
MULTIPLYING AND DIVIDING FRACTIONS

EXAMPLE 1: $\frac{a^4k^5}{u^2b^2} \cdot \frac{a^3k^4}{u^2b}$

= $\frac{a^4k^5a^3k^4}{u^2b^2u^2b}$ (multiply tops and multiply bottoms)

= $\frac{a^4a^3k^5k^4}{u^2u^2b^2b}$ (rearrange the factors, top and bottom)

= $\boxed{\frac{a^7k^9}{u^4b^3}}$ (simplify by adding exponents)

EXAMPLE 2: $\frac{k^4u^6}{ws^2} \cdot \frac{ws^4}{k^6u}$

= $\frac{k^4u^6ws^4}{ws^2k^6u}$ (multiply tops and multiply bottoms)

= $\boxed{\frac{s^2u^5}{k^2}}$ (reduce the fraction)

EXAMPLE 3: **Multiply:** $\frac{x^2 - 9}{x^2 - 6x + 9} \cdot \frac{x + 2}{x^2 + 5x + 6}$

Solution:

$$\begin{aligned} & \frac{x^2 - 9}{x^2 - 6x + 9} \cdot \frac{x + 2}{x^2 + 5x + 6} && \text{(the given problem)} \\ = & \frac{(x + 3)(x - 3)}{(x - 3)(x - 3)} \cdot \frac{x + 2}{(x + 2)(x + 3)} && \text{(factor everything)} \\ = & \frac{\cancel{(x + 3)}(x - 3)}{(x - 3)\cancel{(x - 3)}} \cdot \frac{\cancel{x + 2}}{(x + 2)\cancel{(x + 3)}} && \text{(cancel)} \\ = & \boxed{\frac{1}{x - 3}} && \text{(} x - 3 \text{ is on the bottom)} \end{aligned}$$

EXAMPLE 4: **Divide:** $\frac{x + 10}{x^2 + 6x - 7} \div \frac{x - 12}{x^2 - 13x + 12}$

Solution:

$$\begin{aligned} & \frac{x + 10}{x^2 + 6x - 7} \div \frac{x - 12}{x^2 - 13x + 12} && \text{(the given problem)} \\ = & \frac{x + 10}{x^2 + 6x - 7} \times \frac{x^2 - 13x + 12}{x - 12} && \text{(invert and multiply)} \\ = & \frac{x + 10}{(x + 7)(x - 1)} \times \frac{(x - 1)(x - 12)}{x - 12} && \text{(factor everything)} \\ = & \frac{x + 10}{(x + 7)\cancel{(x - 1)}} \times \frac{\cancel{(x - 1)}\cancel{(x - 12)}}{\cancel{x - 12}} && \text{(cancel)} \\ = & \boxed{\frac{x + 10}{x + 7}} \end{aligned}$$

Homework

1. Multiply or divide:

$$\begin{array}{lll} \text{a. } \frac{x^2k}{t^4u^4} \div \frac{t^4u^5}{x^4k^3} & \text{b. } \frac{r^6a^6}{v^5u} \div \frac{r^4a^4}{vu^6} & \text{c. } \frac{w^2r^5}{k^6x} \div \frac{kx^6}{w^2r^5} \\ \text{d. } \frac{r^5z^5}{b^2n^4} \cdot \frac{b^6n}{r^6z^4} & \text{e. } \frac{u^4w}{v^3m^2} \div \frac{uw^6}{v^6m} & \text{f. } \frac{ku^2}{v^6w^3} \cdot \frac{v^6w^5}{k^4u^3} \end{array}$$

2. Multiply or divide:

$$\begin{array}{ll} \text{a. } \frac{c-2}{c^2} \cdot \frac{c^2+4c}{c+4} & \text{b. } \frac{m}{m^2-2m-35} \cdot \frac{m^2-m-42}{m+6} \\ \text{c. } \frac{c-2}{c^2} \div \frac{c-3}{c^2-4c} & \text{d. } \frac{v}{v^2+4v-21} \div \frac{v+10}{v^2-2v-63} \\ \text{e. } \frac{q+6}{q^2+6q} \div \frac{q}{q^2+6q} & \text{f. } \frac{v-1}{v^2-v-6} \cdot \frac{v^2-2v-3}{v+1} \end{array}$$

3. Multiply or divide:

$$\begin{array}{l} \text{a. } \frac{m-6}{m^2-21m+108} \div \frac{m+5}{m^2-4m-45} \\ \text{b. } \frac{c+7}{c^2-18c+80} \cdot \frac{c^2-6c-40}{c+4} \\ \text{c. } \frac{z-1}{z^2-15z+44} \cdot \frac{z^2+2z-24}{z+6} \\ \text{d. } \frac{z+4}{z^2+8z+7} \div \frac{z-4}{z^2-3z-4} \end{array}$$

$$\text{e. } \frac{m+8}{m^2+22m+120} \div \frac{m+3}{m^2+18m+80}$$

$$\text{f. } \frac{u-8}{u^2-6u-7} \div \frac{u-10}{u^2-9u-10}$$

Solutions

$$1. \text{ a. } \frac{x^6 k^4}{t^8 u^9}$$

$$\text{b. } \frac{r^2 a^2 u^5}{v^4}$$

$$\text{c. } \frac{w^4 r^{10}}{k^7 x^7}$$

$$\text{d. } \frac{z b^4}{r n^3}$$

$$\text{e. } \frac{u^3 v^3}{w^5 m}$$

$$\text{f. } \frac{w^2}{k^3 u}$$

$$2. \text{ a. } \frac{c-2}{c}$$

$$\text{b. } \frac{m}{m+5}$$

$$\text{c. } \frac{c^2-6c+8}{c^2-3c}$$

$$\text{d. } \frac{v^2-9v}{v^2+7v-30}$$

$$\text{e. } \frac{q+6}{q}$$

$$\text{f. } \frac{v-1}{v+2}$$

$$3. \text{ a. } \frac{m-6}{m-12}$$

$$\text{b. } \frac{c+7}{c-8}$$

$$\text{c. } \frac{z-1}{z-11}$$

$$\text{d. } \frac{z+4}{z+7}$$

$$\text{e. } \frac{m^2+16m+64}{m^2+15m+36}$$

$$\text{f. } \frac{u-8}{u-7}$$