# Simplifying Algebraic Fractions

**Algebraic fraction**: is a fraction which contains one or more polynomials.

e.g.s of algebraic fractions:

$$\frac{4x}{8x^2} \; ; \; \frac{42ab^2c^3}{3a^2b} \; ; \; \frac{2m+8}{m^2+6m+8}$$

## 2 steps to simplify an algebraic fraction:

1. Factor the top (numerator) and the bottom (denominator) separately.
2. Cancel "like" terms on the top & bottom.

Simplify the following algebraic fractions:

① $\frac{4x}{8x^2} = \frac{4 \div 4}{8 \div 4 x} = \boxed{\frac{1}{2x}}$

* Won't be factoring monomials, just cancel like terms to simplify.

② $\frac{42ab^2c^3}{3a^2b} = \boxed{\frac{14bc^3}{a}}$

③ $\frac{2m+8}{m^2+6m+8} = \frac{2(m+4)}{(m+2)(m+4)}$

$= \frac{2}{(m+2)}$

④ $\frac{p^2-4}{2p^2+7p+6} = \frac{(p-2)(p+2)}{(p+2)(2p+3)}$

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

prod = 12
sum = 7
3, 4

$(2p^2+3p)+(4p+6)$

$p(2p+3)+2(2p+3)$

$(p+2)(2p+3)$

(5) $\dfrac{2x-14}{3x-21+bx-7b}$

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

$= \boxed{\dfrac{2}{3+b}}$

$(3x-21)+(bx-7b)$

$3(x-7)+b(x-7)$

$(3+b)(x-7)$

(6) $\dfrac{① \; m^2 - m^2 n^2}{② \; m^3 - m^3 n^2} = \dfrac{m^2(1-n)(1+n)}{m^3(1-n)(1+n)}$

$= \dfrac{m^2 \cdot 1}{m^3} = \dfrac{1}{m}$

① $m^2 - m^2 n^2$

↙ Diff Squares 1st ↘

$(m - mn)(m + mn)$

$m(1-n)\,m(1+n)$ Remove c.f. 2nd.

$m^2(1-n)(1+n)$

① $m^2 - m^2 n^2$ Remove c.f. 1st

$m^2(1 - n^2)$

↙ ↘ Diff of squares 2nd

$m^2(1-n)(1+n)$

② $m^3 - m^3 n^2$

$m^3(1 - n^2)$

↙ ↘

$m^3(1-n)(1+n)$

(7) $\frac{6g}{2g} = 3$

(8) $\frac{15^{\div 3} s^2 t u^5}{27^{\div 3} s t u^2} = \frac{5 s u^3}{9}$

(9) $\frac{a^2 - a^2 b}{c^3 - c^3 b} = \frac{a^2(1-b)}{c^3(1-b)} = \frac{a^2}{c^3}$

(10) $\frac{2x+6}{x^2+5x+6} = \frac{2(x+3)}{(x+2)(x+3)} = \boxed{\frac{2}{x+2}}$

(11) $\frac{v^2 - v - 12}{v-4} = \frac{(v-4)(v+3)}{(v-4)} = \boxed{v+3}$

(12) $\frac{6m-12}{8m-16} = \frac{6^{\div 2}(m-2)}{8^{\div 2}(m-2)} = \boxed{\frac{3}{4}}$

(13) $$\frac{ab+bc+a^2+ac}{b^2-a^2} = \frac{(b+a)(a+c)}{(b-a)(b+a)} = \frac{a+c}{b-a}$$

$(ab+bc)+(a^2+ac)$

$b(a+c)+a(a+c)$

$(b+a)(a+c)$

(14) $$\frac{r^2-2r-15}{4r^2+13r+3} = \frac{(r-5)(r+3)}{(r+3)(4r+1)} = \frac{r-5}{4r+1}$$

prod = 12

sum = 13 $\quad 1, 12$

$(4r^2+1r)+(12r+3)$

$r(4r+1)+3(4r+1)$

$(r+3)(4r+1)$

(15) $\dfrac{mn-no}{-n}$

$= \dfrac{n(m-o)}{-1n}$ $= -(m-o)$

$= -m+o$

$= \dfrac{-n(-m+o)}{-n}$ $= o-m$

(16) $\dfrac{4x+4y}{(x+y)^2} = \dfrac{4(x+y)}{(x+y)(x+y)} = \boxed{\dfrac{4}{x+y}}$

(17) $\dfrac{a^2+b^2}{b^2}$ Can't be factored or simplified

(18) $\dfrac{a^2b^2}{b^2} = a^2$

(19) $\dfrac{2+x}{6+x}$ Can't do anything!

(20) $\dfrac{(a+b)(b-2)}{(b+a)} = b-2$

(21) $\dfrac{(-a-b)(b-2)}{a+b}$

$= \dfrac{-1(a+b)(b-2)}{(a+b)}$

$= -1(b-2)$

OR $-(b-2)$

OR $-b+2$

OR $2-b$

(22) $\dfrac{y^2-1}{y-y^2}$

$= \dfrac{-1(-y+1)(y+1)}{y(1-y)}$

$= \dfrac{-1(y+1)}{y}$

OR $\dfrac{y+1}{-y}$