Algebraic Fractions

Simplifying basic algebraic fractions

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

b) $\frac{8}{12} = \frac{2}{3}$

c) $\frac{30}{16} = \frac{15}{4}$

d) $\frac{54}{72} = \frac{6}{8} = \frac{3}{4}$

e) $\frac{10a}{5} = 2a$

f) $\frac{9b}{6} = \frac{3b}{2}$

g) $\frac{18}{12x} = \frac{3}{2x}$

h) $\frac{25}{15y} = \frac{5}{3y}$

i) $\frac{4c}{16c^4} = \frac{1}{4c}$

j) $\frac{32a}{8a^3} = \frac{4}{a^2}$

k) $\frac{13p^2}{52p^3} = \frac{4}{p}$

l) $\frac{36ab}{6bc} = \frac{6a}{c}$

m) $\frac{4a}{2a^2} = \frac{2}{a}$

n) $\frac{10x^2}{12xy} = \frac{5x}{6y}$

o) $\frac{3v^2t}{9vt^2} = \frac{v}{3t}$

p) $\frac{10ab^3}{2a^2b} = \frac{5b^2}{a}$

q) $\frac{30p^2q}{25pq^4} = \frac{6p}{5q}$

r) $\frac{81x^2y^2}{6y^2} = \frac{27x^2}{2}$

s) $\frac{42mn^2}{56mn} = \frac{6n}{8}$

t) $\frac{8def^2}{10e^2f} = \frac{4df}{5e}$

u) $\frac{3ab^2c}{4a^2c} = \frac{3b^2}{4a}$

v) $\frac{4k^2m}{28km^2} = \frac{k}{7m}$

w) $\frac{5efg^2}{10e^2fg^2} = \frac{1}{2eg}$

x) $\frac{21xy^2}{36x^3} = \frac{7y^2}{12x^2}$

Simplifying by factorising

a) $\frac{3a+6b}{6} = \frac{3(a+2b)}{6} = \frac{a+2b}{2}$

b) $\frac{4x+12y}{2} = \frac{4(x+3y)}{2} = 2(x+3y)$

c) $\frac{3a+a^2}{ab} = \frac{a(3+a)}{ab} = \frac{3+a}{b}$

d) $\frac{xy+y^2}{2y} = \frac{y(x+y)}{2y} = \frac{x+y}{2}$

e) $\frac{xy+x^2}{6x+xy} = \frac{x(y+x)}{x(6+y)} = \frac{y+x}{6+y}$

f) $\frac{3ab+6b^2}{9b^2} = \frac{3b(a+2b)}{9b^2} = \frac{a+2b}{3b}$

g) $\frac{25b^2+15b^3}{10b} = \frac{5b^2(5+3b)}{10b} = \frac{b(5+3b)}{2}$

h) $\frac{14p+10q}{25} = \frac{2(7p+5q)}{25} = \frac{7p+5q}{5}$

i) $\frac{3a}{2ab-ac} = \frac{3a}{a(2b-c)} = \frac{3}{2b-c}$

j) $\frac{6x}{9x+9y} = \frac{6x}{9(x+y)} = \frac{2x}{3(x+y)}$

k) $\frac{2st}{6rs-2st} = \frac{2st}{2s(3r-t)} = \frac{t}{3r-t}$

l) $\frac{5c}{10ac+15bc} = \frac{5c}{5c(2a+3b)} = \frac{1}{2a+3b}$

m) $\frac{14p+28p^2}{8+16p} = \frac{14p(1+2p)}{8(1+2p)} = \frac{14p}{8} = \frac{7e}{4}$

n) $\frac{8c+4d}{6ac+3ad} = \frac{4(2c+d)}{3a(2c+d)} = \frac{4}{3a}$

o) $\frac{8n^2-2n}{12n-3} = \frac{2n(4n-1)}{3(4n-1)} = \frac{2n}{3}$

p) $\frac{15x^2+6xy}{10x+4y} = \frac{3x(5x+2y)}{2(5x+2y)} = \frac{3x}{2}$

a) $\frac{b^2-4}{b+2} = \frac{(b-2)(b+2)}{b+2} = b-2$

b) $\frac{x^2-81}{x-9} = \frac{(x+9)(x-9)}{x-9} = x+9$

c) $\frac{a^2-25}{a+5} = \frac{(a+5)(a-5)}{a+5} = a-5$

d) $\frac{y^2-36}{y+6} = \frac{(y-6)(y+6)}{y+6} = y-6$

e) $\frac{c^2-49}{2c-14} = \frac{(c-7)(c+7)}{2(c-7)} = \frac{c+7}{2}$

f) $\frac{a^2-64}{2a+16} = \frac{(a-8)(a+8)}{2(a+8)} = \frac{a-8}{2}$

g) $\frac{p^2-1}{5p-5} = \frac{(p-1)(p+1)}{5(p-1)} = \frac{p+1}{5}$

h) $\frac{q^2-9}{3q+9} = \frac{(q-3)(q+3)}{3(q+3)} = \frac{q-3}{3}$

i) $\frac{a^2-b^2}{3a+3b} = \frac{(a-b)(a+b)}{3(a+b)} = \frac{a-b}{3}$

j) $\frac{x^2-y^2}{5x-5y} = \frac{(x-y)(x+y)}{5(x-y)} = \frac{x+y}{5}$

k) $\frac{2m^2-18}{2m+6} = \frac{2(m^2-9)}{2(m+3)} = \frac{2(m-3)(m+3)}{2(m+3)} = m-3$

l) $\frac{3d^2-48}{12d-48} = \frac{4(d^2-16)}{12(d-4)} = \frac{(d+4)(d-4)}{3(d-4)} = \frac{d+4}{3}$

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

n) $\frac{p-1}{p^2-2p+1} = \frac{p-1}{(p-1)(p-1)} = \frac{1}{p-1}$

o) $\frac{ax-5a}{x^2-25} = \frac{a(x-5)}{(x+5)(x-5)} = \frac{a}{x+5}$

p) $\frac{a^2-1}{a^2+2a+1} = \frac{(a+1)(a-1)}{(a+1)(a+1)} = \frac{a-1}{a+1}$

q) $\frac{b^2+6b-9}{b^2-9} = \frac{b^2+6b-9}{(b+3)(b-3)}$

r) $\frac{c^2+2c-15}{c^2-25} = \frac{(c+5)(c-3)}{(c+5)(c-5)} = \frac{c-3}{c-5}$

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

t) $\frac{y^2+6y+8}{y^2+y-12} = \frac{(y+4)(y+2)}{(y+4)(y-3)} = \frac{y+2}{y-3}$

u) $\frac{p^2-4p-5}{p^2+2p+1} = \frac{(p-5)(p+1)}{(p+1)(p+1)} = \frac{(p-5)}{p+1}$

v) $\frac{c^2-4c-32}{c^2+c-56} = \frac{(c-8)(c+4)}{(c+8)(c-7)}$

w) $\frac{2x^2+13x+6}{x^2+9x+18} = \frac{(2x+1)(x+6)}{(x+6)(x+3)} = \frac{2x+1}{x+3}$

x) $\frac{6a^2-13a-5}{3a^2-11a-4} = \frac{(3a+1)(2a-5)}{(3a+1)(a-4)} = \frac{2a-5}{a-4}$

y) $\frac{10b^2-33b-7}{10b^2-37b+7} = \frac{(5b+1)(2b-7)}{(5b-1)(2b-7)} = \frac{5b+1}{5b-1}$

Adding and Subtracting.

a) $\frac{a}{5} + \frac{a}{5} = \frac{2a}{5}$

b) $\frac{2b}{5} + \frac{b}{10} = \frac{4b}{10} + \frac{b}{10} = \frac{5b}{10} = \frac{b}{2}$

c) $\frac{3x}{4} + \frac{x}{8} = \frac{6x}{8} + \frac{x}{8} = \frac{7x}{8}$

d) $\frac{p}{6} + \frac{2p}{3} = \frac{p}{6} + \frac{4p}{6} = \frac{5p}{6}$

e) $\frac{y}{9} + \frac{2y}{3} = \frac{y}{9} + \frac{6y}{9} = \frac{7y}{9}$

f) $\frac{3}{m} + \frac{2}{m} = \frac{5}{m}$

g) $\frac{5}{x} + \frac{1}{x} = \frac{6}{x}$

h) $\frac{2}{a} + \frac{5}{2a} = \frac{4}{2a} + \frac{5}{2a} = \frac{9}{2a}$

i) $\frac{4}{3y} + \frac{3}{y} = \frac{4}{3y} + \frac{9}{3y} = \frac{13}{3y}$

j) $\frac{8}{p} + \frac{3}{5p} = \frac{40}{5p} + \frac{3}{5p} = \frac{43}{5p}$

k) $\frac{3}{a} + \frac{2}{b} = \frac{3b}{ab} + \frac{2a}{ab} = \frac{3b+2a}{ab}$

l) $\frac{5}{x} + \frac{3}{y} = \frac{5y+3x}{xy}$

a) $\frac{3a}{5} - \frac{a}{5} = \frac{2a}{5}$

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

c) $\frac{3x}{4} - \frac{x}{8} = \frac{6x}{8} - \frac{x}{8} = \frac{5x}{8}$

d) $\frac{5p}{6} - \frac{2p}{3} = \frac{5p}{6} - \frac{4p}{6} = \frac{p}{6}$

e) $\frac{8y}{9} - \frac{2y}{3} = \frac{8y}{9} - \frac{6y}{9} = \frac{2y}{9}$

f) $\frac{5}{m} - \frac{2}{m} = \frac{3}{m}$

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

h) $\frac{5}{a} - \frac{1}{2a} = \frac{10}{2a} - \frac{1}{2a} = \frac{9}{2a}$

i) $\frac{8}{3y} - \frac{2}{y} = \frac{8}{3y} - \frac{6}{3y} = \frac{2}{3y}$

j) $\frac{8}{p} - \frac{3}{5p} = \frac{40}{5p} - \frac{3}{5p} = \frac{37}{5p}$

k) $\frac{3}{a} - \frac{2}{b} = \frac{3b}{ab} - \frac{2a}{ab} = \frac{3b-2a}{ab}$

l) $\frac{5}{x} - \frac{3}{y} = \frac{5y-3x}{xy}$

a) $\frac{x+2}{3} + \frac{x+3}{6} = \frac{2x+4}{6} + \frac{x+3}{6} = \frac{3x+7}{6}$

b) $\frac{a+6}{4} + \frac{a-2}{3} = \frac{3a+18}{12} + \frac{4a-8}{12} = \frac{7a+10}{12}$

c) $\frac{d-3}{2} - \frac{d+2}{6} = \frac{3d-9}{6} - \frac{d+2}{6} = \frac{2d-11}{6}$

d) $\frac{2a-1}{4} - \frac{a+2}{5} = \frac{10a-5}{20} - \frac{4a+8}{20} = \frac{6a-13}{20}$

e) $\frac{a+3b}{2} + \frac{a-2b}{4} = \frac{2a+6b}{4} + \frac{a-2b}{4} = \frac{3a+4b}{4}$

f) $\frac{2u+v}{3} - \frac{u-v}{4} = \frac{8u+4v}{12} - \frac{3u-3v}{12} = \frac{5u+7v}{12}$

g) $\frac{2}{x+3} + \frac{3}{x+2} = \frac{2(x+2)+3(x+3)}{(x+3)(x+2)} = \frac{2x+4+3x+9}{(x+3)(x+2)} = \frac{5x+13}{(x+3)(x+2)}$

h) $\frac{4}{x+5} + \frac{5}{x+1} = \frac{4(x+1)+5(x+5)}{(x+5)(x+1)} = \frac{4x+4+5x+25}{(x+5)(x+1)} = \frac{9x+29}{(x+5)(x+1)}$

i) $\frac{7}{x-3} + \frac{4}{x+2} = \frac{7(x+2)+4(x-3)}{(x+2)(x-3)} = \frac{7x+14+4x-12}{(x+2)(x-3)} = \frac{11x+2}{(x+2)(x-3)}$

j) $\frac{2}{x+4} - \frac{3}{x-3} = \frac{2(x-3)-3(x+4)}{(x+4)(x-3)} = \frac{2x-6-3x-12}{(x+4)(x-3)} = \frac{-x-18}{(x+4)(x-3)}$

k) $\frac{1}{x-3} - \frac{5}{x-2} = \frac{(x-2)-5(x-3)}{(x-3)(x-2)} = \frac{x-2-5x+15}{(x-3)(x-2)} = \frac{-4x+13}{(x-3)(x-2)}$

l) $\frac{2}{x-5} - \frac{3}{x-4} = \frac{2(x-4)-3(x-5)}{(x-5)(x-4)} = \frac{2x-8-3x+15}{(x-5)(x-4)} = \frac{-x+7}{(x-5)(x-4)}$

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

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

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

Multiplying and Dividing.

a) $\frac{x}{3} \times \frac{x}{6} = \frac{x^2}{18}$ b) $\frac{y}{2} \times \frac{y}{4} = \frac{y^2}{8}$ c) $\frac{a}{2} \times \frac{b}{7} = \frac{ab}{14}$

d) $\frac{p}{3} \times \frac{q}{8} = \frac{pq}{24}$ e) $\frac{c^2}{5} \times \frac{c}{6} = \frac{c^3}{30}$ f) $\frac{6}{a} \times \frac{2}{a} = \frac{12}{a^2}$

g) $\frac{3}{x} \times \frac{10}{y} = \frac{30}{xy}$ h) $\frac{3}{p} \times \frac{4}{p} = \frac{12}{p^2}$ i) $\frac{2}{3m} \times \frac{4}{5m} = \frac{8}{15m^2}$

j) $\frac{1}{b} \times \frac{11}{3c} = \frac{11}{3bc}$ k) $\frac{5m}{6} \times \frac{3}{2m} = \frac{15m}{12m} = \frac{5}{4}$

l) $\frac{5}{7x} \times \frac{4x}{3} = \frac{20x}{21x} = \frac{20}{21}$ m) $\frac{2y}{9} \times \frac{12}{5y^2} = \frac{24y}{45y^2} = \frac{8}{15y}$

n) $\frac{2}{3a} \times \frac{3}{7a^2} = \frac{6}{21a^3} = \frac{2}{7a^3}$ o) $\frac{5}{3p} \times \frac{2}{p^3} = \frac{10}{3p^4}$

p) $\frac{3t^2}{5s} \times \frac{2s^2}{6t^3} = \frac{6t^2s^2}{30st^3} = \frac{s}{5t}$ q) $\frac{5pq}{2} \times \frac{3}{4pq^2} = \frac{15pq}{8pq^2} = \frac{15}{8q}$

r) $\frac{7ab^2}{6c} \times \frac{2c^3}{3a^2} = \frac{14ab^2c^3}{18a^2c} = \frac{7b^2c^2}{9a}$ s) $\frac{4}{5mn} \times \frac{2m^4}{n^2} = \frac{8m^4}{5mn^3} = \frac{8m^3}{5n^3}$

t) $\frac{4yz}{9x} \times \frac{3xz}{2y^3} = \frac{12xyz^2}{18xy^3} = \frac{2z^2}{3y^2}$ u) $\frac{5ab^3}{3c} \times \frac{3a}{2bc^2} = \frac{15a^2b^3}{6bc^3} = \frac{5a^2b^2}{3c^3}$

v) $\frac{2cd}{7a} \times \frac{3a^2}{4cd^2} = \frac{6a^2cd}{28acd^2} = \frac{3a}{14d}$ w) $\frac{10xy^2}{3} \times \frac{12xy}{5y^2} = \frac{120x^2y^3}{15y^2} = 8x^2y$

x) $\frac{3}{8s^3} \times \frac{4st}{t^3} = \frac{12st}{8s^3t^3} = \frac{3}{2s^2t^2}$ y) $\frac{4pq^2}{3a} \times \frac{6a^2}{5p^3} = \frac{24pq^2a^2}{15ap^3} = \frac{8q^2a}{5p^2}$

a) $\frac{a}{4} \div \frac{a}{2} = \frac{a}{4} \times \frac{2}{a} = \frac{2a}{4a} = \frac{1}{2}$

b) $\frac{x}{2} \div \frac{y}{2} = \frac{x}{2} \times \frac{2}{y} = \frac{2x}{2y} = \frac{x}{y}$

c) $\frac{ab}{5} \div \frac{a}{2} = \frac{ab}{5} \times \frac{2}{a} = \frac{2ab}{5a} = \frac{2b}{5}$

d) $\frac{p^2}{10} \div \frac{p}{5} = \frac{p^2}{10} \times \frac{5}{p} = \frac{5p^2}{10p} = \frac{p}{2}$

e) $\frac{2c}{3} \div \frac{c^2}{6} = \frac{2c}{3} \times \frac{6}{c^2} = \frac{12c}{3c^2} = \frac{4}{c}$

f) $\frac{3}{t} \div \frac{6}{t} = \frac{3}{t} \times \frac{t}{6} = \frac{3t}{6t} = \frac{1}{2}$

g) $\frac{2}{k} \div \frac{4}{m} = \frac{2}{k} \times \frac{m}{4} = \frac{2m}{4k} = \frac{m}{2k}$

h) $\frac{3}{y} \div \frac{9}{y^2} = \frac{3}{y} \times \frac{y^2}{9} = \frac{3y^2}{9y} = \frac{y}{3}$

i) $\frac{4}{bc} \div \frac{2}{c} = \frac{4}{bc} \times \frac{c}{2} = \frac{4c}{2bc} = \frac{2}{b}$

j) $\frac{3}{2x} \div \frac{12}{x^2} = \frac{3}{2x} \times \frac{x^2}{12} = \frac{3x^2}{24x} = \frac{x}{8}$

k) $\frac{24xy}{35z} \div \frac{20xy}{21z} = \frac{24xy}{35z} \times \frac{21z}{20xy} = \frac{12xy}{5z} \times \frac{3z}{10xy} = \frac{36xyz}{50xyz} = \frac{18}{25}$

l) $\frac{6q^2}{25p} \div \frac{9q}{20p^2} = \frac{6q^2}{25p} \times \frac{20p^2}{9q} = \frac{120p^2q^2}{225pq} = \frac{24pq}{45} = \frac{8pq}{15}$

m) $\frac{8ab}{21c} \div \frac{9b}{14ac} = \frac{8ab}{21c} \times \frac{14ac}{9b} = \frac{8ab}{3c} \times \frac{2ac}{9b} = \frac{16a^2bc}{27bc} = \frac{16a^2}{27}$

n) $\frac{10m}{21n^2} \div \frac{8mn}{9} = \frac{10m}{21n^2} \times \frac{9}{8mn} = \frac{5m}{7n^3} \times \frac{3}{4mn} = \frac{15m}{28mn^4} = \frac{15}{28n^4}$

o) $\frac{20ax}{33y} \div \frac{15x}{44ay^2} = \frac{20ax}{33y} \times \frac{44ay^2}{15x} = \frac{4ax}{3y} \times \frac{4ay^2}{3x} = \frac{16a^2yx}{9xy} = \frac{16a^2}{9}$