



ALGEBRA I ACTIVITY 5: A BOOLEAN LOOK AT INEQUALITIES

ACTIVITY OVERVIEW:

In this activity we will

- Use simple Boolean algebra to determine if a coordinate pair satisfies an inequality
- Extend the use of Boolean algebra to determine when one curve is greater than another in a system of inequalities

Consider the inequality $-4x + 2y > 5$. To quickly determine if the coordinate pair $(1/2, 7/2)$ satisfies this inequality, use a Boolean test on the home screen. Begin by substituting $1/2$ for x and $7/2$ for y as shown. Do not press **ENTER**.

$-4(1/2)+2(7/2)$ ■

Press **2nd****MATH** to access the Test menu. Select **3**:>.

TEST LOGIC
1: =
2: ≠
3: >
4: ≥
5: <
6: ≤

Complete the inequality as shown.

$-4(1/2)+2(7/2)>5$

Press **ENTER**. A return value of 0 indicates that the coordinate pair $(1/2, 7/2)$ does NOT satisfy the inequality.

$-4(1/2)+2(7/2)>5$
0

Try another coordinate pair (1/2, 5). Press $\boxed{2\text{nd}}\boxed{\text{ENTER}}$ to recall the statement. Use the back arrow to change 7/2 to 5 by typing over and using $\boxed{\text{DEL}}$.

$$-4(1/2)+2(5)>5$$

Press $\boxed{\text{ENTER}}$. A return value of 1 indicates that the coordinate pair (1/2, 5) DOES satisfy the inequality.

$$-4(1/2)+2(5)>5 \quad 1$$

Consider a system of inequalities such as, when is $x-1>2x+5$. One method for examining this situation would be to enter both expressions in the Y= register to examine the table. Press $\boxed{\text{Y=}}$ and enter them as shown.

```

Plot1 Plot2 Plot3
Y1 X-1
Y2 2X+5
Y3 =
Y4 =
Y5 =
Y6 =
Y7 =

```

Press $\boxed{2\text{nd}}\boxed{\text{GRAPH}}$. Examine the table. Scroll to find where Y_1 is greater than Y_2 . What information does this tell you?

X	Y1	Y2
-10	-10	-13
-9	-9	-11
-8	-8	-9
-7	-7	-7
-6	-6	-5
-5	-5	-3
-4	-4	-1
-3	-3	1

X = -9

Now take a Boolean look at the same problem. Return to $\boxed{\text{Y=}}$ and clear Y_2 . Arrow up next to the first expression.

```

Plot1 Plot2 Plot3
Y1 X-1
Y2 =
Y3 =
Y4 =
Y5 =
Y6 =
Y7 =

```

Press $\boxed{2\text{nd}}\boxed{\text{MATH}}$ to access the Test menu. Select $\boxed{3}>$.

```

TEST LOGIC
1: =
2: >
3: <
4: >=
5: <=
6: <>
7: <= >=
8: <>

```

Complete the statement as shown.

```

Plot1 Plot2 Plot3
\Y1  X-1 > 2X+5
\Y2 =
\Y3 =
\Y4 =
\Y5 =
\Y6 =
\Y7 =
    
```

Press **2nd****GRAPH**. Examine the table. A Y_1 value of 0 means that the first expression does NOT have a higher value. A Y_1 value of 1 means that the first expression DOES have a higher value. What information does this table show?

X	Y1	
-9	1	
-8	1	
-7	1	
-6	0	
-5	0	
-4	0	
-3	0	

X = -9

Focus in on a smaller section of the table between the values of -6 and -7 where the Boolean test changes from false to true. Press **2nd****WINDOW** to access the TABLE SETUP menu. Set the starting value at -7 and the change in the table as 0.1 as shown.

```

TABLE SETUP
TblStart = -7
ΔTbl = .1
Indent:  Ask
Depend:  Ask
    
```

Press **2nd****GRAPH**. Examine the table. What information does this table show?

X	Y1	
-6.5	1	
-6.4	1	
-6.3	1	
-6.2	1	
-6.1	1	
-6	0	
-5.9	0	

X = -5.9