

A Algebraic Fractions: Adding/Subtracting

19 Write as a single fraction in its simplest form.

$$(b) \frac{p}{2} + \frac{3t}{4} \quad \frac{p}{2} \times 2 + \frac{3t}{4} \times 2$$

$$= \frac{2p}{4} + \frac{3t}{4}$$

$$\frac{2p + 3t}{4} \quad [2]$$

12 (a) Write as a single fraction in its simplest form.

$$\frac{x}{4} + \frac{3x}{8} - \frac{x+2}{12}$$

$$\frac{x}{4} \times 6 + \frac{3x}{8} \times 3 - \frac{x+2}{12} \times 2 = \frac{15x - 2x - 4}{24}$$

$$= \frac{6x}{24} + \frac{9x}{24} - \frac{2(x+2)}{24}$$

$$= \frac{6x + 9x - 2(x+2)}{24} = \frac{13x - 4}{24} \quad [3]$$

23 Write as a single fraction in its simplest form.

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

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

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

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

$$= \frac{2x + 2 - 2x + 1}{x+1} = \frac{3}{x+1} \quad [3]$$

17 Simplify.

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

Write your answer as a single fraction in its simplest form.

$$\begin{aligned} & \frac{2}{1} \times \frac{(x-2)}{(x-2)} - \frac{4-3x}{x-2} \\ & = \frac{2(x-2)}{x-2} - \frac{4-3x}{x-2} \\ & = \frac{2(x-2) - (4-3x)}{x-2} \\ & = \frac{2x-4-4+3x}{x-2} \end{aligned} \quad \rightarrow \quad \frac{5x-8}{x-2} \quad [3]$$

16 Write as a single fraction in its simplest form.

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

$$\begin{aligned} & \frac{1}{x-3} \times \frac{x}{x} - \frac{2}{x} \times \frac{(x-3)}{(x-3)} \\ & = \frac{x}{x(x-3)} - \frac{2(x-3)}{x(x-3)} \\ & = \frac{x - 2(x-3)}{x(x-3)} \end{aligned} \quad \rightarrow \quad \begin{aligned} & = \frac{x - 2x + 6}{x(x-3)} \\ & = \frac{-x + 6}{x(x-3)} \\ & = \frac{6-x}{x(x-3)} \end{aligned} \quad [3]$$

20 Write as a single fraction in its simplest form.

$$\begin{aligned}
 \text{(b)} \quad & \frac{7}{x+3} + \frac{5}{8x-1} \\
 & \frac{7}{x+3} \times \frac{8x-1}{8x-1} + \frac{5}{8x-1} \times \frac{x+3}{x+3} \\
 & = \frac{7(8x-1)}{(x+3)(8x-1)} + \frac{5(x+3)}{(x+3)(8x-1)} \\
 & = \frac{56x - 7 + 5x + 15}{(x+3)(8x-1)} \\
 & = \frac{61x + 8}{(x+3)(8x-1)} \quad [3]
 \end{aligned}$$

22 Write as a single fraction in its simplest form.

$$\begin{aligned}
 & \frac{5}{3x+2} + \frac{4}{2x-1} \\
 & \frac{5}{3x+2} \times \frac{2x-1}{2x-1} + \frac{4}{2x-1} \times \frac{3x+2}{3x+2} \\
 & = \frac{5(2x-1)}{(3x+2)(2x-1)} + \frac{4(3x+2)}{(3x+2)(2x-1)} \\
 & = \frac{5(2x-1) + 4(3x+2)}{(3x+2)(2x-1)} \\
 & = \frac{10x - 5 + 12x + 8}{(3x+2)(2x-1)} \\
 & = \frac{22x + 3}{(3x+2)(2x-1)} \quad [3]
 \end{aligned}$$

23 Write as a single fraction in its simplest form.

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

$$\begin{aligned} & \frac{3}{x-4} \times \frac{(x+3)}{(x+3)} - \frac{4}{x+3} \times \frac{(x-4)}{(x-4)} \\ &= \frac{3(x+3)}{(x-4)(x+3)} - \frac{4(x-4)}{(x-4)(x+3)} \\ &= \frac{3(x+3) - 4(x-4)}{(x-4)(x+3)} \\ &= \frac{3x+9-4x+16}{(x-4)(x+3)} \\ &= \frac{-x+25}{(x-4)(x+3)} \\ &= \frac{25-x}{(x-4)(x+3)} \quad [3] \end{aligned}$$

15 Simplify.

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

$$\begin{aligned} & \frac{3}{x+2} \times \frac{x-1}{x-1} - \frac{2}{x-1} \times \frac{x+2}{x+2} \\ &= \frac{3(x-1)}{(x+2)(x-1)} - \frac{2(x+2)}{(x+2)(x-1)} \\ &= \frac{3(x-1) - 2(x+2)}{(x+2)(x-1)} \\ &= \frac{3x-3-2x-4}{(x+2)(x-1)} \\ &= \frac{x-7}{(x+2)(x-1)} \quad [3] \end{aligned}$$

19 Write as a single fraction in its simplest form.

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

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

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

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

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

$$= \frac{-x+8}{(x-2)(x+1)}$$

$$\frac{8-x}{(x-2)(x+1)} \quad [3]$$

19 Write as a single fraction in its simplest form.

$$\frac{2}{x+3} - \frac{x+2}{7}$$

$$\frac{2}{x+3} \times \frac{7}{7} - \frac{x+2}{7} \times \frac{(x+3)}{(x+3)}$$

$$= \frac{14}{7(x+3)} - \frac{(x+2)(x+3)}{7(x+3)}$$

$$= \frac{14 - (x+2)(x+3)}{7(x+3)}$$

$$= \frac{14 - [x^2 + 3x + 2x + 6]}{7(x+3)}$$

$$= \frac{14 - (x^2 + 5x + 6)}{7(x+3)}$$

$$= \frac{14 - x^2 - 5x - 6}{7(x+3)}$$

$$= \frac{-x^2 - 5x + 8}{7(x+3)} \quad \leftarrow \text{does not factorise}$$

$$\frac{-x^2 - 5x + 8}{7(x+3)} \quad [3]$$

(b) Write as a single fraction in its simplest form.

$$\frac{x+5}{x} + \frac{x+8}{x-1}$$

$$\frac{x+5}{x} \times \frac{x-1}{x-1} + \frac{x+8}{x-1} \times \frac{x}{x}$$

$$= \frac{(x+5)(x-1) + x(x+8)}{x(x-1)}$$

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

$$= \frac{2x^2 + 12x - 5}{x(x-1)}$$

does not factorise

$$\frac{2x^2 + 12x - 5}{x(x-1)}$$

[3]

5 (a) Write as a single fraction in its simplest form.

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

$$\frac{x+3}{x-3} \times \frac{x+2}{x+2} - \frac{x-2}{x+2} \times \frac{x-3}{x-3}$$

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

$$= \frac{[x^2 + 2x + 3x + 6] - [x^2 - 3x - 2x + 6]}{(x-3)(x+2)}$$

$$= \frac{x^2 + 5x + 6 - (x^2 - 5x + 6)}{(x-3)(x+2)}$$

$$= \frac{x^2 + 5x + 6 - x^2 + 5x - 6}{(x-3)(x+2)}$$

$$\frac{10x}{(x-3)(x+2)}$$

[4]

(c) Write as a single fraction in its simplest form.

$$\frac{3}{x-5} - \frac{7}{2x}$$

$$\begin{aligned} & \frac{3}{x-5} \times \frac{2x}{2x} - \frac{7}{2x} \times \frac{x-5}{x-5} \\ &= \frac{6x}{2x(x-5)} - \frac{7(x-5)}{2x(x-5)} \\ &= \frac{6x - 7(x-5)}{2x(x-5)} \\ &= \frac{6x - 7x + 35}{2x(x-5)} \\ &= \frac{35 - x}{2x(x-5)} \quad [3] \end{aligned}$$

14 Write as a single fraction in its simplest form.

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

$$\begin{aligned} & \frac{3a}{a+4} \times \frac{2a}{2a} - \frac{a-1}{2a} \times \frac{a+4}{a+4} \\ &= \frac{6a^2}{2a(a+4)} - \frac{(a-1)(a+4)}{2a(a+4)} \\ &= \frac{6a^2 - (a-1)(a+4)}{2a(a+4)} \\ &= \frac{6a^2 - [a^2 + 4a - a - 4]}{2a(a+4)} \\ &= \frac{6a^2 - (a^2 + 3a - 4)}{2a(a+4)} \\ &= \frac{6a^2 - a^2 - 3a + 4}{2a(a+4)} \end{aligned}$$

does not
✓ factorise

$$\begin{aligned} & \frac{5a^2 - 3a + 4}{2a(a+4)} \quad [3] \end{aligned}$$

$$\frac{2x-3}{2x+3} - \frac{2x+3}{2x-3} = \frac{ax}{bx^2-c}$$

Find the values of a , b and c .

$$\frac{2x-3}{2x+3} \times \frac{2x-3}{2x-3} - \frac{2x+3}{2x-3} \times \frac{2x+3}{2x+3}$$

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

$$= \frac{[4x^2 - 6x - 6x + 9] - [4x^2 + 6x + 6x + 9]}{(2x+3)(2x-3)}$$

$$a = \frac{-24}{\dots\dots\dots}$$

$$b = \frac{4}{\dots\dots\dots}$$

$$c = \frac{9}{\dots\dots\dots} [4]$$

$$= \frac{4x^2 - 12x + 9 - (4x^2 + 12x + 9)}{(2x+3)(2x-3)}$$

$$= \frac{4x^2 - 12x + 9 - 4x^2 - 12x - 9}{(2x+3)(2x-3)}$$

$$= \frac{-24x}{(2x+3)(2x-3)}$$

$$= \frac{-24x}{4x^2 - 6x + 6x - 9}$$

$$= \frac{-24x}{4x^2 - 9}$$

17 Write as a single fraction, giving your answer in its simplest form.

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

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

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

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

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

$$\frac{2x - 1}{1+x} \dots \dots \dots [2]$$

19 Write as a single fraction in its simplest form.

$$\begin{aligned} & \frac{3}{x-2} - 2 \\ &= \frac{3}{x-2} - \frac{2}{1} \times \frac{(x-2)}{(x-2)} \\ &= \frac{3}{x-2} - \frac{2(x-2)}{x-2} \\ &= \frac{3 - 2(x-2)}{x-2} \\ &= \frac{3 - 2x + 4}{x-2} \\ &= \frac{7 - 2x}{x-2} \quad [2] \end{aligned}$$

15 Write as a single fraction in its simplest form.

$$\frac{3}{x-1} - \frac{2}{2x+5}$$

$$\begin{aligned} & \frac{3}{x-1} \times \frac{2x+5}{2x+5} - \frac{2}{2x+5} \times \frac{x-1}{x-1} \\ &= \frac{3(2x+5)}{(x-1)(2x+5)} - \frac{2(x-1)}{(x-1)(2x+5)} \\ &= \frac{3(2x+5) - 2(x-1)}{(x-1)(2x+5)} \\ &= \frac{6x + 15 - 2x + 2}{(x-1)(2x+5)} \\ &= \frac{4x + 17}{(x-1)(2x+5)} \quad [3] \end{aligned}$$