A Review of some Basic Factoring Strategies

x^2

Today we will look at some (not all) of the factoring strategies from the grade 10 math courses. Remember that factoring is the exact opposite of expanding.

Factoring: Finding the Greatest Common Factor

Expand (simplify) each of the following.

a) $2x(x-6)$

$$= 2x^2 - 12x$$

factoring

b) $-3x(2x+5)$

$$= -6x^2 - 15x$$

expand

Factor each of the following, by identifying the greatest common factor.

a) $3x^2 + 9x$

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

b) $4y^2 - 16y$

$$= 4y(y-4)$$

c) $5f^2 - 3f$

$$= f(5f-3)$$

FOIL

Factoring: Simple Trinomials

Expand each of the following. Look for a pattern!

a) $(x+4)(x+3)$

$$= x^2 + 3x + 4x + 12$$
$$= x^2 + 7x + 12$$

b) $(y+2)(y+3)$

$$= y^2 + 3y + 2y + 6$$
$$= y^2 + 5y + 6$$

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

$$= x^2 - x - 6$$

d) $(x-4)(x-6)$

$$= x^2 - 10x + 24$$

Did you see the pattern? The above are called simple trinomials. They have the form $x^2 + bx + c$

$\times$ to

$+$ to

Use your "pattern" to factor each of the following.

a) $x^2 + 9x + 20$

$= (x+5)(x+4)$

b) $x^2 - 3x - 15$

$\_ \times \_ = -15$

$\_ + \_ = -3$

$=$ does not factor

c) $x^2 - x - 30$

10 6 30 15

3 5 1 2

$\_ \times \_ = -30$

$\_ + \_ = -1$

$= (x-6)(x+5)$

d) $s^2 - 5s + 6$

$-3 \times -2 = 6$

$-3 + -2 = -5$

$= (s-3)(s-2)$

e) $e^2 - 8e + 12$

$= (e-6)(e-2)$

You may also remember how to factor trinomials such as the following:
(but its ok if you don't)

general trinomial

$2x^2 + 5x - 12$

$= (2x-3)(x+4)$

\

Solving Quadratic Equations

Remember that we can solve a linear equation by *isolating the variable.*

$2x - 5 = 13$

$2x = 18$

$x = 9$

This strategy sometimes works for quadratic equations as well:

$x^2 - 11 = 14$

$x^2 = 25$

$x = \pm\sqrt{25}$

$x = 5$ or $x = -5$

$x = \pm 5$

$2x^2 - 4 = 16$

$\frac{2x^2}{2} = \frac{20}{2}$

$x^2 = 10$

$x = \pm\sqrt{10}$

$x \doteq \pm 3.16$

However sometimes it does not:

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

$\cancel{x^2 = 5x - 6}$

$\cancel{x = \sqrt{5x-6}}$

$\boxed{?} \times \boxed{?} = 0$

$(x-3)(x-2) = 0$

$x - 3 = 0$ or $x - 2 = 0$

$x = 3$ or $x = 2$

Solve the following by factoring.

$x^2 + 8x + 15 = 0$

$(x+5)(x+3) = 0$

$x + 5 = 0$ or $x + 3 = 0$

$\boxed{x = -5}$ or $\boxed{x = -3}$

$x^2 - x = 12$

$x^2 - x - 12 = 0$

$(x-4)(x+3) = 0$

$x - 4 = 0$ or $x + 3 = 0$

$\boxed{x = 4}$ or $\boxed{x = -3}$

$4n^2 + 8n = 0$

$4n(n+2) = 0$

$4n = 0$ or $n + 2 = 0$

$n = 0$ $\quad$ $n = -2$

But what if a quadratic equation cannot be factored?

Solve $x^2 + 9x - 1 = 0$

$\_ \times \_ = -1 \qquad -1, 1$

$\_ + \_ = 9$

In this case we can use the quadratic formula.

If $ax^2 + bx + c = 0$ then $\boxed{x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}}$

$x^2 + 9x - 1 = 0$

$a = 1 \quad b = 9 \quad c = -1$

$x = \frac{-9 \pm \sqrt{9^2 - 4(1)(-1)}}{2(1)}$

$x = \frac{-9 \pm \sqrt{85}}{2}$

$x \doteq 0.11 \qquad x \doteq -9.11$

Solve using the quadratic formula:

$x = 1 - 6x^2$

$6x^2 + 1x - 1 = 0$

a b c

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

$x = \frac{-1 \pm \sqrt{1^2 - 4(6)(-1)}}{2(6)}$

$x = \frac{-1 \pm \sqrt{25}}{12}$

$x = \frac{-1 \pm 5}{12}$

$x = \frac{4}{12}$ or $x = \frac{-6}{12}$

$\boxed{x = 1/3} \qquad \boxed{x = -1/2}$

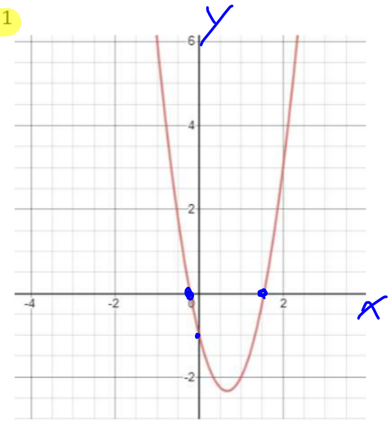
$(3x - 1)(2x + 1) = 0$

$3x - 1 = 0$ or $2x + 1 = 0$

$3x = 1$ or $2x = 1$

$x = 1/3 \qquad x = -1/2$

Find the x and y-intercepts for the graph of $y = 3x^2 - 4x - 1$



y-int $x = 0$

$y = 3(0)^2 - 4(0) - 1$

$y = -1 \quad (0,-1)$

x-int $y = 0$

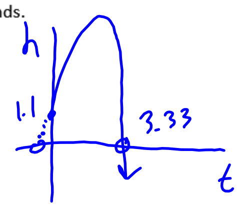
$0 = 3x^2 - 4x - 1 \qquad x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(3)(-1)}}{2(3)}$

$x = \frac{4 \pm \sqrt{28}}{6} \rightarrow x \doteq 1.55$

$x \doteq -0.215$

A model rocket is launched upwards with a velocity of 16 m/s. The equation that models the height of the rocket is $h(t) = -4.9t^2 + 16t + 1.1$ where *h(t)* is the height (in metres) after *t* seconds.



a) Find the initial height of the rocket. $t = 0$

$h(0) = -4.9(0)^2 + 16(0) + 1.1$

$h(0) = 1.1$

$\boxed{1.1 m}$

b) How long is the rocket in the air for? (round to 2 decimal places)

$h(t) = 0$

$0 = -4.9t^2 + 16t + 1.1$

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

$t = \frac{-16 \pm \sqrt{16^2 - 4(-4.9)(1.1)}}{2(-4.9)}$

3.33 seconds

$t = \frac{-16 \pm \sqrt{277.56}}{-9.8}$

$t \cancel{\doteq -0.067}$ or $\boxed{t \doteq 3.33}$

$t > 0$