

**Starter:**

- Factorise:
 - $21x - 14$
 - $24x^2 + 36x$
- Write down two numbers that add up to 11 but multiply to make 18.
- Write down two numbers whose sum is -2 and product is -24.

Skills:

- Factorise:

$$3x^2 + 10x + 8$$

$$5x^2 - 9x - 2$$

- Solve the following equations by factorising:

$$3x^2 + 7x - 6 = 0$$

$$2x^2 - 10x + 12 = 0$$

- Simplify (Use Q1 to save time!)

$$\frac{x+2}{3x^2+10x+8}$$

$$\frac{5x^2-9x-2}{3x-6}$$

Top Tips!

To factorise a quadratic like $3x^2 - 10x - 8$, learn these steps:

Step 1: Find two numbers that multiply to make -24 (always the number in front of x^2 multiplied by the number on its own ie in this case, 3×-8) but adds up to -10 (always the number in front of x)

Now 24 has 4 pairs of factors, 1×24 , 2×12 , 3×8 , 4×6 , if the product is negative then ONE of the numbers must be negative. Now $-2 \times 12 = -24$ and $-2 + 12 = 10$. So the two numbers are -2 and 12.

Step 2: Split up -10x to -2x and 12x: $3x^2 + 12x - 2x - 8$

Step 3: Factorise the first two terms by extracting the highest common factor and do the same for the last two terms: $3x(x+4) - 2(x+4)$

Step 4: $(x+4)$ is now in common so you can factorise: $(x+4)(3x-2)$

Difference between 2 squares: Useful to spot these as there is a quick short cut! ie $x^2 - 9$ (both square numbers with a minus in the middle). Work out the square root of both of them (which would be x and 3) then put these numbers in 2 brackets with a '+' in one and a '-' in the other. ie $(x+3)(x-3)$

More examples: $4x^2 - 49 = (2x-7)(2x+7)$

$9y^2 - 16 = (3y-4)(3y+4)$

$25 - x^2 = (5-x)(5+x)$

$100y^2 - 81y^2 = (10y-9)(10y+9)$

Examination Question:**2013 Summer Lik Methods U1 Higher Q18**

Simplify $\frac{x^2 - 81}{2x^2 + 13x - 45}$.

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**Starter:**

- Factorise:
 - $21x - 14 = 7(3x - 2)$
 - $24x^2 + 36x = 12x(2x + 3)$
- Write down two numbers that add up to 11 but multiply to make 18.
2, 9
- Write down two numbers whose sum is -2 and product is -24.
6, -4

Skills:

- Factorise:

$$3x^2 + 10x + 8$$

$$3x^2 + 6x + 4x + 8$$

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

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

$$5x^2 - 9x - 2$$

$$5x^2 - 10x + x - 2$$

$$5x(x - 2) + 1(x - 2)$$

$$(x - 2)(5x + 1)$$
- Solve the following equations by factorising:

$$3x^2 + 7x - 6 = 0$$

$$3x^2 + 9x - 2x - 6 = 0$$

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

$$(x + 3)(3x - 1) = 0$$

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

$$x = -3 \quad x = \frac{2}{3}$$

$$2x^2 - 10x + 12 = 0$$

Divide through by 2 to get

$$x^2 - 5x + 6 = (x - 2)(x - 3) \text{ or if not noticed this, can still factorise like the others:}$$

$$2x^2 - 6x - 4x + 12 = 0$$

$$2x(x - 3) - 4(x - 3) = 0$$

$$(x - 3)(2x - 4) = 0 \quad x - 3 = 0 \text{ or } 2x - 4 = 0$$
- Simplify (Use Q1 to save time!) $x = 3$ $x = 2$

$$\frac{x+2}{3x^2+10x+8} \quad \frac{5x^2-9x-2}{3x-6}$$

$$\frac{x+2}{(x+2)(3x+4)} \quad \frac{(x-2)(5x+1)}{3(x-2)}$$

$$= \frac{1}{3x+4} \quad = \frac{5x+1}{3}$$

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(4)

$$\frac{(x-9)(x+9)}{2x^2 + 18x - 5x - 45}$$

$$= \frac{(x-9)(x+9)}{2x(x+9) - 5(x+9)}$$

$$= \frac{(x-9)(x+9)}{(2x-5)(x+9)}$$

$$= \frac{x-9}{2x-5}$$

