Exercise 1

1. Simplify these fractions:

(a) $\frac{6}{10}$ (b) $\frac{3}{9}$ (c) $\frac{21}{28}$ (d) $\frac{33}{44}$

(e) $\frac{100}{400}$ (f) $\frac{4a}{5a}$ (g) $\frac{2p}{3p}$ (h) $\frac{5v}{5w}$

(i) $\frac{rs}{rt}$ (j) $\frac{ab}{ac}$ (k) $\frac{a}{ad}$ (l) $\frac{m}{m^2}$

(m) $\frac{a^2}{4a}$ (n) $\frac{8z}{z^2}$ (o) $\frac{x^2}{x}$ (p) $\frac{d}{d^2}$

(q) $\frac{5x^2}{6x}$ (r) $\frac{3v}{6w}$ (s) $\frac{8xy}{4x}$ (t) $\frac{a^2}{3ab}$

(u) $\frac{2pq}{6p}$ (v) $\frac{5b}{5b^2}$ (w) $\frac{xyz}{xz}$ (x) $\frac{3ef}{7ef}$

(y) $\frac{5pq}{2pq^2}$ (z) $\frac{8x^2y}{4xy^2}$ (aa) $\frac{(x+1)^2}{(x+1)^3}$ (ab) $\frac{(x-5)^2}{(x-5)^5}$

2. Factorise either the numerator or the denominator, then simplify:

(a) $\frac{2x+8}{4}$ (b) $\frac{3x+6}{9}$ (c) $\frac{2x-8}{2}$ (d) $\frac{5x-10}{25}$

(e) $\frac{2}{2x+6}$ (f) $\frac{4}{4x-12}$ (g) $\frac{5}{5x+15}$ (h) $\frac{8}{4x-10}$

(i) $\frac{x^2-xy}{x}$ (j) $\frac{pq+p}{p}$ (k) $\frac{v^2+v}{v}$ (l) $\frac{a-a^2}{a}$

3. Factorise the numerator and/or the denominator, then simplify:

(a) $\frac{2a+6}{a+3}$ (b) $\frac{3c+9}{c+3}$ (c) $\frac{d-2}{3d-6}$ (d) $\frac{g^2+g}{g+1}$

(e) $\frac{2x+2y}{5x+5y}$ (f) $\frac{3p+3q}{7p+7q}$ (g) $\frac{4-4w}{1-w}$ (h) $\frac{x^2-xy}{8x-8y}$

(i) $\frac{x^2-1}{x-1}$ (j) $\frac{y^2-9}{y+3}$ (k) $\frac{a^2-25}{a-5}$ (l) $\frac{w+10}{w^2-100}$

(m) $\frac{x^2-1}{x^2+2x+1}$ (n) $\frac{3v^2-5v-2}{v^2-4}$ (o) $\frac{2y^2+y-1}{2y^2+5y-3}$ (p) $\frac{6x^2-13x+6}{3x^2+10x-8}$

Exercise 2

1. Simplify these fractions by multiplying:

(a) $\frac{1}{3} \times \frac{3}{5}$ (b) $\frac{2}{3} \times \frac{1}{6}$ (c) $\frac{5}{6} \times \frac{3}{5}$ (d) $\frac{3}{10} \times \frac{20}{3}$

(e) $\frac{1}{6} \times 12$ (f) $\frac{9}{11} \times \frac{33}{9}$ (g) $\frac{7}{10} \times \frac{5}{1}$ (h) $8 \times \frac{2}{3}$

(i) $\frac{a}{b} \times \frac{c}{d}$ (j) $\frac{x}{y} \times \frac{v}{w}$ (k) $\frac{m}{n} \times \frac{m}{n}$ (l) $\frac{a}{b} \times \frac{b}{a}$

(m) $\frac{x}{2} \times \frac{x}{5}$ (n) $x \times \frac{x}{7}$ (o) $\frac{a}{5} \times \frac{a}{5}$ (p) $\frac{n}{3} \times \frac{3}{n}$

(q) $\frac{a}{6} \times \frac{6}{d}$ (r) $x^2 \times \frac{1}{x}$ (s) $\frac{a^2}{c} \times \frac{c}{a}$ (t) $\frac{a^3}{9} \times \frac{9}{a}$

2. Change these divisions to multiplications and simplify:

(a) $\frac{3}{7} \div \frac{6}{7}$ (b) $\frac{2}{3} \div \frac{8}{3}$ (c) $\frac{3}{8} \div \frac{9}{4}$ (d) $\frac{9}{10} \div \frac{18}{5}$

(e) $\frac{x}{2} \div \frac{x}{3}$ (f) $\frac{a}{8} \div \frac{a}{2}$ (g) $\frac{d}{3} \div \frac{d}{6}$ (h) $\frac{m}{10} \div \frac{m}{50}$

(i) $\frac{a^2}{3} \div \frac{a}{3}$ (j) $\frac{b^2}{6} \div \frac{b}{2}$ (k) $\frac{r^4}{6} \div \frac{r^2}{2}$ (l) $\frac{a}{b} \div \frac{a}{b}$

(m) $\frac{a^2}{d} \div \frac{a}{d^2}$ (n) $\frac{1}{w^2} \div \frac{5}{w}$ (o) $\frac{1}{a^3} \div \frac{1}{a^2}$ (p) $\frac{x^2}{y} \div \frac{2x}{d}$

(q) $\frac{a^2}{b} \div \frac{a}{b}$ (r) $\frac{2a^2}{5d^2} \div \frac{a^2}{d^2}$

3. Do the following additions and subtractions:

(a) $\frac{1}{3} + \frac{1}{4}$ (b) $\frac{1}{4} + \frac{2}{3}$ (c) $\frac{3}{4} - \frac{1}{5}$ (d) $\frac{1}{5} + \frac{1}{3}$

(e) $\frac{1}{3} - \frac{1}{5}$ (f) $\frac{4}{7} - \frac{1}{2}$ (g) $\frac{1}{2} + \frac{1}{5}$ (h) $\frac{1}{2} - \frac{1}{5}$

(i) $\frac{5}{8} - \frac{1}{4}$ (j) $\frac{7}{10} + \frac{1}{5}$ (k) $\frac{x}{3} + \frac{a}{2}$ (l) $\frac{c}{5} + \frac{d}{2}$

(m) $\frac{e}{3} - \frac{h}{4}$ (n) $\frac{m}{4} - \frac{n}{8}$ (o) $\frac{2x}{3} + \frac{k}{2}$ (p) $\frac{u}{2} - \frac{2w}{5}$

(q) $\frac{4r}{5} + \frac{s}{2}$ (r) $\frac{a}{3} - \frac{2d}{5}$ (s) $\frac{2x}{3} + \frac{3y}{2}$ (t) $\frac{3x}{4} + \frac{2u}{5}$

4. By finding a common denominator with letters, work out these additions/subtractions:

(a) $\frac{2}{x} + \frac{3}{y}$ (b) $\frac{5}{a} - \frac{2}{b}$ (c) $\frac{4}{c} + \frac{1}{d}$ (d) $\frac{1}{p} - \frac{2}{q}$

(e) $\frac{2}{v} + \frac{2}{w}$ (f) $\frac{1}{g} - \frac{1}{h}$ (g) $\frac{7}{k} + \frac{1}{n}$ (h) $\frac{1}{x} - \frac{8}{y}$

5. Add or subtract these fractions:

(a) $\frac{x+1}{3} + \frac{x+1}{2}$ (b) $\frac{x+2}{4} + \frac{x-1}{5}$ (c) $\frac{x+3}{2} + \frac{x+1}{4}$ (d) $\frac{2x-3}{5} + \frac{x+1}{3}$

(e) $\frac{x+1}{2} - \frac{x+1}{3}$ (f) $\frac{x+2}{2} - \frac{x+1}{5}$ (g) $\frac{2x+1}{2} - \frac{x+1}{4}$ (h) $\frac{x+1}{2} - \frac{x-1}{5}$

Answers

Exercise 1

1. (a) $^3/_5$ (b) $^1/_3$ (c) $^3/_4$ (d) $^3/_4$ (e) $^1/_4$ (f) $^4/_5$ (g) $^2/_3$ (h) $^v/_w$
   (i) $^s/_t$ (j) $^b/_c$ (k) $^1/_d$ (l) $^1/_m$ (m) $^a/_4$ (n) $^8/_z$ (o) x (p) $^1/_d$
   (q) $^{5x}/_6$ (r) $^v/_{2w}$ (s) $2y$ (t) $^a/_{3b}$ (u) $^q/_3$ (v) $^1/_b$ (w) y (x) $^3/_7$
   (y) $^5/_{2q}$ (z) $^{2x}/_y$ (aa) $^1/_{(x+1)}$ (ab) $^1/_{(x-5)^3}$

2. (a) $\frac{x+4}{2}$ (b) $\frac{x+2}{3}$ (c) $x-4$ (d) $\frac{x-2}{5}$ (e) $\frac{1}{x+3}$
   (f) $\frac{1}{x-3}$ (g) $\frac{1}{x+3}$ (h) $\frac{4}{2x-5}$ (i) $x-y$ (j) $q+1$
   (k) $v+1$ (l) $1-a$

3. (a) 2 (b) 3 (c) $^1/_3$ (d) g (e) $^2/_5$
   (f) $^3/_7$ (g) 4 (h) $^x/_8$ (i) $x+1$ (j) $y-3$
   (k) $a+5$ (l) $^1/_{(w-10)}$ (m) $\frac{x-1}{x+1}$ (n) $\frac{3v+1}{v+2}$ (o) $\frac{y+1}{y+3}$
   (p) $\frac{2x-3}{x+4}$

Exercise 2

1. (a) $^1/_5$ (b) $^1/_9$ (c) $^1/_2$ (d) 2 (e) 2 (f) 3 (g) $^7/_2$ (h) $^{16}/_3$
   (i) $^{ac}/_{bd}$ (j) $^{xv}/_{yw}$ (k) $\frac{m^2}{n^2}$ (l) 1 (m) $\frac{x^2}{10}$ (n) $\frac{x^2}{7}$ (o) $\frac{a^2}{25}$ (p) 1
   (q) $^a/_d$ (r) x (s) a (t) a^2

2. (a) $^1/_2$ (b) $^1/_4$ (c) $^1/_6$ (d) $^1/_4$ (e) $^3/_2$ (f) $^1/_4$ (g) 2 (h) 5
   (i) a (j) $^b/_3$ (k) $^{r^2}/_3$ (l) 1 (m) ad (n) $^1/_{5w}$ (o) $^1/_a$ (p) $^{dx}/_{2y}$
   (q) a (r) $^2/_5$

3. (a) $^7/_{12}$ (b) $^{11}/_{12}$ (c) $^{11}/_{20}$ (d) $^8/_{15}$ (e) $^2/_{15}$
   (f) $^1/_{14}$ (g) $^7/_{10}$ (h) $^3/_{10}$ (i) $^3/_8$ (j) $^9/_{10}$
   (k) $\frac{2x+3a}{6}$ (l) $\frac{2c+5d}{10}$ (m) $\frac{4e-3h}{12}$ (n) $\frac{2m-\mathrm{n}}{8}$ (o) $\frac{4x+3k}{6}$
   (p) $\frac{5u-4w}{10}$ (q) $\frac{8r+5s}{10}$ (r) $\frac{5a-6d}{15}$ (s) $\frac{4x+9y}{6}$ (t) $\frac{15x+8u}{20}$

4. (a) $\frac{2y+3x}{xy}$ (b) $\frac{5b-2a}{ab}$ (c) $\frac{4d+c}{cd}$ (d) $\frac{q-2p}{pq}$ (e) $\frac{2w+2v}{vw}$

   (f) $\frac{h-g}{gh}$ (g) $\frac{7n+k}{kn}$ (h) $\frac{y-8x}{xy}$

5. (a) $\frac{5x+5}{6}$ (b) $\frac{9x+6}{20}$ (c) $\frac{3x+7}{4}$ (d) $\frac{11x-4}{15}$ (e) $\frac{x+1}{6}$
   (f) $\frac{3x+8}{10}$ (g) $\frac{3x+1}{4}$ (h) $\frac{3x+7}{10}$