

## Denominator includes Algebra

### Starter

1. (Review of last lesson)

Express  $\frac{3x-1}{4} - \frac{2x-5}{6}$  as a single fraction as simplified as possible

$$\begin{aligned} \text{Working: } \frac{3x-1}{4} - \frac{2x-5}{6} &= \frac{3(3x-1)}{12} - \frac{2(2x-5)}{12} && \text{common denominator} \\ &= \frac{9x-3}{12} - \frac{4x-10}{12} && \text{expand brackets} \\ &= \frac{5x+7}{12} && \text{subtract the numerators} \end{aligned}$$

**N.B.**  $(9x-3) - (4x-10) = 9x-3-4x+10 = 5x+7$

**E.g. 1** Express as a single simplified fraction:

(a)  $\frac{2}{x+1} + \frac{1}{x-3}$

(b)  $\frac{4}{x-6} - \frac{3}{2x+7}$

$$\begin{aligned} \text{Working: } \text{(a)} \quad \frac{2}{x+1} + \frac{1}{x-3} &= \frac{2(x-3)}{(x+1)(x-3)} + \frac{1(x+1)}{(x+1)(x-3)} \\ &= \frac{2x-6}{(x+1)(x-3)} + \frac{x+1}{(x+1)(x-3)} \\ &= \frac{3x-5}{(x+1)(x-3)} \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad \frac{4}{x-6} - \frac{3}{2x+7} &= \frac{4(2x+7)}{(x-6)(2x+7)} - \frac{3(x-6)}{(x-6)(2x+7)} \\ &= \frac{8x+28}{(x-6)(2x+7)} - \frac{3x-18}{(x-6)(2x+7)} \\ &= \frac{5x+46}{(x-6)(2x+7)} \end{aligned}$$

**N.B.**  $(8x+28) - (3x-18) = 8x+28-3x+18 = 5x+46$

**E.g. 2** Express as a single simplified fraction:

(a)  $\frac{x-2}{x-1} + \frac{x+1}{x+2}$

(b)  $\frac{x+2}{3x-2} - \frac{x-3}{2x+1}$

$$\begin{aligned} \text{Working: } \text{(a)} \quad \frac{x-2}{x-1} + \frac{x+1}{x+2} &= \frac{(x-2)(x+2)}{(x-1)(x+2)} + \frac{(x+1)(x-1)}{(x-1)(x+2)} \\ &= \frac{x^2+2x-2x-4}{(x-1)(x+2)} + \frac{x^2-x+x-1}{(x-1)(x+2)} \\ &= \frac{x^2-4}{(x-1)(x+2)} + \frac{x^2-1}{(x-1)(x+2)} \\ &= \frac{2x^2-5}{(x-1)(x+2)} \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad \frac{x+2}{3x-2} - \frac{x-3}{2x+1} &= \frac{(x+2)(2x+1)}{(3x-2)(2x+1)} - \frac{(x-3)(3x-2)}{(3x-2)(2x+1)} \\ &= \frac{2x^2+x+4x+2}{(3x-2)(2x+1)} - \frac{3x^2-2x-9x+6}{(3x-2)(2x+1)} \\ &= \frac{(3x-2)(2x+1)}{(3x-2)(2x+1)} - \frac{(3x-2)(2x+1)}{(3x-2)(2x+1)} \\ &= \frac{2x^2+5x+2}{(3x-2)(2x+1)} - \frac{3x^2-11x+6}{(3x-2)(2x+1)} \\ &= \frac{(3x-2)(2x+1)}{(3x-2)(2x+1)} - \frac{(3x-2)(2x+1)}{(3x-2)(2x+1)} \\ &= \frac{-x^2+16x-4}{(3x-2)(2x+1)} \end{aligned}$$

**E.g. 3** (a) When finding  $\frac{7}{16} + \frac{3}{4}$  what is the best common denominator to use.

(b) Using the idea from (a), express  $\frac{x-2}{(x+1)^2} + \frac{x+5}{x+1}$  as a single simplified fraction

**Working:** (a) 16

$$\begin{aligned} \text{(b)} \quad \frac{x-2}{(x+1)^2} + \frac{x+5}{x+1} &= \frac{x-2}{(x+1)^2} + \frac{(x+5)(x+1)}{(x+1)^2} \\ &= \frac{x-2}{(x+1)^2} + \frac{x^2+x+5x+5}{(x+1)^2} \\ &= \frac{x-2}{(x+1)^2} + \frac{x^2+6x+5}{(x+1)^2} \\ &= \frac{x^2+7x+3}{(x+1)^2} \end{aligned}$$

**Video:** [Algebraic fractions equations](#)

[Solutions to Starter and E.g.s](#)

**Exercise**

9-1 class textbook: p520 E16.6 Qu 14-15  
A\*-G class textbook: p479 E16.3 Qu 14-15  
9-1 homework book: p176 E16.6 Qu 9-23  
A\*-G homework book: p133 E16.3 Qu 9-20

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