

Logical Operators Worksheet

If $x = -2$, $y = 5$, $z = 0$, and $t = -4$, what is the value of each of the following logical expressions?

- $x + y < z + 1$ false
- $x - 2 * y + y < z * 2 / 3$ true
- $3 * y / 4 < 8 \ \&\& \ y \geq 4$ true
- $t > 5 \ || \ z < 2$ true
- $x * y < 10 \ || \ y * z < 10$ true
- $(y + 2) / 3 > 3 \ \&\& \ t < 0$ false
- $x * 3 > 0 \ || \ y + 5 / t < 2$ false
- $!(x > 0)$ true
- $!(x * t < 10) \ || \ y / x * 4 < y * 2$ true
- $t > 5 \ || \ z < (y + 5) \ \&\& \ y < 3$ false
- $!(4 + 5 * y \geq z - 4) \ \&\& \ (z - 2 < 7)$ false

Write syntactically correct logical expressions for the following conditions:

- m is less than 100 $m < 100$
- n is positive and greater than m $n > 0 \ \&\& \ n > m$
- m is between 5 and 10 (inclusive) $m \geq 5 \ \&\& \ m \leq 10$
- k is less than 1 or greater than 2 $k < 1 \ || \ k > 2$
- j and k are both negative $j < 0 \ \&\& \ k < 0$
- i is an even number $i \% 2 == 0$

1. $x + y < z + 1$
 $-2 + 5 < 0 + 1$
 $3 < 1$
false

2. $-2 - 2 \cdot (5) + 5 < 0 \cdot (2/3)$
 $-2 - 10 + 5 < 0 \cdot 2/3$
 $-12 + 5 < 0/3$
 $-7 < 0$
true

3. $3 \cdot 5/4 < 8$ AND $y \geq 4$
 $15/4 < 8$ AND $y \geq 4$
 $3 < 8$ AND $y \geq 4$
true

4. $t > 5$ || $z < 2$
 $t > 5$ is false but OR $z < 2$ is true!
true

5. $-2 \cdot 5 < 10$ OR $5 \cdot 0 < 10$
 $-10 < 10$ OR $0 < 10$
true

$$6. (5+2)/3 > 3 \text{ AND } -4 < 0$$

$$7/3 > 3 \text{ AND } -4 < 0$$

$$2 > 3 \text{ AND } -4 < 0$$

$2 > 3$ is false, AND means both have to be true

false done

$$7. -2 \cdot 3 > 0 \text{ OR } 5 + 5 / -4 < 2$$

$$-6 > 0 \text{ OR } 5 + (-1) < 2$$

$$-6 > 0 \text{ OR } 4 < 2$$

neither is ^{true} false so...

false

conditional
↓
output

$$8. !(x > 0) \text{ if } !(false)$$

$$!(-2 > 0)$$

$$!(false)$$

true

true

$$9. !(-2 \cdot (-4) < 10) \text{ OR } 5 / -2 \cdot 4 < 5 \cdot 2$$

$$!(+8 < 10) \text{ OR } -2 \cdot 4 < 10$$

$$!(8 < 10) \text{ OR } -8 < 10$$

$$! \text{ true OR true}$$

$$\text{false OR true}$$

one condition is true so TRUE

$$10. -4 > 5 \parallel 0 < (5+5) \text{ AND } 5 < 3$$

$$-4 > 5 \text{ OR } 0 < 10 \text{ AND } 5 < 3$$

$$0 < 10 \quad \text{AND} \quad 5 < 3$$

true

false

BOTH aren't true so false

$$11. \quad ! (4 + 5 \cdot 5 \geq 0 - 4) \text{ AND } (0 - 2 < 7)$$

$$! (4 + 25 \geq -4) \text{ AND } -2 < 7$$

$$! (29 \geq -4) \text{ AND } -2 < 7$$

! (true) AND true

false AND true

only one is true so false