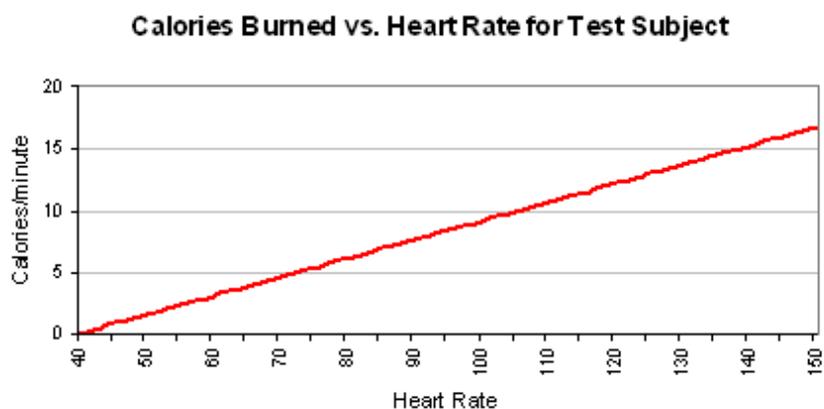
### Warm-Up

Students complete the following problem:

- Write in slope-intercept form the equation of a line with a slope of -3 and goes through the point (2, 4).
- Answer:  $y = -3x + 14$

### Anticipatory Set (Interesting Fact)

"... oxygen is required to burn calories – the more you breathe in, the more you burn. It turns out that your heart rate is directly related to how much oxygen you consume and calories you burn. In fact, there is roughly a linear relationship between heart rate and calories burned, though this linear relationship varies between people based on their age, weight, and gender."



[http://moveyourhyde.com/?page\\_id=309](http://moveyourhyde.com/?page_id=309)

## Modeling

### Brainstorm

Teacher leads a brainstorming session to think of examples where two factors vary directly. The teacher will write the examples on the whiteboard.

### Brainstorm Model

Teacher graphs some examples from the brainstorm to visually model how the dependent variable (y) directly varies with the independent variable (x). After three examples, the teacher will write on the whiteboard and say aloud the different ways in which we refer to direct variation.

### Modeling (5-Step)

Teacher will model how to determine direct variation and write the equation from examples in the textbook (the not worked out examples) and complete the first problem on worksheet page 181.

Steps

1.  $y = Kx$

2.  $y/x = K$
3.  $6/2 = K$ ;  $3 = K$
4.  $y = 3x$
5. what if  $x = ?$

**Guided Practice**

Teacher will prompt students to complete problems 2 and 5 on worksheet page 183.

**Independent Practice**

Students complete worksheet pages 181 and 183 for homework. They are encouraged to start working on them in the remaining class time.

**Closure****Exit Ticket**

Students will turn in two problems which will be completed at the end of the class.

*Problem One*

Determine whether  $y$  varies directly with  $x$ . If so, find the constant of variations and write the equation.

$x$	$y$
-6	-2
3	1
12	4

*Problem Two*

Determine whether  $y$  varies directly with  $x$ . If so, find the constant of variations and write the equation.

$$7x + 4y = 10$$

**Follow-Up**

The next warm-up will be a textbook problem from this section. The teacher will answer any questions the students have about the homework assigned today.

**MATERIALS AND RESOURCES****Instructional Materials****Attachments:**

1. [Worksheet pages 181, 183.pdf](#) Classwork/Homework

**Resources**

- Materials and resources:  
Algebra II textbook (modeling), front whiteboard, whiteboard markers and erasers, documents camera

**Attachments:**

1. [Solution for worksheet pages 181, 183.pdf](#) Provided solutions to worksheet

# STANDARDS & ASSESSMENT

## Standards

Display:  Collapse All  Expand All

### ▼ CA- California Common Core State Standards (2012)

#### ▼ Subject: Mathematics

#### ▼ Grade: Grade 7

#### ▼ Domain: Ratios and Proportional Relationships 7.RPv

#### ▼ Area: Analyze proportional relationships and use them to solve real-world and mathematical problems

##### Standard:

2. Recognize and represent proportional relationships between quantities.

a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.

b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.

c. Represent proportional relationships by equations. *For example, if total cost  $t$  is proportional to the number  $n$  of items purchased at a constant price  $p$ , the relationship between the total cost and the number of items can be expressed as  $t = pn$ .*

d. Explain what a point  $(x, y)$  on the graph of a proportional relationship means in terms of the situation, with special attention to the points  $(0, 0)$  and  $(1, r)$  where  $r$  is the unit rate.

## Assessment Plan

Each student will turn in the homework and classwork (Worksheet pages 181, 183) and be graded on each. Students must show their work on a separate piece of paper.

## Assessment/Rubrics

There are two worksheets (page 181 and 183) with a total of 18 questions and 2 riddles. Each worksheet page has a riddle that is dependent on the student using correct answers to decipher the riddle. Students will receive one point for showing their work for each question (total of 18 points) and one point for each correct riddle (total of 2 points). The entire assignment is graded out of a total of 20 points. For worksheets, have students write their answers and show their work on a separate piece of paper.

A student has shown their work and will receive a point if:

- Work shown begins with the problem and clearly progresses mathematically to their answer
- Answer is in simplest form
- Answer is in the correct format (units)