Which Is Greater?

You will need: a graphing calculator (TI-83 or TI-84), a way to generate random numbers

Evaluating Functions

Definition: A function is a rule that assigns a single output to each input.

Here are some examples of functions, where inputs and outputs are real numbers:
  a. $y = 2x - 3$
  b. $y = .5x + 1.5$
  c. $y = \dfrac{(x-4)(x+5)+6}{4}$

In these examples, x is the input, and y is the output. To find y, you "plug in" a value for x into the formula, and calculate. This is called *evaluating* a function.

1. If the input is 1, find the output for each function above. In other words, if x is 1, what is y?

You can use the calculator to answer questions of this type. For example, enter 2(1) – 3, then press ENTER.

Another approach is to enter the functions into the calculator:

2. Press Y=. You will see Y1=, Y2=, etc. Enter our three functions, each in its own line. To enter the fraction, you should put the whole numerator in parentheses, like this: ((x–4)(x+5)+6)/4

```
Plot1 Plot2 Plot3
\Y1◼2X-3
\Y2◼.5X+1.5
\Y3◼((X-4)(X+5)+
6)/4
\Y4=■
\Y5=
\Y6=
```

3. Press 2nd QUIT to return to the home screen.

To evaluate the functions for x = 1, you need to enter Y1(1) on the home screen, and press ENTER, Y2(1) and press ENTER, etc. To get Y1, Y2, etc., press VARS, ▷ (to highlight Y-VARS, which is short for Y variables), ENTER, and choose one of Y1, Y2, etc.

4. Use this method to check your answers to #1.

A Game

Work with a partner. Each one of you should choose a function among the three suggested above.
   Your function: Your partner's function:

To play the game:
  – Pick a random x such that $0 \le x \le 9$
  – Evaluate your function for this x (pressing 2nd ENTRY saves you from having to go back to Y-VARS.)
  – The winner is the player who gets the higher value

5. Play ten rounds of "Which is Greater?", keeping score.

6. Play another game of ten rounds, using a random x such that $-9 \le x \le 9$

To enter negative numbers into the calculator, you must use the $\boxed{(-)}$ key (opposite), not the $\boxed{-}$ key (subtraction).

7. Is it possible for both players to get the same output from the same input? How?

8. Is the game fair, or does one player tend to win much more often? Why? Analyze the game.

Using Tables

To investigate the fairness of the game, you can use the table feature of the calculator.
–   Press $\boxed{2nd}$ TBLSET

```
TABLE SETUP
 TblStart=-9
 ΔTbl=1
Indent: Auto  Ask
Depend: Auto  Ask
```

–   Press $\boxed{2nd}$ TABLE

Using Graphs

Another way to analyze the game is to look at a graph of the functions.
–   Press $\boxed{WINDOW}$
–   Enter these values:

```
WINDOW
 Xmin=-9.4
 Xmax=9.4
 Xscl=1
 Ymin=-6.2
 Ymax=6.2
 Yscl=1
 Xres=1
```

–   Press $\boxed{GRAPH}$

Turning Functions On and Off

If you want to not look at the table or graph of a given function, you can turn it off without deleting it. Press $\boxed{Y=}$. Move the flashing cursor onto the = sign of the function you want to turn off, and press $\boxed{ENTER}$. To turn it back on, press $\boxed{ENTER}$ again.

Creating Games

9. Create two functions that make a fair game.