Factoring!

Breaking expressions into parts

Opposite of Expanding

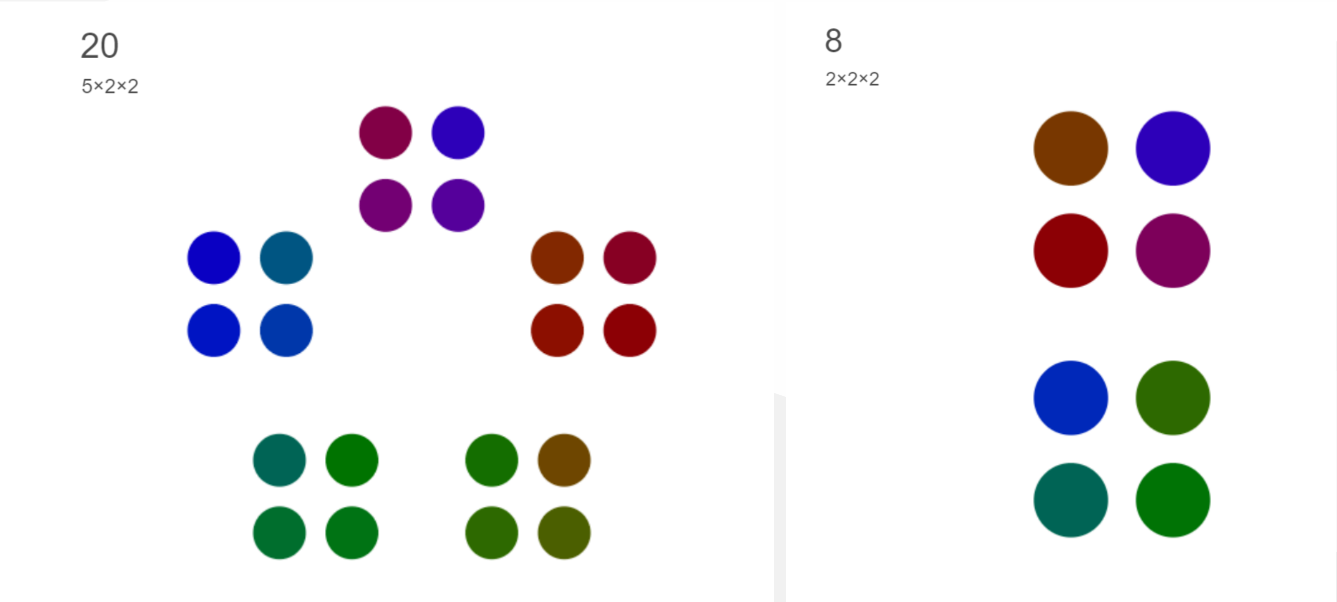
Let's start with HCF

What's an HCF??

- **Highest Common Factor**
  Let's break each of these words down

Watch numbers dance

- An animation of prime factors into patterns
  (In maths we like patterns)



- What's the HCF of 20 and 8?
  - How do we get the HCF from the prime factors?

What does this have to do with Factoring?

Right now we're factoring expressions like *20x + 12*

- What's the HCF of 20 and 12?
- So we'll take 4 common
- Then we have:
  - $20x + 12 = 4(5x + 3)$
- And that's our factored expression!

Examples: We Do

- $15x + 5$
- $8x + 20$
- $16x + 10$
- $6x + 18$
- $33 + 110y$

Examples: You Try

- 18x + 9
- 8 + 28q
- 20q + 25
- 18r + 9d

Can a pronumeral be a common factor?

- Yes!
- Just as if a pronumeral were a prime
- Example: x^2+7x

  = x(x + 7)

Examples

$$2x^2 + 4$$

$$x^2 + 5x$$

$$9x^2 - 3x$$

$$10x^2 + 25x$$

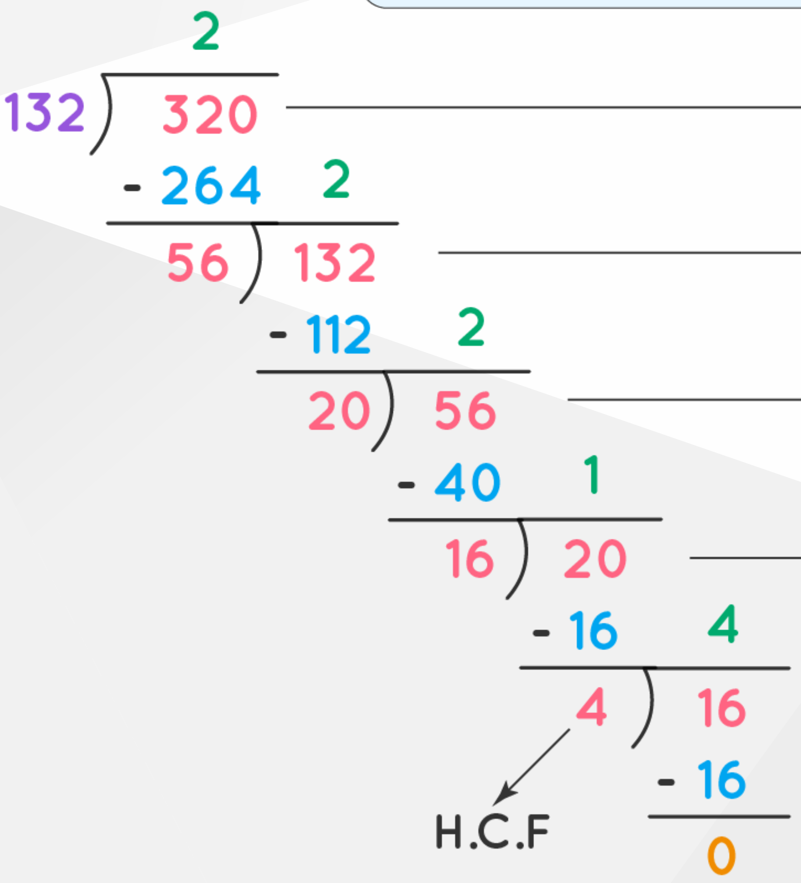
$$6x^2 - 18$$

Extra: The Euclidean Algorithm!

- Let's say we have to find the HCF of two numbers a and b
- Divide the larger number (say, a), by the smaller (say, b)
- If the remainder (let's call it c) is 0, b is the HCF, we're done!
- Otherwise, we replace a with b and b with c and start again
  - i.e. we divide b by c
- If the remainder is 0, the last divisor is the HCF
- If the remainder is 1, a and b are coprime

Euclid's Division Algorithm Formula

Dividend = Divisor × Quotient + Remainder



$320 = 132(2) + 56$

$132 = 56(2) + 20$

$56 = 20(2) + 16$

$20 = 16(1) + 4$

$16 = 4(4) + 0$

↓

H.C.F

Adding And Subtracting Algebraic Fractions

- How do we add and subtract normal fractions?
  - Step 1: Getting a common denominator
    - Find the lowest common multiple
- Same applies to algebraic fractions

Example 1

$$\frac{5}{2a^2} + \frac{c}{6ab}$$

LCM = $6a^2b$

So our fraction becomes

$$= \frac{5 \times 3b}{6a^2b} + \frac{c \times 2a}{6a^2b}$$
$$= \frac{15b + 2ac}{6a^2b}$$

Can we simplify any further?

Example 2

$$\frac{3}{x+4} - \frac{5}{2x}$$

$$= \frac{3 \times 2x}{(x+4) \times 2x} - \frac{5 \times (x+4)}{2x \times (x+4)}$$

$$= \frac{6x}{2x(x+4)} - \frac{5x+20}{2x(x+4)}$$

$$= \frac{6x-(5x+20)}{2x(x+4)}$$

$$= \frac{6x-5x-20}{2x(x+4)}$$

$$= \frac{x-20}{2x(x+4)}$$

or $\frac{x-20}{2x^2+8x}$

Example 3 (Your Turn)

$$\frac{3x+2}{2} - \frac{x-1}{4}$$

$$= \frac{(3x+2)\times 2}{2\times 2} - \frac{x-1}{4}$$

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

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

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

$$= \frac{5x+5}{4}$$

$$= \frac{5(x+1)}{4}$$

Example 4 (You Try First)

$$\frac{1}{2x} + \frac{4}{x+2}$$

$$= \frac{1 \times (x+2)}{2x \times (x+2)} + \frac{4 \times 2x}{(x+2) \times 2x}$$

$$= \frac{x+2}{2x(x+2)} + \frac{8x}{2x(x+2)}$$

$$= \frac{x+2+8x}{2x(x+2)}$$

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