

# 3.8 Factoring complex trinomials

$$ax^2 + bx + c, a \neq 1$$

Yesterday we learned of to factor simple trinomials such as:  $x^2 + 5x + 6$  (the coefficient of  $x^2$  is always 1 or -1

Take a moment to check that your entrance card answers are correct.

**Entrance Card**

Name: Solutions Date: \_\_\_\_\_

Show your work in the space below.

1. Factor completely:

(a) $m^2 + 5m + 6 = 2, 3$ $= (m+2)(m+3)$	(b) $n^2 - 9n + 20 = -4, -5$ $= (n-4)(n-5)$	(c) $a^2 + 5a - 14 = 7, -2$ $= (a+7)(a-2)$
(d) $q^2 - 5q - 24 = -8, 3$ $= (q-8)(q+3)$	(e) $-x^2 - x + 30 = 6, -5$ $= -(x^2 + x - 30)$ $= -(x+6)(x-5)$ or $= (x+6)(5-x)$	(f) $48x^2 - 56x - 30xy + 35y =$ $= 8x(6x-7) - 5y(6x-7)$ $= (6x-7)(8x-5y)$

Today we will learn how to factor complex trinomials such as:  $2x^2 + 7x + 6$

- Pay attention that the coefficient of  $x^2$  is not 1 or -1
- Comment 1: As first step, you should ALWAYS try to common factor. You may end up with a simple trinomial that is easier to factor.
- Comment 2: There are more than one method to factor complex trinomials. We will only be learning **factoring by decomposition** you can use other methods but you will be doing it at your own risk and you need to show your steps...

**Example 1:** Factor  $2x^2 + 7x + 6$

$$= \underline{2x^2 + 4x} + \underline{3x + 6}$$

factoring by  
grouping

$$= 2x(\underline{x + 2}) + 3(\underline{x + 2})$$

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

Why  $4x$  and  $3x$ ?

$$2x^2 + 7x + 6$$

product is  $(6)(2) = 12$   
sum is  $7$

## Example 2:

Factor:  $3x^2 - 11x + 6$

product  $(3)(6)$   
 $= 18$

sum:  $-11$   
 $-9, -2$

$= \underline{3x^2 - 9x} - \underline{2x + 6}$

$= 3x(\underline{x - 3}) - 2(\underline{x - 3})$

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

factoring by  
grouping

### Example 3:

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

$= \underline{4x^2 - 6x} + \underline{2x - 3}$

$= 2x(\underline{2x - 3}) + 1(\underline{2x - 3})$

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

product  $(4)(-3)$   
 $= -12$

sum:  $-4$   
 $-6, 2$

factoring by  
grouping

## Example 4:

Factor:  $6x^2 - 5x - 1$

$= \underline{6x^2 - 6x} + \underline{x - 1}$

$= 6x(\underline{x - 1}) + 1(\underline{x - 1})$

$= (x - 1)(6x + 1)$

product  $(6)(-1)$   
 $= -6$

sum:  $-5$   
 $-6, 1$

factoring by  
grouping

## Example 5:

Factor:  $12x^2 - 5x - 2$

$= \underline{12x^2 - 8x} + \underline{3x - 2}$

$= 4x(\underline{3x - 2}) + 1(\underline{3x - 2})$

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

product  $(12)(-2)$   
 $-24$

sum:  $-5$   
 $-8, 3$

factoring by  
grouping