Name:	Date:
Topic:	Class:

Main Ideas/Questions	Notes/Examples	
Rational Expression	A **rational expression** is a _____ of two polynomial expressions.	
	To **simplify** a rational expression:	
	① Factor everything that can be factored.	
	② Simplify the monomials (use the exponent rules!)	
	③ Eliminate common binomial factors.	
Examples	**1.** $\frac{20x^6}{14x^2}$	**2.** $\frac{6k-36}{k-6}$
	3. $\frac{y+8}{y^2+2y-48}$	**4.** $\frac{2r^2-2r-40}{8r+32}$
Watch out! $\frac{a-b}{b-a}=$ →	**5.** $\frac{p^2-49}{7-p}$	**6.** $\frac{12a^3-3a}{12a^3+6a^2}$
	7. $\frac{6n^2+8n+2}{2n^2-2}$	**8.** $\frac{45-5w}{3w^2-28w+9}$

Name:	Date:
Topic:	Class:

Main Ideas/Questions	Notes/Examples
Rational Expression	A **rational expression** is a ratio of two polynomial expressions. To **simplify** a rational expression: ① Factor everything that can be factored. ② Simplify the monomials (use the exponent rules!) ③ Eliminate common binomial factors.

Examples

1. $\frac{20x^6}{14x^2} = \boxed{\frac{10x^4}{7}}$

2. $\frac{6k-36}{k-6} = \frac{6(k-6)}{k-6} = \boxed{6}$

3. $\frac{y+8}{y^2+2y-48} = \frac{y+8}{(y+8)(y-6)} = \boxed{\frac{1}{y-6}}$

4. $\frac{2r^2-2r-40}{8r+32} = \frac{2(r^2-r-20)}{8(r+4)} = \frac{2(r-5)(r+4)}{8(r+4)} = \boxed{\frac{r-5}{4}}$

Watch out! $\frac{a-b}{b-a} = -1$

5. $\frac{p^2-49}{7-p} = \frac{(p-7)(p+7)}{7-p} = -1(p+7) = \boxed{-p-7}$

6. $\frac{12a^3-3a}{12a^3+6a^2} = \frac{3a(4a^2-1)}{6a^2(2a+1)} = \frac{3a(2a+1)(2a-1)}{6a^2(2a+1)} = \boxed{\frac{2a-1}{2a}}$

7. $\frac{6n^2+8n+2}{2n^2-2} = \frac{2(3n^2+4n+1)}{2(n^2-1)} = \frac{2(3n+1)(n+1)}{2(n+1)(n-1)} = \boxed{\frac{3n+1}{n-1}}$

8. $\frac{45-5w}{3w^2-28w+9} = \frac{5(9-w)}{(3w-1)(w-9)} = \boxed{\frac{-5}{3w-1}}$

Multiplying Rational Expressions

If the problem contains-

- **Monomials only:** Multiply together, then simplify.
- **Binomials/Trinomials**: Factor everything you can FIRST, then simplify.

9. $\frac{6x^2y^3}{2x^2y^2} \cdot \frac{10x^3y^4}{18y^2}$

10. $\frac{4a^2b^2}{15ab^3} \cdot \frac{5a^3b^6}{12a^4b^7}$

11. $\frac{4x^2-4x}{2x^2+4x-6} \cdot \frac{x^2+x-6}{4x^2+8x}$

12. $\frac{10v-5v^2}{v^2-11v+18} \cdot \frac{v^2-8v-9}{15v}$

Dividing Rational Expressions

To divide rational expressions, multiply by the _____!

13. $\frac{5pq}{16p^3} \div \frac{35p^2q^2}{8q^5}$

14. $\frac{10}{4x-8} \div \frac{2x^2+6x}{x^2+x-6}$

15. $\frac{2a^3-12a^2}{a^2-4a-12} \div \frac{24a^2-8a^3}{a^2-8a+15}$

16. $\frac{k+3}{k} \div (4k+1) \cdot \frac{16k^2-1}{k+3}$

Multiplying Rational Expressions

If the problem contains-
- **Monomials only:** Multiply together, then simplify.
- **Binomials/Trinomials:** Factor everything you can FIRST, then simplify.

9. $\frac{6x^2y^3}{2x^2y^2} \cdot \frac{10x^3y^4}{18y^2}$

$= \frac{60x^5y^7}{36x^2y^4}$

$= \boxed{\frac{5x^3y^3}{3}}$

10. $\frac{4a^2b^2}{15ab^3} \cdot \frac{5a^3b^6}{12a^4b^7}$

$= \frac{20a^5b^8}{180a^5b^{10}}$

$= \boxed{\frac{1}{9b^2}}$

11. $\frac{4x^2-4x}{2x^2+4x-6} \cdot \frac{x^2+x-6}{4x^2+8x}$

$\frac{4x(x-1)}{2(x+3)(x-1)} \cdot \frac{(x+3)(x-2)}{4x(x+2)}$

$= \boxed{\frac{x-2}{2(x+2)}}$

12. $\frac{10v-5v^2}{v^2-11v+18} \cdot \frac{v^2-8v-9}{15v}$

$\frac{5v(2-v)}{(v-9)(v-2)} \cdot \frac{(v-9)(v+1)}{15v}$

$= \frac{-1(v+1)}{3}$

$= \boxed{\frac{-v-1}{3}}$

Dividing Rational Expressions

To divide rational expressions, multiply by the reciprocal!

13. $\frac{5pq}{16p^3} \div \frac{35p^2q^2}{8q^5}$

$\frac{5pq}{16p^3} \cdot \frac{8q^5}{35p^2q^2}$

$= \frac{40pq^6}{560p^5q^2}$ $= \boxed{\frac{q^4}{14p^4}}$

14. $\frac{10}{4x-8} \div \frac{2x^2+6x}{x^2+x-6}$

$= \frac{10}{4(x-2)} \cdot \frac{(x+3)(x-2)}{2x(x+3)}$

$= \boxed{\frac{5}{4x}}$

15. $\frac{2a^3-12a^2}{a^2-4a-12} \div \frac{24a^2-8a^3}{a^2-8a+15}$

$\frac{2a^2(a-6)}{(a-6)(a+2)} \cdot \frac{(a-3)(a-5)}{8a^2(3-a)}$

$= \frac{-1(a-5)}{4(a+2)}$ $= \boxed{\frac{-a+5}{4(a+2)}}$

16. $\frac{k+3}{k} \div (4k+1) \cdot \frac{16k^2-1}{k+3}$

$= \frac{k+3}{k} \cdot \frac{1}{4k+1} \cdot \frac{(4k+1)(4k-1)}{k+3}$

$= \boxed{\frac{4k-1}{k}}$

Name: _____ **Unit 8:** Rational Functions

Date: _____ **Bell:** _____ **Homework 1:** Simplify, Multiply, & Divide Rational Expressions

**** This is a 2-page document! ****

Directions: Simplify the expressions below.	
1. $\frac{16m^2}{24m^7}$	**2.** $\frac{n^2+7n}{4n^2+28n}$
3. $\frac{x^2-10x-24}{x+2}$	**4.** $\frac{1-9w^2}{12w-4}$
5. $\frac{4a^2-36a}{2a^4-24a^3+54a^2}$	**6.** $\frac{y^2-36}{5y^2-26y-24}$

Directions: Find the product. Give your answer in simplest form.	
7. $\frac{32x^3y}{5xy^2}\cdot\frac{15y}{8x^2y^4}$	**8.** $\frac{m^2-6m+8}{2m-2}\cdot\frac{10}{m-4}$
9. $\frac{28n+40}{35n+50}\cdot\frac{12n+24}{8n+16}$	**10.** $\frac{p+10}{9-p}\cdot\frac{p^2-5p-36}{4p^2+16p}$

11. $\frac{v^2-49}{20v^3}\cdot\frac{4v^2-24v}{v^2+v-42}$	**12.** $\frac{2n-3}{n+1}\cdot\frac{2n^2+5n+3}{9-4n^2}$
13. $\frac{12k^2-54k}{6k}\cdot\frac{6}{81-18k}$	**14.** $\frac{6c^2+13c-63}{6c^2-17c+7}\cdot\frac{2c^2-9c+4}{12c+54}$

Directions: Find the quotient. Give your answer in simplest form.

15. $\frac{14m^4}{3m}\div\frac{7m^2}{18m^5}$	**16.** $\frac{x^2-3x-28}{6x}\div\frac{2x-14}{2}$
17. $\frac{2a^2+14a}{8a^2}\div(10a+70)$	**18.** $\frac{1-h^2}{2h^2-10h-12}\div\frac{2h-2}{6}$
19. $\frac{2r+2}{r+2}\div\frac{4r^2+8r+4}{12r+12}$	**20.** $\frac{20x-4}{8x^2}\div(5x-1)\cdot\frac{6x}{5}$