Honors Advanced Algebra DATE: 10/22

Multiplying and Dividing Rational Expressions

Multiplying Rational Expressions

- Multiply the numerators and the denominators
- For all rational expressions $\frac{a}{b}$ and $\frac{c}{d}$,

$$\frac{a}{b}\cdot\frac{c}{d}=\frac{ac}{bd} \text{ if } b\neq 0 \text{ and } d\neq 0$$

Dividing Rational Expressions

- Multiply by the reciprocal of the divisor "Copy-dot-flip"
- For all rational expressions $\frac{a}{b}$ and $\frac{c}{d}$,

copy dot flip

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

Perform the operation indicated and simplify if possible.

Note: When multiplying/dividing, leave the numerators and denominator in factored form to make simplifying easier.

You try it ☺

1. $\frac{4a}{5b}\cdot\frac{15b^2}{16a^3}=\frac{2\cdot 2\cdot a\cdot 3\cdot 5\cdot b\cdot b}{5\cdot b\cdot 2\cdot 2\cdot 2\cdot 2\cdot a\cdot a\cdot a}$

$=\boxed{\frac{3b}{4a^2}}$

2. $\frac{5}{3m^2}\cdot\frac{8}{m^3}=\frac{5\cdot 2\cdot 2\cdot 2}{3\cdot m\cdot m\cdot m\cdot m\cdot m}$

Nothing can be "divided out", so multiply to finish

$=\boxed{\frac{40}{3m^5}}$

3. $\frac{2x+6}{x+3}\cdot\frac{x^3+4x^2+3x}{6x}$

$=\frac{2(x+3)}{(x+3)}\cdot\frac{x(x^2+4x+3)}{2\cdot 3\cdot x}$ $\quad 3 \quad 1\cdot 3$

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

4. $\frac{x+5}{7x-21}\cdot\frac{14x}{x^2+3x-10}=\frac{(x+5)}{7(x\quad)}\cdot\frac{2\cdot 7\cdot x}{(x\quad)(x\quad)}$

Finish it ☺ $=\ldots$

$\boxed{\text{Ans: } \frac{2x}{(x-3)(x-2)}}$

5. $\frac{2x-14}{4x-6}\cdot\frac{6x^2-13x+6}{1}$ multiply

$36 \quad -9\cdot -4$

$=\frac{\cancel{2}(x-7)}{\cancel{2}\cancel{(2x-3)}}\cdot\frac{\cancel{(2x-3)}(3x-2)}{1}$

$(x-\frac{9}{6})(x-\frac{4}{6})$

$=(x-\frac{3}{2})(x-\frac{2}{3})$

$=(2x-3)(3x-2)$

$=\frac{(x-7)(3x-2)}{1}$

$=\boxed{(x-7)(3x-2)}$

6. $\frac{h-1}{6h+3}\cdot\frac{2h^2+9h+4}{1}$ multiply

$8 \quad 1\cdot 8$

$=\frac{h-1}{3(\quad)}\cdot\frac{(h\quad)(2h\quad)}{1}$

$(h+\frac{1}{2})(h+\frac{8}{2})$

$=\ldots$

Finish it ☺

$\boxed{\text{Ans: } \frac{(h-1)(h+4)}{3}}$

" copy dot flip" on all problems

7. $\frac{4x^2y}{15a^3b^3} \div \frac{2xy^2}{5ab^3}$ flip

$= \frac{4x^2y}{15a^3b^3} \cdot \frac{5ab^3}{2xy^2}$

$= \frac{\cancel{2}\cdot 2\cdot \cancel{x}\cdot x\cdot \cancel{y}\cdot \cancel{5}\cdot \cancel{a}\cdot \cancel{b}\cdot \cancel{b}\cdot \cancel{b}}{3\cdot \cancel{5}\cdot \cancel{a}\cdot a\cdot a\cdot \cancel{b}\cdot \cancel{b}\cdot \cancel{b}\cdot \cancel{2}\cdot \cancel{x}\cdot \cancel{y}\cdot y}$

$= \boxed{\frac{2x}{3a^2y}}$

8. $\frac{3x+6}{40x^2} \div \frac{3x^2}{24}$ flip

$= \frac{3x+6}{40x^2} \cdot \frac{24}{3x^2}$

$= \frac{3(x+2)\cdot 2\cdot 2\cdot 2\cdot 3}{2\cdot 2\cdot 2\cdot 5\cdot x\cdot x\cdot 3\cdot x\cdot x} = \ldots$

Finish it

Ans: $\frac{3(x+2)}{5x^4}$

9. $\frac{x^2+2x-3}{x^2+4x+4} \div \frac{x^2-3x+2}{x^2-4}$ flip

$= \frac{x^2+2x-3}{x^2+4x+4} \cdot \frac{x^2-4}{x^2-3x+2}$

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

$= \boxed{\frac{x+3}{x+2}}$

10. $\frac{x^2+5x+4}{x-2} \div \frac{(x+1)}{1}$ flip

$= \frac{x^2+5x+4}{x-2} \cdot \frac{1}{(x+1)}$

$= \ldots$

Finish it

Ans: $\frac{x+4}{x-2}$

11. $\frac{3r^2-12r}{5r} \div \frac{(r^2-3r-4)}{1}$ flip

$= \frac{3r^2-12r}{5r} \cdot \frac{1}{r^2-3r-4}$

$= \frac{3\cancel{r}(r-4)}{5\cancel{r}} \cdot \frac{1}{(r+1)\cancel{(r-4)}}$

$= \boxed{\frac{3}{5(r+1)}}$

12. $\frac{z^2-2z+1}{z^2+2} \div \frac{(z-1)}{1}$ flip

$= \ldots$

Finish it

Ans: $\frac{z-1}{z^2+2}$

13. $\frac{\frac{x^2-9}{x^2-3x}}{\frac{x+3}{x^2-x}} \rightarrow \div$

$= \frac{x^2-9}{x^2-3x} \div \frac{x+3}{x^2-x}$ flip

$= \frac{\cancel{(x-3)}\cancel{(x+3)}}{\cancel{x}\cancel{(x-3)}} \cdot \frac{\cancel{x}(x-1)}{\cancel{(x+3)}}$

$= \boxed{x-1}$

14. $\frac{\frac{t^2+2t-8}{3t}}{\frac{t+4}{t-2}} \rightarrow \div$

$= \frac{t^2+2t-8}{3t} \div \frac{t+4}{t-2}$

Finish it

Ans: $\frac{(t-2)^2}{3t}$