

What you need to know & be able to do	Things to remember	Examples					
1. <u>Factor</u>	1. Look for GCF 2. x <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td> </td></tr><tr><td> </td><td> </td></tr></table>					<p>a. Factor: <math>3x^2 - 6x</math> * GCF</p> $3x \begin{array}{ c c } \hline x & +2 \\ \hline 3x^2 & -6x \\ \hline \end{array}$ $3x(x+2)$	<p>b. Factor: <math>3x^2 - 11x + 8</math> * <math>a \neq 1</math></p> $\begin{array}{l} 24(x) \\ -8 \end{array} \begin{array}{l} -3 \\ -11 \end{array} \begin{array}{l} (+) \\ (+) \end{array}$ $x \begin{array}{ c c } \hline 3x & -8 \\ \hline 3x^2 & -8x \\ \hline \end{array}$ $\begin{array}{ c c } \hline -1 & -3x \\ \hline -3x & 8 \\ \hline \end{array}$ $(3x-8)(x-1)$ <p>NO GCF</p>
2. <u>Factor Completely</u>	1. Look for GCF 2. x <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td> </td></tr><tr><td> </td><td> </td></tr></table>					<p>a. Factor: <math>3x^2 - 27</math> * GCF</p> $3 \begin{array}{ c c } \hline x^2 & -9 \\ \hline 3x^2 & -27 \\ \hline \end{array}$ $3(x^2 - 9)$	<p>b. Factor: <math>4x^2 - 4x - 48</math> * <math>a \neq 1</math></p> $4 \begin{array}{ c c c } \hline x^2 & -x & -12 \\ \hline 4x^2 & -4x & -48 \\ \hline \end{array}$ $\begin{array}{l} -12(x) \\ 3 \end{array} \begin{array}{l} -4 \\ -1 \end{array} \begin{array}{l} (+) \\ (+) \end{array}$ $4(x+3)(x-4)$ <p>with GCF</p>
3. <u>Solve equations in factored form.</u>	Zero Product Property	<p>a. Solve <math>(x-7)(x+3) = 0</math></p> $\begin{array}{r} x-7=0 \\ +7 \quad +7 \\ \hline x=7 \end{array} \quad \begin{array}{r} x+3=0 \\ -3 \quad -3 \\ \hline x=-3 \end{array}$	<p>b. Solve: <math>(x-4)(5x-7) = 0</math></p> $\begin{array}{r} x-4=0 \\ +4 \quad +4 \\ \hline x=4 \end{array} \quad \begin{array}{r} 5x-7=0 \\ +7 \quad +7 \\ \hline 5x=7 \\ \frac{5x}{5} = \frac{7}{5} \\ x = \frac{7}{5} \end{array}$				
4. <u>Solve equations by factoring when <math>a=1</math>.</u>  $a=1$ • x-method		<p>a. Solve <math>x^2 - 9x + 20 = 0</math> * <math>a=1</math></p> $\begin{array}{l} 20(x) \\ -5 \end{array} \begin{array}{l} -4 \\ -9 \end{array} \begin{array}{l} (+) \\ (+) \end{array}$ $\begin{array}{r} x-8=0 \\ +8 \quad +8 \\ \hline x=8 \end{array} \quad \begin{array}{r} x-1=0 \\ +1 \quad +1 \\ \hline x=1 \end{array}$ $(x-8)(x-1)$	<p>b. Solve <math>x^2 - 6x - 16 = 0</math> * <math>a=1</math></p> $\begin{array}{l} -16(x) \\ -8 \end{array} \begin{array}{l} 2 \\ -6 \end{array} \begin{array}{l} (+) \\ (+) \end{array}$ $\begin{array}{r} x-8=0 \\ +8 \quad +8 \\ \hline x=8 \end{array} \quad \begin{array}{r} x+2=0 \\ -2 \quad -2 \\ \hline x=-2 \end{array}$ $(x-8)(x+2)$				
		<p>c. <math>x^2 - 13x + 47 = 7</math> * <math>a=1</math></p> $x^2 - 13x + 47 = 7$ $\begin{array}{r} -7 \quad -7 \\ \hline x^2 - 13x + 40 = 0 \end{array}$ $\begin{array}{l} 40(x) \\ -8 \end{array} \begin{array}{l} -5 \\ -13 \end{array} \begin{array}{l} (+) \\ (+) \end{array}$ $\begin{array}{r} x-8=0 \\ +8 \quad +8 \\ \hline x=8 \end{array} \quad \begin{array}{r} x-5=0 \\ +5 \quad +5 \\ \hline x=5 \end{array}$ $(x-8)(x-5)$	<p>d. <math>x^2 - 100 = 0</math> * Difference of 2 squares</p> $\sqrt{x^2} \quad \sqrt{100}$ $(x+10)(x-10)$ $\begin{array}{r} x+10=0 \\ -10 \quad -10 \\ \hline x=-10 \end{array} \quad \begin{array}{r} x-10=0 \\ +10 \quad +10 \\ \hline x=10 \end{array}$				

5. Solve equations by factoring when a is not 1

- $a \neq 1$
- GCF
- X-method
- box method

a. Solve  $5x^2 - 16x + 12 = 0$  no GCF

$$\begin{array}{r} 60 \quad (x) \\ -10 \quad -6 \\ \hline -16 \quad (+) \end{array}$$

$$5x \begin{array}{|c|c|} \hline x & -2 \\ \hline 5x^2 & -10x \\ \hline -6 & 12 \\ \hline \end{array}$$

$$\begin{array}{l} 5x - 6 = 0 \\ +6 \quad +6 \\ \hline 5x = 6 \\ \hline x = \frac{6}{5} \end{array}$$

$$\begin{array}{l} x - 2 = 0 \\ +2 \quad +2 \\ \hline x = 2 \end{array}$$

b. Solve  $3x^2 - 18x + 15 = 0$  with GCF

$$3 \begin{array}{|c|c|c|} \hline x^2 & -6x & +5 \\ \hline 3x^2 & -18x & 15 \\ \hline \end{array}$$

$$\begin{array}{r} 5 \\ -5 \quad -1 \\ \hline -6 \end{array} \quad 3(x-5)(x-1)$$

$$\begin{array}{l} 3 = 0 \\ +5 \quad +5 \\ \hline x - 5 = 0 \\ \hline x = 5 \end{array}$$

$$\begin{array}{l} x - 1 = 0 \\ +1 \quad +1 \\ \hline x = 1 \end{array}$$

6. Solve equations by factoring GCF

Use factoring by GCF when you have two terms (a & b) and both contain an x.

One of the solutions will always be 0.

c. Solve  $3x^2 + 2x - 8 = 0$  no GCF

$$\begin{array}{r} -24 \quad (x) \\ 6 \quad -4 \\ \hline 2 \quad (+) \end{array}$$

$$3x \begin{array}{|c|c|} \hline x & +2 \\ \hline 3x^2 & 6x \\ \hline -4 & -8 \\ \hline \end{array}$$

$$\begin{array}{l} 3x - 4 = 0 \\ +4 \quad +4 \\ \hline 3x = 4 \\ \hline x = \frac{4}{3} \end{array}$$

$$\begin{array}{l} x + 2 = 0 \\ -2 \quad -2 \\ \hline x = -2 \end{array}$$

d.  $6x^2 - 5x - 11 = 0$  no GCF

$$\begin{array}{r} -36 \quad (x) \\ -9 \quad 4 \\ \hline -5 \quad (+) \end{array}$$

$$6x^2 - 5x - 11 = 0$$

$$3x \begin{array}{|c|c|} \hline 2x & -3 \\ \hline 6x^2 & -9x \\ \hline 4x & -6 \\ \hline \end{array}$$

$$\begin{array}{l} 3x + 2 = 0 \\ -2 \quad -2 \\ \hline 3x = -2 \\ \hline x = -\frac{2}{3} \end{array}$$

$$\begin{array}{l} 2x - 3 = 0 \\ +3 \quad +3 \\ \hline 2x = 3 \\ \hline x = \frac{3}{2} \end{array}$$

7. Solve equations by finding square roots.

"Solve for x" using inverse operations

Use solving by square roots when your equations have parenthesis or two terms (a & c).

PEMDAS (backwards)

a.  $x^2 - 4x = 0$  \* GCF

$$x \begin{array}{|c|c|} \hline x & -4 \\ \hline x^2 & -4x \\ \hline \end{array}$$

$$\begin{array}{l} x = 0 \\ x - 4 = 0 \\ +4 \quad +4 \\ \hline x = 4 \end{array}$$

b.  $12x^2 = -36x$  \* GCF

$$12x^2 + 36x = 0$$

$$12x \begin{array}{|c|c|} \hline x & +3 \\ \hline 12x^2 & 36x \\ \hline \end{array}$$

$$\begin{array}{l} 12x = 0 \\ 12 \quad 12 \\ \hline x = 0 \\ x + 3 = 0 \\ -3 \quad -3 \\ \hline x = -3 \end{array}$$

a.  $x^2 = 12$  \*  $\sqrt{12}$

$$\sqrt{x^2} = \sqrt{12}$$

$$x = \pm 2\sqrt{3}$$

b.  $8x^2 = 392$  \*  $\sqrt{12}$

$$\sqrt{x^2} = \sqrt{49}$$

$$x = \pm 7$$

c.  $7x^2 - 49 = 0$

$$\sqrt{x^2} = \sqrt{64}$$

$$x = \pm 8$$

d.  $(x-4)^2 = 9$

$$\sqrt{(x-4)^2} = \sqrt{9}$$

$$\begin{array}{l} x - 4 = \pm 3 \\ x - 4 = +3 \\ +4 \quad +4 \\ \hline x = 7 \\ x - 4 = -3 \\ +4 \quad +4 \\ \hline x = 1 \end{array}$$

e.  $\frac{1}{2}(x+2)^2 = 72$

$$\sqrt{(x+2)^2} = \sqrt{36}$$

$$\begin{array}{l} x + 2 = \pm 6 \\ x + 2 = +6 \\ -2 \quad -2 \\ \hline x = 4 \\ x + 2 = -6 \\ -2 \quad -2 \\ \hline x = -8 \end{array}$$

f.  $3(x-3)^2 + 7 = 26$  \*  $\sqrt{8}$

$$\sqrt{(x-3)^2} = \sqrt{8}$$

$$\begin{array}{l} x - 3 = \pm 2\sqrt{2} \\ x - 3 = +2\sqrt{2} \\ +3 \quad +3 \\ \hline x = 3 + 2\sqrt{2} \\ x - 3 = -2\sqrt{2} \\ +3 \quad +3 \\ \hline x = 3 - 2\sqrt{2} \end{array}$$

$\sqrt{12}$  \*  
 $\sqrt{4} \sqrt{3}$   
 $2\sqrt{3}$

8. Solve equations by completing the square

Move the c term to the right side  
 Use  $\left(\frac{b}{2}\right)^2$  to complete the square and then apply square root method

a. Solve  $x^2 + 4x + 4 = 10$

$$x^2 + 4x + 4 = -1 + 4$$

$$\div 2 \quad \textcircled{2} \rightarrow \textcircled{4}$$

$$x^2 + 4x + 4 = 3$$

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

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

$$x+2 = \pm \sqrt{3}$$

$$x = -2 + \sqrt{3} \quad x = -2 - \sqrt{3}$$

b. Solve  $x^2 - 16x + 64 = 0$

$$x^2 - 16x + 64 = -52 + 64$$

$$\div 2 \quad \textcircled{8} \rightarrow \textcircled{64}$$

$$x^2 - 16x + 64 = 12$$

$$(x-8)(x-8) = 12$$

$$\sqrt{(x-8)^2} = \sqrt{12} *$$

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

$$x = 8 + 2\sqrt{3} \quad x = 8 - 2\sqrt{3}$$

9. Solve equations by using Quadratic Formula

Standard Form:  
 $Ax^2 + Bx + C$

Use Q.F. when the equation is in standard form and number diamonds does not work.

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

$\sqrt{40}$  \*  
 $\sqrt{4} \sqrt{10}$   
 $2\sqrt{10}$

$\sqrt{108}$  \*  
 $\sqrt{36} \sqrt{3}$   
 $6\sqrt{3}$

$\sqrt{80}$  \*  
 $\sqrt{16} \sqrt{5}$   
 $4\sqrt{5}$

a.  $x^2 + 10x + 15 = 0$   
 $a=1 \quad b=10 \quad c=15$

$$x = \frac{-10 \pm \sqrt{(10)^2 - 4(1)(15)}}{2(1)}$$

$$x = \frac{-10 \pm \sqrt{100 - 60}}{2}$$

$$x = \frac{-10 \pm \sqrt{40}}{2} *$$

$$x = \frac{-10 \pm 2\sqrt{10}}{2}$$

$$x = -5 \pm \sqrt{10}$$

b.  $2x^2 + 10x - 1 = 0$   
 $a=2 \quad b=10 \quad c=-1$

$$x = \frac{-10 \pm \sqrt{(10)^2 - 4(2)(-1)}}{2(2)}$$

$$x = \frac{-10 \pm \sqrt{100 + 8}}{4}$$

$$x = \frac{-10 \pm \sqrt{108}}{4} *$$

$$x = \frac{-10 \pm 6\sqrt{3}}{4} \quad x = \frac{-5 \pm 3\sqrt{3}}{2}$$

c.  $3x^2 + 6x + 3 = 0$   
 $a=3 \quad b=6 \quad c=3$

$$x = \frac{-6 \pm \sqrt{(6)^2 - 4(3)(3)}}{2(3)}$$

$$x = \frac{-6 \pm \sqrt{36 - 36}}{6}$$

$$x = \frac{-6 \pm \sqrt{0}}{6}$$

$$x = \frac{-6 \pm 0}{6}$$

$$x = \frac{-6}{6} = -1$$

d.  $8x^2 - 4x + 7 = 0$   
 $a=8 \quad b=-4 \quad c=7$

$$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(8)(7)}}{2(8)}$$

$$x = \frac{4 \pm \sqrt{16 - 224}}{16}$$

$$x = \frac{4 \pm \sqrt{80}}{16} *$$

$$x = \frac{4 \pm 4\sqrt{5}}{16}$$

$$x = \frac{1 \pm \sqrt{5}}{4}$$

$x = \frac{1 \pm \sqrt{5}}{4}$

<p>10. Determine the best method for solving quadratic equations.</p>	<p>Use graphic organizer to determine the best method for solving each equation.</p>	<p>a. <math>x^2 - 9 = 5</math></p> <p>Solve equations by finding square roots. (Solving for <math>x^2</math>)</p>	<p>b. <math>5x^2 - 7x = 0</math></p> <p>GCF method</p>
		<p>c. <math>4(x+5)^2 = 64</math></p> <p>Finding square roots.</p>	<p>d. <math>x^2 + 12x + 30 = 0</math></p> $\begin{array}{r} +5 +5 \\ \hline x^2 + 12x + 35 \\ 7 \quad 5 \checkmark \\ \hline 12 \end{array}$ <p>factorable <math>a=1</math></p>
		<p>e. <math>6x^2 + 8x + 1 = 0</math></p> <p><del>6</del> not factorable! <del>8</del></p> <p>Quadratic Formula</p>	<p>f. <math>3x^2 + 13x + 12 = 0</math></p> $\begin{array}{r} 36 \\ 9 \quad 4 \checkmark \\ \hline 13 \end{array}$ <p>Factorable <math>a \neq 1</math></p>
		<p>g. <math>5(x-2)^2 = 125</math></p> <p>Finding square roots.</p>	<p>h. <math>x^2 - 16 = 0</math></p> <p>Difference of 2 squares.</p>
		<p>i. <math>5x^2 - 3x - 1 = 0</math></p> $\begin{array}{r} -7 -7 \\ \hline 5x^2 - 3x - 8 = 0 \\ -8 \quad 5 \checkmark \\ \hline -3 \end{array}$ <p>Factorable <math>a \neq 1</math></p>	<p>j. <math>x^2 - 15x + 56 = 0</math></p> $\begin{array}{r} 56 \\ -8 \quad -7 \checkmark \\ \hline -15 \end{array}$ <p>factorable <math>a=1</math></p>