ANSWER PRESENTATION TOOL

2. Use square roots because the equation can easily be put in the form $u^2 = d$.

$$3x^2 - 4 = 8$$
$$3x^2 = 12$$
$$x^2 = 4$$
$$x = \pm\sqrt{4}$$
$$x = \pm 2$$

So, the solutions of the equation are $x = -2$ and $x = 2$.

4. Use the Zero-Product Property because the equation can easily be put in the form $a(x - p)(x - q) = 0$.

$$2x^2 - 17x = -30$$
$$2x^2 - 17x + 30 = 0$$
$$(2x - 5)(x - 6) = 0$$
$$2x - 5 = 0 \quad \text{or} \quad x - 6 = 0$$
$$x = \frac{5}{2} \quad \text{or} \quad x = 6$$

So, the solutions of the equation are $x = \frac{5}{2}$ and $x = 6$.

6. To have no real solution, $b^2 - 4ac < 0$, or $b^2 < 4ac$. Thus, to be possible, $4ac$ must be positive.

a. yes; The product of two positives is positive, so no solutions is possible.

b. no; The product of a positive and a negative is negative, so no solutions is not possible.

c. no; The product of a negative and a positive is negative, so no solutions is not possible.

d. yes; The product of two negatives is positive, so no solutions is possible.

8. Set the real parts equal to each other and the imaginary parts equal to each other.

$$36 = 4x \qquad -y = 3$$

$$x = 9 \qquad y = -3$$

So, $x = 9$ and $y = -3$.

10. $(9 + 3i) - (-2 - 7i) = (9 + 2) + (3 + 7)i$

$$= 11 + 10i$$

12. $(8 + 2i)(8 - 2i) = 8^2 + 2^2 = 68$

14. $7x^2 + 21 = 0$

$$7x^2 = -21$$

$$x^2 = -3$$

$$x = \pm\sqrt{-3}$$

$$x = \pm i\sqrt{3}$$

The solutions are $x = i\sqrt{3}$ and $x = -i\sqrt{3}$.

16. Use square roots because the equation can easily be put in the form $u^2 = d$.

$$x^2 + 6x + 9 = 49$$
$$(x + 3)^2 = 49$$
$$x + 3 = \pm 7$$
$$x = -3 \pm 7$$

The solutions are $x = -3 - 7 = -10$ and $x = -3 + 7 = 4$.

18. Complete the square, because the equation cannot immediately be put in the form $u^2 = d$.

$$4x^2 + 16x + 25 = 0$$
$$x^2 + 4x + \frac{25}{4} = 0$$
$$x^2 + 4x = -\frac{25}{4}$$
$$x^2 + 4x + 4 = -\frac{25}{4} + 4$$
$$(x + 2)^2 = -\frac{9}{4}$$
$$x + 2 = \pm\sqrt{-\frac{9}{4}}$$
$$x = \frac{-4 \pm 3i}{2}$$

The solutions are $x = \dfrac{-4 - 3i}{2}$ and $x = \dfrac{-4 + 3i}{2}$.

20. $y = x^2 - 2x + 20$

$y + ? = (x^2 - 2x + ?) + 20$

$y + 1 = (x^2 - 2x + 1) + 20$

$y + 1 = (x - 1)^2 + 20$

$y = (x - 1)^2 + 19$

The vertex form of the function is $y = (x - 1)^2 + 19$. The vertex is (1, 19).

22. Let ℓ represent the length (in feet) and w represent the width (in feet).

Perimeter = 40 Area = 80

$2\ell + w = 40$ $\ell w = 80$

Solve the perimeter equation for w to obtain $w = -2\ell + 40$. Substitute this into the area inequality to obtain a quadratic inequality in one variable.

$$\ell(-2\ell + 40) = 80$$
$$-2\ell^2 + 40\ell = 80$$
$$-2\ell^2 + 40\ell - 80 = 0$$
$$\ell^2 - 20\ell + 40 = 0$$

$$\ell = \frac{-(-20) \pm \sqrt{(-20)^2 - 4(1)(40)}}{2(1)}$$
$$= 20 \pm \frac{\sqrt{400 - 160}}{2}$$
$$= \frac{20 \pm 4\sqrt{15}}{2}$$
$$= 10 \pm 2\sqrt{15}$$

$\ell = 10 + 2\sqrt{15} \approx 17.7$ or $\ell = 10 - 2\sqrt{15} \approx 2.3$

$w = -2(10 + 2\sqrt{15}) + 40$ $w = -2(10 - 2\sqrt{15}) + 40$

$w = 20 - 4\sqrt{15} \approx 4.5$ $w = 20 + 4\sqrt{155} \approx 35.$

There are two possible dimensions of the garden. One dimension is about 17.7 feet by about 4.5 feet. The other dimension is about 2.3 feet by about 35.5 feet.

24. $2x^2 + 5x = 3$

$2x^2 + 5x - 3 = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-5 \pm \sqrt{5^2 - 4(2)(-3)}}{2(2)}$$

$$x = \frac{-5 \pm \sqrt{49}}{4}$$

$$x = \frac{-5 \pm 7}{4}$$

So, the solutions are $x = \frac{1}{2}$ and $x = -3$.

26. $3x^2 - 12x + 13 = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-12) \pm \sqrt{(-12)^2 - 4(3)(13)}}{2(3)}$$

$$x = \frac{12 \pm \sqrt{-12}}{6}$$

$$x = \frac{12 \pm 2i\sqrt{3}}{6}$$

$$x = \frac{6 \pm i\sqrt{3}}{3}$$

So, the solutions are $x = \frac{6 + i\sqrt{3}}{3}$ and $x = \frac{6 - i\sqrt{3}}{3}$.

28. Equation: $x^2 - 2x - 9 = 0$

Discriminant: $b^2 - 4ac = (-2)^2 - 4(1)(-9) = 40$

The equation has two real solutions.

$$\text{Solutions: } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-2) \pm \sqrt{40}}{2(1)}$$

$$x = 1 \pm \sqrt{10}$$

30. $ax^2 + 12x = -c$

$ax^2 + 12x + c = 0$

A quadratic equation has exactly one real solution when $b^2 - 4ac = 0$.

$$12^2 - 4ac = 0$$

$$144 - 4ac = 0$$

$$144 = 4ac$$

$$36 = ac$$

Sample answer: $a = 1, c = 36, x^2 + 12x + 36 = 0$

32. $g(x) = 0.000004x^2 - 0.0119x + 10.605$

Find x when $g(x) = 3$.

$3 = 0.000004x^2 - 0.0119x + 10.605$

$0 = 0.000004x^2 - 0.0119x + 7.605$

Use technology to find the x-intercepts.

The x-intercepts are 929.46214 and 2045.5379. So, you can expect to find a generality of 3 plant species per ant species at elevations around 929.462 meters and 2045.538 meters.

34. Use elimination because adding like terms will result in a quadratic equation in one variable. First, add the equations to eliminate the y term and obtain a quadratic equation in x.

$$\begin{array}{rl} y = & x^2 - 6x + 13 \\ -y = & \quad\; - 2x + 3 \\ \hline 0 = & x^2 - 8x + 16 \end{array}$$

Solve by factoring.

$$\begin{aligned} x^2 - 8x + 16 &= 0 \\ (x - 4)^2 &= 0 \\ x - 4 &= 0 \\ x &= 4 \end{aligned}$$

To solve for y, substitute $x = 4$ into the equation $y = 2x - 3$.

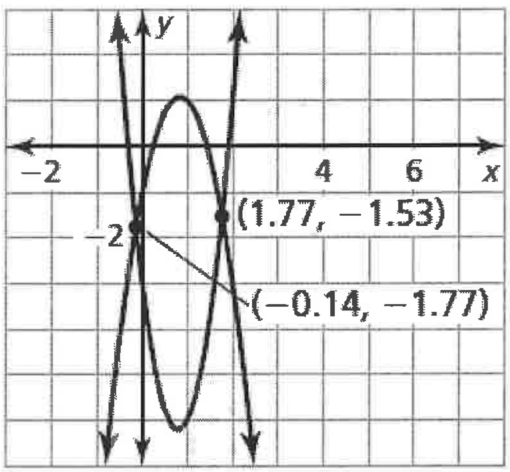
$y = 2x - 3 = 2(4) - 3 = 5$

The solution is $(4, 5)$.

36. Write a system of equations using each side of the original equation.

Equation	*System*
$-3x^2 + 5x - 1 = 5x^2 - 8x - 3$	$y = -3x^2 + 5x - 1$
	$y = 5x^2 - 8x - 3$

Graph the equations in the same plane.



The solutions are $x \approx -0.14$ and $x \approx 1.77$.

38. **Step 1** Graph $y = x^2 + 8x + 16$. Because the inequality symbol is >, make the parabola dashed.

Step 2 Test a point inside the parabola, such as $(-4, 1)$.

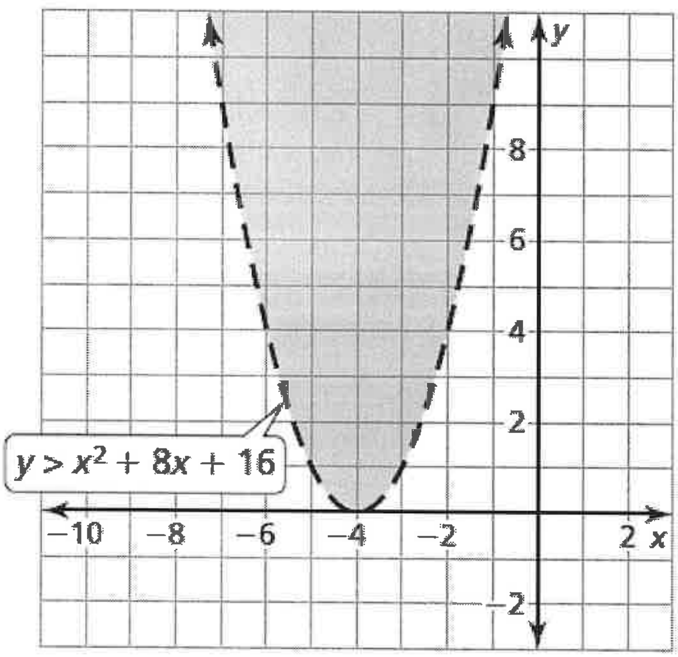
$$y > x^2 + 8x + 16$$

$$1 \overset{?}{>} (-4)^2 + 8(-4) + 16$$

$$1 > 0$$

So, $(-4, 1)$ is a solution of the inequality.

Step 3 Shade the region inside the parabola.



40. Step 1 Rewrite the inequality.

$$x^2 + y \leq 7x - 12$$

$$y \leq -x^2 + 7x - 12$$

Step 2 Graph $y = -x^2 + 7x - 12$. Because the inequality symbol is $\leq$, make the parabola with a solid line.

Step 3 Test a point inside the parabola, such as $(3, -1)$.

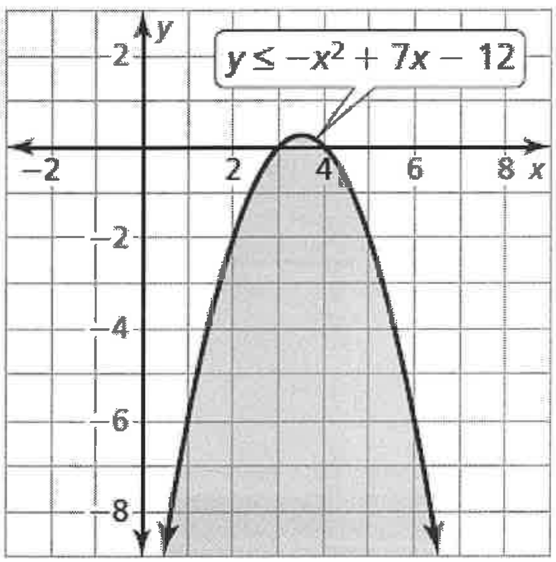
$$y \leq -x^2 + 7x - 12$$

$$-1 \overset{?}{\leq} -(3)^2 + 7(3) - 12$$

$$-1 \leq 0$$

So, $(3, -1)$ is a solution of the inequality.

Step 4 Shade the region inside the parabola.



42. $2x^2 - x \leq y + 5$ $\qquad$ $0.5x^2 > y - 2x - 1$

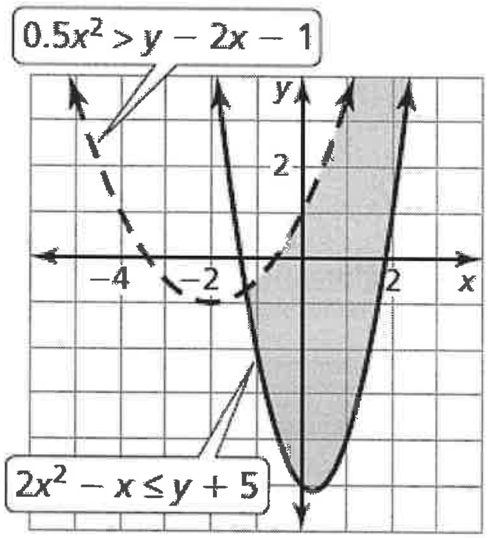
$2x^2 - x - 5 \leq y$ $\qquad$ $0.5x^2 + 2x + 1 > y$

$y \geq 2x^2 - x - 5$ $\qquad$ $y < 0.5x^2 + 2x + 1$

Step 1 Graph $y \geq 2x^2 - x - 5$

Step 2 Graph $y < 0.5x^2 + 2x + 1$

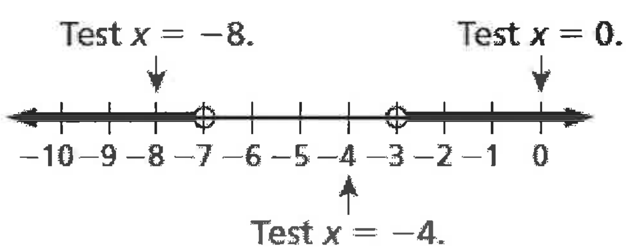
Step 3 Identify the region where the two graphs overlap. This region is the graph of the system.



44. First, write and solve the equation obtained by replacing $<$ with $=$.

$$-x^2 - 10x = 21$$
$$x^2 + 10x + 21 = 0$$
$$(x + 3)(x + 7) = 0$$
$$x = -3 \quad \text{or} \quad x = -7$$

The numbers -7 and -3 are critical values of the original inequality. Plot -7 and -3 on a number line, using open dots because the values do not satisfy the inequality. The critical x-values partition the number line into three intervals. Test an x-value in each interval to determine whether it satisfies the inequality.



$$-(-8)^2 - 10(-8) < 21 \checkmark$$
$$-(-4)^2 - 10(-4) \not< 21$$
$$-(0)^2 - 10(0) < 21 \checkmark$$

So, the solution is $x < -7$ or $x > -3$.

46. **a.** $>$ or $\geq$;

$$4(-1)^2 - 3(-1) > (-1) + 6$$
$$7 > 5$$

b. $<$ or $\leq$;

$$4(1)^2 - 3(1) < (-4) + 6$$
$$1 < 2$$

c. $\leq$ or $\geq$;

$$-3(2) \leq (4) + 6$$
$$10 \leq 10$$