SOLVING MORE COMPLICATED QUADRATIC EQUATIONS BY FACTORING

- Need some basic practice with quadratic equations first?
  Identifying Quadratic Equations
  Writing Quadratic Equations in Standard Form
  Solving Simple Quadratic Equations by Factoring

(more mathematical cats)

To solve a quadratic equation by factoring:

- put it in standard form: $ax^2 + bx + c = 0$
- factor the left-hand side
- use the Zero Factor Law

EXAMPLES:

Solve: $3x^2 = 5 - 14x$

Solution:

Write a nice, clean list of equivalent equations:

$3x^2 = 5 - 14x$	(original equation)
$3x^2 + 14x - 5 = 0$	(put in standard form: subtract 5 from both sides; add $14x$ to both sides)
$(3x - 1)(x + 5) = 0$	(factor the left-hand side; you may want to use the factor by grouping method)
$3x - 1 = 0$ or $x + 5 = 0$	(use the Zero Factor Law)
$3x = 1$ or $x = -5$	(solve the simpler equations)
$x = \frac{1}{3}$ or $x = -5$	(solve the simpler equations)

Check by substituting into the original equation:

$3(\frac{1}{3})^2 \stackrel{?}{=} 5 - 14(\frac{1}{3})$; $3 \cdot \frac{1}{9} \stackrel{?}{=} \frac{15}{3} - \frac{14}{3}$; $\frac{1}{3} = \frac{1}{3}$; Check!

$3(-5)^2 \stackrel{?}{=} 5 - 14(-5)$; $3 \cdot 25 \stackrel{?}{=} 5 + 70$; $75 = 75$; Check!

Solve: $(2x+3)(5x-1)=0$

Solution:

Note: Don't multiply it out!

If it's already in factored form, with zero on one side,

then be happy that a lot of the work has already been done for you.

$(2x+3)(5x-1)=0$	(original equation)
$2x+3=0 \quad \text{or} \quad 5x-1=0$	(use the Zero Factor Law)
$2x=-3 \quad \text{or} \quad 5x=1$	(solve the simpler equations)
$x=-\frac{3}{2} \quad \text{or} \quad x=\frac{1}{5}$	(solve the simpler equations)

Check by substituting into the original equation:

$(2(-\frac{3}{2})+3)(5(-\frac{3}{2})-1) \stackrel{?}{=} 0\,; \quad 0=0\,; \quad$ Check!

$(2(\frac{1}{5})+3)(5(\frac{1}{5})-1) \stackrel{?}{=} 0\,; \quad 0=0\,; \quad$ Check!

Solve: $10x^2-11x-6=0$

Solution:

Note that it's already in standard form.

$10x^2-11x-6=0$	(original equation)
$(5x+2)(2x-3)=0$	(factor the left-hand side; you may want to use the factor by grouping method)
$5x+2=0 \quad \text{or} \quad 2x-3=0$	(use the Zero Factor Law)
$5x=-2 \quad \text{or} \quad 2x=3$	(solve the simpler equations)
$x=-\frac{2}{5} \quad \text{or} \quad x=\frac{3}{2}$	(solve the simpler equations)

Check by substituting into the original equation:

$10(-\frac{2}{5})^2-11(-\frac{2}{5})-6 \stackrel{?}{=} 0\,; \quad 10(\frac{4}{25})+\frac{22}{5}-6 \stackrel{?}{=} 0\,; \quad 2(\frac{4}{5})+\frac{22}{5}-\frac{30}{5} \stackrel{?}{=} 0\,; \quad 0=0\,;$ Check!

$10(\frac{3}{2})^2-11(\frac{3}{2})-6 \stackrel{?}{=} 0\,; \quad 10(\frac{9}{4})-\frac{33}{2}-6 \stackrel{?}{=} 0\,; \quad 5(\frac{9}{2})-\frac{33}{2}-\frac{12}{2} \stackrel{?}{=} 0\,; \quad 0=0\,;$ Check!