

Simplifying Algebraic Fractions involving Quadratics

Starter

1. **(Review of last lesson)** Simplify: (a) $\frac{6xy - 6x}{3y - 3}$ (b) $\frac{15xz + 5z}{25xyz - 35yz}$

Working: (a) $\frac{6xy - 6x}{3y - 3} = \frac{6x(y - 1)}{3(y - 1)} = 2x$

(b) $\frac{15xz + 5z}{25xyz - 35yz} = \frac{5z(3x + 1)}{5yz(5x - 7)} = \frac{3x + 1}{y(5x - 7)}$

2. (a) Factorise: (i) $x^2 - 16$ (ii) $x^2 + 8x + 16$
 (b) Hence simplify $\frac{x^2 - 16}{x^2 + 8x + 16}$

Working: (a) (i) $(x - 4)(x + 4)$ *difference of 2 squares*
 (ii) $1 \times 16 = 16$ *coefficient of $x^2 \times$ constant term*

Looking for 2 numbers that multiply to give 16 and add to give 8

Multiply: $16 = 4 \times 4$

Add: $8 = 4 + 4$

$x^2 + 4x + 4x + 16$

$x(x + 4) + 4(x + 4)$

$(x + 4)(x + 4)$

*split the 8x term into 4x + 4x
factorise by grouping*

(b) $\frac{x^2 - 16}{x^2 + 8x + 16} = \frac{(x - 4)(x + 4)}{(x + 4)(x + 4)} = \frac{x - 4}{x + 4}$

E.g. 1 Simplify: (a) $\frac{x^2 + 7x + 10}{x^2 + 2x - 15}$ (b) $\frac{x^2 - 7x + 12}{x^2 - 2x - 8}$ (c) $\frac{2x^2 - 7x - 4}{x^2 + x - 20}$

Working: (a) $x^2 + 7x + 10 = x^2 + 5x + 2x + 10 = x(x + 5) + 2(x + 5) = (x + 5)(x + 2)$
 $x^2 + 2x - 15 = x^2 + 5x - 3x - 15 = x(x + 5) - 3(x + 5) = (x + 5)(x - 3)$
 $\frac{x^2 + 7x + 10}{x^2 + 2x - 15} = \frac{(x + 5)(x + 2)}{(x + 5)(x - 3)} = \frac{x + 2}{x - 3}$

(b) $x^2 - 7x + 12 = x^2 - 4x - 3x + 12 = x(x - 4) - 3(x - 4) = (x - 4)(x - 3)$
 $x^2 - 2x - 8 = x^2 - 4x + 2x - 8 = x(x - 4) + 2(x - 4) = (x - 4)(x + 2)$
 $\frac{x^2 - 7x + 12}{x^2 - 2x - 8} = \frac{(x - 4)(x - 3)}{(x - 4)(x + 2)} = \frac{x - 3}{x + 2}$

(c) $2x^2 - 7x - 4 = 2x^2 - 8x + x - 4 = 2x(x - 4) + 1(x - 4) = (x - 4)(2x + 1)$
 $x^2 + x - 20 = x^2 + 5x - 4x - 20 = x(x + 5) - 4(x + 5) = (x + 5)(x - 4)$
 $\frac{2x^2 - 7x - 4}{x^2 + x - 20} = \frac{(x - 4)(2x + 1)}{(x + 5)(x - 4)} = \frac{2x + 1}{x + 5}$

Video: [Simplifying algebraic fractions](#)

Exercise

9-1 class textbook:	p517 E16.4 Qu 19-29
A*-G class textbook:	p476 E16.1 Qu 19-29
9-1 homework book:	p517 E16.4 Qu 3e-l
A*-G homework book:	p132 E16.1 Qu 3e-l

[Homework book answers \(only available during a lockdown\)](#)

