

Lesson 32 Completing the Square

Completing the Square:

$(x + 4)^2$ is a perfect square

Box Method:

	x	+	4	
x	x^2		$4x$	$= x^2 + 8x + ?$
+				
4	$4x$?	

Steps to Follow: for $ax^2 + bx + ?$

1. Factor a out of both terms
2. Find b
3. Divide b by 2
4. Square this new value
5. Multiply back through by a

Examples: Complete the square.

1. $x^2 + 16x + \underline{64}$

$$\left(\frac{16}{2}\right)^2 = (8)^2 = 64$$

2. $x^2 - 10x + \underline{25}$

$$\left(-\frac{10}{2}\right)^2 = (-5)^2 = 25$$

Solving Equations by Completing the Square.

Steps to Follow:

1. Get all x – terms on the left side and all number terms on the right side, by using opposite operations.
2. Complete the square on the left.
3. Add the new c value to both sides of the equal sign.
4. Factor the left side of the equation as a perfect square.
5. Simplify the right side of the equation.
6. Square root both sides of the equation.
7. Put a \pm in front of the right side of the equation.
8. Write out 2 new equations.
(One equation with a + on the right side, and one equation with a – on the right side)
9. Solve each equation.

Examples: Solve the equation by completing the square.

$$3. (x-3)^2 = 25$$

$$\sqrt{(x-3)^2} = \pm \sqrt{25}$$

$$x-3 = \pm 5$$

$$\begin{array}{rcl} x-3=5 & \text{or} & x-3=-5 \\ +3 & +3 & +3 & +3 \\ \hline x=8 & & x=-2 \end{array}$$

$$4. (3x+5)^2 = 16$$

$$\sqrt{(3x+5)^2} = \pm \sqrt{16}$$

$$3x+5 = \pm 4$$

$$\begin{array}{rcl} 3x+5=4 & \text{or} & 3x+5=-4 \\ -5 & -5 & -5 & -5 \\ \hline 3x=-1 & & 3x=-9 \\ \frac{3x}{3} = \frac{-1}{3} & & \frac{3x}{3} = \frac{-9}{3} \\ x = -\frac{1}{3} & & x = -3 \end{array}$$

$$5. x^2 + 6x - 7 = 0$$

$$\begin{array}{r} x^2 + 6x + \underline{\quad} = 7 + \underline{\quad} \\ +7 \quad +7 \end{array}$$

$$\left(\frac{6}{2}\right)^2 = 3^2 = 9$$

$$x^2 + 6x + \underline{9} = 7 + \underline{9}$$

$$(x+3)^2 = 16$$

$$\sqrt{(x+3)^2} = \pm \sqrt{16}$$

$$x+3 = \pm 4$$

$$\begin{array}{rcl} x+3=4 & \text{or} & x+3=-4 \\ -3 & -3 & -3 & -3 \\ \hline x=1 & & x=-7 \end{array}$$