Standard Form

- If a quadratic in factored form is expanded (all brackets removed) it will take a new form $y = ax^2 + bx + c$. A quadratic written in this form is said to be in standard form.

- To expand a set of binomials, we need to multiply all the terms in the first bracket by all the terms in the second bracket. To help us remember this, use FOIL.

F - First term in each bracket
O - Outside terms of the brackets
I - Inside terms of the brackets
L - Last term in each bracket

Ex/ Expand.

a) $(2x+1)(x-4)$

$= 2x^2 - 8x + 1x - 4$ (collect like terms)

$= 2x^2 - 7x - 4$

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

$= x^2 - 2x + 5x - 10$

$= x^2 + 3x - 10$

c) $(3x-5)(4x+1)$

$= 12x^2 + 3x - 20x - 5$

$= 12x^2 - 17x - 5$

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

Do FOIL first, then multiply by 3

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

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

$= 6x^2 - 15x + 9$

e) $-2(x+4)(x-7)$

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

$= -2(x^2 - 3x - 28)$

$= -2x^2 + 6x + 56$

f) $(x+2)^2$

$= (x+2)(x+2)$ Write it twice then FOIL

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

$= x^2 + 4x + 4$

g) $(2x-3y)^2$

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

$= 4x^2 - 6xy - 6xy + 9y^2$

$= 4x^2 - 12xy + 9y^2$

h) $4(x+2)^2$

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

$= 4(x^2 + 2x + 2x + 4)$

$= 4(x^2 + 4x + 4)$

$= 4x^2 + 16x + 16$

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

$= (3x^2 - x + 6x - 2)(x+4)$ Do FOIL with any 2 brackets

$= (3x^2 + 5x - 2)(x+4)$

$= 3x^3 + 12x^2 + 5x^2 + 20x - 2x - 8$ Multiply everything in 1st bracket by everything in 2nd

$= 3x^3 + 17x^2 + 18x - 8$

Ex/ A parabola has zeros of 2 and 4. It passes through the point (6,-16). Determine:

a) The equation in standard form.
b) The direction of opening.
c) The axis of symmetry.
d) The vertex.
e) The y-intercept.

a) start in factored form

$y = a(x-2)(x-4)$

$-16 = a(6-2)(6-4)$

$-16 = a(4)(2)$

$-16 = 8a$

$a = -2$

$y = -2(x-2)(x-4)$

$= -2(x^2-4x-2x+8)$

$= -2(x^2-6x+8)$

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

b) opens down ($a = -2$ in both forms)

c) $x = \frac{2+4}{2} = 3$

d) $y = -2(3-2)(3-4)$

$= -2(1)(-1)$

$= 2$

Vertex: $(3,2)$

OR $y = -2(3)^2+12(3)-16$

$= 2$

$(3,2)$

e) $x = 0$, $y = -2(0-2)(0-4)$

$= -2(-2)(-4)$

$= -16$

OR $y = -2(0)^2+12(0)-16$

$= -16$

Properties of Standard Form $y = ax^2 + bx + c$.

1) a is the direction of opening.
2) The axis of symmetry is given by $x = \frac{-b}{2a}$.
3) The vertex can be found by using the axis of symmetry and the equation.
4) The y-intercept is c.

Axis $x = \frac{-b}{2a}$ $x = \frac{-12}{2(-2)} = \frac{-12}{-4} = 3$

Ex/ Given $y = -2x^2 + 6x - 3$, determine:

a) The direction of opening.
b) The axis of symmetry.
c) The vertex.

a) Opens down

$a = -$

b) $x = \frac{-b}{2a} = \frac{-6}{2(-2)} = \frac{-6}{-4} = 1.5$

c) $y = -2(1.5)^2+6(1.5)-3$

$= 1.5$

$\therefore$ Vertex $(1.5, 1.5)$

Homework: Pg. 166 #'s: 5-7(AB),9,10(AB)12ab,14,17a