19 Write as a single fraction in its simplest form.

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

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

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

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

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

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

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

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

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

$= \frac{15x - 2x - 4}{24}$

$\frac{13x-4}{24}$ [3]

19 Write as a single fraction in its simplest form.

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

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

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

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

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

$\frac{7-2x}{x-2}$ [2]

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

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

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

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

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

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

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

23 Write as a single fraction in its simplest form.

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

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

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

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

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

$= \frac{3}{x+1}$

$\frac{3}{x+1}$ [3]

17 Simplify.

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

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

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

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

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

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

$= \frac{5x-8}{x-2}$

$\frac{5x-8}{x-2}$ [3]

16 Write as a single fraction in its simplest form.

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

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

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

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

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

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

$$\frac{6-x}{x(x-3)}$$ [3]

20 Write as a single fraction in its simplest form.

(b) $\frac{7}{x+3} + \frac{5}{8x-1}$

$$\frac{7}{x+3} \times \frac{8x-1}{8x-1} + \frac{5}{8x-1} \times \frac{x+3}{x+3}$$

$$= \frac{7(8x-1)}{(x+3)(8x-1)} + \frac{5(x+3)}{(x+3)(8x-1)}$$

$$= \frac{7(8x-1) + 5(x+3)}{(x+3)(8x-1)}$$

$$= \frac{56x - 7 + 5x + 15}{(x+3)(8x-1)}$$

$$\frac{61x + 8}{(x+3)(8x-1)}$$ [3]

22 Write as a single fraction in its simplest form.

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

$$\frac{5}{3x+2} \times \frac{2x-1}{2x-1} + \frac{4}{2x-1} \times \frac{3x+2}{3x+2}$$

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

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

$$= \frac{10x - 5 + 12x + 8}{(3x+2)(2x-1)}$$

$$\frac{22x + 3}{(3x+2)(2x-1)}$$ [3]

15 Simplify.

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

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

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

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

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

$= \frac{x-7}{(x+2)(x-1)}$

$\frac{x-7}{(x+2)(x-1)}$ [3]

23 Write as a single fraction in its simplest form.

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

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

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

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

$= \frac{3x+9-4x+16}{(x-4)(x+3)}$

$= \frac{-x+25}{(x-4)(x+3)}$

$\frac{25-x}{(x-4)(x+3)}$ [3]

15 Write as a single fraction in its simplest form.

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

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

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

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

$= \frac{6x+15-2x+2}{(x-1)(2x+5)}$

$\frac{4x+17}{(x-1)(2x+5)}$ [3]

19 Write as a single fraction in its simplest form.

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

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

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

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

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

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

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

19 Write as a single fraction in its simplest form.

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

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

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

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

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

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

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

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

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

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

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

$= \frac{6x}{2x(x-5)} - \frac{7(x-5)}{2x(x-5)}$

$= \frac{6x - 7(x-5)}{2x(x-5)}$

$= \frac{6x - 7x + 35}{2x(x-5)}$

$\frac{35 - x}{2x(x-5)}$ [3]

14 Write as a single fraction in its simplest form.

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

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

$= \frac{6a^2}{2a(a+4)} - \frac{(a-1)(a+4)}{2a(a+4)}$

$= \frac{6a^2 - (a-1)(a+4)}{2a(a+4)}$

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

$= \frac{6a^2 - (a^2 + 3a - 4)}{2a(a+4)}$

$= \frac{6a^2 - a^2 - 3a + 4}{2a(a+4)}$

does not factorise

$\frac{5a^2 - 3a + 4}{2a(a+4)}$ [3]

12 $\frac{2x-3}{2x+3} - \frac{2x+3}{2x-3} = \frac{ax}{bx^2-c}$

Find the values of a, b and c.

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

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

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

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

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

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

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

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

$a =$ −24

$b =$ 4

$c =$ 9 [4]