Special Products

Lesson objectives

- I know how to expand and simplify to write vertex form in standard form
- I know how to multiply the sum and difference of two terms

1.1

Lesson objectives | Teachers' notes | Lesson notes

MHR Page 225 #s 2aceg, 3bdfh, 4ace, 5abcd, 6bdf, 8, 11, & 14bc

Extending on from last time, there are some situations that arise that have some "interesting" characteristics.

For example, when we square a binomial we can see that there is a common pattern to the simplified expression.

$$\begin{aligned}(x+3)^2 &= (x+3)(x+3)\\ &= x^2+3x+3x+3^2\\ &= x^2+2(3x)+9\\ &= x^2+6x+9\end{aligned}$$

$$\begin{aligned}(x-4)^2 &= (x-4)(x-4)\\ &= x^2-4x-4x+(-4)^2\\ &= x^2-2(4x)+16\\ &= x^2-8x+16\end{aligned}$$

We can use this technique to convert from vertex form to standard form. Expand the binomial and add on the value of k.

In general:

$$(a + b)^2 = a^2 + 2ab + b^2$$

$$(a - b)^2 = a^2 - 2ab + b^2$$

To square a binomial:

1. Square the first term
2. Find twice the product of the terms
3. Square the last term

The resulting expression is known as a perfect square trinomial.

When simplifying the product of a sum and a difference we also get an "interesting" result.

$$\begin{aligned}(x + 3)(x - 3) &= x^2 - 3x + 3x - 3^2 \\ &= x^2 - 9\end{aligned}$$

This will also work if finding the product of a difference and a sum, we just get the middle terms the other way around.

In general: $(a + b)(a - b) = a^2 - b^2$

$(a - b)(a + b) = a^2 - b^2$

The resulting expression is known as a difference of squares.

Expand and simplify the following examples:

a) $(x + 4)^2$

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

$= x^2 + 8x + 16$

c) $(3y + 7x)^2$

$= (3y)^2 + 2(3y)(7x) + (7x)^2$

$= 9y^2 + 42xy + 49x^2$

b) $(k - 5)^2$

$= (k)^2 - 2(k)(5) + (5)^2$

$= k^2 - 10k + 25$

d) $(q - 11)(q + 11)$

$= (q)^2 - (11)^2$

$= q^2 - 121$

e) $(4m + 3n)(4m - 3n)$

$= (4m)^2 - (3n)^2$

$= 16m^2 - 9n^2$