9.5: Factor $x^2 + bx + c$:

Goals: * Factor trinomials whose leading coefficient is 1
  * Solve equations by factoring

Quadratic Function: a non-linear function written in the form $y = ax^2 + bx + c$

Factoring using the GCF is essentially: UN-Distributing

Factoring trinomials into the product of two binomials is essentially: UN-Foiling

Factor means to rewrite a polynomial as the product of two binomials

a needs to be 1****

Ex: Factor:

$x^2 + 11x + 18$

Factors of 18 that add up to 11 are:
9 and 2

So $x^2 + 11x + 18$ factored is:

$(x + 2)(x + 9)$ You can check your answer by FOILING!

$$x^2 + bx + c = (x + p)(x + q)$$

*To find p and q…find the factors of c whose sum is b

Factor each trinomial:

Ex: $x^2 + 3x + 2$

$(x + 1)(x + 2)$

Ex: $a^2 + 7a + 10$

$(a + 5)(a + 2)$

Ex: $t^2 + 9t + 14$

$(t + 7)(t + 2)$

Ex: $x^2 + 8x + 12$

$(x + 6)(x + 2)$

Ex: $t^2 + t - 20$

   $(t + 5)(t - 4)$

Ex: $n^2 - 6n + 8$

   $(n - 4)(n - 2)$

Ex: $x^2 - 4x + 3$

   $(x - 3)(x - 1)$

Ex: $n^2 - 5n + 6$

   $(n - 3)(n - 2)$

Ex: $y^2 + 2y - 15$

   $(y + 5)(y - 3)$

Ex: $w^2 + 6w - 16$

   $(w + 8)(w - 2)$

Ex: $y^2 + 3y - 10$

   $(y + 5)(y - 2)$

Solve:

Ex: $x^2 + 3x - 18 = 0$

   $(x + 6)(x - 3) = 0$
   $x = -6$ or $x = 3$

Ex: $s^2 - 2s = 24$

   $s^2 - 2s - 24 = 0$
   $(s - 6)(s + 4) = 0$
   $s = 6$ or $s = -4$
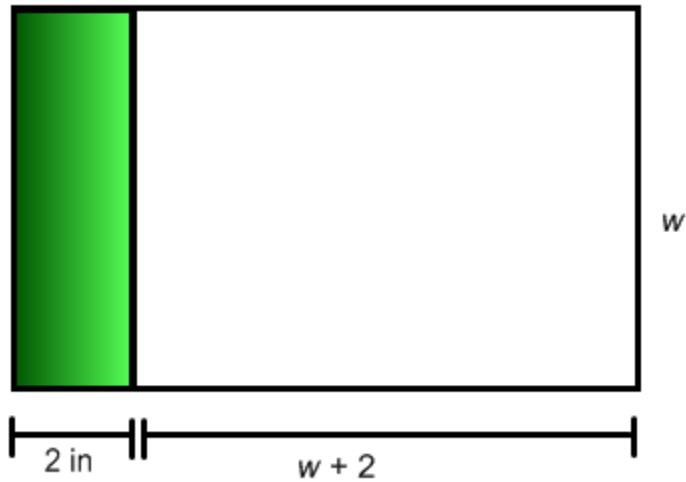
Ex: $x^2 - 3x = 28$

   $x^2 - 3x - 28 = 0$
   $(x - 7)(x + 4) = 0$
   $x = 7$ or $x = -4$

Ex: You are making banners to hang during school spirit week. Each banner requires 16.5 square feet of felt and will be cut as shown. Find the width of each banner.
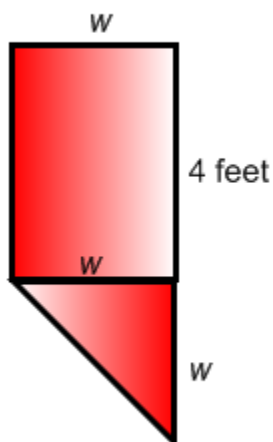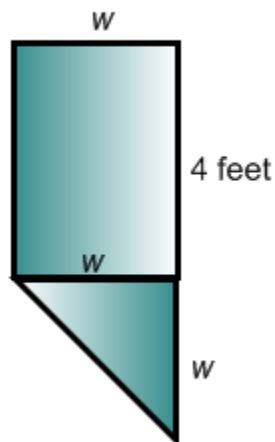
$2(4w + \frac{1}{2} w^2) = 33$
$8w + w^2 = 33$
$w^2 + 8w - 33 = 0$
$(w + 11)(w - 3) = 0$
$w = -11$ or $w = 3$
$w = 3$ since it can't be negative

Ex: You are designing a team flag. The shaded region will have the team name. The entire flag requires 117 square inches of fabric. Find the width.

$w(w + 4) = 117$
$w^2 + 4w - 117 = 0$
$(w + 13)(w - 9) = 0$
$w = 9$ (can't be −13)

Factor completely.

Ex: $-x^2 - 6x - 5$

*Make $a = 1$ by factoring out a GCF of −1

$-1(x^2 + 6x + 5)$

$-1(x + 2)(x + 3)$

Ex: $-x^2 - 4x - 3$

$-1(x^2 + 4x + 3)$

$-1(x + 3)(x + 1)$

Ex: $-x^2 - 3x + 70$

$-1(x - 7)(x + 10)$

Ex: $-x^2 + 17x - 72$

$-1(x - 9)(x - 8)$

Ex: $2a^2 + 12a + 16$

$2(a^2 + 6a + 8)$
$2(a + 4)(a + 2)$

Ex: $3x^2 + 24x - 144$

$3(x^2 + 8x - 48)$
$3(x + 12)(x - 4)$

Ex: $4x^2 - 40x + 84$

$4(x^2 - 10x + 21)$
$4(x - 3)(x - 7)$

Ex: $-2x^2 - 10x - 12$

$-2(x^2 + 5x + 6)$
$-2(x + 3)(x + 2)$