

rational expression : fraction equations!

**SIMPLIFYING**  
Rational Expressions

1. Factor anything that can be factored.
2. Simplify monomials using the exponent rules.
3. Eliminate common binomial factors.  ~~$\frac{x+4}{x+4}$~~
4. Write what's left!

**EXAMPLES**

1. $\frac{12y}{48y^3} \div 12$ $\frac{1}{4y^2}$	2. $\frac{21b}{35ab^2} \div 7$ $\frac{3}{5b}$	3. $\frac{8m^2n}{24mn^3} \div 8$ $\frac{1m}{3n^2}$
4. $\frac{16x^3y^3}{36x^5y^2} \div 4$ $\frac{4y}{9x^2}$	5. $\frac{12a^2b^2}{40a^3b} \div 4$ $\frac{3b^2}{10a}$	6. $\frac{6xy^3}{3x^2y^2} \div 3$ $\frac{2z^2}{xy}$
7. $\frac{n+6}{n+18}$ $\frac{n+6}{3(n+6)} = \frac{1}{3}$	8. $\frac{4x-4}{4x+4}$ $\frac{4(x-1)}{4(x+1)}$	
9. $\frac{y^2-64}{y+8}$ $\frac{(y+8)(y-8)}{y+8} = y-8$	10. $\frac{z+1}{z^2-1}$ $\frac{(z+1)}{(z+1)(z-1)} = \frac{1}{z-1}$	
11. $\frac{k^2-7k-18}{k-9}$ $\frac{(k-9)(k+2)}{k-9} = k+2$	12. $\frac{m+6}{m^2+2m-24}$ $\frac{m+6}{(m+6)(m-4)} = \frac{1}{m-4}$	
13. $\frac{2d+10}{-2d-35}$ $\frac{2(d+5)}{-2(d+5)} = -\frac{1}{d+5}$	14. $\frac{r^2+9r-10}{3r+30}$ $\frac{(r+10)(r-1)}{3(r+10)} = \frac{r-1}{3}$	

**Doesn't Cancel**  
 $\frac{x^2+1}{x^2}$   
Divide doesn't cancel  
Add

**CANCELS**  
 $\frac{x^2(x+1)}{x^2}$   
Divide  
Cancel  
Multiply!

<p>15. <math>\frac{x^2+5x+6}{x^2+6x+8}</math></p>	<p>16. <math>\frac{a^2+3a-4}{a^2+2a-8}</math></p>
<p>17. <math>\frac{4m^2-20m}{m^2-4m-5}</math></p>	<p>18. <math>\frac{6p^3-8p}{9p^3-12p}</math></p>
<p>19. <math>\frac{(8x^3+8x^2)}{(10x^2+10x)}</math> <del><math>\frac{8x^2(x+1)}{10x(x+1)}</math></del></p> <p><math>\frac{4x}{5}</math></p>	<p>20. <math>\frac{5y^2+10y-40}{(10y^2-30y+20)}</math> <del><math>\frac{5(y^2+2y-8)}{10(y^2-3y+2)}</math></del></p> <p><del><math>\frac{4(y-2)(y+4)}{10(y-1)(y-2)}</math></del></p> <p><math>\frac{1(y+4)}{2(y-1)}</math></p>

21.  $\frac{4k-20}{3k^2-14k-5}$

$\frac{3 \cdot -5}{1 \cdot -5}$   
 $\frac{1 \cdot -15}{-1 \cdot 1}$

$3k^2$	$1k$
$-15k$	$-5$

$4(k-5)$   
 $(k-5)(3k+1)$

22.  $\frac{6w^2+5w-4}{4w^2-1}$

$3w+4$	$2w-1$
$2w$	$-1$

$(3w+4)(2w-1)$   
 $(2w+1)(2w-1)$

23.  $\frac{2b^2+12b+18}{3b^2-3b-36}$

$\frac{2(b^2+6b+9)}{3(b^2-b-12)}$

$\frac{2(b+3)(b+3)}{3(b-4)(b+3)}$

normal

24.  $\frac{2y^2+9y+4}{4y^2-4y-3}$

$2y^2$	$8y$
$1y$	$4$

$(2y+1)(2y+4)$   
 $(2y+1)(2y-3)$

$4y^2$	$2y$
$6y$	$-3$

$(2y+1)$

**Directions:** Simplify the following rational expressions.**HW #1**

**1.**  $\frac{12ab}{6a^2b^2}$

**2.**  $\frac{7n^3}{21n^8}$

**3.**  $\frac{4x^2yz^5}{6x^2y^3z^2}$

**4.**  $\frac{x+2}{x^2-4}$

**5.**  $\frac{2n-8}{n^2-16}$

**6.**  $\frac{5b-10}{b^2+5b-14}$

**7.**  $\frac{v^2+2v+1}{v^2-1}$

**8.**  $\frac{y^2-25}{y^2-4y-5}$

**9.**  $\frac{c^2+6c-16}{c^2-11c+18}$

**10.**  $\frac{8a^3-10a}{20a^3-25a}$

**11.**  $\frac{g^2+g-6}{2g^2-8}$

**12.**  $\frac{m^2-2m+1}{2m^2-m-1}$

**13.**  $\frac{2h^2-4h-6}{2h^2-8h-10}$

**14.**  $\frac{5w^2-9w-2}{w^2+4w-12}$

**15.**  $\frac{4k^2-k-3}{4k^2-17k-15}$

Main Ideas/Questions	Notes/Examples	
<p><b>MULTIPLYING</b> Rational Expressions</p>	If the problem contains- <ul style="list-style-type: none"> <li>• <b>Monomials only:</b> Multiply together, then simplify.</li> <li>• <b>Binomials/Trinomials:</b> Factor everything you can FIRST, then simplify.</li> </ul>	
	<b>Example 1:</b> $\frac{10a^3bd}{5ab^2} \cdot \frac{a^2bc^2}{4cd}$	<b>Example 2:</b> $\frac{x^2-16}{2x+8} \cdot \frac{x+4}{x^2+8x+16}$
<p><b>YOU TRY!</b></p>	Find each product. Final answers must be written in simplest form.	
	<b>1.</b> $\frac{3k^2}{2k} \cdot \frac{k^2}{12}$	<b>2.</b> $\frac{3x^2}{2y} \cdot \frac{4y^2}{9}$
	<b>3.</b> $\frac{14}{c^2} \cdot \frac{c^5}{2c}$	<b>4.</b> $\frac{2x^2y}{3x^2y} \cdot \frac{3xy}{4y}$
	<b>5.</b> $\frac{c^2-1}{2c-14} \cdot \frac{c^2-4c-21}{c^2+2c-3}$	<b>6.</b> $\frac{x^2-16}{x^2-4} \cdot \frac{x+2}{x-4}$
<b>7.</b> $\frac{2w-12}{7w} \cdot \frac{14}{3w-18}$	<b>8.</b> $\frac{m+2}{m^2-3m} \cdot \frac{8m^2}{m+2}$	

<b>9.</b> $\frac{4p+8}{p^2-2p} \cdot \frac{p-2}{p+2}$	<b>10.</b> $\frac{a+5}{3a+6} \cdot \frac{3a^2+6a}{a^2+2a-15}$
<b>11.</b> $\frac{x^2-49}{x^2+5x} \cdot \frac{x+5}{x+7}$	<b>12.</b> $\frac{v^2-4}{5v+10} \cdot \frac{v+2}{v-2}$
<b>13.</b> $\frac{y^2-36}{y^2-25} \cdot \frac{y+5}{y-6}$	<b>14.</b> $\frac{r^2+2r+1}{r-1} \cdot \frac{3r-3}{r+1}$
<b>15.</b> $\frac{n^2+10n+16}{5n-10} \cdot \frac{n-2}{n^2+9n+8}$	<b>16.</b> $\frac{b^2-2b-24}{b^2-36} \cdot \frac{b^2+5b-6}{b^2+2b-8}$

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**17.**  $\frac{2n^2 - 10n}{n^2 - 9n + 20} \cdot \frac{n^2 - 8n + 16}{4n^2}$

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**18.**  $\frac{x^2 + 7x + 12}{x^2 + 8x + 16} \cdot \frac{x + 4}{x + 3}$

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**19.**  $\frac{2k + 4}{k + 4} \cdot \frac{5k^2 + 21k + 4}{10k + 2}$

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**20.**  $\frac{3y^2 - 7y + 4}{12y^2 - 4y} \cdot \frac{3y - 1}{15y^3 - 20y^2}$

HW #2

Directions: Find each product. Final answers must be simplified.

1.  $\frac{6ab \cdot a^2}{a^2b^2 \cdot b^2} = \frac{6a^3b}{a^2b^4}$   
 $\frac{6a}{b^3}$

2.  $\frac{24mn^2}{8m^4n^3} \cdot \frac{12m^3n^2}{36m^2n}$

3.  $\frac{18x^2}{10y^2} \cdot \frac{15y^3}{24x}$   
 $\frac{9xy}{8}$

4.  $\frac{(2n-8)(3n+6)}{n+2} \cdot \frac{(n+2)(n-4)}{(n+2)(n-4)}$   
 $\frac{6}{1}$

5.  $\frac{(y^2+9y+8)(2y-3)}{(4y^2-9)(y+1)}$   
 $\frac{y+8}{2y+3}$

6.  $\frac{8x+8}{x^2-2x+1} \cdot \frac{x-1}{2x+2}$

7.  $\frac{a^2-25}{a+2} \cdot \frac{a^2-4}{a^2-7a+10}$

8.  $\frac{(x^2+6x+8)(-x-1)}{(2x^2+9x+4)(-3x+2)}$   
 $\frac{(x+2)(x+4)(-x-1)}{(2x+1)(x+4)(-x-1)(x-2)}$   
 $\frac{x+2}{x-2}$

9.  $\frac{m^2-1}{2m-2} \cdot \frac{4m}{m+1}$



10.  $\frac{n^2 - 1}{n^2 - 7n + 10} \cdot \frac{n^2 - 25}{n^2 + 6n + 5}$

11.  $\frac{3p - 3r}{10pr} \cdot \frac{20p^2r^2}{p^2 - r^2}$

12.  $\frac{(6x^2 + 6x)(2x^2 - 7x - 4)}{(x^2 - 3x - 4)(8x^3 + 4x^2)}$

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

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

*Handwritten notes: 4/3, -8, 1, 2x, 1, 2x^2, 1x, -2, -8x, -4*

13.  $\frac{v^2 - 4v - 21}{3v^2 + 6v} \cdot \frac{v^2 + 8v}{v^2 + 11v + 24}$

14.  $\frac{x+7}{x^3} \cdot \frac{x^2 - 10x}{x^2 - 3x - 70}$

15.  $\frac{2n-3}{(10n^2 - 17n + 3)} \cdot \frac{(15n^3 - 3n^2)}{(6n^2 - 6n)}$

~~$\frac{(2n-3)3n^2(5n-1)}{(2n-3)(5n-1)2n(n-1)}$~~

$\frac{n}{2(n-1)}$

*Handwritten notes: 30, -2, -17, 5n-1, 2n, 15n^2, 2n, -3, 15n, 3*

For questions 16-17, find a simplified expression that makes the statement true.

16.  $\frac{(p^2 + 10p + 24) \boxed{?}}{(p^2 - 4p - 32)} = \frac{p+6}{p-7}$

~~$\frac{(p+6)(p+4)}{(p-8)(p+4)}$~~   ~~$\frac{p+6}{p-7}$~~

$\frac{(p+6)(p+4) \cdot ?}{(p-8)(p+4)(p+8)(p-7)} = \frac{p+6}{p-7}$

need  $(p-8)(p+8)$  so that those would cancel.  
or  $p^2 - 64$

17.  $\frac{9x^2 - 1}{\boxed{?}} = \frac{x^3 + 4x^2}{3x^2 - x} = \frac{3x+1}{x-5}$