SOLVING SIMPLE QUADRATIC EQUATIONS BY FACTORING

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

(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: $x^2 = 2 - x$
Solution:
Write a nice, clean list of equivalent equations:

$x^2 = 2 - x$	(original equation)
$x^2 + x - 2 = 0$	(put in standard form: subtract 2 from both sides; add x to both sides)
$(x+2)(x-1) = 0$	(factor the left-hand side)
$x + 2 = 0 \quad \text{or} \quad x - 1 = 0$	(use the Zero Factor Law)
$x = -2 \quad \text{or} \quad x = 1$	(solve the simpler equations)

Check by substituting into the original equation:

$(-2)^2 \overset{?}{=} 2 - (-2)\,; \quad 4 = 4\,; \quad$ Check!

$(1)^2 \overset{?}{=} 2 - 1\,; \quad 1 = 1\,; \quad$ Check!

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

$(x+3)(x-2)=0$	(original equation)
$x+3=0$ or $x-2=0$	(use the Zero Factor Law)
$x=-3$ or $x=2$	(solve the simpler equations)

Check by substituting into the original equation:

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

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

Solve: $(2x-3)(1-3x)=0$
Solution:
Again, don't multiply it out!
When you have a product on one side, and zero on the other side,
then you're all set to use the Zero Factor Law.

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

Check by substituting into the original equation:

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

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

Solve: $x^2 + 4x - 5 = 0$
Solution:
Note that it's already in standard form.

$x^2 + 4x - 5 = 0$	(original equation)
$(x+5)(x-1) = 0$	(factor the left-hand side)
$x + 5 = 0 \quad \text{or} \quad x - 1 = 0$	(use the Zero Factor Law)
$x = -5 \quad \text{or} \quad x = 1$	(solve the simpler equations)

Check by substituting into the original equation:

$$(-5)^2 + 4(-5) - 5 \overset{?}{=} 0\,; \quad 25 - 20 - 5 \overset{?}{=} 0\,; \quad 0 = 0\,; \quad \text{Check!}$$

$$1^2 + 4(1) - 5 \overset{?}{=} 0\,; \quad 1 + 4 - 5 \overset{?}{=} 0\,; \quad 0 = 0\,; \quad \text{Check!}$$

Solve: $14 = -5x + x^2$
Solution:

$14 = -5x + x^2$	(original equation)
$x^2 - 5x - 14 = 0$	(put in standard form: subtract 14 from both sides; write in the conventional way)
$(x-7)(x+2) = 0$	(factor the left-hand side)
$x - 7 = 0 \quad \text{or} \quad x + 2 = 0$	(use the Zero Factor Law)
$x = 7 \quad \text{or} \quad x = -2$	(solve the simpler equations)

Check by substituting into the original equation:

$$14 \overset{?}{=} -5(7) + 7^2\,; \quad 14 \overset{?}{=} -35 + 49\,; \quad 14 = 14\,; \quad \text{Check!}$$

$$14 \overset{?}{=} -5(-2) + (-2)^2\,; \quad 14 \overset{?}{=} 10 + 4\,; \quad 14 = 14\,; \quad \text{Check!}$$

Solve: $6x = 2x^2$

Solution:

When there's no constant term, the factoring is much easier:

$6x = 2x^2$	(original equation)
$2x^2 - 6x = 0$	(put in standard form: subtract $6x$ from both sides; write in the conventional way)
$x^2 - 3x = 0$	(optional step: divide both sides by 2)
$x(x-3) = 0$	(factor the left-hand side)
$x = 0$ or $x - 3 = 0$	(use the Zero Factor Law)
$x = 0$ or $x = 3$	(solve the simpler equations)

Check by substituting into the original equation:

$6 \cdot 0 \overset{?}{=} 2 \cdot 0^2$; $0 = 0$; Check!

$6 \cdot 3 \overset{?}{=} 2 \cdot 3^2$; $18 = 18$; Check!