Multiply
Rational
Expressions

Divide
Rational
Expressions

Multiply Rational Expressions

Let a, b, c, and d be polynomials,

$$\frac{a}{b} \cdot \frac{c}{d} = \frac{ac}{bd}$$

where $b \neq 0$ and $d \neq 0$.

Find the product.

Example 1:

$$\frac{3x^2}{4x} \cdot \frac{6x^2}{9x^3} = \frac{18x^4}{36x^4} = \frac{1}{2}$$

Example 2:

$$\frac{5x^2 - 5x}{x^2 - 7x + 10} \cdot \frac{x^2 - 3x - 10}{8x^2 + 16x}$$

$$\frac{5x(x-1)}{(x-5)(x-2)} \cdot \frac{(x+2)(x-5)}{8x(x+2)}$$

$$\boxed{\frac{5(x-1)}{8(x-2)}}$$

Example 3:

$$\frac{x^2 - 9}{5x + 15} \cdot \frac{4x + 4}{x^2 - 7x + 12}$$

$$\frac{(x-3)(x+3)}{5(x+3)} \cdot \frac{4(x+1)}{(x-3)(x-4)}$$

$$\boxed{\frac{4(x+1)}{5(x-4)}}$$

Example 4:

$$\frac{2x}{x^2 - 6x + 8} \cdot \frac{(x-4)}{1}$$

$$\frac{2x}{(x-4)(x-2)} \cdot \frac{(x-4)}{1}$$

$$\frac{2x}{(x-2)}$$

Divide Rational Expressions

Let a, b, c, and d be polynomials,

$$\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \cdot \frac{d}{c} = \frac{ad}{bc}$$

where $b \neq 0$, $c \neq 0$ and $d \neq 0$.

Find the quotient.

Example 5:

$$\frac{x^4}{5x} \div \frac{7x^4}{15x^2} = \frac{x^4}{5x} \cdot \frac{15x^2}{7x^4} = \frac{15x^6}{35x^5}$$

$$= \frac{3x}{7}$$

Example 6:

$$\frac{x^2 - 2x - 15}{3x - 3} \div \frac{x^2 + 5x + 6}{x - 1}$$

$$\frac{x^2 - 2x - 15}{3x - 3} \cdot \frac{x - 1}{x^2 + 5x + 6}$$

$$\frac{(x-5)(x+3)}{3(x-1)} \cdot \frac{(x-1)}{(x+3)(x+2)} = \boxed{\frac{(x-5)}{3(x+2)}}$$

Example 7:

$$\frac{x^2 - 4x - 5}{5x + 5} \div \frac{x^2 - 25}{2x}$$

$$\frac{x^2 - 4x - 5}{5x + 5} \cdot \frac{2x}{x^2 - 25}$$

$$\frac{(x-5)(x+1)}{5(x+1)} \cdot \frac{2x}{(x+5)(x-5)} = \frac{2x}{5(x+5)}$$

Example 8:

$$\frac{x^2 + 5x - 14}{2x^2} \div (x + 7)$$

$$\frac{x^2 + 5x - 14}{2x^2} \cdot \frac{1}{x + 7}$$

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

What Do You Call a Message
Printed on a Lion With Chickenpox?

Express each product in simplest form. Find your answer below and notice the letter next to it. Write this letter in each box containing the number of that exercise.

① $\dfrac{x^3}{2y^2} \cdot \dfrac{6y^4}{xy}$

② $\dfrac{5xy^2}{4x^2} \cdot \dfrac{8x^3y}{15y^5}$

③ $\dfrac{x^2 + 7x + 12}{x - 5} \cdot \dfrac{2x - 10}{x + 3}$

④ $\dfrac{x^2 - 3x - 10}{x + 7} \cdot \dfrac{3x + 21}{6x - 30}$

⑤ $\dfrac{x - 1}{4xy^3} \cdot \dfrac{6x^2y}{1 - x}$

⑥ $\dfrac{13xy^2}{x^2 + 3x - 18} \cdot \dfrac{x^2 - 9}{26x^4y^2}$

⑦ $\dfrac{25 - x^2}{14x^3y^8} \cdot \dfrac{7x^2y}{8x + 40}$

⑧ $\dfrac{2x^2 + 5x - 7}{x + 4} \cdot \dfrac{x^2 + 4x}{x^2 - 2x + 1}$

⑨ $\dfrac{2x + 10}{32 - 8x} \cdot \dfrac{x^2 - 10x + 24}{x^2 - x - 30}$

⑩ $\dfrac{12x + 48}{6x - 15} \cdot \dfrac{4x^2 - 25}{x^2 + 9x + 20}$

Ⓖ $-\dfrac{3x}{2y^2}$

Ⓞ $\dfrac{4(2x + 5)}{x + 5}$

Ⓛ $\dfrac{x + 3}{2x^3(x + 6)}$

Ⓕ $-\dfrac{x - 4}{x + 4}$

Ⓗ $3x^2y$

Ⓣ $-\dfrac{1}{4}$

Ⓓ $\dfrac{2x^2}{3y^2}$

Ⓘ $\dfrac{x + 2}{2}$

Ⓔ $2(x + 4)$

Ⓝ $\dfrac{x(2x + 7)}{x - 1}$

Ⓢ $-\dfrac{x - 5}{16xy^7}$

Ⓐ $\dfrac{4(2x - 5)}{3(x + 4)}$

7	4	5	8	10	8	9	1	3	2	10	9	9	3	2	6	4	10	8

OBJECTIVE 5-e: To multiply algebraic fractions.

What Happened to the Peanut Who Went Walking Late at Night?

Express each quotient below in simplest form. Find your answer in the answer column and notice the letter next to it. Write this letter in each box containing the number of that exercise.

(1) $\dfrac{12m^2n^5}{m+5} \div \dfrac{3m^3n}{m^2-25}$

(2) $\dfrac{n^2-9n+20}{6m^7n^2} \div \dfrac{5n-20}{10mn^2}$

(3) $\dfrac{m^2}{m^2-7m} \div \dfrac{1}{m^2-4m-21}$

(4) $\dfrac{16-2m}{m^2+2m-24} \div \dfrac{m-8}{3m+18}$

(5) $\dfrac{12n-36}{9-n^2} \div \dfrac{8n^5}{n^2+3n}$

(6) $\dfrac{m^2-n^2}{m^2+2mn+n^2} \div \dfrac{m^2n-mn^2}{7m^2}$

(7) $\dfrac{n^2-n-12}{2n^2-15n+18} \div \dfrac{3n^2-12n}{2n^3-9n^2}$

(8) $\dfrac{17mn^3}{m^2+2m-35} \div \dfrac{34m^8n^4}{m^2+7m}$

(9) $\dfrac{4n^3-25n}{3n^2-16n+5} \div (10n+25)$

(H) $7m(m-n)$

(N) $-3n^4(n-3)$

(T) $m(m+3)$

(D) $-\dfrac{3}{2n^4}$

(U) $\dfrac{4n^4(m-5)}{m}$

(R) $\dfrac{1}{2m^4n(m-7)}$

(S) $\dfrac{n(2n-9)(n+3)}{3(2n-3)(n-6)}$

(I) $-\dfrac{6}{m-4}$

(A) $\dfrac{n(2n-5)}{5(3n-1)(n-5)}$

(W) $\dfrac{7m}{n(m+n)}$

(L) $\dfrac{1}{2m^6n(m-5)}$

(E) $\dfrac{n-5}{3m^6}$

4	3	6	9	7	9	7	7	9	1	8	3	2	5

OBJECTIVE 5–g: To divide algebraic fractions.