

Simplify $(2x+3)(4x+5) \leftarrow$ factor

$$2x(4x+5) + 3(4x+5)$$

$$8x^2 + 10x + 12x + 15$$

$$8x^2 + 22x + 15$$

$8x^2 + 22x + 15$ is called

(i) function

(ii) polynomial

(iii) expression

coefficient $\rightarrow 8x^2 \rightarrow$ power / index / exponential
 \uparrow
 variable | degree 2.

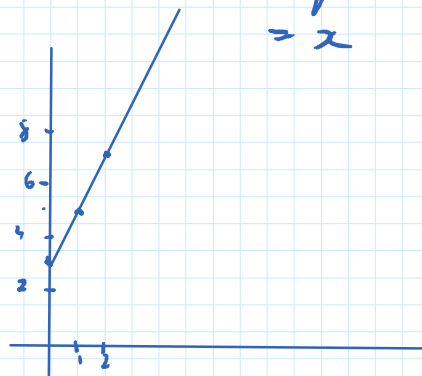
$8x^2 + 22x + 5$ has 3
 \uparrow terms
 constant

I have €3 will save €2 every day. Show on a table and a graph. Form a function for savings?

Time	Money
0	3
1	5
2	7
3	9

$x \mid y = 2x + 3$

Money = dependent
 $y = f(x)$
 Time = independent
 $= x$



Equal gap \Rightarrow linear = degree 1.

Gap of gap is equal = quadratic degree 2.

Factors

Type 1: Grouping \Rightarrow 2 or 4 terms.

Take out what's common.

Factors of (i) $ax + ay$
 $a(x + y)$

(ii) $ab - a - b + 1$
 $a(b - 1) - 1(b - 1)$
 $(b - 1)(a - 1)$

$$(iii) \quad mx + 2(12by - my) - 12bx$$

$$mx + 24by - 2my - 12bx$$

$$mx - 2my + 24by - 12bx$$

$$mx - 2my - 12bx + 24by$$

$$m(x - 2y) - 12b(x - 2y)$$

$$(x - 2y)(m - 12b)$$

Homework - review the day.

Learn -

- extra questions.

Later = written \Rightarrow no help
 \Rightarrow no notes

Type 2: Difference of 2 squares

$$x^2 - y^2 = (x - y)(x + y)$$

Factors ↓

$$(i) \quad x^2 - 25$$

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

$$(ii) \quad 4x^2 - 49 = (2x)^2 - 7^2$$

$$(2x - 7)(2x + 7)$$

$$(iii) \quad a^2 - 6$$

$$a^2 - (\sqrt{6})^2$$

$$(a - \sqrt{6})(a + \sqrt{6})$$

$$(iv) \quad 100^2 - 99^2$$

$$\left[(100 - 99)(100 + 99) \right]$$

$$x^2 - y^2$$

$$\left[\begin{array}{c} (10 - \sqrt{99})(10 + \sqrt{99}) \\ 100 - 99 \end{array} \right]$$

$$100^2 - 99^2$$

$$= (100 - 99)(100 + 99)$$

$$= 199$$

$$(v) \quad (2x - y)^2 - 36$$

$$(2x - y)^2 - 6^2$$

$$(2x - y - 6)(2x - y + 6)$$

$$(vi) \quad 49 - (3a - b)^2$$

$$7^2 - (3a - b)^2$$

$$(7 + 3a - b)(7 - (3a - b))$$

$$(7 + 3a - b)(7 - 3a + b)$$

Type 3: Sum or difference of 2 cubes.

$$x^3 + y^3 = (x + y)(x^2 - xy + y^2)$$

$$x^3 - y^3 = (x - y)(x^2 + xy + y^2)$$

Find factors of

$$(i) \quad x^3 + 8$$

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

$$x^3 + y^3 = (x+y)(x^2 - xy + y^2)$$

$$(ii) \quad 8a^3 - 27$$

$$(2a)^3 - 3^3 = (2a-3)(4a^2 + 6a + 9)$$

$$x^3 - y^3 = (x-y)(x^2 + xy + y^2)$$

$$(iii) \quad 27 - 125y^3$$

$$3^3 - (5y)^3 = (3-5y)(9 + 15y + 25y^2)$$

$$x^3 - y^3 = (x-y)(x^2 + xy + y^2)$$

Type 4 - Quadratics \Rightarrow Trinomial

Factors \downarrow

(i) $x^2 + 7x + 12$ CN +2

$(x+3)(x+4)$ Add \rightarrow

(ii) $2x^2 - x - 6$ CN -12

$2x^2 - 4x + 3x - 6$ Sub -1

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

Type 5: Combinations.

Find factors

(i) $ax^2 - ay^2$ $ax^2 \neq (ax)^2$
 $(ax)^2 = a^2x^2$

~~$(2x)^2 = 4x^2$ $(ax - ay)(ax + ay)$~~

$3^2 = (3)(3) = 9$ $(y)^2 = yy = y^2$

$(3y)^2 = (3y)(3y) = 9y^2$

$ax^2 - ay^2$

$a(x^2 - y^2)$

$a(x-y)(x+y)$

(iii) $x^3 - x^2 - y^3 + y^2$

wrong
not same in
both brackets

$x^2(x-1) - y^2(y-1)$

$(x^2 - y^2)(x-1)(y-1)$

Terrible

$x^3 - y^3 - x^2 + y^2$

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

$$(x-y)(x^2+xy+y^2) - (x-y)(x+y)$$

$$(x-y)(x^2+xy+y^2 - (x+y))$$

$$(x-y)(x^2+xy+y^2 - x - y)$$

$$(iii) \quad a^2 + 2ab + b^2 - 100$$

$$\text{Try 1} \quad a(a+2b) + (b-10)(b+10)$$

$$\text{Try 2} \quad a^2 + b^2 + 2ab - 100$$

$$(a+b)(a-b)$$

$$\text{Try 3} \quad a^2 + 2ab + b^2 - 100$$

$$a^2 + 2a + 1 \quad a^2 + 2ab + b^2 \quad \text{GN 1}$$

$$1 + 2b + b^2 \quad a^2 + ab + ab + b^2 \quad \text{Add 2}$$

$$a(a+b) + b(a+b)$$

$$(a+b)^2$$

$$(a+b)^2 - 100$$

$$(a+b)^2 - 10^2$$

$$(a+b-10)(a+b+10)$$

Multiplication

Simply

	$2x$	3
$5x$	$10x^2$	$15x$
$+1$	$2x$	3

$$(2x+3)(5x+1)$$
$$2x(5x+1) + 3(5x+1)$$
$$10x^2 + 2x + 15x + 3$$
$$10x^2 + 17x + 3$$

$$(2x+3)^2$$
$$(2x+3)(2x+3)$$
$$4x^2 + 6x + 6x + 9$$
$$4x^2 + 12x + 9$$

5^2
 $6^2 = 6 \times 6$

$$(5x+2)^2$$
$$(5x+2)(5x+2)$$
$$25x^2 + 20x + 4$$

$$(6x+5)^2$$
$$36x^2 + 60x + 25$$

Perfect Square

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

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

Simplify $(x + y - 3)(x + y + 3)$

$$x^2 + 2xy + 3x + xy + y^2 + 3y - 3x - 3y - 9$$

$$x^2 + 2xy + y^2 - 9$$

$$(x + y - 3)(x + y + 3) \quad \begin{array}{l} a^2 - b^2 \\ (a - b)(a + b) \end{array}$$

$$(x + y)^2 - 9$$

$$x^2 + 2xy + y^2 - 9$$