6.2: Multiplying and Dividing Rational Expressions

Multiply:

Ex. A) Multiply then simplify: B) Simply then multiply:

$\left(\frac{5}{8}\right)\left(\frac{4}{15}\right) = \frac{20}{120} = \frac{1}{6}$ $\left(\frac{\cancel{5}}{\cancel{8}}\right)\left(\frac{\cancel{4}}{\cancel{15}}\right) = \frac{1}{6}$

Ex. $\left(\frac{4x^2}{3xy}\right)\left(\frac{y^2}{8x}\right)$ $\left(\frac{\cancel{4x^2}}{\cancel{3xy}}\right)\left(\frac{y^{\cancel{2}}}{\cancel{8x}}\right) = \frac{y}{6}$

$= \frac{4x^2y^2}{24x^2y}$

$= \frac{y}{6}$

Multiply, leave in simplest form, and identify all non-permissible values.

STEPS: 1) Factor 2) NPVs 3) Cancel out common factors (top and bottom)

Ex. $\frac{a^2-a-12}{a^2-9} \times \frac{a^2-4a+3}{a^2-4a}$

NPV's: $a \neq \pm 3, 0, 4$

$\frac{\cancel{(a-4)}\cancel{(a+3)}}{\cancel{(a+3)}\cancel{(a-3)}} \times \frac{(a-1)\cancel{(a-3)}}{a\cancel{(a-4)}}$

$\frac{a-1}{a}$

$a+3=0$ $a \neq 0$

$a \neq -3$ $a-4=0$

$a-3=0$ $a \neq 4$

$a \neq 3$

Ex. $\frac{d}{2\pi r} \times \frac{2\pi rh}{d-2}$

NPV's: $r \neq 0 \quad d \neq 2$

$\frac{dh}{d-2}$

Ex. $\frac{y^2-9}{r^3-r} \times \frac{r^2-r}{y+3}$

NPV's: $r \neq 0, \pm 1$

$y \neq -3$

$\frac{(y-3)(y+3)}{r(r-1)(r+1)} \times \frac{r(r-1)}{y+3}$

$\frac{y-3}{r+1}$

Dividing Rational Expressions: Multiply by the Reciprocal!

STEPS: **1) Flip second expression or (top * bottom) / (middle * middle)**
2) Factor 3) NPVs 4) Cancel out common factors (top and bottom)

Ex. A) $\frac{5}{3} \div \frac{1}{7}$ or $\frac{\left(\frac{5}{3}\right)}{\left(\frac{1}{7}\right)}$

NPV's: N/A

$\frac{35}{3}$

Ex. A) $\frac{3x^2}{y^2} \div \frac{x}{y^3}$ or $\frac{\left(\frac{3x^2}{y^2}\right)}{\left(\frac{x}{y^3}\right)}$

NPV's: $y \neq 0$
$x \neq 0$

$\frac{3x^2}{y^2} \times \frac{y^3}{x}$

$3xy$

Ex. A) $\dfrac{x^2-4}{x^2-4x} \div \dfrac{x^2+x-6}{x^2+x-20}$

B) $\dfrac{\left(\dfrac{x^2-4}{x^2-4x}\right)}{\left(\dfrac{x^2+x-6}{x^2+x-20}\right)}$

NPV's $x \neq 0, 4, -3, 2, -5$

$\dfrac{(x-2)(x+2)}{x(x-4)} \times \dfrac{(x+5)(x-4)}{(x+3)(x-2)}$

$\dfrac{(x+2)(x+5)}{x(x+3)}$

Ex. $\dfrac{2m^2-7m-15}{2m^2-10m} \div \dfrac{4m^2-9}{6} \times (3-2m)$

NPV's: $m \neq 0, 5, \frac{3}{2}, -\frac{3}{2}$

$-10 \cdot 3 = -30$

$-10 + 3 = -7$

$2m^2 + 3m - 10m - 15$

$m(2m+3) - 5(2m+3)$

$\dfrac{(m-5)(2m+3)}{2m(m-5)} \times \dfrac{6}{(2m-3)(2m+3)} \times \dfrac{-(-3+2m)}{1}$

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