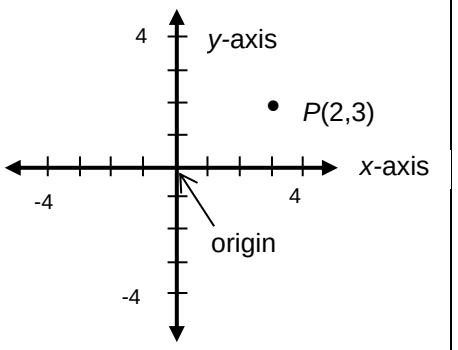
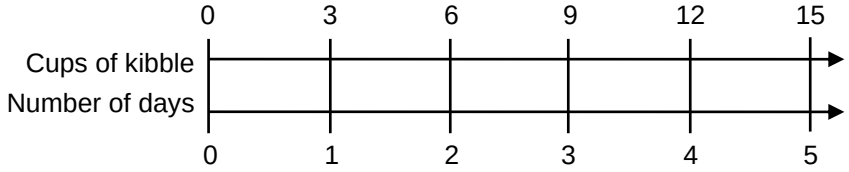
STUDENT RESOURCES

Word or Phrase	Definition
coefficient	A coefficient is a number or constant factor in a term of an algebraic expression. In the expression $3x + 5$, 3 is the coefficient of the term $3x$, and 5 is the constant term.
coordinate plane	A coordinate plane is a plane with two perpendicular number lines (coordinate axes) meeting at a point (the origin). Each point P of the coordinate plane corresponds to an ordered pair (a, b) of numbers, called the coordinates of P. The point P may be denoted $P(a, b)$. The coordinate axes are often referred to as the x-axis and the y-axis respectively. The origin has coordinates (0, 0). 
dependent variable	A dependent variable is a variable whose value is determined by the values of the independent variables. See independent variable.
double number line	A double number line is a diagram made up of two parallel number lines that visually depict the relative sizes of two quantities. Double number lines are often used when the two quantities have different units, such as miles and hours. The proportional relationship "Wrigley eats 3 cups of kibble per day" can be represented in the following double number line diagram. 
equation	An equation is a mathematical statement that asserts the equality of two expressions. $18 = 8 + 10$ is an equation that involves only numbers. This is a numerical equation. $18 = x + 10$ is an equation that involves numbers and a variable and $y = x + 10$ is an equation that involves a number and two variables. These are both algebraic (variable) equations.
expression	A mathematical expression is a combination of numbers, variables, and operation symbols. When values are assigned to the variables, an expression represents a number. Some mathematical expressions are 19, $7x$, $a + b$, $\frac{8 + x}{10}$, and $4v - w$.

<table>
<tr><th>Word or Phrase</th><th>Definition</th></tr>
<tr><td>independent variable</td><td>An <u>independent variable</u> is a variable whose value may be specified. Once specified, the values of the independent variables determine the values of the dependent variables.

For the equation $y = 3x$, y is the dependent variable and x is the independent variable. We may assign a value to x. The value assigned to x determines the value of y.</td></tr>
<tr><td>input-output rule</td><td>An <u>input-output rule</u> for a sequence of values is a rule that establishes explicitly an output value for each given input value.

<table>
<tr><td>input value (x)</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>x</td></tr>
<tr><td>output value (y)</td><td>1.5</td><td>3</td><td>4.5</td><td>6</td><td>7.5</td><td>1.5x</td></tr>
</table>
In the table above, the input-output rule could be $y = 1.5x$. In other words, to get the output value, multiply the input value by 1.5. If $x = 100$, then $y = 1.5(100) = 150$.</td></tr>
<tr><td>rate</td><td>See <u>unit rate</u>.</td></tr>
<tr><td>unit price</td><td>A <u>unit price</u> is a price for one unit of measure.

If 4 apples cost $1.00, then the unit price is $\frac{\$1.00}{4} = \$0.25$ for one apple, or 0.25 dollars per apple or 25 cents per apple.</td></tr>
<tr><td>unit rate</td><td>The <u>unit rate</u> associated with a ratio $a : b$ of two quantities a and b, $b \neq 0$, is the number $\frac{a}{b}$, to which units may be attached. This is sometimes referred to as the <u>value of the ratio</u>.

The ratio of 40 miles for every 5 hours has a unit rate of $\frac{40}{5} = 8$ miles per hour.</td></tr>
<tr><td>variable</td><td>A <u>variable</u> is a quantity whose value has not been specified. Variables are used in many different ways. They may refer to quantities that vary in a relationship (as in a formula or an input-output rule). They may refer to unknown quantities in expressions, equations, or inequalities. Finally, they may be used to generalize rules of arithmetic.

In the equation $d = rt$, the quantities d, r, and t are variables.
In the equation $2x = 10$, the variable x may be referred to as the unknown.
The equation $a + b = b + a$ generalizes the commutative property of addition for all numbers a and b.</td></tr>
</table>

The Coordinate Plane

A coordinate plane is determined by a horizontal number line (the *x*-axis) and a vertical number line (the *y*-axis) intersecting at the zero on each line. The point of intersection (0, 0) of the two lines is called the origin. Points are located using ordered pairs (*x*, *y*).

- The first number (*x*-coordinate) indicates how far the point is to the right of the *y*-axis.
- The second number (*y*-coordinate) indicates how far the point is above the *x*-axis.

Point, coordinates, and interpretation

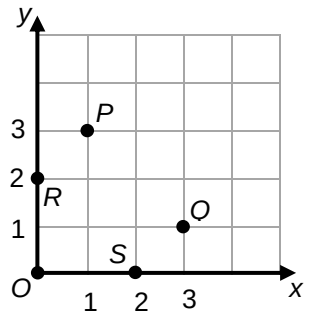
O (0, 0) → at the intersection of the axes

P (1, 3) → start at the origin, move 1 unit right, then 3 units up

Q (3, 1) → start at the origin, move 3 units right, then 1 unit up

R (0, 2) → start at the origin, move 0 units right, then 2 units up

S (2, 0) → start at the origin, move 2 units right, then 0 units up



Multiple Representations: Tables, Graphs, and Equations

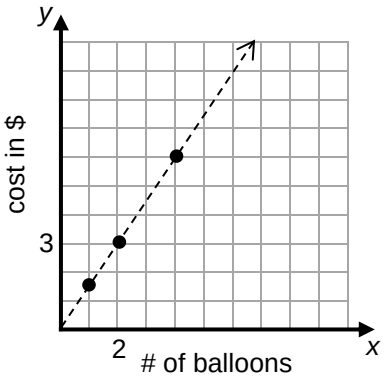
Suppose 4 balloons cost $6.00 and each balloon is the same price. Here are some representations for this relationship.

Table

Number of Balloons	Cost in $
4	6.00
2	3.00
1	1.50
8	12.00

Note that the unit price is $1.50 per balloon

Graph



Numbers of balloons must be discrete values (specifically, whole numbers), however a trend line may be drawn to show a growth pattern.

Equation (input-output rule)

Let *y* = cost in dollars and *x* = number of balloons.

We can see from the table that the unit price is 1.50 dollars per balloon.

It appears that multiplying any input value by 1.5 yields its corresponding output value.

Therefore, $y = 1.5x$.