Solutions

2.1

- cancel the common factor $3x$: $\dfrac{6x^2}{9x} = \boldsymbol{\dfrac{2x}{3}}$

2.2

- factorise: $\dfrac{4(x+3)}{x(x+3)}$
- cancel $(x+3)$: $\boldsymbol{\dfrac{4}{x}}$

2.3

- top: $x^2+5x+6 = (x+2)(x+3)$
- bottom: $x^2-4 = (x-2)(x+2)$
- cancel $(x+2)$: $\boldsymbol{\dfrac{x+3}{x-2}}$

2.4

- common denominator 12: $\dfrac{4x}{12} + \dfrac{3(x+1)}{12}$
- $\dfrac{4x+3x+3}{12} = \boldsymbol{\dfrac{7x+3}{12}}$

2.5

- factorise: $\dfrac{x+2}{5} \times \dfrac{10}{x(x+2)}$
- cancel $(x+2)$ and 5: $\boldsymbol{\dfrac{2}{x}}$

3.1

- x and 6 are **terms** added together, not factors: only a factor of the whole top and whole bottom can cancel; at $x=1$ the fraction is $\frac{7}{3}$, not 3

3.2

- common denominator $(x+2)(x-1)$: $\dfrac{3(x-1)-2(x+2)}{(x+2)(x-1)}$
- top: $3x-3-2x-4 = x-7$
- single fraction: $\boldsymbol{\dfrac{x-7}{(x+2)(x-1)}}$

3.3

- multiply by the reciprocal: $\dfrac{x^2-1}{x^2+3x+2} \times \dfrac{x+2}{x-1}$
- factorise: $\dfrac{(x-1)(x+1)}{(x+1)(x+2)} \times \dfrac{x+2}{x-1}$
- every factor cancels: $\boldsymbol{1}$ (for $x \neq 1, -1, -2$)

3.4

- top: $2x^2-5x-3 = (2x+1)(x-3)$
- bottom: $4x^2-1 = (2x-1)(2x+1)$
- cancel $(2x+1)$: $\boldsymbol{\dfrac{x-3}{2x-1}}$

3.5

- multiply every term by $x(x-2)$: $3x+(x-2) = 2x(x-2)$
- $4x-2 = 2x^2-4x$, so $2x^2-8x+2=0$, that is $x^2-4x+1=0$
- quadratic formula: $x = \dfrac{-b \pm \sqrt{b^2-4ac}}{2a} = \dfrac{4 \pm \sqrt{16-4}}{2} = 2 \pm \sqrt{3}$
- $\boldsymbol{x = 2+\sqrt{3}}$ or $\boldsymbol{x = 2-\sqrt{3}}$; neither is 0 or 2, so both are allowed