ANSWER PRESENTATION TOOL

1. Use square roots because the equation is of the form $u^2 = d$.

$6x^2 = 150$

$x^2 = 25$

$x = \pm 5$

The solutions are $x = 5$ and $x = -5$.

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

$x^2 + 6x - 16 = 0$

$(x + 8)(x - 2) = 0$

$x + 8 = 0$ or $x - 2 = 0$

$x = -8$ or $x = 2$

So, the solutions of the equation are $x = -8$ and $x = 2$.

5. Because the ball is dropped, use the model $h = -16t^2 + h_0$.

Since the initial height is 3 feet, a function that represents the situation is $h = -16t^2 + 3$. Find when the height is zero.

$$0 = -16t^2 + 3$$
$$16t^2 = 3$$
$$t^2 = \frac{3}{16}$$
$$t = \pm\frac{\sqrt{3}}{4}$$

Reject the negative solution since time cannot be negative.

The ball is in the air for $\frac{\sqrt{3}}{4} \approx 0.43$ seconds.

7. An equation that represents the area is $2 \cdot 35 \cdot 18 = (x + 35)(x + 18)$ because the same amount will be added to both the width and length and the area is doubled. Solve the equation.

$$2 \cdot 35 \cdot 18 = (x + 35)(x + 18)$$
$$1260 = x^2 + 53x + 630$$
$$0 = x^2 + 53x - 630$$
$$0 = (x - 10)(x + 63)$$
$$x - 10 = 0 \quad \text{or} \quad x + 63 = 0$$
$$x = 10 \quad \text{or} \quad x = -63$$

Reject the negative solution because measurements are positive. Use $x = 10$. So, the dimensions of the new area are 45 feet by 28 feet.

9. $(-2 + 3i) + (7 - 6i) = (-2 + 7) + (3 - 6)i$
$$= 5 - 3i$$

11. $(5 + 6i)(-4 + 7i) = -20 + 35i - 24i + 42i^2$

$= -20 + 11i + 42(-1)$

$= -62 + 11i$

13. The resistor has a resistance of 7 ohms, so its impedance is 7 ohms. The inductor has a reactance of 5 ohms, so its impedance is $5i$ ohms. The capacitor has a reactance of 2 ohms, so its impedance is $-2i$ ohms.

Impedance of circuit $= 7 + 5i + (-2i) = 7 + 3i$

The impedance of the circuit is $(7 + 3i)$ ohms.

15. $2x^2 + 32 = 0$

$2x^2 = -32$

$x^2 = -16$

$x = \pm\sqrt{-16}$

$x = \pm 4i$

So, the zeros of f are $4i$ and $-4i$.

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

$x^2 + 16x + 17 = 0$

$x^2 + 16x = -17$

$x^2 + 16x + 64 = -17 + 64$

$(x + 8)^2 = 47$

$x + 8 = \pm\sqrt{47}$

$x = -8 \pm \sqrt{47}$

The solutions are $x = -8 - \sqrt{47}$ and $x = -8 + \sqrt{47}$.

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

$$9x(x - 6) = 81$$
$$x(x - 6) = 9$$
$$x^2 - 6x = 9$$
$$x^2 - 6x + 9 = 9 + 9$$
$$(x - 3)^2 = 18$$
$$x - 3 = \pm\sqrt{18}$$
$$x = 3 \pm 3\sqrt{2}$$

The solutions are $x = 3 - 3\sqrt{2}$ and $x = 3 + 3\sqrt{2}$.

21. $y = -0.1x^2 + 6x + 4$

$a = -0.1$, $b = 6$, and $c = 4$

The x-coordinate of the vertex of the graph is

$$-\frac{b}{2a} = -\frac{6}{2(-0.1)} = 30.$$

The y-coordinate of the vertex of the graph is
$-0.1(30)^2 + 6(30) + 4 = 94$

Because a is negative, the parabola opens down and has a maximum value. The maximum value is 94. So, the maximum height of the T-shirt is 94 feet.

23. $$-x^2 + 5x = 2$$

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

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

$$x = \frac{-5 \pm \sqrt{5^2 - 4(-1)(-2)}}{2(-1)}$$

$$x = \frac{5 \pm \sqrt{17}}{2}$$

So, the solutions are $x = \frac{5 - \sqrt{17}}{2}$ and $x = \frac{5 + \sqrt{17}}{2}$.

25. $$-x^2 + 3x = 2.25$$

$$-x^2 + 3x - 2.25 = 0$$

$$x = \frac{-3 \pm \sqrt{3^2 - 4(-1)(-2.25)}}{2(-1)}$$

$$= \frac{-3 \pm \sqrt{9 - 9}}{-2}$$

$$= \frac{-3 \pm 0}{-2}$$

$$= \frac{3}{2}$$

The solution is $x = \frac{3}{2}$.

27. Equation: $-x^2 - 6x - 9 = 0$

Discriminant: $b^2 - 4ac = (-6)^2 - 4(-1)(-9) = 0$

The equation has one real soluton.

Solution: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-(-6) \pm \sqrt{0}}{2(-1)} = -3$

29. Equation: $x^2 + 6x + 5 = 0$

Discriminant: $b^2 - 4ac = 6^2 - 4(1)(5) = 16$

The equation has two real solutions.

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

$$x = \frac{-6 \pm \sqrt{16}}{2(1)}$$

$$x = -3 \pm 2$$

$$x = -5 \text{ or } x = -1$$

31. Use the Quadratic Formula.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{3 \pm \sqrt{-131}}{10}$$

$-b = 3$, so $b = -3$

$2a = 10$, so $a = 5$

$$b^2 - 4ac = -131$$

$$(-3)^2 - 4(5)c = -131$$

$$9 - 20c = -131$$

$$-20c = -140$$

$$c = 7$$

So, a quadratic equation is $5x^2 - 3x + 7 = 0$.

33. Use substitution because both equations are already solved for y. Substitute $-2x + 2$ for y in Equation 1 and solve for x.

$$2x^2 - 2 = -2x + 2$$
$$2x^2 + 2x - 4 = 0$$
$$x^2 + x - 2 = 0$$
$$(x + 2)(x - 1) = 0$$
$$x + 2 = 0 \quad \text{or} \quad x - 1 = 0$$
$$x = -2 \quad \text{or} \quad x = 1$$

To solve for y, substitute $x = -2$ and $x = 1$ into the equation $y = -2x + 2$.

$y = -2x + 2 = -2(-2) + 2 = 6$

$y = -2x + 2 = -2(1) + 2 = 0$

The solutions are $(-2, 6)$ and $(1, 0)$.

35. Use substitution because elimination is not a possibility with no like terms. First, solve for y in Equation 2.

$y = -3x + 1$

Next, substitute $-3x + 1$ for y in Equation 1 and solve for x.

$$x^2 + (-3x + 1)^2 = 4$$
$$x^2 + 9x^2 - 6x + 1 = 4$$
$$10x^2 - 6x - 3 = 0$$
$$x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(10)(-3)}}{2(10)}$$
$$x = \frac{6 \pm \sqrt{156}}{20}$$
$$x = \frac{6 \pm 2\sqrt{39}}{20}$$
$$x = \frac{3 \pm \sqrt{39}}{10}$$

To solve for y, substitute $x = \dfrac{3 - \sqrt{39}}{10}$ and $x = \dfrac{3 + \sqrt{39}}{10}$ into the equation $y = -3x + 1$.

$$y = -3x + 1 = -3\left(\frac{3 - \sqrt{39}}{10}\right) + 1$$
$$= \frac{-9 + 3\sqrt{39}}{10} + 1 = \frac{1 + 3\sqrt{39}}{10}$$
$$y = -3x + 1 = -3\left(\frac{3 + \sqrt{39}}{10}\right) + 1$$
$$= \frac{-9 - 3\sqrt{39}}{10} + 1 = \frac{1 - 3\sqrt{39}}{10}$$

The solutions are $\left(\dfrac{3 - \sqrt{39}}{10}, \dfrac{1 + 3\sqrt{39}}{10}\right)$ and $\left(\dfrac{3 + \sqrt{39}}{10}, \dfrac{1 - 3\sqrt{39}}{10}\right)$.

37. $(h, k) = (2, 5)$

$$f(x) = a(x-2)^2 + 5$$
$$1 = a(0-2)^2 + 5$$
$$1 = 4a + 5$$
$$-4 = 4a$$
$$-1 = a$$

So, $f(x) = -(x-2)^2 + 5$.

$$y + 3 = -\tfrac{1}{2}(x-8)$$
$$y + 3 = -\tfrac{1}{2}x + 4$$
$$y = -\tfrac{1}{2}x + 1$$

So, $g(x) = -\frac{1}{2}x + 1$

$$f(x) = g(x)$$
$$-(x-2)^2 + 5 = -\tfrac{1}{2}x + 1$$
$$-(x^2 - 4x + 4) + 5 = -\tfrac{1}{2}x + 1$$
$$-x^2 + 4x - 4 + 5 = -\tfrac{1}{2}x + 1$$
$$-x^2 + 4x + 1 = -\tfrac{1}{2}x + 1$$
$$-x^2 + \tfrac{9}{2}x + 1 = 1$$
$$-x^2 + \tfrac{9}{2}x = 0$$
$$-x\left(x - \tfrac{9}{2}\right) = 0$$

So, $f(x) = g(x)$ when $x = 0$ and $x = \frac{9}{2}$.

39. Step 1 Graph $y = x^2 + 6x + 8$. Because the inequality symbol is $\geq$, make the parabola with a solid line.

Step 2 Test a point inside the parabola, such as $(-3, 1)$.

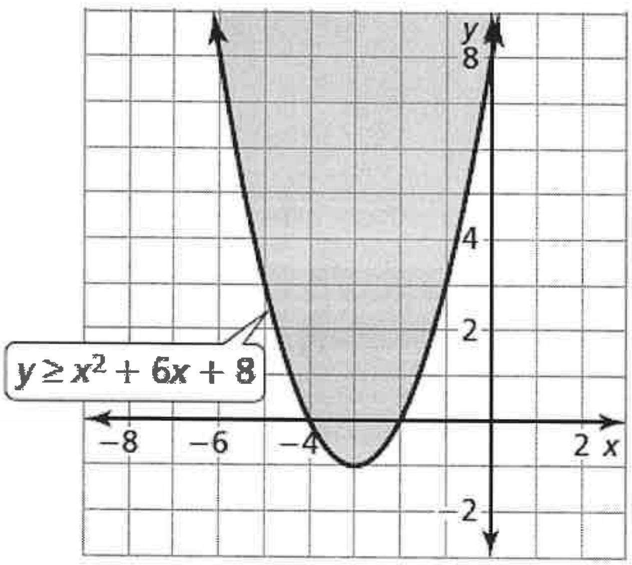
$y \geq x^2 + 6x + 8$

$1 \overset{?}{\geq} (-3)^2 + 6(-3) + 8$

$1 \geq -1$

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

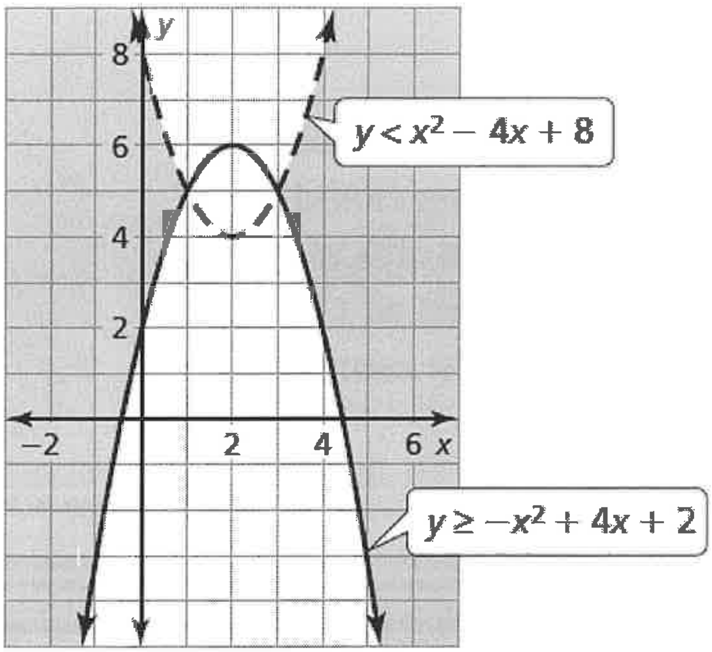
Step 3 Shade the region inside the parabola.



41. Step 1 Graph $x^2 - 4x + 8 > y$.

Step 2 Graph $-x^2 + 4x + 2 \leq y$.

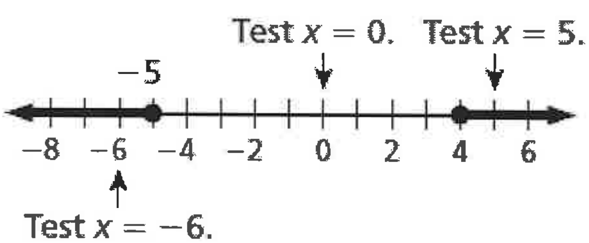
Step 3 Identify the region where the two graphs overlap. This region is the graph of the system.



43. First, write and solve the equation obtained by replacing $\geq$ with $=$.

$$3x^2 + 3x - 60 = 0$$
$$x^2 + x - 20 = 0$$
$$(x + 5)(x - 4) = 0$$
$$x = -5 \quad \text{or} \quad x = 4$$

The numbers -5 and 4 are critical values of the original inequality. Plot -5 and 4 on a number line, using closed dots because the values do 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.



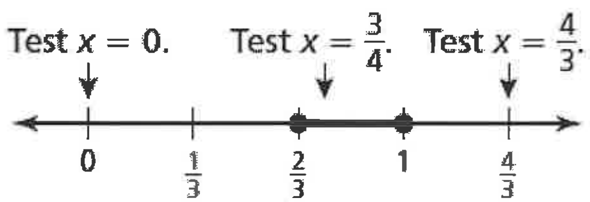
$$3(-6)^2 + 3(-6) - 60 \geq 0 \checkmark$$
$$3(0)^2 + 3(0) - 60 \not\geq 0$$
$$3(5)^2 + 3(5) - 60 \geq 0 \checkmark$$

So, the solution is $x \leq -5$ or $x \geq 4$.

45. First, write and solve the equation obtained by replacing $\leq$ with $=$.

$$3x^2 + 2 = 5x$$
$$3x^2 - 5x + 2 = 0$$
$$(3x - 2)(x - 1) = 0$$
$$3x - 2 = 0 \quad \text{or} \quad x - 1 = 0$$
$$x = \frac{2}{3} \quad \text{or} \quad x = 1$$

The numbers $\frac{2}{3}$ and 1 are critical values of the original inequality. Plot $\frac{2}{3}$ and 1 on a number line, using closed dots because the values do 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.



$$3(0)^2 + 2 \not\leq 5(0)$$
$$3\left(\frac{3}{4}\right)^2 + 2 \leq 5\left(\frac{3}{4}\right) \checkmark$$
$$3\left(\frac{4}{3}\right)^2 + 2 \not\leq 5\left(\frac{4}{3}\right)$$

So, the solution is $\frac{2}{3} \leq x \leq 1$.