

ALGEBRAIC FRACTIONS - PRACTICE QUESTIONS



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1.

Simplify fully $\frac{6x+15}{8x+20}$

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

2.

Simplify fully $\frac{12x-16}{3x^2-4x}$

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

3.

Simplify fully $\frac{x^2+4x}{x^2+6x+8}$

$$= \frac{x(\cancel{x+4})}{(\cancel{x+4})(x+2)} = \frac{x}{x+2}$$

4.

Simplify fully $\frac{x^2-x-12}{x^2+9x+18}$

$$= \frac{(x-4)(\cancel{x+3})}{(x+6)(\cancel{x+3})} = \frac{x-4}{x+6}$$

5.

Simplify fully $\frac{9x+18}{x^2+4x+4}$

$$= \frac{9(\cancel{x+2})}{(\cancel{x+2})(\cancel{x+2})} = \frac{9}{x+2}$$

6.

Simplify fully $\frac{x^2+2x-24}{x^2-16}$

$$= \frac{(\cancel{x+6})(\cancel{x-4})}{(\cancel{x+4})(\cancel{x-4})} = \frac{x+6}{x+4}$$

7.

Simplify fully $\frac{2x^2+13x+20}{2x^2+x-10}$

$$2x^2+13x+20 : 2 \times 20 = 40$$

$$2x^2+8x+5x+20$$

$$2x(x+4)+5(x+4)$$

$$(2x+5)(x+4)$$

$$2x^2+x-10 : 2x-10 = -20$$

$$2x^2+5x-4x-10$$

$$x(2x+5)-2(2x+5)$$

$$(x-2)(2x+5)$$

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

8.

Simplify fully $\frac{x^2+x}{x^2+x-2} \times \frac{x^2-3x-10}{x^2-4x-5}$

$$= \frac{\cancel{x}(\cancel{x}+1)}{(\cancel{x}+2)(x-1)} \times \frac{(\cancel{x}-5)(x+2)}{(\cancel{x}-5)(\cancel{x}+1)} = \left(\frac{x}{x-1} \right)$$

9.

Simplify fully $\frac{2x^2+7x+3}{4x^2+2x} \div \frac{3x^2+7x-6}{6x^2-4x}$

$$2x^2+7x+3: 2 \times 3 = 6 \quad 2x^2+6x \mid +x+3$$

$$2x(x+3) \mid +1(x+3)$$

$$= (2x+1)(x+3)$$

$$4x^2+2x = 2x(2x+1)$$

$$3x^2+7x-6: 3x-6 = -18 \quad 3x^2+9x \mid -2x-6$$

$$3x(x+3) \mid -2(x+3)$$

$$(3x-2)(x+3)$$

$$6x^2-4x = 2x(3x-2)$$

$$= \frac{(\cancel{2x}+1)(x+3)}{2x(\cancel{2x}+1)} \div \frac{(\cancel{3x}-2)(x+3)}{2x(\cancel{3x}-2)} = \frac{\cancel{x}+3}{2x} \times \frac{2x}{\cancel{x}+3} = \left(1 \right)$$

10.

Simplify fully $\frac{3x^2+13x+12}{x^2-9} \times \frac{x^2+2x-15}{4x^2+17x-15}$

$$3x^2+13x+12: 3 \times 12 = 36 \quad \begin{array}{l} 3x^2 + 9x + 4x + 12 \\ 3x(x+3) + 4(x+3) \\ = (3x+4)(x+3) \end{array}$$

$$x^2-9 = (x+3)(x-3)$$

$$x^2+2x-15 = (x+5)(x-3)$$

$$4x^2+17x-15: 4 \times -15 = -60 \quad \begin{array}{l} 4x^2 + 20x - 3x - 15 \\ 4x(x+5) - 3(x+5) \\ = (4x-3)(x+5) \end{array}$$

$$= \frac{(3x+4)\cancel{(x+3)}}{\cancel{(x+3)}(x-3)} \times \frac{\cancel{(x+5)}(x-3)}{(4x-3)\cancel{(x+5)}} = \frac{3x+4}{4x-3}$$

11.

Simplify fully $\frac{4x^2-9}{6x^2+11x+3} \div \frac{4x^2-17x-15}{3x^2-14x-5}$

$$4x^2-9 = (2x+3)(2x-3)$$

$$6x^2+11x+3: 6 \times 3 = 18 \quad \begin{array}{l} 6x^2 + 9x + 2x + 3 \\ 3x(2x+3) + 1(2x+3) \\ = (3x+1)(2x+3) \end{array}$$

$$4x^2-17x-15: 4 \times -15 = -60 \quad \begin{array}{l} 4x^2 - 20x + 3x - 15 \\ 4x(x-5) + 3(x-5) \\ = (4x+3)(x-5) \end{array}$$

$$3x^2-14x-5: 3 \times -5 = -15 \quad \begin{array}{l} 3x^2 - 15x + x - 5 \\ 3x(x-5) + 1(x-5) \\ = (3x+1)(x-5) \end{array}$$

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

12.

Simplify fully $\frac{4x^3+10x^2}{4x^2+4x-15} - \frac{3x^2-18x}{2x^2-15x+18}$

$$4x^3 + 10x^2 = 2x^2(2x+5)$$

$$4x^2 + 4x - 15 : 4x - 15 = -60$$

$$\begin{array}{r} 4x^2 + 10x \quad | \quad -6x - 15 \\ 2x(2x+5) \quad | \quad -3(2x+5) \\ \hline (2x-3)(2x+5) \end{array}$$

$$3x^2 - 18x = 3x(x-6)$$

$$2x^2 - 15x + 18 : 2 \times 18 = 36$$

$$\begin{array}{r} 2x^2 - 12x \quad | \quad -3x + 18 \\ 2x(x-6) \quad | \quad -3(x-6) \\ \hline (2x-3)(x-6) \end{array}$$

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

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

13.

Simplify fully $\frac{4x^3-16x}{3x^2+11x+10} \times \frac{9x^2-25}{3x^2-11x+10}$

$$4x^3 - 16x = 4x(x^2 - 4) = 4x(x+2)(x-2)$$

$$3x^2 + 11x + 10 : 3 \times 10 = 30$$

$$\begin{array}{r} 3x^2 + 5x \quad | \quad 6x + 10 \\ x(3x+5) \quad | \quad +2(3x+5) \\ \hline (x+2)(3x+5) \end{array}$$

$$9x^2 - 25 = (3x+5)(3x-5)$$

$$3x^2 - 11x + 10 : 3 \times 10 = 30$$

$$\begin{array}{r} 3x^2 - 5x \quad | \quad -6x + 10 \\ x(3x-5) \quad | \quad -2(3x-5) \\ \hline (x-2)(3x-5) \end{array}$$

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

$$= \textcircled{4x}$$

14.

Show that, for all values of x , $\frac{x^2-6x}{x^2-4x-12} + \frac{6x+8}{3x^2+10x+8} = 1$

$$x^2 - 6x = x(x-6)$$

$$x^2 - 4x - 12 = (x-6)(x+2)$$

$$6x + 8 = 2(3x+4)$$

$$3x^2 + 10x + 8 : 3 \times 8 = 24$$

$$\begin{array}{l} 3x^2 + 6x + 4x + 8 \\ 3x(x+2) + 4(x+2) \\ (3x+4)(x+2) \end{array}$$

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

$$= \frac{\cancel{x+2}}{\cancel{x+2}}$$

$$= \boxed{1}$$