

## 3.5 Polynomial of the Form

$$x^2 + bx + c$$

### **Lesson Focus**

Use models and algebraic strategies to multiply binomials and to factor trinomials

# FOIL

To distribute a binomial multiplied by a binomial  
remember FOIL

F – (first)(first)

O – (outside)(outside)

I – (inside)(inside)

L – (last)(last)

$$(h + 11)(h + 5)$$

# Reminder - Like Terms

- **Like terms** – terms that differ only by coefficients
  - **SAME variables**
  - **SAME exponents on the variables**

- Examples:

$$3x \text{ and } -5x$$
$$2ab^2 \text{ and } 187ab^2$$

- Non-examples:

$$3x \text{ and } 3x^2$$
$$-a^2b \text{ and } 6ab^2$$

# Example

Expand and simplify.

$$\begin{aligned} \text{a) } & (c + 3)(c - 7) \\ &= c^2 - 7c + 3c - 21 \\ &= c^2 - 4c - 21 \end{aligned}$$
Detailed description: The image shows the expansion of the expression (c+3)(c-7). The original expression is written in black. Blue handwritten annotations include a curved line above the first two terms (c+3) and another curved line below the last two terms (c-7). A red arrow points from the final result, c^2 - 4c - 21, back to the original expression. The final result is circled in red. A green bracket is drawn under the terms -7c and +3c in the intermediate step.

$$\begin{aligned} \text{b) } & (5 - s)(9 - s) \\ &= 45 - 5s - 9s + s^2 \\ &= 45 - 14s + s^2 \end{aligned}$$
Detailed description: The image shows the expansion of the expression (5-s)(9-s). The original expression is written in black. The final result, 45 - 14s + s^2, is written in blue. A green bracket is drawn under the terms -5s and -9s in the intermediate step.

## Example – Your Turn

Expand and simplify.

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

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

$$= x^2 - 2x - 8$$

b)  $(8 - b)(3 - b)$

$$= 24 - 8b - 3b + b^2$$

$$= 24 - 11b + b^2$$

# Homework

P. 166-167

# 5, 10, 12, 18

*don't worry about sketching or modelling  
with alge-tiles*

# Factoring

- *Factoring is the inverse process of distribution*
- *We need to be able to go from:*

$$x^2 + bx + c$$

- *To:*

$$(x + c)(x + d)$$

- *This is **crucial** in later math classes*

## Explore

- *For the multiplication sentence*

$$x^2 + bx + c = (x + d)(x + e)$$

*What relationships exist among  $b$ ,  $c$ ,  $d$ , and  $e$ ?*

$$ax^2 + bx + c$$

$$x^2 - 7x + 10$$



# Steps to Factor

## Teach Me How To Factor

### 1. *Hi to Low*

- *Reorder the terms in standard form:*

$$ax^2 + bx + c$$

### 2. *GCF*

- *Factor out any GCF there may be*

### 3. *Difference of Squares*

- *Special kind of quadratic*

### Numbers

*We need two numbers that:*

*Multiply together = c*

*Add together = b*

### Signs

*(+) at the back*

*We're going to have **same signs** when we factor*

*(-) at the back*

*We're going to have **different signs** when we factor*

# Example

Find two integers with the given properties.

	$a$	$b$	Product $ab$	Sum $a + b$
i)			2	3
ii)			6	5
iii)			9	10
iv)			10	7
v)			12	7
vi)			15	8

$$x^2 - 1x - 6$$

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

# Example

Factor each trinomial.

a)  $x^2 - 2x - 8$

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

Simple Trinomials

$$P = -8$$

$$S = -2$$

$$\begin{array}{c} \diagdown \quad \diagup \\ -4, 2 \end{array}$$

# Example

Factor each trinomial.

b)  $z^2 - 12z + 35$

$$= (z - 7)(z - 5)$$

$$P = 35$$

$$S = -12$$

$$\begin{array}{l} \backslash \quad / \\ -7, -5 \end{array}$$

## Example – Your Turn

Factor each trinomial.

a)  $x^2 - 8x + 7$

$$= (x - 7)(x - 1)$$

b)  $a^2 + 7a - 18$

$$= (a - 2)(a + 9)$$

$$P = 7$$

$$S = -8$$

$$\begin{array}{l} \diagdown \quad \diagup \\ -1, -7 \end{array}$$

$$P = -18$$

$$S = 7$$

$$-2, 9$$

# Homework

P. 166-167

# 11, 14

Handout

$$x^2 + 3x - 10$$

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

30

$$x^2 - 8x + 15$$

$$(x - 5)(x - 3)$$

# Factoring Different Scenarios

- *Not every trinomial will be given to you in the form:*

$$x^2 + bx + c$$

## Remember these two rules!

### 1. *Hi to Low*

- *Reorder the terms in standard form:*

$$ax^2 + bx + c$$

### 2. *GCF*

- *Factor out any GCF there may be*



## Example – Reorder

Factor:  $-24 - 5d + d^2$

$$d^2 - 5d - 24$$

$$(d + 3)(d - 8)$$

## Example – GCF

Factor.

$$-4t^2 - 16t + 128$$

$$= -4(t^2 + 4t - 32)$$

$$= -4(t + 8)(t - 4)$$

## Example – Your Turn

Factor.

$$-5h^2 - 20h + 60$$

$$= -5(h^2 + 4h - 12)$$

$$= \underline{-5(h + 6)(h - 2)}$$

$$-30 + 7m + m^2$$

$$m^2 + 7m - 30$$

$$= (m + 10)(m - 3)$$

# Homework

**P. 165-167**

**# 15, 17, 21**