

## Module 3.C : Algebra- Solving Equations

### SECTION 1 : Solve a linear inequality.

Steps to solving a linear inequality.

- Collect like terms by placing numbers on one side of the inequality, variables on the other.
- Multiply or divide by the coefficient of the term with the variable.
- Remember, when multiplying or dividing by a negative number, to *reverse* the inequality symbol.

#### EXERCISE 7

Solve  $5 - 2x + 3 - 4x > -1$

SOLUTION

$$5 - 2x + 3 - 4x > -1$$

$$-6x + 8 > -1$$

$$-6x > -1 - 8 \Rightarrow -6x > -9 \Rightarrow x < \frac{-9}{-6} \Rightarrow x < \frac{3}{2}$$

#### Three.8 Solve a quadratic inequality.

Steps to solving a linear inequality.

- Collect all terms on one side of the inequality.
- Factor the quadratic polynomial (if possible)
- Set each factor equal to zero and solve.
- Create intervals, using the above solutions (zeros) as boundary points.
- Test the original inequality in each interval above by evaluating the inequality with any real number in within each interval.
- The intervals that agree with the inequality are the intervals of solutions.

## EXERCISE 8

Solve  $x^2 - 4x - 12 > 0$

### SOLUTION

Factor:  $x^2 - 4x - 12 = (x - 6)(x + 2)$ .

Set each factor equal to zero and solve:  $x - 6 = 0$  or  $x + 2 = 0$   
 $x = 6$  or  $x = -2$

Create intervals, using the solutions as boundary points:  $(-\infty, -2), (-2, 6), (6, \infty)$ .

Test each interval with a representative real number in the interval:

$(-\infty, -2)$ : Let  $x = -5$ . Then  $(-5)^2 - 4(-5) - 12 > 0 \Rightarrow 25 + 20 - 12 > 0 \Rightarrow 33 > 0$ : TRUE

$(-2, 6)$ : Let  $x = 0$ . Then  $(0)^2 - 4(0) - 12 > 0 \Rightarrow -12 > 0$ : FALSE

$(6, \infty)$ : Let  $x = 10$ . Then  $(10)^2 - 4(10) - 12 > 0 \Rightarrow 100 - 40 - 12 > 0 \Rightarrow 48 > 0$ : TRUE

The solution intervals are  $(-\infty, -2)$  or  $(6, \infty)$ .

## SECTION 2 : Solve an absolute value inequality.

- $|p(x)| < c$  means  $-c < p(x) < c$ .
- $|p(x)| > c$  means  $p(x) > c$  or  $p(x) < -c$ .

## EXERCISE 9

Solve a)  $|2x - 3| > 6$  b)  $|2x - 3| < 6$

### SOLUTION

a)  $|2x - 3| > 6$

$$2x - 3 > 6 \text{ or } 2x - 3 < -6$$

$$2x > 9 \text{ or } 2x < -3$$

$$x > \frac{9}{2} \text{ or } x < \frac{-3}{2}$$

b)  $|2x - 3| < 6$

$$-6 < 2x - 3 < 6$$

$$-6 + 3 < 2x - 3 + 3 < 6 + 3$$

$$-3 < 2x < 9$$

$$\frac{-3}{2} < x < \frac{9}{2}$$

MODULE 3.C - ASSESSMENT

\_\_\_\_\_7. Solve  $4 - 3x + 7 - 9x > 5$

- A**  $x < \frac{1}{2}$       **B**  $x < -\frac{1}{2}$       **C**  $x > -\frac{1}{2}$       **D**  $x > \frac{1}{2}$       **E** I do not know

\_\_\_\_\_8. Solve  $x^2 - 9 \leq 0$ .

- A**  $[-3, 3]$       **B**  $(-3, 3)$       **C**  $(-\infty, -3] \cup [3, \infty)$       **D**  $3 \leq x \leq -3$   
**E** I do not know

\_\_\_\_\_9. Solve.  $|7 - x| > 4$

- A**  $3 < x < 11$       **B**  $x < 3$  or  $x > 11$       **C**  $x < 3$  and  $x > 11$       **D**  $x < 3$   
**E** I do not know

\_\_\_\_\_10. Solve.  $|5 - 2x| < 11$

- A**  $x < -3$       **B**  $x < -3$  or  $x > 8$       **C**  $x < -3$  and  $x > 8$       **D**  $-3 < x < 8$   
**E** I do not know