KING'S MATHS SCHOOL

Welcome to GCSE 7+

Friday 9 April 2021

Session 3:

Fluency with quadratic expressions

Keep GCSE 7+ safe for everyone

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- **Do not <u>ASK</u>** anyone for **their** personal contact details: email, 'phone number, social media name, Instagram address etc.
- **Do not <u>GIVE</u>** anyone **your** personal contact details: email, 'phone number, social media name, Instagram address etc.
- If **anyone** asks you, in the Chat or directly, for your personal contact details, or
- If you read in the Chat, or if you overhear, **anyone** asking for or giving out personal contact details, or
- If you have any concerns about the welfare/wellbeing of any participant, including yourself, then you must **as soon as possible**
  - email the Head teacher dan.abramson@kcl.ac.uk or text him 07902 911144 and say what your concern is,
  - or email kclmsoutreach@kcl.ac.uk and ask Dan to contact you.

Expanding brackets

Expand

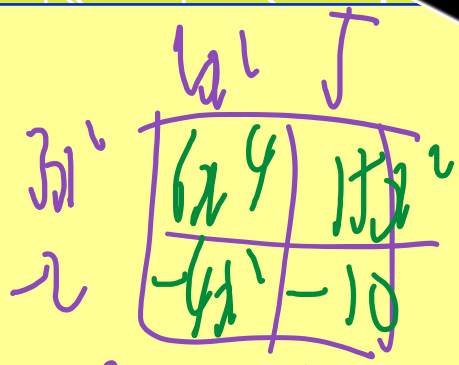
- $(x+3)(3x-2)$
- $(2x+5)(3x-2)$
- $(3x-2)^2$
- $(3x+2)(3x-2)$

Expanding brackets

Expand

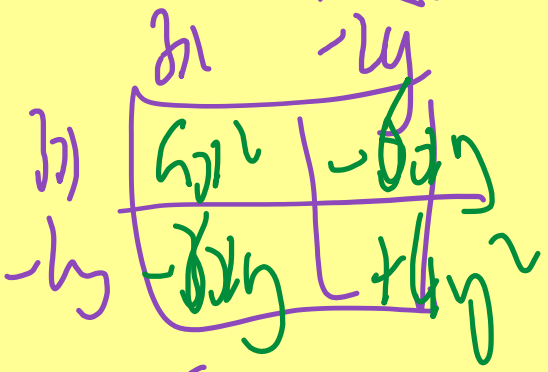
- $(2x^2 + 5)(3x^2 - 2)$

$= 6x^4 + 11x^2 - 10$



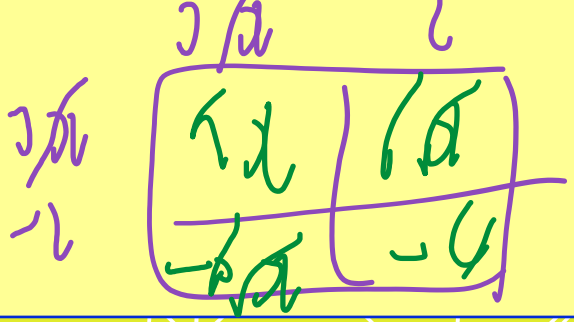
- $(3x - 2y)^2$

$= 9x^2 - 12xy + 4y^2$



- $(3\sqrt{x} + 2)(3\sqrt{x} - 2)$

$= 9x - 4$



Expanding brackets

Expand

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

$(6x^2 + 11x - 4)(x + 3)$

	$6x^2$	$11x$	-4
x	$6x^3$	$11x^2$	$-4x$
3	$18x^2$	$33x$	-12

$\equiv 6x^3 + 29x^2 + 29x - 12$

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

$\equiv (x^2 - 9)(3x - 2)$

	x^2	-9
$3x$	$3x^3$	$-27x$
-2	$-2x^2$	$+18$

$\equiv 3x^3 - 2x^2 - 27x + 18$

Factorising quadratic expressions

Factorise

- $x^2 - 4x + 3$

$\equiv (x-1)(x-3)$

(think of a multiplication)

$(\quad)(\quad)$

- $x^2 - 4x + 4$

$\equiv (x-2)(x-2) \equiv (x-2)^2$

- $x^2 - 4x$

$\equiv x(x-4)$

- $x^2 - 4$ $\equiv (x-2)(x+2)$

Factorising quadratic expressions

Factorise

- $x^2 + 10x + 25$

$\equiv (x+5)(x+5) \equiv (x+5)^2$

- $9x^2 - 30x + 25$

$\equiv (3x-5)(3x-5) \equiv (3x-5)^2$

- $x^2 - 16$

$\equiv (x+4)(x-4)$

- $9x^2 - 25 \equiv (3x+5)(3x-5)$

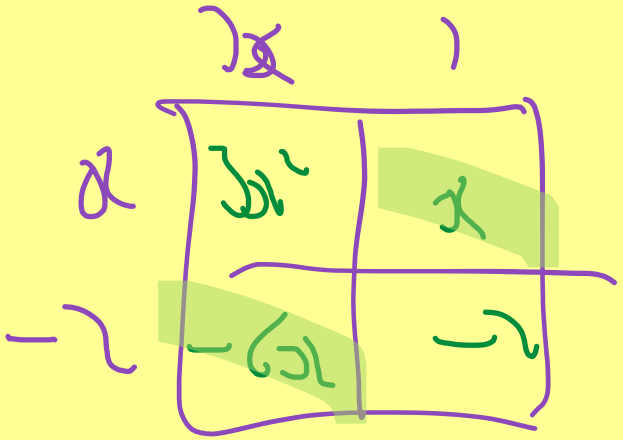
5^2

Factorising quadratic expressions

Factorise

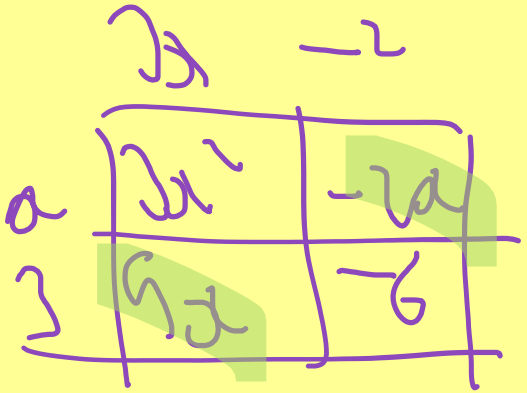
- $3x^2 - 5x - 2$

$\equiv (3x + 1)(x - 2)$



- $3x^2 + 7x - 6$

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

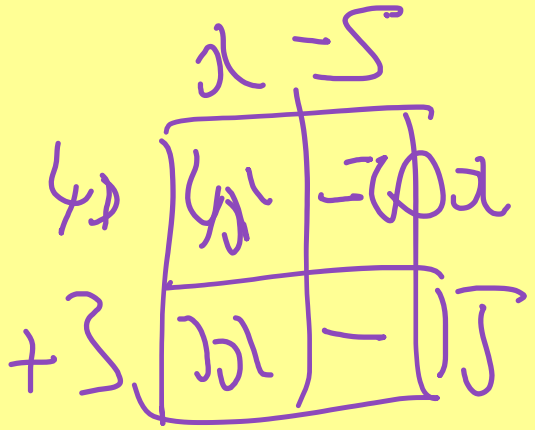


Factorising quadratic expressions

Factorise

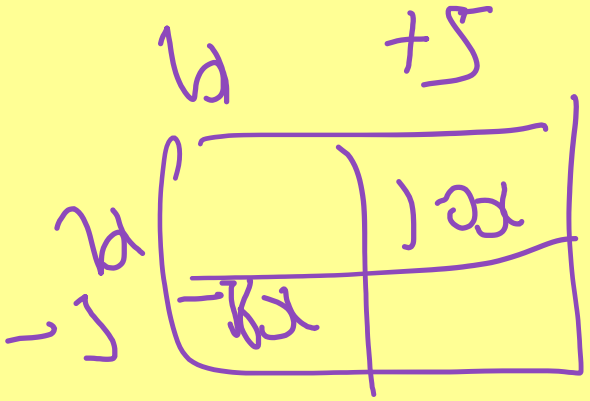
- $4x^2 - 17x - 15$

$= (4x + 3)(x - 5)$



- $4x^2 + 4x - 15$

$= (2x + 5)(2x - 3)$



Factorising quadratic? expressions

Factorise

- $x^2 - 4$ $\equiv (x-2)(x+2)$

- $x^4 - 4x^2$ $\equiv x^2(x^2-4)$ ← 2)3

$\equiv x^2(x-2)(x+2)$ ← 3)3

- $x^4 - 4$ $\equiv (x^2-2)(x^2+2)$ $(x^4)^2 \equiv [\ ]^2$

Factorising quadratic? expressions

Factorise

- $x^2 - 4x + 3$
- $x^4 - 4x^2 + 3$
- $x^2 - 4xy + 3y^2$

Simplifying quadratic fractions

Simplify

- $\frac{x^2 - 4x}{x}$ $= \frac{x(x-4)}{x} = x - 4$
- $\frac{x^2 - 4}{2x - 4}$ $= \frac{(x-2)(x+2)}{2(x-2)} = \frac{x+2}{2}$
- $\frac{3x - 12}{x^2 - 4x}$ $= \frac{3(x-4)}{x(x-4)} = \frac{3}{x}$
- $\frac{x^2 - 4}{x^2 - 4x - 12}$ $= \frac{(x-2)(x+2)}{(x+2)(x-6)} = \frac{x-2}{x-6}$

Solving quadratic equations

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Solve

- $(x-2)(x+3)=0$

$\Rightarrow x-2=0$ or $x+3=0$ $\quad x=2$ or $x=-3$

- $(3x-2)(2x+3)=0$

$\Rightarrow 3x-2=0$ or $2x+3=0 \Rightarrow x=\frac{2}{3}$ or $x=-\frac{3}{2}$

- $(3x-2)^2=0 \Rightarrow (\ )(\ )=0$

$\Rightarrow 3x-2=0 \Rightarrow x=\frac{2}{3}, \frac{2}{3}$

Solving quadratic equations

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Solve

- $x^2 - 8x - 9 = 0$

$\Rightarrow (x-9)(x+1) = 0 \Rightarrow x = 9$ or $x = -1$

- $2x^2 - 3x - 9 = 0$

$\Rightarrow (2x+3)(x-3) = 0 \Rightarrow x = -\frac{3}{2}$ or $x = 3$

- $4x^2 - 3x = 0$

$\Rightarrow x(4x-3) = 0 \Rightarrow x = 0$ or $x = \frac{3}{4}$

- $4x^2 - 9 = 0$ $\Rightarrow (2x-3)(2x+3) = 0 \Rightarrow x = \frac{3}{2}, -\frac{3}{2}$

$= \pm\frac{3}{2}$

Solving quadratic equations

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Solve

- $(x-2)(x+3)=0$ ✓ $x=2, x=-3$
- $(x-2)(x+3)=6$

$\Rightarrow x^2+x-6=6$

$\Rightarrow x^2+x-12=0$ ...

- $(x-2)(x+3)=-6$

$\Rightarrow x^2+x-6=-6$

$\Rightarrow x^2+x=0 \Rightarrow x(x+1)=0$ ...

Solving quadratic equations

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Solve

- $x = \dfrac{10}{x-3}$

$\Rightarrow x(x-3) = 10$

$\Rightarrow x^2 - 3x - 10 = 0 \ldots$

Solving quadratic equations

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Solve

- $2x = \left(1 + \frac{10}{x}\right)$ $\times x$ $\times x$

$\Rightarrow 2x^2 = x + \frac{10}{x} \times x$

$\Rightarrow 2x^2 = x + 10$

$\Rightarrow 2x^2 - x - 10 = 0$ ...

Solving quadratic equations

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Solve

$$\frac{5}{x} - \frac{2}{x^2} = 2$$

$\times x^2$

$\Rightarrow 5x - 2x = 2x^2$

$\Rightarrow 5x - 2 = 2x^2$ ...

$\Rightarrow$ ——— $= 0$

Solving quadratic equations

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Solve

$$\frac{6}{x-1}+\frac{4}{x}=3x(x-1)$$

$$\Rightarrow \frac{6x(x-1)}{x-1}+\frac{4x(x-1)}{x}=3x^2-3x$$

$$\Rightarrow 6x+4x-4=3x^2-3x$$

$$\Rightarrow \quad =0$$

Solving quadratic equations

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Solve

- $36x^2 + 33x - 20 = 0$

$a = 36 \quad b = +33 \quad c = -20$

$\frac{5}{12}, \frac{-4}{3}$

$$x = \frac{-33 \pm \sqrt{(33)^2 - 4 \times 36 \times (-20)}}{72}$$

1) Discriminant

$$= \frac{-33 \pm \sqrt{3969}}{72} = \frac{-33 \pm 63}{72} = \frac{30}{72}, \frac{-96}{72}$$

Solving quadratic equations

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Solve

- $x^2 + 4x - 2 = 0$

$$\Rightarrow x = \frac{-4 \pm \sqrt{16 - 4 \times 1 \times -2}}{2}$$

$$= \frac{-4 \pm \sqrt{24}}{2} = \frac{-4 \pm 2\sqrt{6}}{2}$$

$$= -2 \pm \sqrt{6}$$

Completing the square

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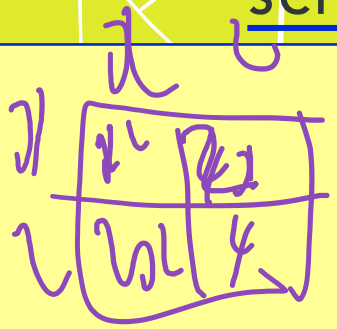
Complete the square in

- $x^2 + 4x + 4$

$\equiv (x+2)^2 + 0$



- $x^2 + 4x + 6$

$\equiv (x+2)^2 + 2$

- $x^2 + 4x + 1 \equiv (x+2)^2 - 3 \equiv$

Completing the square

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Complete the square in

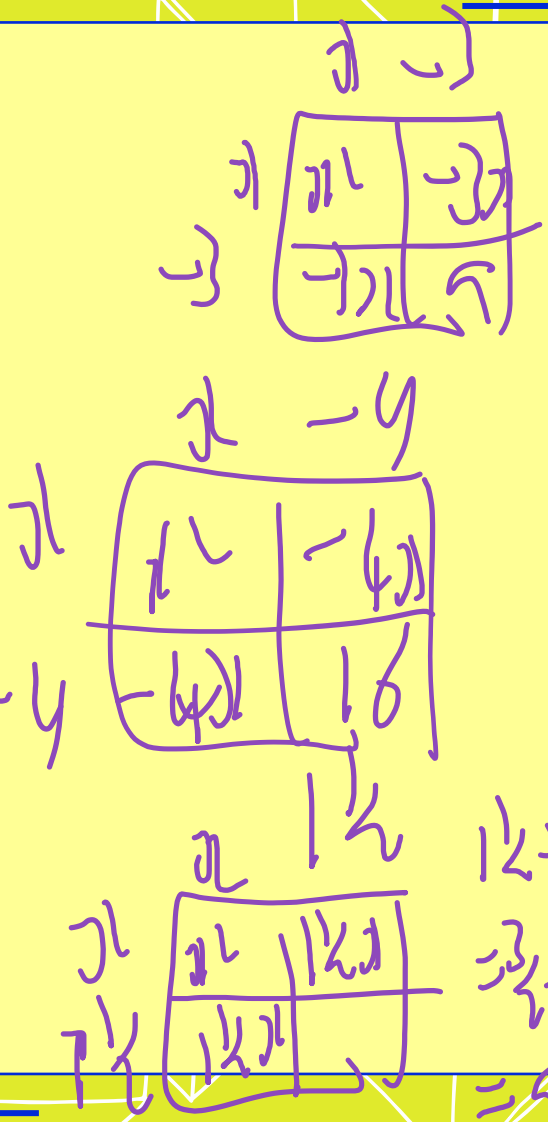
- $x^2 - 6x + 2$

$\equiv (x-3)^2 - 7$

- $x^2 - 8x + 11$

$\equiv (x-4)^2 - 5$

- $x^2 + 3x + 1 \equiv (x+1\frac{1}{2})^2 - 1\frac{1}{4}$



Solving quadratic equations …

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… by completing the square

- $x^2 - 4x + 1 = 0$

$(x-2)^2 - 3 = 0$

$\Rightarrow (x-2)^2 = 3 \Rightarrow x - 2 = \pm\sqrt{3}$

$\Rightarrow x = 2 \pm \sqrt{3}$

	x	-2
x	x^2	$-2x$
-2	$-2x$	4

- $x^2 - 4x + 1 = 2x - 5$

$\Rightarrow x^2 - 6x + 6 = 0$

$\Rightarrow (x-3)^2 - 3 = 0 \Rightarrow x - 3 = \pm\sqrt{3}$

$\Rightarrow x = 3 \pm \sqrt{3}$

GCSE 7+: what now?

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- 0930-1030: all together, for revision teaching
- 1045-1145: you work independently on the practice questions we will give you
- 1145-1245: in break-out rooms, in small groups with two teachers, you can go over the "practice [illegible] permanent" questions, ask your own questi[illegible] your **knowledge, fluency and unde[illegible]**

Return here in time for **starting** the examples classes at 1145. Don't be late!