



Student Instruction Sheet: Unit 2, Lesson 1

Equations of Lines

Suggested Time: 75 minutes

What's important in this lesson:

In this lesson, you will learn how to write the equation of a line in the form $y = mx + b$.

Complete the following steps:

1. Read through the lesson portion of the package on your own.
2. Complete the exercises.
3. Check your answers with the Answer Key that your teacher has.
4. Seek assistance from the teacher as required.
5. Complete the Assessment and Evaluation and hand it in. Be sure to ask the teacher for assistance if you are having difficulty.

Hand in the following:

1. Student Handout
2. Assessment and Evaluation

Questions for the teacher:



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Topic 1: The Form of a Linear Equation

All linear equations can be written in the form $y = mx + b$, where m is the slope and b is the y -intercept.

Slope can be found by dividing *rise* by *run*. Rise is the difference in the y values. Run is the difference in the x values. The y -intercept is the y -coordinate of the point where the line crosses the y -axis.

To find the y -intercept, we can always substitute $x = 0$ into the equation. It is easy to find the slope from a table of values **if the points are equally spaced**.

1. Find the linear equation:

Difference in x Values	x	y	Difference in y Values
$(0 - (-1)) = 1$	-1	3	$(6 - 3) = 3$
$(1 - 0) = 1$	0	6	$(9 - 6) = 3$
$(2 - 1) = 1$	1	9	$(12 - 9) = 3$
	2	12	

Table 1

2. Find the linear equation:

Difference in x Values	x	y	Difference in y Values
	-4	0	
2			-1
	-2	-1	
2			-1
	0	-2	
2			-1
	2	-3	

Table 2

Slope: $m = \frac{\text{difference in } y}{\text{difference in } x}$

$$= 3/1$$

$$= 3$$

y -intercept: when $x = 0$, $y = 6$
so in equation $b = 6$

\therefore the equation is: $y = 3x + 6$

Slope: $m = \frac{\text{difference in } y}{\text{difference in } x}$

$$= -1/2$$

y -intercept: when $x = 0$, $y = -2$
so in equation $b = -2$

\therefore the equation is: $y = -\frac{1}{2}x - 2$

In these first two examples, the y -intercept was easy to find because we had $x = 0$ in both tables.



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3. Find the linear equation:

Difference in x Values	x	y	Difference in y Values
2	1	2	2
	3	4	
	5	6	
	7	8	

Table 3

Remember:

The equation of a linear relation is

$$y = mx + b$$

where m is the slope and
 b is the y-intercept

Slope: $m = \frac{\text{difference in } y}{\text{difference in } x}$

$$= \frac{2}{2}$$
$$= 1$$

In the third example, $x = 0$ is not in the table, so you will have to *work* to find the y-intercept.

If we continue the pattern, we can find the point $x = -1, y = 0$ by taking one more difference at the beginning of the table. This gets us closer, but we still don't know the value when $x = 0$.

If we notice that $x = 0$ is halfway between $x = -1$ and $x = 1$, then we can go halfway between $y = 0$ and $y = 2$ to get our y-intercept of $y = 1$.

\therefore the equation is: $y = x + 1$

After you find an equation from a table, always substitute a few points from the table into your equation to make sure that it works!



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You try: Find the differences, to get the linear equation for each chart:

[a]

Difference in x Values	x	y	Difference in y Values
	-2	1	
	0	2	
	2	3	
	4	4	

[b]

Difference in x Values	x	y	Difference in y Values
	0	2	
	1	2	
	2	2	
	3	2	

[c]

Difference in x Values	x	y	Difference in y Values
	1	-1	
	2	2	
	3	5	
	4	8	

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Topic 2: Translating from Written Descriptions

Express each sentence as a mathematical equation.

Examples:

1. Dwayne earns \$100 per week, plus 10% of his sales

$$E = 100 + .10x$$

where the variables are defined as
E is his weekly earnings and x is the value of his sales.

2. The cost of a movie is twice the cost of an album.

$$m = 2a$$

where m represents the cost of a movie and
a represents the cost of an album.

Write an equation, and define the variables as shown above.

1. A hall charges a base rate of \$60, plus \$15 per person.

2. Shaneen has 50 comic books, and she increases her collection by 3 books per week.

Write a sentence that matches each linear equation ($y = mx + b$).

Examples:

1. $y = 0.05x + 200$, where x is the total value of sales and y is the weekly salary.

“The weekly salary is 5% of the total value of sales, plus \$200.”

2. $y = \$1.25x + 20$, where y is the value of a baseball card and x is the number of months it is kept.

“The value of the baseball card starts at \$20 and increases by \$1.25 per month.”



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You try: Write a sentence to match each equation.

1. $C = 0.10x + 35$, where C is the total cost of owning a cellphone and x is the number of minutes.

2. $P = 8.25x$, where P is the profit in dollars and x is the number of people attending.



Assessment and Evaluation: Unit 2, Lesson 1

1. A long-distance carrier charges \$1.20 for a 10-minute call, \$1.80 for a 15-minute call, and \$2.40 for a 20-minute call.

[a] Put these values into a table. x is the number of minutes a call lasts, and C is the cost of the call.

x	C
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[b] Write an equation that relates x , the number of minutes a call lasts, to C , the cost of the call.

[c] What does the **slope** of the equation represent?

[d] What is the value of the C -intercept? What is the meaning of the intercept?

[e] Use your equation to predict the charge for a 40-minute call.



Assessment and Evaluation: Unit 2, Lesson 1

2. The Students' Council is organizing a dance. The profit from the dance is related to the number of tickets sold. The relation of the profit, P dollars, to the number of tickets sold, T , is given by the equation:

$P = 5T - 1000$, The “ $- 1000$ ” in the equation represents fixed costs of \$1000 for the DJ.

[a] Write a sentence to match the equation, and expresses the relationship between the profit and the number of tickets sold.

[b] What will the profit be if 450 people attend? (Use the equation!)

[c] How many tickets need to be sold to make a profit of \$500?

[d] How many tickets must be sold for the Students' Council to break even? (“break even” means that all costs are covered, but the profit is \$0.)

[e] Rewrite the equation to show what would happen if the price per person changed to \$6.

[f] Rewrite the original equation to show what would happen if the fixed costs were reduced to \$500.