

Exercise 1.2

1 Work out the following. Answers *may* be left as improper fractions.

(a) $\frac{4}{7} \times 5$ (b) $\frac{5}{12} \times 3$ (c) $\frac{7}{9} \times 2$ (d) $\frac{4}{15} \times 3$

(e) $\frac{8}{11} \div 4$ (f) $\frac{8}{11} \div 3$ (g) $\frac{6}{7} \div 3$ (h) $\frac{6}{7} \div 5$

(i) $\frac{3x}{y} \times x$ (j) $\frac{3x}{y^2} \times y$ (k) $\frac{5x^3}{4y} \div x$ (l) $\frac{5x^2}{6y} \div y$

(m) $\frac{5x^3}{2y} \times 3x$ (n) $\frac{3y^4}{4x^2z} \times 2x$ (o) $\frac{6x^2y^3}{5z} \div 2xy$ (p) $\frac{5a^2}{6x^3z^2} \div 2y$

2 Make x the subject of the following formulae.

(a) $\frac{1}{2}A = \pi x^2$ (b) $V = \frac{4}{3}\pi x^3$ (c) $\frac{1}{2}(u + v) = tx$ (d) $W = \frac{2}{3}\pi x^2h$

3 Write as single fractions.

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

(e) $2 - \frac{1}{x-1}$ (f) $\frac{2x}{x+1} - 3$ (g) $\frac{3}{4(2x-1)} - \frac{1}{4x^2-1}$

Further Maths Only

4* Write as single fractions.

(a) $\frac{x+1}{\sqrt{x}} + \sqrt{x}$ (b) $\frac{2x}{\sqrt{x+3}} + \sqrt{x+3}$ (c) $\frac{x}{\sqrt[3]{x-2}} + \sqrt[3]{(x-2)^2}$

Exercise 1.2

$$(1) (a) \frac{4}{7} \times 5 = \frac{20}{7} (= 2\frac{6}{7})$$

$$(b) \frac{5}{12} \times 3 = \frac{15}{12} = \frac{5}{4} (= 1\frac{1}{4})$$

$$(c) \frac{7}{9} \times 2 = \frac{14}{9} (= 1\frac{5}{9})$$

$$(d) \frac{4}{15} \times 3 = \frac{12}{15} = \frac{4}{5}$$

$$(e) \frac{8}{11} \div 4 = \frac{8}{11} \times \frac{1}{4} = \frac{8}{44} = \frac{2}{11}$$

$$(f) \frac{8}{11} \div 3 = \frac{8}{11} \times \frac{1}{3} = \frac{8}{33}$$

$$(g) \frac{6}{7} \div 3 = \frac{6}{7} \times \frac{1}{3} = \frac{6}{21} = \frac{2}{7}$$

$$(h) \frac{6}{7} \div 5 = \frac{6}{7} \times \frac{1}{5} = \frac{6}{35}$$

$$(i) \frac{3x}{y} \times x = \frac{3x^2}{y}$$

$$(j) \frac{3x}{y^2} \times y = \frac{3xy}{y^2} = \frac{3x}{y}$$

$$(k) \frac{5x^3}{4y} \div x = \frac{5x^3}{4y} \times \frac{1}{x} = \frac{5x^3}{4xy} = \frac{5x^2}{4y}$$

$$(l) \frac{5x^2}{6y} \div y = \frac{5x^2}{6y} \times \frac{1}{y} = \frac{5x^2}{6y^2}$$

$$(m) \frac{5x^3}{2y} \times 3x = \frac{15x^4}{2y}$$

$$(n) \frac{3y^4}{4x^2z} \times 2x = \frac{6xy^4}{4x^2z} = \frac{3y^4}{2xz}$$

$$(o) \frac{6xy^{23}}{5z} \div 2xy = \frac{6xy^{23}}{5z} \times \frac{1}{2xy} = \frac{6xy^{23}}{10xy^2z} = \frac{3xy^2}{5z}$$

$$(p) \frac{5a^2}{6x^3z^2} \div 2y = \frac{5a^2}{6x^3z^2} \times \frac{1}{2y} = \frac{5a^2}{12x^3yz^2}$$

$$(2) (a) \frac{1}{2}A = \pi x^2 \quad (\text{i.e. } \pi x^2 = \frac{A}{2})$$

$$(\div \pi) \quad x^2 = \frac{A}{2\pi}$$

$$(\text{square root}) \quad x = \pm \sqrt{\frac{A}{2\pi}}$$

although x is probably a distance if A is an area and so the positive root is needed

$$(b) \quad V = \frac{4}{3} \pi x^3$$

$$\left(\times \frac{3}{4} \right) \quad \frac{3V}{4} = \pi x^3$$

$$\left(\div \pi \right) \quad x^3 = \frac{3V}{4\pi}$$

} (can be done at the same time)

$$\left(\text{cube root} \right) \quad \underline{x = \sqrt[3]{\frac{3V}{4\pi}}}$$

$$(c) \quad \frac{1}{2}(u+v) = tx$$

$$\left(\text{e.g. } t_{sc} = \frac{u+v}{2} \right)$$

$$\left(\div t \right) \quad \underline{x = \frac{u+v}{2t}}$$

$$(d) \quad W = \frac{2}{3} \pi h x^2$$

$$\left(\times \frac{3}{2} \right) \quad \frac{3W}{2} = \pi h x^2$$

$$\left(\div \pi h \right) \quad x^2 = \frac{3W}{2\pi h}$$

} (can be done at the same time)

(square root)

$$\underline{x = \sqrt{\frac{3W}{2\pi h}}}$$

(x is probably a distance, so the positive square root is needed)

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

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

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

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

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

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

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

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

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

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

Page 5

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

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



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

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

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



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

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

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

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



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

↑
difference
of
two
squares

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

$$= \frac{6x+3-4}{4(2x-1)(2x+1)}$$

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

FURTHER MATHEMATICS ONLY

④ (a) $\frac{x+1}{\sqrt{x}} + \sqrt{x} = \frac{x+1 + (\sqrt{x})^2}{\sqrt{x}}$

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

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

(b) $\frac{2x}{\sqrt{x+3}} + \sqrt{x+3} = \frac{2x + (\sqrt{x+3})^2}{\sqrt{x+3}}$

$$= \frac{2x + x+3}{\sqrt{x+3}}$$

$$= \frac{3x+3}{\sqrt{x+3}} \left(= \frac{3(x+1)}{\sqrt{x+3}} \right)$$

$$\begin{aligned} (c) \quad \frac{x}{\sqrt[3]{x-2}} + \sqrt[3]{(x-2)^2} &= \frac{x}{\sqrt[3]{x-2}} + \left(\sqrt[3]{x-2}\right)^2 \\ &= \frac{x + \left(\sqrt[3]{x-2}\right)^3}{\sqrt[3]{x-2}} \\ &= \frac{x + x - 2}{\sqrt[3]{x-2}} \\ &= \frac{2x - 2}{\sqrt[3]{x-2}} \\ &= \left(\frac{2(x-1)}{\sqrt[3]{x-2}} \right) \end{aligned}$$