Welcome Back to MYP Math 9!

	Assignment Effort Grade (Circle One)	Comments (What was interesting or challenging?)
Monday Date: 3/5 Topic:_____	0 1 2	
Tuesday Date: 3/6 Topic:_____	0 1 2	No Homework (Test Friday)
Wednesday Date: 3/7 Topic: Polynomial Degree	0 1 2	
Thursday Date: 3/8 Topic: 4ABCDE Factored to General Form	0 1 2	
Friday Date: _____ Topic:_____	0 1 2	

Warm-up: Translate from factored to general form.

How could you go the other way?

Consider the expansion:

$2x(x - 3)$

$2x^2 - 6x$

$(x + 1)(x + 6)$

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

$x^2 + 7x + 6$

Warm-up: Translate from factored to general form.

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Consider the expansion:

$2x(x - 3)$

$2x^2 - 6x$

$(x + 1)(x + 6)$

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

$= x^2 + 7x + 6$

Warm-up: Translate from factored to general form.

How could you go the other way?

Consider the expansion:

$(x+1)(x+6)$

$x^2+6x+1x+1\cdot 6$

$x^2+(6+1)x+1\cdot 6$

sum PRODUCT

x^2+7x+6

E FACTORISING QUADRATIC TRINOMIALS

Consider this expansion

$$\begin{aligned}(x+1)(x+6) &= x^2+6x+x+1\times 6 \qquad \{\text{using FOIL}\}\\ &= x^2+(6+1)x+(1\times 6)\\ &= x^2+(\textbf{sum of } 1 \text{ and } 6)x+(\textbf{product of } 1 \text{ and } 6)\\ &= x^2+7x+6\end{aligned}$$

To factor: We need two numbers that **sum** to 7 and **multiply** to 6....1 and 6!

So, to factorise x^2+7x+6, we need two numbers with a sum of 7 and a product of 6. These numbers are 1 and 6, and so $x^2+7x+6=(x+1)(x+6)$.

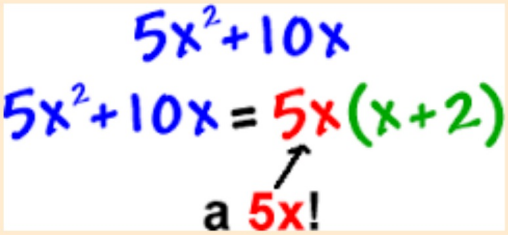
We call this the **sum and product method**.

Class Plan:

1. Warm-up

2. 9AE Quadratic Factorization

3. Practice



Chapter 9

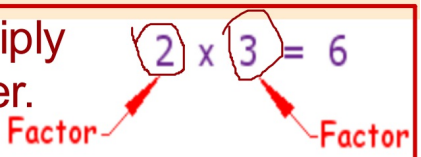
Quadratic factorisation

A Removing common factors
B Difference of two squares factorisation
C Perfect square factorisation
D Factorising expressions with four terms
E Factorising quadratic trinomials
F Factorising $ax^2 + bx + c, \ a \neq 1$

Take a step back...

What is a **factor**?

Factors are numbers you multiply together to get another number.



fac·tor

/ˈfaktər/

noun
plural noun: **factors**

1. a circumstance, fact, or influence that contributes to a result or outcome.
   "his legal problems were not a factor in his decision"
   synonyms: element, part, component, ingredient, strand, constituent, point, detail, item, feature, facet, aspect, characteristic, consideration, influence, circumstance
   "this had been a key factor in his decision to withdraw"

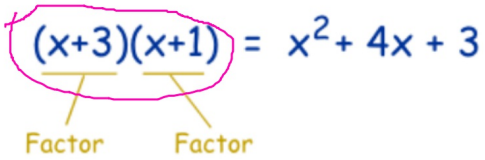
2. a number or quantity that when multiplied with another produces a given number or expression.

Take a step back...

What is a **factor (in Algebra)**?

In Algebra, factors are what we can multiply together to get an expression.

(x+3) and (x+1) are factors of $x^2 + 4x + 3$:



Today we are solving for factors. (**what** we can multiply together to get an expression)

https://www.mathsisfun.com/definitions/factor.html

Quadratic factorisation

The process of writing an expression as a product of its factors.

A **quadratic trinomial** in x is an expression of the form $ax^2 + bx + c$ where x is the variable, and a, b, and c are constants, $a \neq 0$.

$$\underset{\text{the } x^2 \text{ term}}{ax^2} + \underset{\text{the } x \text{ term}}{bx} + \underset{\text{the constant term}}{c}$$

For example: $x^2 + 5x + 6$, $4x^2 - 9$ and $9x^2 + 6x + 1$ are quadratic expressions.

In **Chapter 4** we studied the expansion of algebraic factors, many of which resulted in quadratic trinomials. In this chapter we will consider **factorisation**, which is the reverse process of expansion.

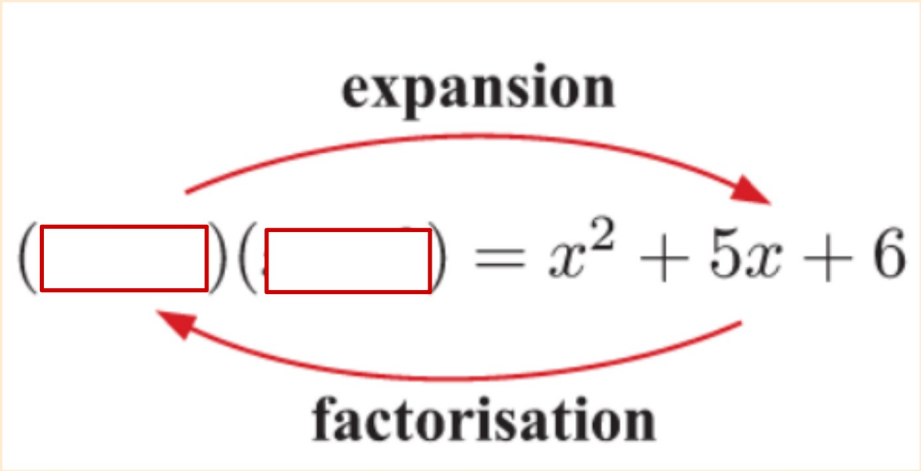
Factorisation is the process of writing an expression as a **product** of its **factors**.

For example:

$$(x+2)(x+3) \underset{\text{factorisation}}{\overset{\text{expansion}}{\rightleftharpoons}} x^2 + 5x + 6$$

Goal Today:

How can we translate from general form to factored form?



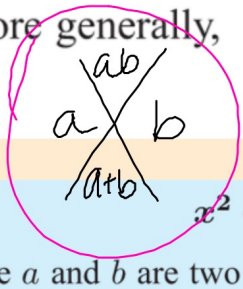
The *reverse* process of expansion

E FACTORISING QUADRATIC TRINOMIALS

More generally, $(x + a)(x + b) = x^2 + bx + ax + ab$

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

SUM PRODUCT



$$x^2 + px + q = (x + a)(x + b)$$

where a and b are two numbers whose sum is p, and whose product is q.

Factoring Method Introduction:

How do the values **2 and **3** relate to the coefficients in the expression $x^2 + 5x + 6$?

$2+3=5 \quad 2 \cdot 3 = 6$

***How is this digram related to the situation above?

A REMOVING COMMON FACTORS

What are the common factors?

Factorise by removing a common factor: GCF = $2x$

a $2x^2 + 3x$ GCF

x x

$x(2x+3)$

b $-2x^2 - 6x$

$-2x$ $-2x$

$-2x(x+3)$

$-x(2x+6)$

A REMOVING COMMON FACTORS

What are the common factors?

Factorise by removing a common factor: GCF = -2x

a $2x^2 + 3x$ GCF = x

$x(2x+3)$

b $-2x^2 - 6x$

$-2x$

$-2x(x+3)$

$x(x+1) \Leftrightarrow x^2+x$ $(x+2)(x+3) \Leftrightarrow x^2+5x+6$

a $2x^2 + 3x$ has HCF x

$\therefore\ 2x^2 + 3x = x(2x+3)$

b $-2x^2 - 6x$ has HCF $-2x$

$\therefore\ -2x^2 - 6x = -2x(x+3)$

E FACTORISING QUADRATIC TRINOMIALS

Example 10

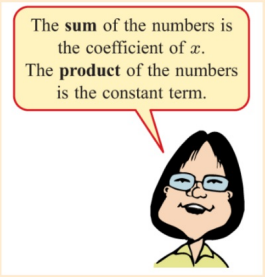
Use the sum and product method to fully factorise:

a $x^2 + 5x + 4$

$(x+4)(x+1)$

Product

Sum



Example 10

Use the sum and product method to fully factorise:

b $x^2 - x - 12$

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

+

$3 + -4 = -1$

$3 \cdot -4 = -12$

SOLUTIONS

a We need two numbers with sum 5, and product 4.
The numbers are 1 and 4.
$\therefore \quad x^2 + 5x + 4 = (x + 1)(x + 4)$

b We need two numbers with sum -1 and product -12.
The numbers are -4 and 3.
$\therefore \quad x^2 - x - 12 = (x - 4)(x + 3)$

Example 7

Fully factorise:

a $x^2 + 10x + 25$

$(x+5)(x+5)$

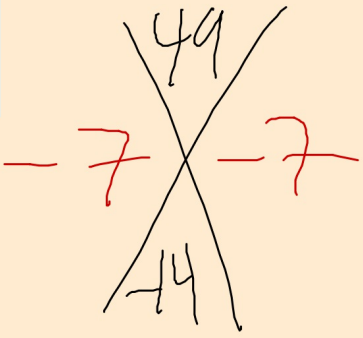
$(x+5)^2$

Example 7

Fully factorise:

b $x^2 - 14x + 49$

$(x-7)^2$



SOLUTIONS

Example 7 Self

Fully factorise:

a $x^2 + 10x + 25$ **b** $x^2 - 14x + 49$

a
$$\begin{aligned} & x^2 + 10x + 25 \\ &= x^2 + 2 \times x \times 5 \\ &= (x+5)^2 \end{aligned}$$

b $x^2 - 14x + 49$

b
$$\begin{aligned} & x^2 - 14x + 49 \\ &= x^2 - 2 \times x \times 7 + 7^2 \\ &= (x-7)^2 \end{aligned}$$

Exercises...

9E: first column

1 aceg
2adg
3adg
3adg
4adgjm
5adgjm

If you need additional practice, do more!!

Exercises... DO: First column of 9E

Chapter 9E: Quadratic Factorizations

EXERCISE 9E

1 Find two numbers which have:

a product 12 and sum 7	**b** product 15 and sum 8	
c product 16 and sum 10	**d** product 18 and sum 11	
e product -36 and sum 9	**f** product -36 and sum -9	
g product -12 and sum -4	**h** product -30 and sum 13	

2 Factorise:

a $x^2 + 4x + 3$	**b** $x^2 + 11x + 24$	**c** $x^2 + 10x + 21$
d $x^2 + 15x + 54$	**e** $x^2 + 9x + 20$	**f** $x^2 + 8x + 15$
g $x^2 + 10x + 24$	**h** $x^2 + 9x + 14$	**i** $x^2 + 6x + 8$

3 Factorise:

a $x^2 - 3x + 2$	**b** $x^2 - 4x + 3$	**c** $x^2 - 5x + 6$
d $x^2 - 14x + 33$	**e** $x^2 - 16x + 39$	**f** $x^2 - 19x + 48$
g $x^2 - 11x + 28$	**h** $x^2 - 14x + 24$	**i** $x^2 - 20x + 36$

4 Factorise:

a $x^2 - 7x - 8$	**b** $x^2 + 4x - 21$	**c** $x^2 - x - 2$
d $x^2 - 2x - 8$	**e** $x^2 + 5x - 24$	**f** $x^2 - 3x - 10$
g $x^2 + 3x - 54$	**h** $x^2 + x - 72$	**i** $x^2 - 4x - 21$
j $x^2 - x - 6$	**k** $x^2 - 7x - 60$	**l** $x^2 + 7x - 60$
m $x^2 + 3x - 18$	**n** $x^2 - 7x - 18$	**o** $x^2 - 12x + 35$

5 Fully factorise by first removing a common factor:

a $2x^2 - 6x - 8$	**b** $3x^2 + 9x - 12$	**c** $5x^2 + 10x - 15$
d $4x^2 + 4x - 80$	**e** $2x^2 - 4x - 30$	**f** $3x^2 + 12x - 63$
g $-2x^2 + 2x + 40$	**h** $-3x^2 + 12x - 12$	**i** $-7x^2 - 21x + 28$
j $-x^2 - 3x - 2$	**k** $-x^2 + 5x - 6$	**l** $-x^2 + 9x - 18$
m $5x^2 + 15x - 50$	**n** $-2x^2 - 8x + 42$	**o** $4x - x^2 + 32$

Late Start Schedule:

Lunch A		
1st Hour	10:05-10:38	33 minutes
2nd Hour	10:43-11:16	33 minutes
3rd Hour	11:21-11:54	33 minutes
Lunch A	11:59-12:29	30 minutes
4th Hour	12:34-1:07	33 minutes
5th Hour	1:12-1:45	33 minutes
6th Hour	1:50-2:23	33 minutes
7th Hour	2:28-3:00	32 minutes

Lunch B		
1st Hour	10:05-10:38	33 minutes
2nd Hour	10:43-11:16	33 minutes
3rd Hour	11:21-11:54	33 minutes
4th Hour	11:59-12:32	33 minutes
Lunch B	12:37-1:07	30 minutes
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7th Hour	2:28-3:00	32 minutes

Lunch C		
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2nd Hour	10:43-11:16	33 minutes
3rd Hour	11:21-11:54	33 minutes
4th Hour	11:59-12:32	33 minutes
5th Hour	12:37-1:12	33 minutes
Lunch C	1:17-1:45	30 minutes
6th Hour	1:50-2:23	33 minutes
7th Hour	2:28-3:00	32 minutes

Exercises: 9E, page 180

EXERCISE 9E

1 Find two numbers which have:

a product 12 and sum 7

b product 15 and sum 8

c product 16 and sum 10

d product 18 and sum 11

e product -36 and sum 9

f product -36 and sum -9

g product -12 and sum -4

h product -30 and sum 13

2 Factorise:

a $x^2 + 4x + 3$

b $x^2 + 11x + 24$

c $x^2 + 10x + 21$

d $x^2 + 15x + 54$

e $x^2 + 9x + 20$

f $x^2 + 8x + 15$

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h $x^2 + 9x + 14$

i $x^2 + 6x + 8$

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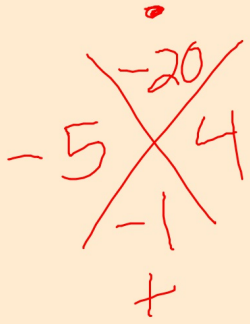
(g) $\frac{-2x^2}{-2} + \frac{2x}{-2} + \frac{40}{-2}$

$-2(x^2 - x - 20)$

$-2(x-5)(x+4)$



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a) $2x^2 - 6x - 8$

$2(x^2 - 3x - 4)$

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

-4, 1, -4, -3

Solutions to Factorization:

EXERCISE 9E

1 **a** 3 and 4 **b** 3 and 5 **c** 2 and 8 **d** 2 and 9
e -3 and 12 **f** 3 and -12 **g** 2 and -6 **h** -2 and 15

2 **a** $(x+1)(x+3)$ **b** $(x+3)(x+8)$ **c** $(x+3)(x+7)$
d $(x+6)(x+9)$ **e** $(x+4)(x+5)$ **f** $(x+3)(x+5)$
g $(x+4)(x+6)$ **h** $(x+2)(x+7)$ **i** $(x+2)(x+4)$

3 **a** $(x-1)(x-2)$ **b** $(x-1)(x-3)$ **c** $(x-2)(x-3)$
d $(x-3)(x-11)$ **e** $(x-3)(x-13)$ **f** $(x-3)(x-16)$

Solutions to Factorization: #3 continued, and 4 & 5

	g $(x-4)(x-7)$	**h** $(x-2)(x-12)$	**i** $(x-2)(x-18)$
4	**a** $(x-8)(x+1)$	**b** $(x+7)(x-3)$	**c** $(x-2)(x+1)$
	d $(x-4)(x+2)$	**e** $(x+8)(x-3)$	**f** $(x-5)(x+2)$
	g $(x+9)(x-6)$	**h** $(x+9)(x-8)$	**i** $(x-7)(x+3)$
	j $(x-3)(x+2)$	**k** $(x-12)(x+5)$	**l** $(x+12)(x-5)$
	m $(x+6)(x-3)$	**n** $(x+2)(x-9)$	**o** $(x-5)(x-7)$

5	**a** $2(x-4)(x+1)$	**b** $3(x+4)(x-1)$
	c $5(x+3)(x-1)$	**d** $4(x+5)(x-4)$
	e $2(x-5)(x+3)$	**f** $3(x+7)(x-3)$
	g $-2(x-5)(x+4)$	**h** $-3(x-2)^2$
	i $-7(x+4)(x-1)$	**j** $-(x+2)(x+1)$
	k $-(x-3)(x-2)$	**l** $-(x-3)(x-6)$
	m $5(x+5)(x-2)$	**n** $-2(x+7)(x-3)$
	o $-(x-8)(x+4)$	