

Multiplying algebraic fractions

Starter

1. **(Review of last lesson)** Simplify: (a) $\frac{x^2 + 4x}{x^2 + 7x + 12}$ (b) $\frac{2t^2 - t - 45}{4t^2 - 81}$.

Working: (a) $x^2 + 4x = x(x + 4)$
 $x^2 + 7x + 12 = x^2 + 4x - 3x + 12 = x(x + 4) + 3(x + 4) = (x + 4)(x + 3)$

$$\frac{x^2 + 4x}{x^2 + 7x + 12} = \frac{x(x + 4)}{(x + 4)(x + 3)} = \frac{x}{x + 3}$$

(b) $2t^2 - t - 45 = 2t^2 - 10t + 9t - 45 = 2t(t - 5) + 9(t - 5) = (t - 5)(2t + 9)$
 $4t^2 - 81 = (2t)^2 - 9^2 = (2t - 9)(2t + 9)$

$$\frac{2t^2 - t - 45}{4t^2 - 81} = \frac{(t - 5)(2t + 9)}{(2t - 9)(2t + 9)} = \frac{t - 5}{2t - 9}$$

2. Find the value of $\frac{2}{3} \times \frac{9}{14}$.

Working: $\frac{2}{3} \times \frac{9}{14} = \frac{3}{7}$

E.g. 1 Simplify: (a) $\frac{2a}{4b^2} \times \frac{5b}{a^3}$ (b) $\frac{x}{y} \times \frac{2}{x^2}$ (c) $\frac{64xy^2}{9y} \times \frac{3x^3}{16x^2y}$

Working: (a) $\frac{2a}{4b^2} \times \frac{5b}{a^3} = \frac{10a^{1-3}b^{1-2}}{4} = \frac{5a^{-2}b^{-1}}{2} = \frac{5}{2a^2b}$

(b) $\frac{x}{y} \times \frac{2}{x^2} = \frac{2x^{1-2}}{y} = \frac{2x^{-1}}{y} = \frac{2}{xy}$

(c) $\frac{64xy^2}{9y} \times \frac{3x^3}{16x^2y} = \frac{4x^4y^2}{3x^2y^2}$ *simplify numbers and powers*
 $= \frac{4x^{4-2}y^{2-2}}{3}$
 $= \frac{4x^2}{3}$

E.g. 2 Simplify:

(a) $\frac{x^2 - 16}{x^2 + 5x + 6} \times \frac{x + 3}{x + 4}$

(b) $\frac{x + 4}{2x + 6} \times \frac{x^2 + 4x + 3}{x^2 + 6x + 8}$

(c) $\frac{x^2 + 2x}{x^2 + 6x - 7} \times \frac{x^2 + 10x + 21}{x^2 - x - 6}$

Working: (a) $x^2 - 16 = (x - 4)(x + 4)$ *difference of 2 squares*

$$x^2 + 5x + 6 = x^2 + 3x + 2x + 6 = x(x + 3) + 2(x + 3) = (x + 3)(x + 2)$$

$$\frac{x^2 - 16}{x^2 + 5x + 6} \times \frac{x + 3}{x + 4} = \frac{(x - 4)(x + 4)}{(x + 3)(x + 2)} \times \frac{x + 3}{x + 4} = \frac{x - 4}{x + 2}$$

(b) $2x + 6 = 2(x + 3)$

$$x^2 + 4x + 3 = x^2 + 3x + x + 3 = x(x + 3) + 1(x + 3) = (x + 3)(x + 1)$$

$$x^2 + 6x + 8 = x^2 + 4x + 2x + 8 = x(x + 4) + 2(x + 4) = (x + 4)(x + 2)$$

$$\begin{aligned} \frac{x + 4}{2x + 6} \times \frac{x^2 + 4x + 3}{x^2 + 6x + 8} &= \frac{x + 4}{2x + 6} \times \frac{(x + 3)(x + 1)}{(x + 4)(x + 2)} \\ &= \frac{x + 1}{2(x + 2)} \end{aligned}$$

(c) $x^2 + 2x = x(x + 2)$

$$x^2 + 6x - 7 = x^2 + 7x - x - 7 = x(x + 7) - 1(x + 7) = (x + 7)(x - 1)$$

$$x^2 + 10x + 21 = x^2 + 7x + 3x + 21 = x(x + 7) + 3(x + 7) = (x + 7)(x + 3)$$

$$x^2 - x - 6 = x^2 - 3x + 2x - 6 = x(x - 3) + 2(x - 3) = (x - 3)(x + 2)$$

$$\begin{aligned} \frac{x^2 + 2x}{x^2 + 6x - 7} \times \frac{x^2 + 10x + 21}{x^2 - x - 6} &= \frac{x(x + 2)}{(x + 7)(x - 1)} \times \frac{(x + 7)(x + 3)}{(x - 3)(x + 2)} \\ &= \frac{x(x + 3)}{(x - 1)(x - 3)} \end{aligned}$$

Video: [Multiplying algebraic fractions](#)

[Solutions to Starter and E.g.s](#)

Exercise

9-1 class textbook:	p519 E16.5 Qu 1-6, 13, 15abdfik
A*-G class textbook:	p477 E16.2 Qu 1-6, 13, 15abdfik
9-1 homework book:	p175 E16.5 Qu 1-4, 8-11, 15
A*-G homework book:	p477 E16.2 Qu 1-4, 8-11, 15

Homework book answers (only available during a lockdown)