Welcome Back to MYP Math 9!

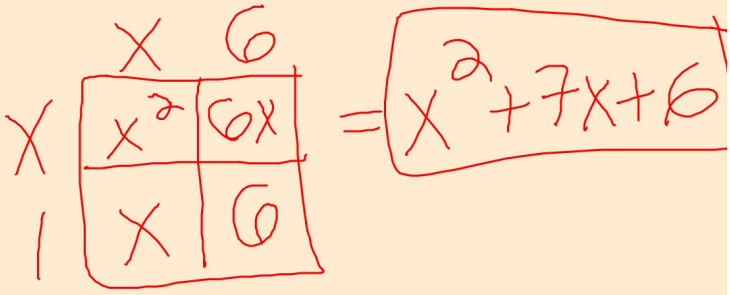
	Assignment Effort Grade (Circle One)	Comments (What was interesting or challenging?)
Monday Date: 3/12 Topic: 4CD Distribution	0 1 2	
Tuesday Date: _____ Topic: _____	0 1 2	
Wednesday Date: _____ Topic: _____	0 1 2	
Thursday Date: _____ Topic: _____	0 1 2	
Friday Date: _____ Topic: _____	0 1 2	

Warm-up: Translate from factored to general form.

How could you go the other way?

Consider the expansion:

$(x + 1)(x + 6)$ $= x^2 + 6x + x + 6$



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 the expansion

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

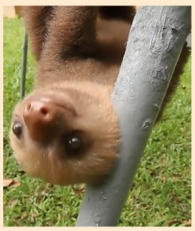
So, to factorise x^2+7x+6, we need two numbers with a sum of 7 and a product of 6. These nu
are 1 and 6, and so $x^2+7x+6=(x+1)(x+6)$.

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

Class Plan:

1. Warm-up

2. 9E Quadratic Factorization
- Video Break
- Examples



3. Practice

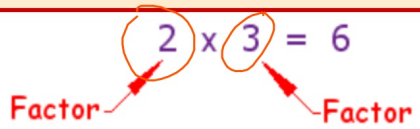
Chapter 9

Quadratic factorisation

Take a step back...

What is a **factor**?

Factors are the numbers you multiply together to get another number:



fac·tor

/ˈfaktər/

2 values multiplied

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.

Times Table - 12x12

	1	2	3	4	5	6	7	8	9	10	11	12
1	**1**	2	3	4	5	6	7	8	9	10	11	12
2	2	**4**	6	8	10	12	14	16	18	20	22	24
3	3	6	**9**	12	15	18	21	24	27	30	33	36
4	4	8	12	**16**	20	24	28	32	36	40	44	48
5	5	10	15	20	**25**	30	35	40	45	50	55	60
6	6	12	18	24	30	**36**	42	48	54	60	66	72
7	7	14	21	28	35	42	**49**	56	63	70	77	84
8	8	16	24	32	40	48	56	**64**	72	80	88	96
9	9	18	27	36	45	54	63	72	**81**	90	99	108
10	10	20	30	40	50	60	70	80	90	**100**	110	120
11	11	22	33	44	55	66	77	88	99	110	**121**	132
12	12	24	36	48	60	72	84	96	108	120	132	**144**

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 $x^2 + 4x + 3$:

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

Factor Factor

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**.

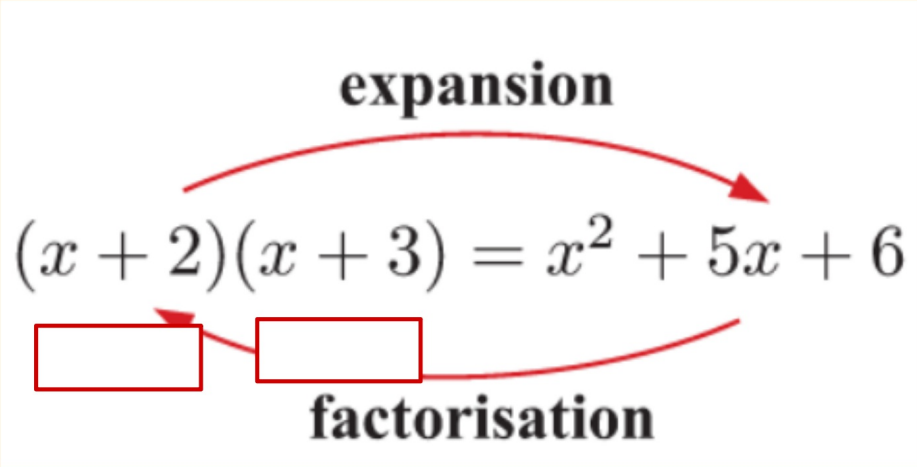
For example:

$$(x+2)(x+3) \xrightarrow{\text{expansion}} x^2 + 5x + 6$$

$$(x+2)(x+3) \xleftarrow{\text{factorisation}} x^2 + 5x + 6$$

Goal Today:

How can we translate from general form to factored form?



The *reverse* process of expansion

E FACTORISING QUADRATIC TRINOMIALS

Factored form

$$y = a(x - r_1)(x - r_2)$$

General form

$$y = ax^2 + bx + c$$

a: Stretch or shrink factor of the parabola

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:

Example: $x^2 + 5x + 6$

Factors of 6

Times Table - 12x12

	1	2	3	4	5	6	7	8	9	10	11	12
1	**1**	2	3	4	5	6	7	8	9	10	11	12
2	2	**4**	6	8	10	12	14	16	18	20	22	24
3	3	6	**9**	12	15	18	21	24	27	30	33	36
4	4	8	12	**16**	20	24	28	32	36	40	44	48
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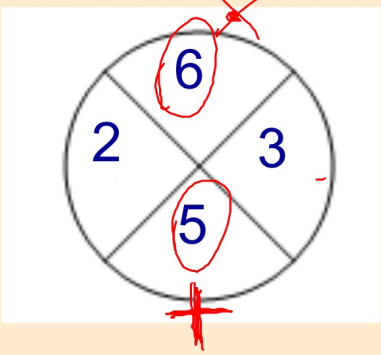
12	12	24	36	48	60	72	84	96	108	120	132	**144**

Factoring Method Introduction:

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

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



$(2)+(3)=5$

$(2)(3)=6$

E FACTORISING QUADRATIC TRINOMIALS

Example 10

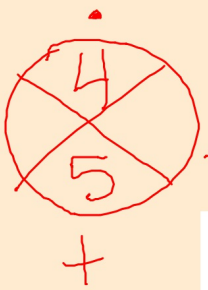
Use the sum and product method to fully factorise:

a $x^2 + 5x + 4$

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

OR

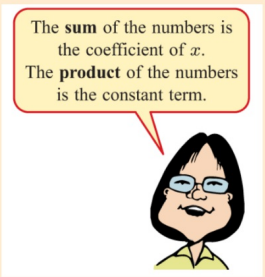
$(x+1)(x+4)$



$2 \cdot 2 = 4$

$4 \cdot 1 = 4$

$-4 \cdot -1 = 4$



Example 10

Use the sum and product method to fully factorise:

b $x^2 - x - 12$

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

-12

$-4 \quad 3$

-1

$x - 4$

$x \mid x^2 - 4x$

$3 \mid 3x - 12$

$= x^2 - x - 12$ ✓

$-12 + 1 \neq -1$

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.
$\therefore \quad x^2 - x - 12 = (x - 4)(x + 3)$

Video Break!

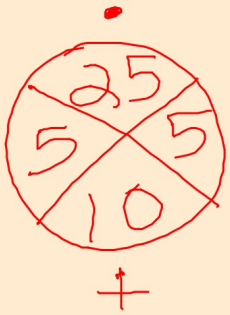
http://www.boredpanda.com/rescued-baby-sloths-conversation/

Example 7

Fully factorise:

a $x^2 + 10x + 25$ $= (x+5)^2$

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

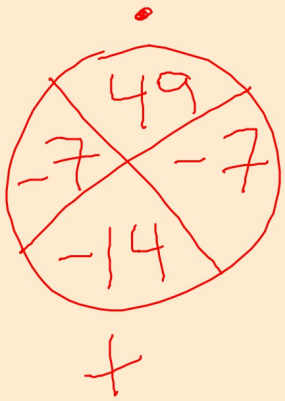


Example 7

Fully factorise:

b $x^2 - 14x + 49$

$= (x-7)^2$



Do: Exit Ticket!

1) Expand - FOIL method? Box method?

2) Factor

Exit Ticket **Name**_____

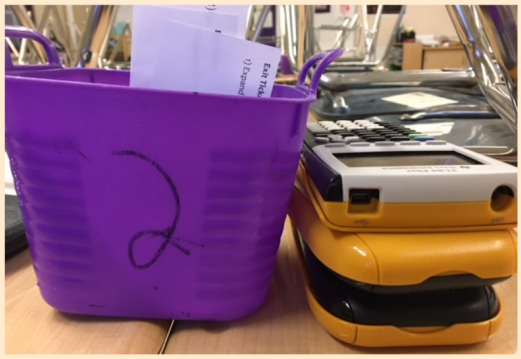
1) Expand: $(x+5)(x-3)$

2) Factor: $x^2+8x+12$

Done?

1) Put in bucket or give to your teacher

2) Get homework



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 $x^2 - 14x + 49$

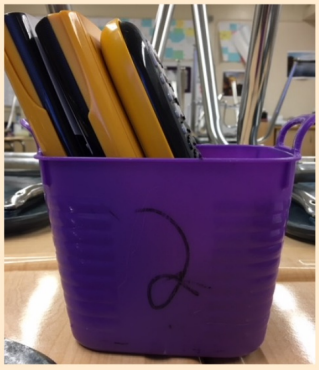
b
$$\begin{aligned} & x^2 - 14x + 49 \\ &= x^2 - 2 \times x \times 7 + 7^2 \\ &= (x-7)^2 \end{aligned}$$

Exercises...Please organize your table. Thank you!

EXERCISE 9E

1 Find two numbers which have:

- **a** product 12 and sum 7 3, 4
- **c** product 16 and sum 10
- **e** product -36 and sum 9 $-3, 12$
- **g** product -12 and sum -4



2 Factorise:

a $x^2 + 4x + 3$

b $x^2 + 11x + 24$

d $x^2 + 15x + 54$

e $x^2 + 9x + 20$

EXERCISE 9E

1 Find two numbers which have:

- **a** product 12 and sum 7
- **c** product 16 and sum 10
- **e** product -36 and sum 9
- **g** product -12 and sum -4

2 Factorise:

a $x^2 + 4x + 3$

b $x^2 + 11x + 24$

d $x^2 + 15x + 54$

e $x^2 + 9x + 20$

g $x^2 + 10x + 24$

h $x^2 + 9x + 14$

3 Factorise:

a $x^2 - 3x + 2$

b $x^2 - 4x + 3$

d $x^2 - 14x + 33$

e $x^2 - 16x + 39$

g $x^2 - 11x + 28$

h $x^2 - 14x + 24$

4 Factorise:

a $x^2 - 7x - 8$ **b** $x^2 + 4x - 21$

d $x^2 - 2x - 8$ **e** $x^2 + 5x - 24$

9E Solutions

EXERCISE 9E

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

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

3 **a** $(x-1)(x-2)$ **b** $(x-1)(x-3)$
d $(x-3)(x-11)$ **e** $(x-3)(x-13)$
g $(x-4)(x-7)$ **h** $(x-2)(x-12)$

4 **a** $(x-8)(x+1)$ **b** $(x+7)(x-3)$
d $(x-4)(x+2)$ **e** $(x+8)(x-3)$