# ADDING AND SUBTRACTING ALGEBRAIC FRACTIONS

Simplify:

1 $\frac{x}{5}-\frac{x}{6}$ 2 $\frac{3x}{8}+\frac{x}{2}$ 3 $\frac{a}{3}+\frac{4a}{5}-\frac{a}{6}$ 4 $\frac{y}{2}+\frac{2y}{3}-\frac{y}{4}$

① $\frac{x}{5}-\frac{x}{6}=\frac{6x}{30}-\frac{5x}{30}=\frac{6x-5x}{30}=\frac{x}{30}$

② $\frac{3x}{8}+\frac{x}{2}=\frac{3x}{8}+\frac{4x}{8}=\frac{7x}{8}$

③ $\frac{a}{3}+\frac{4a}{5}-\frac{a}{6}=\frac{10a}{30}+\frac{24a}{30}-\frac{5a}{30}=\frac{29a}{30}$

④ $\frac{y}{2}+\frac{2y}{3}-\frac{y}{4}=\frac{6y+8y-3y}{12}=\frac{11y}{12}$

9 $\frac{x}{2}+\frac{y}{4}-\frac{x+y}{3}$ 10 $\frac{a-2b}{6}-\frac{2a+b}{9}$ 11 $\frac{3(a+b)}{4}-\frac{a-b}{6}$ 12 $\frac{1}{x}-\frac{2}{3x}$

⑨ $\frac{x}{2}+\frac{y}{4}-\frac{x+y}{3}=\frac{6x+3y-4(x+y)}{12}=\frac{2x-y}{12}$

⑩ $\frac{a-2b}{6}-\frac{2a+b}{9}=\frac{9(a-2b)-6(2a+b)}{54}=\frac{-3a-24b}{54}=\frac{-a-8b}{18}$

⑪ $\frac{3(a+b)}{4}-\frac{(a-b)}{6}=\frac{18(a+b)-4(a-b)}{24}=\frac{14a+22b}{24}=\frac{7a+11b}{12}$

⑫ $\frac{1}{x}-\frac{2}{3x}=\frac{3-2}{3x}=\frac{1}{3x}$

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13 $\frac{3}{a}+\frac{1}{a^2}$ 14 $\frac{1}{ab}-\frac{2}{b}$ 15 $\frac{m}{n}-\frac{n}{m}$ 16 $\frac{4}{xy}+\frac{3}{yz}$

(13) $\frac{3}{a}+\frac{1}{a^2}=\frac{3a+1}{a^2}$

(14) $\frac{1}{ab}-\frac{2}{b}=\frac{1-2a}{ab}$

(15) $\frac{m}{n}-\frac{n}{m}=\frac{m^2-n^2}{mn}=\frac{(m-n)(m+n)}{mn}$

(16) $\frac{4}{xy}+\frac{3}{yz}=\frac{4z+3x}{xyz}$

17 $\frac{5}{a^2b}-\frac{2}{ab^2}$ 18 $\frac{a+1}{6a}+\frac{a-4}{2a}$ 19 $\frac{1}{x+1}+\frac{2}{3}$ 20 $\frac{1}{x}+\frac{2}{x}-\frac{1}{x^2}$

(17) $\frac{5}{a^2b}-\frac{2}{ab^2}=\frac{5b-2a}{a^2b^2}$

(18) $\frac{a+1}{6a}+\frac{a-4}{2a}=\frac{a+1+3(a-4)}{6a}=\frac{4a-11}{6a}$

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

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

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For questions **22** to **29**, write the lowest common multiple (LCM).

**22** $(x-3)$ and $(x+3)$ **23** $x$ and $(x-2)$ **24** $(2x-4)$ and $(3x-6)$

(22) LCM $= (x-3)(x+3) = x^2-9$

(23) LCM $= x(x-2) = x^2-2x$

(24) LCM $= 6(x-2)$ $\quad = 2(x-2) \quad = 3(x-2)$

Express each of the following as a single fraction.

**31** $\frac{1}{a-b}+\frac{1}{a+b}$ **32** $\frac{3}{x-y}-\frac{2}{x+y}$ **33** $\frac{x}{x-y}+\frac{y}{x-y}$

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

(32) $\frac{3}{x-y}-\frac{2}{x+y} = \frac{3x+3y-2(x-y)}{x^2-y^2} = \frac{x+5y}{x^2-y^2}$

(33) $\frac{x}{x-y}+\frac{y}{x-y} = \frac{x+y}{x-y}$

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**49** $\frac{1}{a+3}+\frac{a+4}{a^2+5a+6}$ **50** $\frac{3}{x^2-4}-\frac{2}{x^2-3x+2}$ **51** $\frac{x+1}{x-1}-\frac{x-1}{x+1}$

(49) $\frac{1}{a+3}+\frac{a+4}{a^2+5a+6}=\frac{1}{a+3}+\frac{a+4}{(a+3)(a+2)}=\frac{a+2+a+4}{(a+3)(a+2)}$

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

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

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

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

**52** $\frac{5}{x-2}+\frac{3}{x^2-4}$ **53** $\frac{3x}{x^2-16}-\frac{2}{x+4}$ **54** $\frac{5}{3x}-\frac{2}{x^2-5x}$

(52) $\frac{5}{x-2}+\frac{3}{x^2-4}=\frac{5}{x-2}+\frac{3}{(x-2)(x+2)}=\frac{5(x+2)+3}{x^2-4}=\frac{5x+13}{x^2-4}$

(53) $\frac{3x}{x^2-16}-\frac{2}{x+4}=\frac{3x}{(x-4)(x+4)}-\frac{2}{x+4}=\frac{3x-2(x-4)}{(x+4)(x-4)}$

$=\frac{x+8}{(x-4)(x+4)}$

(54) $\frac{5}{3x}-\frac{2}{x^2-5x}=\frac{5}{3x}-\frac{2}{x(x-5)}=\frac{5(x-5)-2\times3}{3x(x-5)}$

$=\frac{5x-31}{3x(x-5)}$