Name ____________________ Date ____________

CHAPTER 5 Graphing Calculators and Logic

A graphing calculator can be used to test whether or not a mathematical statement containing equalities, inequalities, and logical connectors is true.

The TEST menu on a graphing calculator contains the functions $=$, $\neq$, $>$, $\geq$, $<$, and $\leq$. Example 1 shows how to test and interpret the results of these functions.

EXAMPLE 1 Test equalities and inequalities

Use a graphing calculator to determine whether each statement is true or false.

a. $\frac{6}{8} = \frac{8}{12}$ **b.** $-5 \cdot (3 + 1) < -16 \div (6 - 2)$

Solution:

a. Enter this sequence into the calculator: $6 \div 8$ 2nd TEST $= 8 \div 12$ ENTER

The output shows 0. This means the statement is false.

b. Enter this sequence into the calculator:

$-5 \cdot (3 + 1)$ 2nd TEST $< -16 \div (6 - 2)$ ENTER

The output shows 1. This means the statement is true. ■

Logical connectors for *and*, the inclusive or (*or*), and the exclusive or (*xor*) are featured in the LOGIC menu within the TEST menu.

EXAMPLE 2 Test logic statements

Use a graphing calculator to determine whether each statement is true or false.

a. $-8 \div -4 \neq -2$ *and* $5 + 8 < 15 - 3$ **b.** $5 + (-9) \geq 0$ *or* $-3 \cdot -3 > -3 \cdot 3$

c. $6 > -2 - (-5)$ *xor* $3 \cdot 2 = 30 \div 5$

Solution:

a. $-8 \div -4$ 2nd TEST $\neq -2$ 2nd TEST LOGIC *and*

$5 + 8$ 2nd TEST $< 15 - 3$ ENTER

The output shows 0. This means the statement is false. Although the first part of this statement is true, the second part is not. With *and* statements, both parts need to be true. Otherwise, the entire statement is false.

b. $5 + (-9)$ 2nd TEST ≥ 0 2nd TEST LOGIC *or*

$-3 \cdot -3$ 2nd TEST $> -3 \cdot 3$ ENTER

The output shows 1. The statement is true. Only one part of an *or* statement needs to be true for the entire statement to be true.

c. 6 2nd TEST $> -2 - (-5)$ 2nd TEST LOGIC *xor*

$3 \cdot 2$ 2nd TEST $= 30 \div 5$ ENTER

The output shows 0. The statement is false. With *exclusive or* statements, only one part, *not* both parts, must be true for the entire statement to be true. Here both parts are true, so the entire statement is false. ■

Name ______________________ Date ____________

CHAPTER 5

Graphing Calculators and Logic *continued*

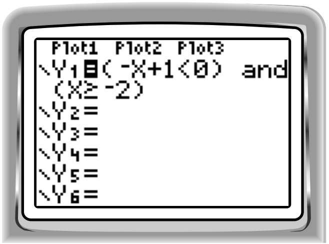
You can also use the TABLE feature of a graphing calculator to test different values of a variable in an algebraic statement.

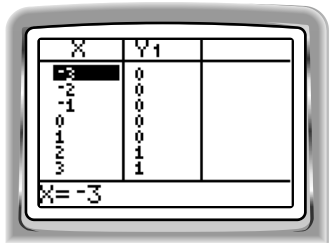
EXAMPLE 3 Test logic connectors on algebraic statements

Use a graphing calculator to determine whether $-x + 1 < 0$ *and* $x \geq -2$ is true or false for $x = -3, -2, -1, 0, 1, 2, 3$.

Solution:

In the Y= screen, enter the algebraic statement for Y_1 as shown below on the left. Then set the table to evaluate $x = -3, -2, -1, 0, 1, 2, 3$ and press 2nd TABLE to get the get the screen shown below on the right.





This shows that the statement is true for $x = 2, 3$, but false for $x = -3, -2, -1, 0, 1$. ■

Practice

Use a graphing calculator to determine whether each statement is true or false.

1. $1.5 \cdot 6 \neq 9$ **2.** $13 - (-4) < 8$ **3.** $64 \div 6 \geq 50 \div 4$ **4.** $8 = 4 + 2 \cdot 2$

Use a graphing calculator to determine whether each logic statement is true or false.

5. $6 - 2 < -5$ *or* $4 \div 2 \neq -3 - (-5)$

6. $11 > -2 + 14$ *xor* $-4 \cdot -6 \leq -24$

7. $5 \div 2 \cdot 4 = 10$ *and* $3 - (-4 \cdot -1) = -1$

8. $1 - 3 \cdot 4 \geq -7 - 8$ *and* $20 \div 4 < 0.5 \div 0.1$

9. $1 - 8 \leq -2 \div 2$ *xor* $3 + 2 \neq 10 \div 5$

10. $5 + 3 \leq -12 \div -4$ *or* $8 \cdot 2 = 7 - (1 - 10)$

Use a graphing calculator to determine whether each algebraic statement is true or false for the given values.

11. $7 - x < -2$ *and* $5 \geq 10x$ for $x = -3, -2, -1, 0, 1, 2, 3$

12. $4x + 2 = -10$ *or* $3x > -6$ for $x = -3, -2, -1, 0, 1, 2, 3$

13. $9 < 3x + 12$ *or* $-2x \neq 4$ for $x = -3, -2, -1, 0, 1, 2, 3$

14. $x + 1 \leq 0$ *xor* $21 \geq 8x - 5$ for $x = -1, 0, 1, 2, 3, 4, 5$

15. $3 \div 5 < 2x$ *and* $3 - x = 2x$ for $x = -1, 0, 1, 2, 3, 4, 5$

16. $x - (-3) \neq 5$ *xor* $x \div 2 < -1$ for $x = -3, -2, -1, 0, 1, 2, 3$