

Factoring Method # 3

→ The "shortcut" method for factoring trinomials of the form:

$$x^2 + bx + c$$

↑ ↑
some numbers

e.g. 1

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

↑ ↑
b c

$$\textcircled{3 \cdot 5}$$

1 · 15

← "magic numbers"

Method: Think of two numbers which multiply to give "c", and add to give "b".

prod = 15 sum = 8

$$x^2 + 8x + 15 = (x+3)(x+5)$$

Check: $(x+3)(x+5)$

$$x^2 + 5x + 3x + 15$$

$$= x^2 + 8x + 15$$

e.g. 2

$$x^2 + 11x + 24$$

\uparrow \uparrow
 b c

$$\text{prod} = 24 \longrightarrow \begin{array}{l} 1 \cdot 24 \\ 2 \cdot 12 \\ 3 \cdot 8 \\ 4 \cdot 6 \end{array}$$

$$\text{Sum} = 11$$

$$\longrightarrow (x+3)(x+8)$$

Check : $(x+3)(x+8)$

$$x^2 + 8x + 3x + 24$$

$$x^2 + 11x + 24$$

e.g. 3

$$x^2 + 3x + 2$$

$$\text{prod} = 2 \quad 2 \cdot 1$$

$$\text{sum} = 3$$

$$= \boxed{(x+2)(x+1)}$$

e.g. 4

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

$$\text{prod} = 6 \quad 1 \cdot 6 \quad 2 \cdot 3$$

$$= \boxed{(x+1)(x+6)}$$

$$\text{sum} = 7$$

$$\text{e.g.5.} \quad x^2 + 7x + 12 = (x+3)(x+4)$$

3,4

$$\text{e.g.6.} \quad y^2 + 8y + 12 = (y+2)(y+6)$$

$$\text{e.g.7} \quad x^2 + 12x + 35 = (x+5)(x+7)$$

5,7

e.g.

$$x^2 - 13x - 30$$

Whenever "c" is negative, one of the numbers must be negative, and one positive

$$\text{prod} = -30$$

$$\overset{-}{\underline{\quad}} \cdot \overset{+}{\underline{\quad}} = -30$$

$$\text{Sum} = -13$$

$$\underline{\quad} + \underline{\quad} = -13$$

$$\begin{array}{l} \textcircled{+2, -15} \\ -2, +15 \end{array}$$

$$(x-15)(x+2)$$

Check

$$(x-15)(x+2)$$

$$x^2 + 2x - 15x - 30$$

$$x^2 - 13x - 30$$

e.g. 9

$$x^2 - 5x - 14$$

1 · 14
2 · 7

↑ ↑
 prod = -

Sum
is -ve, ∴ + — , - —

∴ the -ve
must be larger

2, -7

$$= (x+2)(x-7) \text{ OR } (x-7)(x+2)$$

$$\text{e.g. 10} \quad x^2 - 2x - 15 =$$

$$-5, +3 \quad (x-5)(x+3)$$

$$\text{e.g. 11} \quad a^2 - 6a - 7 = (a-1)(a-7)$$

$$1, -7$$

$$\text{e.g. 12} \quad x^2 - 3x - 28 = (x-7)(x+4)$$

$$-7, +4$$

$$\text{e.g. 13} \quad x^2 + 2x - 24 = (x+6)(x-4)$$

→ - and + number

→ This time the + will be the lger #.

$$+6, -4$$

e.g. 14

$$m^2 + 5m - 36 = (m - 4)(m + 9)$$

-4, 9

e.g. 15

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

4, -1

$$\text{e.g. 16} \quad t^2 + 7t - 30 = (t+10)(t-3)$$

+10, -3

$$\text{e.g. 17} \quad b^2 + 1b - 6 = (b+3)(b-2)$$

3, -2

e.g. $x^2 - 4x + 4$ prod = +
Sum = -

What are the signs of the two numbers?

prod = +4
sum = -4

-2, -2

$(x - 2)(x - 2)$

OR $(x - 2)^2$

e.g. 19

$$p^2 - 13p + 42 = (p-7)(p-6)$$

$-7, -6$

e.g. 20

$$x^2 - 10x + 9 = (x-1)(x-9)$$

$-1, -9$

$$\text{e.g. 21} \quad w^2 - 5w + 4 = (w-4)(w-1)$$

$-4, -1$

$$\text{e.g. 22} \quad x^2 - 2x + 1 = (x-1)(x-1)$$

$-1, -1$

OR $(x-1)^2$

$$\text{e.g. 23} \quad x^2 - 10x + 25 =$$

$-5, -5$

$(x-5)(x-5)$
OR $(x-5)^2$

Be careful with these: !!!

$$\textcircled{1} \quad x^2 + x - 6 \\ = (x-2)(x+3)$$

$$\textcircled{2} \quad x^2 - x - 6 \\ = (x+2)(x-3)$$

$$\textcircled{3} \quad x^2 - 5x + 6 \\ = (x-2)(x-3)$$

$$\textcircled{4} \quad x^2 - 5x - 6 \\ = (x-6)(x+1)$$

$$\textcircled{5} \quad x^2 - 13x - 30 \\ = (x-15)(x+2)$$

$$\textcircled{6} \quad x^2 - 13x + 30 \\ = (x-3)(x-10)$$

$$\textcircled{7} \quad x^2 - 10x - 24 \\ = (x-12)(x+2)$$

$$\textcircled{8} \quad x^2 - 10x + 24 \\ = (x-4)(x-6)$$

Today

- ① Finish Worksheet # 3
- ② Do quiz # 3
- ③ Worksheet # 4 \Rightarrow Optional
(Practice of
worksheets 1-3)