Part 2

The first year a soccer camp was offered, 44 girls and 56 boys enrolled. From then on, each year 5 more girls enrolled and 4 boys enrolled. Let t represent the number of years since the camp opened.

Write a rule for the number of girls enrolled as a function of time:

$g(t) =$ $44 + 5t$

Write a rule for the number of boys enrolled as a function of time:

$b(t) =$ $56 + 4t$

Write a rule for the total enrollment as a function of time. EXPLAIN HOW YOU GOT IT.

$T(t) =$ $g(t) + b(t) = 44 + 5t + 56 + 4t = 100 + 9t$

$\boxed{T(t) = 100 + 9t}$

Just like numbers can be added/subtracted/multiplied/divided, so can functions. A new function is created.

Ex 5;

Given: $f(x) = 3x - 1$, $g(x) = -2x - 2$, find...

SUBTRACT: SWITCH SIGNS

a. $h(x) = f(x) + g(x)$

$h(x) = 3x - 1 + -2x - 2$

$1x - 3$

$\boxed{h(x) = 1x - 3}$

b. $h(x) = f(x) - g(x)$

$3x - 1 - (-2x - 2)$

$h(x) = 3x - 1 + 2x + 2$

$\boxed{h(x) = 5x + 1}$

c. $h(x) = f(x) \cdot g(x)$

$h(x) = (3x - 1) \cdot (-2x - 2)$

	$3x$	-1
$-2x$	$-6x^2$	$+2x$
-2	$-6x$	$+2$

$\boxed{-6x^2 - 4x + 2 = h(x)}$

Ex 6:

Given: $f(x) = x^2 + 2x - 15$, $g(x) = x^2 - 9$, find...

d. $h(x) = f(x) + g(x)$

$h(x)$

$= x^2 + 2x - 15 + x^2 - 9$

$= 2x^2 + 2x - 24$

$\boxed{h(x) = 2x^2 + 2x - 24}$

b. $h(x) = f(x) - g(x)$

$\downarrow$

$x^2 + 2x - 15 - (x^2 - 9)$

$h(x) = \cancel{x^2} + 2x - 15 + \cancel{-x^2} + 9$

$\boxed{2x - 6 = h(x)}$

c. $h(x) = \frac{f(x)}{g(x)}$

$h(x) = \dfrac{x^2 + 2x - 15}{x^2 - 9}$

FACTOR FIRST!

difference of two squares!

	-15	
$+5$		-3
	2	

$\dfrac{(x+5)\cdot\cancel{(x-3)}}{\cancel{(x-3)}\cdot(x+3)}$

$\boxed{h(x) = \dfrac{x+5}{x+3}}$

Exit Ticket:

Summarize the different things you can do with a function.

Algebra 1: Unit 5 Notes

Lesson 3 Notes: Piecewise Functions

Part 1: Introduction

1. For each stretch, determine the distance traveled. Then assess how many total miles you traveled during each stretch.

2. Label your dependent and independent variables on the coordinate plane.
   - Independent variable: Time (hours)
   - Dependent variable: Distance (miles)

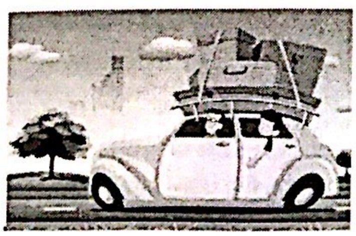
3. Using the given the information from your table, graph the total distance traveled after each leg.

4. Why doesn't this look like a continuous pattern?

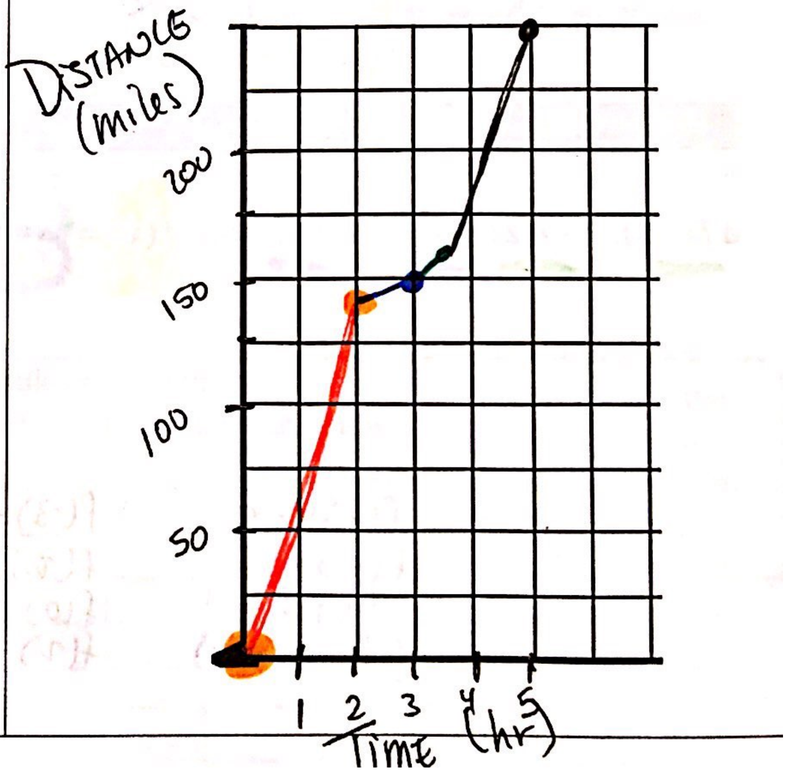
   Because the traffic prevented us from moving at a constant rate.

For the Thanksgiving holiday, you are driving to the Los Angeles area. The traffic was not pretty. Here's how it broke down:

- **Stretch 1:** *For the first two hours from here to Santa Barbara, the traffic was fine. You drove 70 miles/hour.*
- **Stretch 2:** *Once you hit Santa Barbara, however, the traffic was terrible. You averaged 10 miles/hour for the next hour.*
- **Stretch 3:** *The next stretch from Santa Barbara to Ventura was an improvement, but not loads better. You averaged 20 miles/hour for the next half hour.*
- **Stretch 4:** *Finally, in Ventura you jumped on the 126 to the 5 and then to the 210, and were able to average 60 miles/hour for the next hour and a half.*
- *You pulled up to Grandma's.*



	m.p.h r · Rate	hours t = Time	D Distance	Total miles traveled from home
Stretch 1	70 ·	2 =	140	140
Stretch 2	10 ·	1 =	10	150
Stretch 3	20 ·	0.5 =	10	160
Stretch 4	60 ·	1.5 =	90	250



Part 2: Evaluating Piecewise Functions

- Because there are different rules for different parts of the domain, this function is called A piecewise function.
- Each piece of the function has its own rule, depending on its domain.
- In our trip to Grandma's example....

	Write the expression you used to find the distance traveled for this stretch. Use x for time.	For what values in the domain was this expression used in your graph?
Stretch 1	$f(x) = 70 \cdot x$	$0 \leq x \leq 2$
Stretch 2	$f(x) = 10x$	$2 < x \leq 3$
Stretch 3	$f(x) = 20x$	$3 < x \leq 3.5$
Stretch 4	$f(x) = 60x$	$3.5 < x \leq 5$

- Formally, this is expressed like so, since all three parts are used to build the piecewise function that represents this situation:

$$f(x) = \begin{cases} 70x & \text{if } 0 \leq x \leq 2 \\ 10x & \text{if } 2 < x \leq 3 \\ 20x & \text{if } 3 < x \leq 3.5 \\ 60x & \text{if } 3.5 < x \leq 5 \end{cases}$$

How to evaluate piecewise functions for the given values

Ex 1:

Find $f(-3), f(-0.2), f(0), and\ f(2)\ for\ f(x) = \begin{cases} -x & \text{if } x < 0 \\ x+1 & \text{if } x \geq 0 \end{cases}$

	Based on its domain, which rule will it follow?	Evaluate that value in the function.
$f(-3)$	$f(x) = -x$	$f(-3) = -{-3} = 3$
$f(-0.2)$	$f(x) = -x$	$f(-0.2) = -{-0.2} = 0.2$
$f(0)$	$f(x) = x+1$	$f(0) = 0+1 = 1$
$f(2)$	$f(x) = x+1$	$f(2) = 2+1 = 3$

1. For each evaluation, it needs to be determined which function it specifically follows.
2. Look at the x-value in the parentheses to determine which rule it follows.
3. Then see which domain it fits into for the piecewise function.
4. Evaluate for the designated function.

Ex 2: Find $f(-2), f(-0.4), f(\underline{3.7}),$ *and* $f(5)$ *for* $f(x) = \begin{cases} -x & \text{if } x < 2 \\ 2x+3 & \text{if } 2 \le x < 4 \\ x^2 & \text{if } x \ge 4 \end{cases}$

x	Based on its domain, which rule will it follow	Evaluate $f(x)$	$f(x) =$
-2	$f(x) = -x$	$f(-2) = - {}^{-}2$	2
-0.4		$f(-0.4) = - {}^{-}0.4$	0.4
3.7	$f(x) = 2x+3$	$f(3.7) = 2(3.7)+3$	10.4
5	$f(x) = x^2$	$f(5) = 5^2$	25

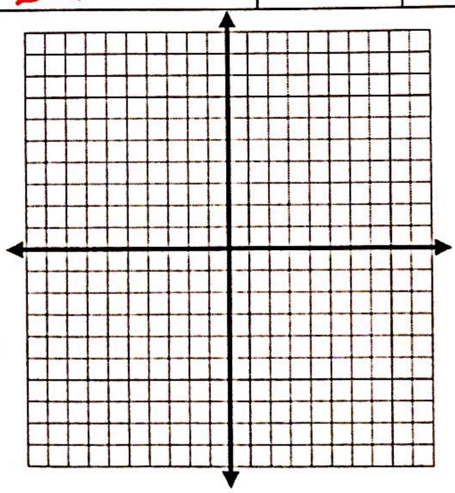
Part 3: Graphing piecewise functions

Likewise, by paying attention to the domain, the graphs of piecewise functions can also be plotted according to the different functions that define them.

Ex 3:

$$f(x) = \begin{cases} -x & \text{if } x < 0 \\ x+1 & \text{if } x \ge 0 \end{cases}$$

x	Evaluate $f(x)$	$f(x)$	Ordered Pair
-2	$f(-2) = - {}^{-}2$	2	(-2, 2)
-1	$f(-1) = - {}^{-}1$	1	(-1, 1)
$\underline{0}$	$f(0) = 0+1$	1	(0, 1)
1	$f(1) = 1+1$	2	(1, 2)
2	$f(2) = 2+1$	3	(1, 3)



How to graph a piecewise function

1. Make a table of values. Make sure the boundary points are evaluated for each function.
2. Evaluate the piecewise function for each input; record as an ordered pair.
3. Plot the points on a coordinate plane. Connect the values from the same functions.
4. Between the different functions, be very aware of the domain. If the inequality sign is a greater than or less than and the point plotted is an end point, that point is ***open.*** If the inequality sign is a greater than or equal to (or less than or equal to), and it's on an end point, that end point is ***closed***