Algebraic Fractions

Simple Numerical Fractions

Addition $\frac{2}{5} + \frac{3}{7} = \frac{14+15}{35} = \frac{29}{35}$

$= \frac{2\times7+3\times5}{5\times7} = \frac{14+15}{35} = \frac{29}{35}$

Subtraction $\frac{5}{8} - \frac{1}{3} = \frac{15-8}{24} = \frac{7}{24}$

$= \frac{5\times3-8\times1}{8\times3} = \frac{15-8}{24} = \frac{7}{24}$

Multiplication $\frac{7}{\cancel{10}_{5}} \times \frac{\cancel{2}^{1}}{5} = \frac{7\times1}{5\times5} = \frac{7}{25}$

Division $\frac{8}{9} \div \frac{2}{5} = \frac{\cancel{8}^{4}}{9} \times \frac{5}{\cancel{2}_{1}} = \frac{4\times5}{9\times1} = \frac{20}{9}$

Algebraic Fractions

Addition $\frac{a}{b} + \frac{c}{d} \equiv \frac{ad+bc}{bd}$

Subtraction $\frac{a}{b} - \frac{c}{d} \equiv \frac{ad-bc}{bd}$

Multiplication $\frac{a}{b} \times \frac{c}{d} \equiv \frac{ac}{bd}$

Division $\frac{a}{b} \div \frac{c}{d} \equiv \frac{a}{b} \times \frac{d}{c} \equiv \frac{ad}{bc}$

EXERCISE 20A

1 Simplify each of these.

a $\frac{x}{2} + \frac{x}{3}$ b $\frac{3x}{4} + \frac{x}{5}$ c $\frac{3x}{4} + \frac{2x}{5}$

d $\frac{x}{2} + \frac{y}{3}$ e $\frac{xy}{4} + \frac{2}{x}$ f $\frac{x+1}{2} + \frac{x+2}{3}$

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

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

2 Simplify each of these.

a $\frac{x}{2} - \frac{x}{3}$ b $\frac{3x}{4} - \frac{x}{5}$ c $\frac{3x}{4} - \frac{2x}{5}$

d $\frac{x}{2} - \frac{y}{3}$ e $\frac{xy}{4} - \frac{2}{y}$ f $\frac{x+1}{2} - \frac{x+2}{3}$

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

j $\frac{x-4}{5} - \frac{2x-3}{2}$

3 Solve the following equations.

a $\frac{x+1}{2} + \frac{x+2}{5} = 3$ b $\frac{x+2}{4} + \frac{x+1}{7} = 3$ c $\frac{4x+1}{3} - \frac{x+2}{4} = 2$

d $\frac{2x-1}{3} + \frac{3x+1}{4} = 7$ e $\frac{2x+1}{2} - \frac{x+1}{7} = 1$ f $\frac{3x+1}{5} - \frac{5x-1}{7} = 0$

Exercise 20A Blue Books

1a) $\frac{x}{2} + \frac{x}{3} = \frac{3x+2x}{6} = \frac{5x}{6}$

1c) $\frac{3x}{4} + \frac{2x}{5} = \frac{15x+8x}{20} = \frac{23x}{20}$

1e) $\frac{xy}{4} + \frac{2}{x} = \frac{x^2y+8}{4x}$

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

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

$= \frac{7x-3}{4}$

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

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

$= \frac{3x-1}{4}$

Classwork

1b) $\frac{3x}{4} + \frac{x}{5} = \frac{15x+4x}{20} = \frac{19x}{20}$

1d) $\frac{x}{2} + \frac{y}{3} = \frac{3x+2y}{6}$

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

$= \frac{3x+3+2x+4}{6}$

$= \frac{5x+7}{6}$

1h) $\frac{x}{5} + \frac{(2x-1)}{3} = \frac{3x+5(2x-1)}{15}$

$= \frac{3x+10x-5}{15}$

$= \frac{13x-5}{15}$

1j) $\frac{(x-4)}{5} + \frac{(2x-3)}{2} = \frac{2(x-4)+5(2x-3)}{10}$

$= \frac{2x-8+10x-15}{10}$

$= \frac{12x-23}{10}$

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

2c) $\frac{3x}{4} - \frac{2x}{5} = \frac{15x-8x}{20} = \frac{7x}{20}$

2e) $\frac{xy}{4} - \frac{2}{y} = \frac{xy^2-8}{4y}$

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

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

$= \frac{x-1}{4}$

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

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

$= \frac{x-1}{4}$

Classwork

2b) $\frac{3x}{4} - \frac{x}{5} = \frac{15x-4x}{20} = \frac{11x}{20}$

2d) $\frac{x}{2} - \frac{y}{3} = \frac{3x-2y}{6}$

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

$= \frac{3x+3-2x-4}{6}$

$= \frac{x-1}{6}$

2h)

$$\frac{x}{5} - \frac{(2x+1)}{3} = \frac{3x - 5(2x+1)}{15}$$

$$= \frac{3x - 10x - 5}{15}$$

$$= \frac{-7x - 5}{15}$$

2j)

$$\frac{(x-4)}{5} - \frac{(2x-3)}{2} = \frac{2(x-4) - 5(2x-3)}{10}$$

$$= \frac{2x - 8 - 10x + 15}{10}$$

$$= \frac{-8x + 7}{10}$$

3a)

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

$$\frac{10(x+1)}{2} + \frac{10(x+2)}{5} = 10 \times 3$$

$$5(x+1) + 2(x+2) = 30$$

$$5x + 5 + 2x + 4 = 30$$

$$7x + 9 = 30$$

$$7x = 30 - 9$$

$$7x = 21$$

$$x = \frac{21}{7}$$

$$\underline{x = 3}$$

3c)

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

$$\frac{12(4x+1)}{3} - \frac{12(x+2)}{4} = 12 \times 2$$

$$4(4x+1) - 3(x+2) = 24$$

$$16x + 4 - 3x - 6 = 24$$

$$13x - 2 = 24$$

$$13x = 24 + 2$$

$$13x = 26$$

$$x = \frac{26}{13} \qquad \underline{x = 2}$$

3e

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

$$\frac{14(2x+1)}{2} - \frac{14(x+1)}{7} = 14 \times 1$$

$$7(2x+1) - 2(x+1) = 14$$

$$14x + 7 - 2x - 2 = 14$$

$$12x + 5 = 14$$

$$12x = 14 - 5$$

$$12x = 9$$

$$x = \frac{9}{12} \qquad \underline{x = \frac{3}{4}}$$

Classwork

3b)

$$\frac{x+2}{4} + \frac{x+1}{7} = 3$$

$$\frac{28(x+2)}{4} + \frac{28(x+1)}{7} = 28 \times 3$$

$$7(x+2) + 4(x+1) = 84$$

$$7x + 14 + 4x + 4 = 84$$

$$11x + 18 = 84$$

$$11x = 84 - 18$$

$$11x = 66$$

$$x = \frac{66}{11}$$

$$\underline{x = 6}$$