1.

$$x^2 + 16x + 55 = 0$$
$$(x + 11)(x + 5) = 0$$
$$x + 11 = 0,\ x + 5 = 0$$
$$x = -11,\ -5$$

2.

$$x^2 - 3x - 18 = 0$$
$$(x - 6)(x + 3) = 0$$
$$x - 6 = 0,\ x + 3 = 0$$
$$x = 6,\ -3$$

3.

$$14x^3 + 5x^2 - x = 0$$
$$x(14x^2 + 5x - 1) = 0$$
$$x(7x - 1)(2x + 1) = 0$$
$$x = 0,\ 7x - 1 = 0,\ 2x + 1 = 0$$
$$x = 0,\ \frac{1}{7},\ -\frac{1}{2}$$

4.

$$6x^2 + x - 12 = 0$$
$$(2x + 3)(3x - 4) = 0$$
$$2x + 3 = 0,\ 3x - 4 = 0$$
$$x = -\frac{3}{2},\ \frac{4}{3}$$

5.

$$x^2 - 21x = 100$$
$$x^2 - 21x - 100 = 0$$
$$(x - 25)(x + 4) = 0$$
$$x - 25 = 0,\ x + 4 = 0$$
$$x = 25,\ -4$$

The solution −4 is extraneous because you cannot have a negative side length.
The sides of the rectangle are 25 feet and 4 feet. Since one side is 25 feet and the total area is 100 square feet, the remaining side is 4 feet ($25 \cdot 4 = 100$).

OR

The sides of the rectangle are 25 feet and 4 feet. The expression $x^2 - 21x$ factors to $x(x - 21)$. When $x = 25$, $x - 21 = 25 - 21 = 4$.

6.

$$x(5x - 7) = -2$$
$$5x^2 - 7x = -2$$
$$5x^2 - 7x + 2 = 0$$
$$(5x - 2)(x - 1) = 0$$
$$5x - 2 = 0,\ x - 1 = 0$$
$$x = \frac{2}{5},\ 1$$

Both values will make the equation true.

7. w: width, l: length, A: Area

$$w = w,\ l = 3w - 1,\ A = 10$$
$$A = lw$$
$$10 = w(3w - 1)$$

8.

$$10 = w(3w - 1)$$
$$10 = 3w^2 - w$$
$$0 = 3w^2 - w - 10$$
$$0 = (3w + 5)(w - 2)$$
$$3w + 5 = 0,\ w - 2 = 0$$
$$w = -\frac{5}{3},\ 2$$

The solution $-\frac{5}{3}$ is extraneous because you cannot have a negative side length.

When $w = 2$, the width is 2 inches and the length is 5 inches ($l = 3(2) - 1 = 5$). This is correct because when the dimensions are multiplied together the result is 10 square inches.

9.

$$(x - 2)(x - 2) = 64$$
$$x^2 - 4x + 4 = 64$$
$$x^2 - 4x - 60 = 0$$
$$(x - 10)(x + 6) = 0$$
$$x - 10 = 0,\ x + 6 = 0$$
$$x = 10,\ -6$$

The side of the box lid is 10 inches before the corners are cut and 8 inches after the corners are cut.

10.

$d = 192, v = 64$

$d = 16t^2 + vt$

$192 = 16t^2 + 64t$

$0 = 16t^2 + 64t - 192$

$0 = 16(t^2 + 4t - 12)$

$0 = 16(t + 6)(t - 2)$

$t + 6 = 0, t - 2 = 0$

$t = -6, 2$

It cannot take −6 seconds for the object to hit the ground, making −6 extraneous.
The rock will take 2 seconds to hit the canyon floor.