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 these steps:

1. Read through the lesson portion of the package independently.
2. Complete any of the examples in the lesson.
3. Check your lesson answer with the lesson key your teacher has.
4. Seek assistance from the teacher as needed. If you have any questions about the examples.
5. Complete the 'Assessment and Evaluation' and hand-in for evaluation. Be sure to ask the teacher for any assistance when you are experiencing any difficulty.

Hand-in the following to your teacher:

1. The 'Student Handout'.
2. Assessment and Evaluation

Questions for the teacher:

Student Handout: Unit 2 Lesson 1

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 <u>if the points are equally spaced</u>.

Difference in x values	x	y	Difference in y values
	-1	3	
(0–(-1))=1			(6 – 3) = 3
	0	6	
(1 – 0)=1			(9 – 6) = 3
	1	9	
(2 –1)= 1			(12 – 9)= 3
	2	12	

Table 1

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

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

Table 3

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

$= \dfrac{3}{1}$

$= 3$

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

$= \dfrac{-1}{2}$

$= \dfrac{-1}{2}$

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

$= \dfrac{2}{2}$

$= 1$

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

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

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

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

In the first two examples above, the y-intercept was easy to find as we had x=0 in both tables of values.

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

Student Handout: Unit 2 Lesson 1

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 for $x = 0$.
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 $y = 1$.

The final example must have an equation of $y = x + 1$.

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!

Find the differences to get the equation for each chart.

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

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

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

Student Handout: Unit 2 Lesson 1

Translating from written descriptions

Express each sentence as a mathematical equation.

Examples:

1. Daren earns $100 per week plus 10% of his sales

   $E = 100 + 0.1x$ where E is his weekly earnings and x is the value of his sales

2. The cost of a compact disc is twice the cost of a tape

   $c = 2t$ where c represents the cost of a c.d. and t represents the cost of a tape

Write an equation and define the variables as shown above.

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

2. John has 50 comic books and he increases his collection by 3 books per week.

Write a sentence that matches a mathematical equation i.e. 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 his 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".

1. To run a 30 second ad, a radio station charges a fixed cost of $400, plus $200 for each day the ad is run.
   a. Write the partial variation equation to show the cost of the ad in terms of the number of days it is run.

   b. For how many days could a company run the ad if the company could afford to spend $1000?

   c. How would the equation from part a change if the fixed cost was changed to $300 but the cost per day remained at $200?

   d. How would the equation from part a change if the fixed cost remained at $400 but the cost per day was changed to $400?

2. Samantha works in a computer store. She earns $300/week, plus a commission of 10% of her sales.
   a. Write a partial variation equation to describe her earnings for one week.

   b. Find Samantha's earnings for a week in which her sales totalled $6500.

   c. If Samantha wants to earn $825 a week, what must her sales be?

3. There is a fixed cost of $500 to write and design an advertising flyer. It costs $0.15 to print a flyer.
   a. Write a partial variation equation that relates the total cost to the number of flyers printed.

   b. Find the total cost of producing 60 000 flyers

   c. How many flyers can be produced for a total cost of $ 12 500?

Real World Applications of Slope and Y-intercept

Complete the following table for each equation given.

Equation	Slope Rate of Change	Real Context for Slope	y-intercept Initial Value	Real context for y-intercept	Real context equation
C = 2.5k + 5 Cab Ride	2.5	$2.50/km	5	$5 starting fee	The cost of a cab ride is $2.50 per km with a flat rate of $5
C = 2m + 17 Cell phone Costs					
B = 250 – 10w Weekly Bank Account Balance					
C = 6 + 0.2w Newspaper Advertising Costs					
B = 100m + 2000 Monthly Bank Account Balance					
C = 75p Banquet Costs					

Assessment and Evaluation: Unit 2 Lesson 1

1. The table below shows the cost for a pizza at Pete's Pizza Parlour.

# of Toppings	Cost
0	9.50
1	10.00
2	10.50
3	11.00

a) Write an equation that relates the cost of a pizza to the number of toppings.

b) Use your equation to find the cost of a pizza with 8 toppings. Show your work.

c) If you pay $12.50 how many toppings can you get on your pizza? Show your work.

2. The Athletic Council is holding a banquet. The cost is $450 plus $8 per person.

a) Write an equation that relates the cost of the banquet to the number of people who attend.

b) What is the cost if 120 people attend the banquet? Show your work.

c) If they spent $1250 on the banquet how many people attended? Show your work.

d) Rewrite the equation to show what would happen if the price per person changed to $5.