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Lesson 3.3 Understanding Linear Equations with Two Variables

Express a linear relationship between two variables.

Example

a) Write a linear relationship between kilometers, k, and meters, n.

1 kilometer is 1,000 meters. So, a linear equation for n in terms of k is $n = 1{,}000k$.

b) A ball is dropped from the top of a building and the distance of the ball from the ground was measured. The results are shown in the following table. Write a linear equation for the relationship between the time, t, and the distance from the ground, d.

Time (t seconds)	0	1	2	3	4
Distance (d meters)	120	90	60	30	0

The height at which the ball is dropped is 120 meters. After that, the height from ground decreases by 30 meters for every second. Make a table of values of t and d.

t	d
0	$120 = 120 - 0 = 120 - 30 \cdot 0$
1	$90 = 120 - 30 = 120 - 30 \cdot 1$
2	$60 = 120 - 60 = 120 - 30 \cdot 2$
3	$30 = 120 - 90 = 120 - 30 \cdot 3$
4	$0 = 120 - 120 = 120 - 30 \cdot 4$

A linear equation for d in terms of t is $d = 120 - 30t$.

Complete.

1. Write a linear equation for the relationship between degree Celsius, T, and Kelvins, K.

1°C is _____ Kelvins. So a linear equation for K in terms of T is _____.

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Complete.

2. As a sandpit is being filled with sand, the height of the sand level in the pit was recorded. The results are shown in the table. Write a linear equation for the relationship between the time, *t*, and the height of the sand level, *s*.

Time (*t* minutes)	0	1	2	3	4
Height of Sand Level (*s* centimeters)	1	3	5	7	9

The initial height of the sand in the pit was _____ centimeters. The height of the sand level increases by _____ centimeters for every minute.

t	***s***
0	_____ = _____ + _____ = _____ + _____ · _____
1	_____ = _____ + _____ = _____ + _____ · _____
2	_____ = _____ + _____ = _____ + _____ · _____
3	_____ = _____ + _____ = _____ + _____ · _____
4	_____ = _____ + _____ = _____ + _____ · _____

A linear equation for *s* in terms of *t* is _____.

Solve. Show your work.

3. Write a linear equation for the relationship between liters, *L*, and cubic centimeters, *b*.

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Solve. Show your work.

4. Drip coffee is collected by dripping water from a container on ground coffee and collecting the filtrate. The table shows the volume of water left in the container after making drip coffee for *t* minutes. Write a linear equation for the relationship between the time, *t*, and the volume of the water remaining, *V*.

Time (*t* minutes)	0	1	2	3	4
Volume of water remaining (*V* cm^3)	50	48	46	44	42

Evaluate linear equations with two variables.

Example

Find the value of y when $x = 10$ in each of the equations.

a) $7y + 3x = 5$

$7y + 4(10) = 5$	Substitute $x = 10$.
$7y + 40 = 5$	Simplify.
$7y + 40 - 40 = 5 - 40$	Subtract 40 from both sides.
$7y = -35$	Simplify.
$\frac{7y}{7} = \frac{-35}{7}$	Divide both sides by 7.
$y = -5$	Simplify.

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b) $2y = \frac{x-1}{3}$

$2y = \frac{10-1}{3}$	Substitute $x = 10$.
$2y = \frac{9}{3}$	Simplify.
$2y = 3$	Simplify.
$\frac{2y}{2} = \frac{3}{2}$	Divide both sides by 2.
$y = 1\frac{1}{2}$	Simplify. Express the value of y as a mixed number.

Complete.

5. Find the value of y when $x = -2$ in the equation $\frac{1}{2}y = 4 - x$.

$\frac{1}{2}y = 4 - x$

_____ = _____ − _____ Substitute $x =$ _____.

_____ = _____ + _____ Use the distributive property. Simplify.

_____ · _____ = _____ · _____ Multiply on both sides by _____.

$y =$ _____ Simplify.

Find the value of y when $x = 3$.

6. $6y - \frac{1}{3}x + 11 = 0$

7. $y = \frac{2x+8}{5}$