

TOPIC 3

Proportionality

Lesson 3.1a/b

How Does Your Garden Grow?
Proportional Relationships

Lesson 3.2a/b

Complying with Title IX
Constant of Proportionality

Lesson 3.3

Fish-Inches
Identifying the Constant of Proportionality in Graphs.

Lesson 3.4a/b

Minding Your Ps and Qs
Constant of Proportionality in Multiple Representations



Objective

Proportional Relationships

Warm-Up



1. A bus travels 18 miles in 15 minutes. At the same rate, what distance will the bus travel in 50 minutes?

2. A copy machine averages 210 copies in 5 minutes. At the same rate, how many copies can the machine make in 12 minutes?

GETTING STARTED

Keep on Mixing!

Amount of Bluish Green Paint	Amount of Yellow Paint	Amount of Blue Paint
3 pt	1pt	2 pt
5pt	2 pt	3 pt
6pt	2 pt	4 pt
12 pt	4 pt	8 pt
15 pt	6 pt	9 pt
20 pt	8 pt	12 pt

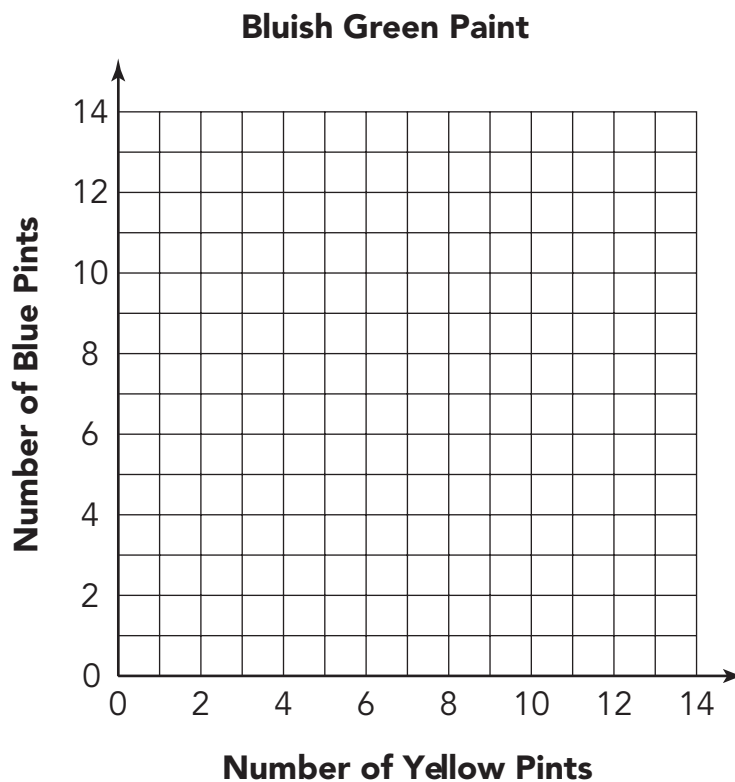
The students in Mr. Raith's art class created various quantities of bluish green paint using pints of yellow and blue paint.

The table shows the different mixtures of paint, in pints, that the students made.

1. How many different shades of paint did the students make? How do you know?

2 Plot an ordered pair for each bluish green paint mixture.

Use a ruler to draw a straight line connecting each point to the origin. What do you notice?





The student government association (SGA) at Radloff Middle School is creating an urban garden at their school for use by their community. They divided up into groups to design different parts of the garden and were asked to (1) describe their project, (2) create an equation to model part of their design or to answer a question about their design, and (3) sketch a graph of their equation.

1. Isaac, the president of the SGA, mixed up the representations of the projects after they were submitted to him. Help Isaac match the scenarios, equations, and graphs.

- Cut out the scenarios, equations, and graphs provided by Mr. Gilbes.
- Sort the scenarios, equations, and graphs into corresponding groups.
- Tape the representations into a table in your notebook. Follow the table outline



Duplicate this table in your notebook to tape the cut outs



Table	Graph	Equation	Scenario



When looking over the submissions from the urban garden working groups, Isaac notices that there are two different types of graphical relationships represented: linear and non-linear.

1. Classify each group's graph as representing a linear or a non-linear relationship between quantities.

Isaac notices that the linear graphs are slightly different but he doesn't know why. He decides to analyze a table of values for each linear graph.

2. Copy the table of values for each linear relationship in the urban garden project and calculate each Y value.

$y=1.6x$	
X	Y
1	
3	
5	
7	

$y=x + 6$	
X	Y
1	
3	
5	
7	

Isaac knows that simple equations can represent additive or multiplicative relationships between quantities.

3. Analyze the equations.

a. Based on the equations, which graph represents an additive relationship between the variables and which represents a multiplicative relationship?

b. Which variable represents the independent (input) and which represents the dependent (output)?

One special type of relationship that compares quantities using multiplicative reasoning is a **ratio** relationship. When two equivalent ratios are set equal to each other, they form a **proportion**. The quantities in the proportion are in a proportional relationship.

You can decide if two quantities are in a proportional relationship by testing that all ratios, $\frac{y}{x}$ or $\frac{x}{y}$, in a table of values are equivalent.

4. Use your tables of values in Question 2 to determine which, if any, of the linear relationships illustrate a proportional relationship. Show the values of the ratios in each relationship.

Isaac says the equation $y = \pi r^2$ represents a proportional relationship between y and r because it includes multiplication between a numerical coefficient and a variable expression.



5. Use a table of values and corresponding ratios in the form of $\frac{y}{x}$ to explain why Isaac is incorrect.

6. Explain to Isaac how the graphs in the urban garden design project are different. Include the terms linear relationship and non-linear relationship, proportional relationship, and equivalent ratios.

**LESSON 3.1a**
How Does Your Garden Grow?

Objective

Proportional Relationships**Review**

Use proportions to solve each.

1. In the town of Clover, 3 out of 5 citizens who are eligible to vote did so in the fall election.
 - a. Determine the number of citizens that voted in the fall election if 400 citizens were eligible.

 - b. Determine the number of citizens that were eligible to vote in the fall election if 180 actually voted.

2. The student council at Camp Creek Middle School determines that 3 out of 4 students prefer that all school assemblies be held on Friday afternoon.
 - a. If 200 students are surveyed, how many will prefer that school assemblies be held on Friday afternoon?

 - b. If 747 students prefer the school assemblies be held on Friday afternoon, how many students were surveyed?

Write a unit rate to represent the relationship between the given quantities. Round to the nearest hundredth, if necessary.

3. 2.5 liters \approx 0.66 gallon4. 430.6 centimeters \approx 169.5 inches

Determine each quotient.

5. $67.36 \div 3.2$ 6. $3401.74 \div 7.9$