What is Zero All About?

Examining Fractions Numerically and Graphically

What happens to a fraction when there is a zero in the numerator? What about in the denominator?

A. On your calculator, use the fraction template to calculate the values of these fractions:

- TI-84+: use **ALPHA-XTθn** or **ALPHA-Y=** for fraction template. Set **MODE** to DEC for decimal values.
- TI-Nspire: use **ctrl-divide** for fraction template. **Use ctrl-enter (≈)** for decimal values.

$\frac{4}{5}$	$\frac{2}{5}$	$\frac{1}{5}$	$\frac{0}{5}$
$\frac{5}{1}$	$\frac{5}{0.1}$	$\frac{5}{0.001}$	$\frac{5}{0}$

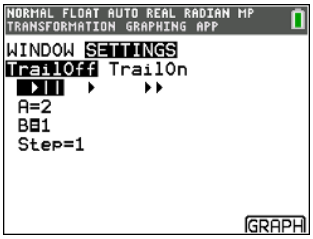
1. What do you notice about your results?

2. What happens in the second row as the denominator gets smaller?

3. Try some other fractions. What happens if the denominator is constant and the numerator increases?

B. Let's examine a fraction graphically using slope.

- TI-84+: open Transformation Graphing **APP**. The slope will be represented by $\frac{a}{b}$ since parameters can only be a, b, c, or d.
  - Select **WINDOW>ZoomDecimal**.
  - In **WINDOW>Settings** set A=2, B=1 and Step=1 as shown ---->
  - If you have color screen (TI-84+C or TI-84+CE) set **2nd > Format > Gridline**
  - Enter Y1 = $\frac{a}{b} \cdot x$ and view the graph.
- TI-Nspire: open the file *Slope Fractions*. The slope will be represented by $\frac{n}{d}$.
  - The function *f1(x)* = $\frac{n}{d} \cdot x$ is already entered on the graph page.



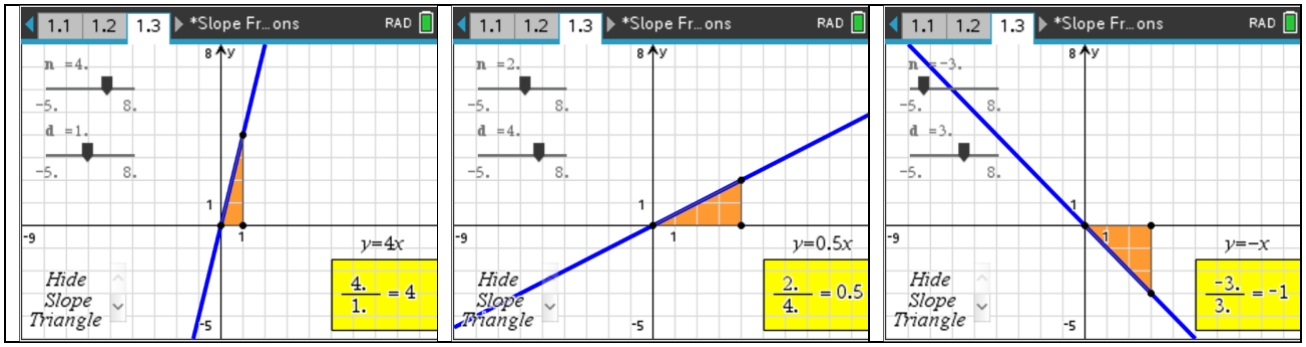
4. Begin with slope of $\frac{2}{1}$ and increase the numerator. What do you observe (make a sketch if desired)?

5. What happens when the numerator = 0?

6. Reset the numerator = 2 and adjust the denominator. What happens to the slope as the denominator increases? What happens to the slope as the denominator decreases?

7. What do you observe when the denominator = 0?

8. (*TI-Nspire only*) Show the slope triangle & explore. How is the slope triangle related to the fraction?
(*TI-84+*) Use these screen images below to explain how the slope triangle is related to the fraction.



9. Can the equation of the line be put into slope-intercept form when the numerator of the slope = 0? When the denominator of the slope = 0?

10. Are there other forms of the equation that you could use instead if slope-intercept form doesn't work? Explain your thinking.

11. Fill in the following sentence frames:

A _____ line has slope = _____ and equation _____

A _____ line has slope = _____ and equation _____

When the _____ = 0, the slope = _____.

When the _____ = 0, the slope = _____.

12. *Notes to my future self*:
What do you want to remember about fractions containing zeros and graphs of different types of lines?