Section 10.1 - Solving Quadratic Equations by the Square Root Property

3 ways to solve Quadratics

Factoring Section 7.6	* Square Root method section 10.1	Quadratic Formula section 10.3

when solving equations you must do the same thing to both sides. We can even take the square root of both sides.

ex:

To get x by itself do the opposite of squaring

2. $\sqrt{x^2} = \sqrt{100}$

what number squared equals 100?

10 or -10

$x = \pm 10$

$\{\pm 10\}$

4. $\sqrt{y^2} = \sqrt{144}$

$y = \pm 12$

$\{\pm 12\}$

when you take the square root of both sides add the ± symbol to the number.

6. $\sqrt{x^2} = \sqrt{13}$

$x = \pm\sqrt{13}$

$\{\pm\sqrt{13}\}$

13 is not a perfect square so the solutions are irrational

8. $\sqrt{x^2} = \sqrt{27}$

$x = \pm\sqrt{27}$

$x = \pm\sqrt{9}\sqrt{3}$

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

$\{\pm 3\sqrt{3}\}$

simplify the radical by pulling out perfect squares.

10. $\frac{3x^2}{3} = \frac{75}{3}$ Isolate the x^2 first

$\sqrt{x^2} = \pm\sqrt{25}$

$x = \pm 5$

$\{\pm 5\}$

16. $3x^2 - 5 = 0$

$+5 \quad +5$

Get the x^2 by itself

$\frac{3x^2}{3} = \frac{5}{3}$

$\sqrt{x^2} = \sqrt{\frac{5}{3}}$

$x = \pm\sqrt{\frac{5}{3}}\frac{\sqrt{3}}{\sqrt{3}}$ Rationalize the denominator

$x = \pm\frac{\sqrt{15}}{3}$

$\{\pm\frac{\sqrt{15}}{3}\}$

20. $\sqrt{(x-2)^2} = \sqrt{25}$

Now the quantity x-2 is squared

$x - 2 = \pm\sqrt{25}$

$x - 2 = \pm 5$

Isolate the x

$+2 \quad +2$

$x = 2 \pm 5$

$x = 2 + 5$ or $x = 2 - 5$

$x = 7$ or -3

$\{-3, 7\}$

26. $\sqrt{(x-3)^2} = \sqrt{15}$

$x - 3 = \pm\sqrt{15}$

$+3 \quad +3$

$x = 3 \pm \sqrt{15}$

$\{3 \pm \sqrt{15}\}$

30. $\sqrt{(z-6)^2} = \sqrt{12}$

$z - 6 = \pm\sqrt{12}$

Pull out the perfect square

$z - 6 = \pm 2\sqrt{3}$

$+6 \quad +6$

$z = 6 \pm 2\sqrt{3}$

$\{6 \pm 2\sqrt{3}\}$

Factor to make a perfect square trinomial first

32. $x^2 + 4x + 4 = 25$

$(x+2)(x+2) = 25$

$\sqrt{(x+2)^2} = \sqrt{25}$

$x + 2 = \pm 5$

$\quad -2 \quad -2$

$x = -2 \pm 5 \qquad x = -2+5 \text{ or } -2-5$

$x = 3 \text{ or } -7$

$\{-7, 3\}$

40. $y^2 - 14y + 49 = 18$

$(y-7)(y-7) = 18$

$\sqrt{(y-7)^2} = \sqrt{18}$

$y - 7 = \pm\sqrt{18}$

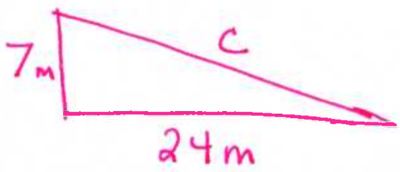
$y - 7 = \pm 3\sqrt{2}$

$\quad +7 \quad +7$

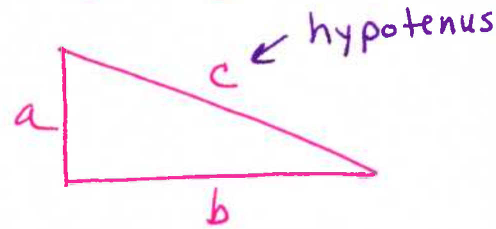
$y = 7 \pm 3\sqrt{2}$

$\{7 \pm 3\sqrt{2}\}$

42. Use the Pythagorean Theorem



$$a^2+b^2=c^2$$



$$a^2+b^2=c^2$$

$$7^2+24^2=c^2$$

$$49+576=c^2$$

$$\sqrt{625}=\sqrt{c^2}$$

$$\pm 25=c$$

$c=25$ meters

54. Use the distance formula

$$d=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$$

$(\overset{x_1}{-4},\overset{y_1}{-1})$ and $(\overset{x_2}{2},\overset{y_2}{-3})$

$$d=\sqrt{(2-(-4))^2+(-3-(-1))^2}$$

$$=\sqrt{(2+4)^2+(-3+1)^2}$$

$$=\sqrt{6^2+(-2)^2}$$

$$=\sqrt{36+4}$$

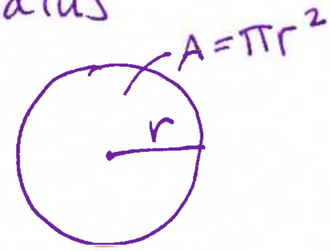
$$=\sqrt{40}$$

$$=\sqrt{4}\sqrt{10}$$

$$=2\sqrt{10}$$

Applications

72. Area = 36π in^2, find the radius



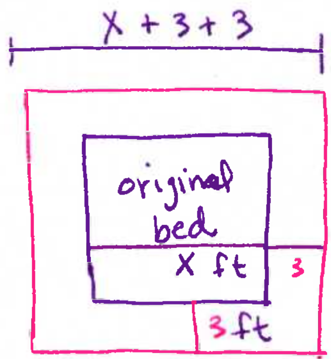
$$\frac{\pi r^2}{\pi} = \frac{36\pi}{\pi}$$

$$\sqrt{r^2} = \sqrt{36}$$

$$r = \pm 6$$

The radius is 6 inches.

78.



3 feet added on each side

Larger square Area = 169 ft^2

$$(x+6)(x+6) = 169$$

$$\sqrt{(x+6)^2} = \sqrt{169}$$

$$x + 6 = \pm 13$$

$$-6 \quad -6$$

$$x = -6 \pm 13$$

$$x = -6 \pm 13$$

$$x = 7 \text{ or } \cancel{-19}$$

The length of the original flower bed was 7 feet.