



Algebraic fractions

- Finding and identifying equivalent algebraic fractions
- Adding and subtracting algebraic fractions

Keywords

You should know

explanation 1a

explanation 1b

1 Find three number fractions that are equivalent to each of these fractions.

a $\frac{1}{3}$

b $\frac{2}{5}$

c $\frac{4}{5}$

d $\frac{7}{8}$

e $\frac{9}{10}$

2 In each group of fractions, find the odd one out.

a $\frac{1}{2}, \frac{9}{16}, \frac{19}{38}, \frac{7}{14}, \frac{56}{112}$

b $\frac{3}{5}, \frac{9}{15}, \frac{42}{75}, \frac{21}{35}, \frac{180}{300}$

c $\frac{4}{7}, \frac{46}{84}, \frac{36}{63}, \frac{12}{21}, \frac{28}{49}$

3 Find a pair of equivalent fractions in each group.

a $\frac{a}{3}, \frac{4a}{3}, \frac{4a}{12}$

b $\frac{x}{8}, \frac{xy}{8}, \frac{3x}{24}$

c $\frac{2b}{3}, \frac{6b}{12}, \frac{2b}{4}$

d $\frac{ab}{4}, \frac{a+b}{4}, \frac{2(a+b)}{8}$

4 a Match each fraction in the left-hand column with an equivalent fraction from the right-hand column.

b Write three other pairs of equivalent algebraic fractions.

$\frac{a}{2}$	$\frac{10(a+1)}{20}$
$\frac{2(a+1)}{4}$	$\frac{a^2}{2a}$
$\frac{2a}{8}$	$\frac{10(a+3)}{20}$
$\frac{2a+3}{2}$	$\frac{10a}{30}$
$\frac{a}{3}$	$\frac{2(2a+3)}{4}$
$\frac{2(a+3)}{4}$	$\frac{4a}{16}$

5 Copy these and fill in the missing expressions.

a $\frac{2m}{4} = \frac{\square}{12}$

b $\frac{3a+1}{4} = \frac{\square}{8}$

c $\frac{5p-4}{5} = \frac{\square}{20}$

d $\frac{3x+y}{6} = \frac{\square}{18}$

e $\frac{5x-3}{4} = \frac{\square}{12}$

f $\frac{7a+4}{9} = \frac{\square}{18}$

g $\frac{2y+3}{y} = \frac{\square}{2y}$

h $\frac{4-x}{2x} = \frac{\square}{6x}$

i $\frac{2a+5}{3} = \frac{\square}{9a}$

explanation 2

6 Simplify these fractions by cancelling common numeric factors.

a $\frac{6y}{3}$

b $\frac{4c}{2}$

c $\frac{2b}{8}$

d $\frac{10f}{25}$

e $\frac{16m^2}{4}$

f $\frac{7x^2}{56}$

g $\frac{3ab}{12}$

h $\frac{24xy}{16}$

7 Simplify these fractions by cancelling all common factors.

a $\frac{3y}{yz}$

b $\frac{c}{cd}$

c $\frac{5ef}{f}$

d $\frac{gh}{g^2}$

e $\frac{4x}{xy}$

f $\frac{s}{s^2}$

g $\frac{pr}{2prq}$

h $\frac{8rst}{2st}$

8 Match each expression in the top row with a simplified form from the bottom row.

$$\frac{10x^2}{5xy}$$

$$\frac{10x}{5x^2y}$$

$$\frac{5x^2}{10xy}$$

$$\frac{5x}{10x^2y}$$

$$\frac{5x}{10xy^2}$$

$$\frac{10x}{5xy^2}$$

$$\frac{2}{y^2}$$

$$\frac{1}{2y^2}$$

$$\frac{2x}{y}$$

$$\frac{1}{2xy}$$

$$\frac{2}{xy}$$

$$\frac{x}{2y}$$

explanation 3

9 Simplify each fraction by factorising and then cancelling common factors.

a $\frac{16+4m}{4}$

b $\frac{7x+21}{14}$

c $\frac{2m^2+4}{6}$

d $\frac{10}{5y+15}$

e $\frac{3x-9}{6}$

f $\frac{12}{6-3y}$

g $\frac{30}{25b+15}$

h $\frac{7x+21}{14x}$

10 Simplify each fraction by factorising and then cancelling common factors.

a $\frac{x^2 + 3x}{x}$

b $\frac{2m^2 - 8m}{m}$

c $\frac{7h^2 - 14h}{h}$

d $\frac{x - 4}{2x - 8}$

e $\frac{5x + 15}{x + 3}$

f $\frac{7}{14x + 21}$

g $\frac{5x^2 - 10x}{x^2 - 2x}$

h $\frac{25g^3 + 10g^2}{5g^2 + 2g}$

i $\frac{2x^2 - x}{4x - 2}$

11 Peter is simplifying this expression in his maths lesson.

Explain what he has done wrong and then complete the problem correctly.

$$\frac{12xy^2 + 10y^2}{6y^2 + 2y} = \frac{\cancel{12}xy^{\cancel{2}} + \cancel{10}y^{\cancel{2}}}{\cancel{6}y^{\cancel{2}} + \cancel{2}y} = 10xy \quad \text{X}$$

explanation 4a

explanation 4b

12 Work out these additions.

a $\frac{3}{4} + \frac{8}{9}$

b $\frac{4}{7} + \frac{3}{11}$

c $\frac{5}{6} + \frac{2}{9}$

d $\frac{2}{5} + \frac{7}{8}$

13 Work out these subtractions.

a $\frac{4}{7} - \frac{2}{9}$

b $\frac{7}{8} - \frac{5}{6}$

c $\frac{11}{12} - \frac{2}{3}$

d $\frac{7}{10} - \frac{3}{7}$

14 Copy these and fill in the gaps.

a $\frac{a}{2} + \frac{a}{3} = \frac{3a}{6} + \frac{\square}{6}$
 $= \frac{\square}{6}$

b $\frac{y}{4} + \frac{2y}{8} = \frac{\square}{8} + \frac{\square}{8}$
 $= \frac{\square}{8} = \frac{\square}{2}$

c $\frac{2c}{5} + \frac{3c}{4} = \frac{\square}{20} + \frac{\square}{20}$
 $= \frac{\square}{20}$

- 15** Add these fractions together and simplify your answers where possible.

First find the lowest common multiple of the denominators.

a $\frac{b}{2} + \frac{b}{4}$

b $\frac{d}{5} + \frac{d}{6}$

c $\frac{x}{3} + \frac{x}{6}$

d $\frac{2m}{5} + \frac{m}{2}$

e $\frac{5s}{4} + \frac{3t}{3}$

f $\frac{4x}{7} + \frac{3y}{14}$

g $\frac{5r}{5} + \frac{4s}{4}$

h $\frac{x+1}{2} + \frac{3y}{4}$

i $\frac{2a+5}{5} + \frac{a}{3}$

j $\frac{x-2}{10} + \frac{3x}{5}$

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

l $\frac{n+m}{12} + \frac{n+3m}{4}$

m $\frac{a^2}{3} + \frac{2a^2}{4}$

n $\frac{3b^2}{5} + \frac{b^2}{4}$

o $\frac{3n^2}{7} + \frac{4n^2}{3}$

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

- 16** Find the errors in these pupils' calculations. Write out each calculation correctly.

a

$$\frac{q}{9} + \frac{3q}{5} = \frac{4q}{14}$$

X

b

$$\frac{r}{3} + \frac{3r}{4} = \frac{2r}{4}$$

X

c

$$\frac{x+2}{3} + \frac{2x}{4} = \frac{3x+2}{12}$$

X

- 17** Work out these subtractions and simplify your answers where possible.

a $\frac{g}{3} - \frac{g}{5}$

b $\frac{h}{2} - \frac{h}{4}$

c $\frac{3x}{2} - \frac{5x}{6}$

d $\frac{5m}{2} - \frac{7m}{10}$

e $\frac{5y}{3} - \frac{3y}{4}$

f $\frac{3b+2}{5} - \frac{2b}{10}$

g $\frac{a-b}{3} - \frac{a}{5}$

h $\frac{g-f}{3} - \frac{g}{6}$

i $\frac{5x+3}{4} - \frac{x+2}{12}$

j $\frac{3m-3}{5} - \frac{2m+4}{10}$

k $\frac{n^2}{3} - \frac{n}{2}$

l $\frac{3y^2}{7} - \frac{2y^2}{21}$

- 18** Sam has done this algebra problem. She has made one mistake. Explain her error and write out the calculation correctly.

$$\frac{2x+1}{2} - \frac{x-3}{5} = \frac{10x+5}{10} - \frac{2x-6}{10} = \frac{10x+5-2x-6}{10} = \frac{8x-1}{10}$$

X

explanation 5

- 19** The expression in each rectangle is the sum of the expressions in the circles. Copy and complete each problem.

a

b

c

- 20** In these addition pyramids, the expression in each brick is the sum of the expressions in the two bricks below.

Copy and complete each pyramid.

