

# **Math Connections Worksheets**

MAT0028C Developmental Math II

## **Chapter 8**

Rational Expressions and Equations



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## Chapter 8 RATIONAL EXPRESSIONS AND EQUATIONS

### 8.2 Multiplying and Dividing Rational Expressions

#### KEY PROPERTIES, PROCEDURES, OR STRATEGIES

##### Multiplying Rational Expressions

##### Dividing Rational Expressions

##### Using Dimensional Analysis to Convert between Units of Measurement

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### GUIDED EXAMPLES

1. Multiply.

$$\frac{125 - 5z}{49} \cdot \frac{245}{7z - 175}$$

**Solution**

$$\frac{125 - 5z}{49} \cdot \frac{245}{7z - 175} =$$

**Factor the numerators and denominators completely.**

$$=$$

**Divide out the common factors.**

$$=$$

**Multiply the remaining numerator factors and denominator factors.**

2. Divide.

$$\frac{50x^9}{2y^9} \div \frac{625x^4}{10y^3}$$

**Solution**

$$\frac{50x^9}{2y^9} \div \frac{625x^4}{10y^3} =$$

**Write an equivalent multiplication statement by changing the division sign to multiplication and changing the divisor to its reciprocal.**

$$=$$

**Factor the numerators and denominators completely.**

$$=$$

**Divide out the common factors.**

$$=$$

**Multiply the remaining numerator factors and denominator factors.**

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### PRACTICE PROBLEMS

*Multiply.*

1.  $\frac{11}{m} \cdot \frac{m^5}{11}$

1. \_\_\_\_\_

2.  $\frac{12y}{7} \cdot \frac{y}{3} \cdot \frac{2}{y^2}$

2. \_\_\_\_\_

3.  $\frac{8-2z}{49} \cdot \frac{98}{7z-28}$

3. \_\_\_\_\_

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

4. \_\_\_\_\_

5.  $\frac{9x}{x^2-4x+4} \cdot \frac{x^2-4}{18x^2}$

5. \_\_\_\_\_

6.  $\frac{c^2+cf-cd-df}{c^2+5c+cf+5f} \cdot \frac{c^2-7c-35+5c}{c^2-7d+cd-7c}$

6. \_\_\_\_\_

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*Divide.*

7.  $\frac{3}{r} \div \frac{27}{r}$

7. \_\_\_\_\_

8.  $\frac{20x^6}{5y^5} \div \frac{16x^4}{10y^2}$

8. \_\_\_\_\_

9.  $\frac{w^3 - 7w^2 + 12w}{2x} \div \frac{2w - 6}{4w + 16}$

9. \_\_\_\_\_

10.  $\frac{w + 4}{2} \div \frac{3w + 12}{8}$

10. \_\_\_\_\_

11.  $\frac{v^2 + 8v + 16}{v + 3} \div (5v^2 + 17v - 12)$

11. \_\_\_\_\_

12.  $\frac{k + 4}{3} \div \frac{2k + 8}{9}$

12. \_\_\_\_\_

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## Chapter 8 RATIONAL EXPRESSIONS AND EQUATIONS

### 8.3 Adding and Subtracting Rational Expressions with the Same Denominator

#### KEY PROPERTIES, PROCEDURES, OR STRATEGIES

#### Adding or Subtracting Rational Expressions (Same Denominator)

#### GUIDED EXAMPLES

1. Add  $\frac{c}{c+4} + \frac{8}{c+4}$ .

**Solution**

$$\frac{c}{c+4} + \frac{8}{c+4} =$$

**Add the numerators and keep the same denominator.**

Because  $c$  and 8 are not like terms, we express their sum as a polynomial.

2. Subtract  $\frac{a^2}{a+2} - \frac{4}{a+2}$ .

**Solution**

$$\frac{a^2}{a+2} - \frac{4}{a+2} =$$

**Subtract the numerators and keep the same denominator.**

=

**Factor the numerator.**

=

**Divide out the common factor.**

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### GUIDED EXAMPLE

3. Add  $\frac{y^2 + 8y - 8}{3y^3 + 9y^2 - 30y} + \frac{2y^2 + 6y + 3}{3y^3 + 9y^2 - 30y}$ .

**Solution**

$$\frac{y^2 + 8y - 8}{3y^3 + 9y^2 - 30y} + \frac{2y^2 + 6y + 3}{3y^3 + 9y^2 - 30y}$$

=

**Add the numerators  
and keep the same  
denominator.**

=

**Combine like terms.**

=

**Factor the numerator  
and denominator  
completely.**

=

**Divide out common  
factors.**

**NOTES**



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### PRACTICE PROBLEMS

*Add or subtract. Simplify your answers to lowest terms.*

1.  $\frac{3x}{104} + \frac{5x}{104}$

1. \_\_\_\_\_

2.  $\frac{8}{n^2} - \frac{7}{n^2}$

2. \_\_\_\_\_

3.  $\frac{y^2}{y+2} + \frac{2y}{y+2}$

3. \_\_\_\_\_

4.  $\frac{m+5}{m^2-49} - \frac{12}{m^2-49}$

4. \_\_\_\_\_

5.  $\frac{c-2b}{c+b} + \frac{c+4b}{c+b}$

5. \_\_\_\_\_

6.  $\frac{w^2+12}{w+1} + \frac{9-w^2}{w+1}$

6. \_\_\_\_\_

7.  $\frac{z^2}{z-2} + \frac{z-6}{z-2}$

7. \_\_\_\_\_

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8.  $\frac{11c+71}{10y} - \frac{c+1}{10y}$

8. \_\_\_\_\_

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

9. \_\_\_\_\_

10.  $\frac{z^2}{z+4} + \frac{4z}{z+4}$

10. \_\_\_\_\_

11.  $\frac{b-7d}{b+d} + \frac{b+9d}{b+d}$

11. \_\_\_\_\_

12.  $\frac{5z+21}{4c} - \frac{z+1}{4c}$

12. \_\_\_\_\_

13.  $\frac{x^2}{x-14} + \frac{x-210}{x-14}$

13. \_\_\_\_\_

14.  $\frac{h^3-14}{h+7} - \frac{2h}{h+7} + \frac{7h^2}{h+7}$

14. \_\_\_\_\_

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## Chapter 8 RATIONAL EXPRESSIONS AND EQUATIONS

### 8.4 Adding and Subtracting Rational Expressions with Different Denominators

#### KEY PROPERTIES, PROCEDURES, OR STRATEGIES

##### Finding the LCD

##### Adding or Subtracting Rational Expressions with Different Denominators

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### GUIDED EXAMPLE

Subtract  $\frac{5y}{y^2 - 13y + 36} - \frac{4y}{y^2 - 14y + 45}$ .

#### Solution

First, find the LCD by factoring the denominators.

$$y^2 - 13y + 36 = \boxed{\phantom{y^2 - 13y + 36}}$$

$$y^2 - 14y + 45 = \boxed{\phantom{y^2 - 14y + 45}}$$

LCD:  $\boxed{\phantom{y^2 - 13y + 36}}$

$$\frac{5y}{y^2 - 13y + 36} - \frac{4y}{y^2 - 14y + 45}$$

$$= \boxed{\phantom{\frac{5y}{y^2 - 13y + 36} - \frac{4y}{y^2 - 14y + 45}}}$$

**Write equivalent rational expressions with the LCD.**

$$= \boxed{\phantom{\frac{5y}{y^2 - 13y + 36} - \frac{4y}{y^2 - 14y + 45}}}$$

**Distribute in the numerators.**

$$= \boxed{\phantom{\frac{5y}{y^2 - 13y + 36} - \frac{4y}{y^2 - 14y + 45}}}$$

**Subtract numerators.**

$$= \boxed{\phantom{\frac{5y}{y^2 - 13y + 36} - \frac{4y}{y^2 - 14y + 45}}}$$

**Factor the numerator.**

$$= \boxed{\phantom{\frac{5y}{y^2 - 13y + 36} - \frac{4y}{y^2 - 14y + 45}}}$$

**Divide out the common factor.**

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### PRACTICE PROBLEMS

Find the least common denominator for the rational expressions and write equivalent rational expressions with the LCD.

1.  $\frac{2}{3a^5}, \frac{3}{11a^6}$

1. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

2.  $\frac{2x}{x+4}, \frac{7}{x-1}$

2. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

3.  $\frac{8x}{3x-6}, \frac{5x}{4x-8}$

3. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

4.  $\frac{2}{p^2-4}, \frac{7+p}{p+2}$

4. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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*Add or subtract as indicated.*

5.  $\frac{8}{z} + \frac{9}{5z}$

5. \_\_\_\_\_

6.  $\frac{9}{z+3} - \frac{5}{z-3}$

6. \_\_\_\_\_

7.  $\frac{y}{y-c} - \frac{c}{c-y}$

7. \_\_\_\_\_

8.  $\frac{9}{y-5} + \frac{7}{5-y}$

8. \_\_\_\_\_

9.  $\frac{y}{y^2-2y-35} + \frac{8}{y+5}$

9. \_\_\_\_\_

10.  $\frac{x-3}{x+5} + \frac{x+6}{x-8}$

10. \_\_\_\_\_

## Chapter 8 RATIONAL EXPRESSIONS AND EQUATIONS

### 8.2 Multiplying and Dividing Rational Expressions

1.  $m^4$     2.  $\frac{8}{7}$     3.  $-\frac{4}{7}$     4.  $\frac{x-2}{(x+2)(x-5)}$     5.  $\frac{x+2}{2x(x-2)}$

6.  $\frac{c-d}{c+d}$     7.  $\frac{1}{9}$     8.  $\frac{5x^2}{2y^3}$     9.  $\frac{w(w-4)(w+4)}{x}$     10.  $\frac{4}{3}$

11.  $\frac{v+4}{(v+3)(5v-3)}$     12.  $\frac{3}{2}$     13. 180 in.

### 8.3 Adding and Subtracting Rational Expressions with the Same Denominator

1.  $\frac{x}{13}$     2.  $\frac{1}{n^2}$     3.  $y$     4.  $\frac{1}{m+7}$     5. 2    6.  $\frac{21}{w+1}$

7.  $z+3$     8.  $\frac{c+7}{y}$     9.  $\frac{y-2}{y}$     10.  $z$     11. 2    12.  $\frac{z+5}{c}$

13.  $x+15$     14.  $h^2-2$

### 8.4 Adding and Subtracting Rational Expressions with Different Denominators

1.  $33a^6; \frac{22a}{33a^6}, \frac{9}{33a^6}$     2.  $(x+4)(x-1); \frac{2x^2-2x}{(x+4)(x-1)}, \frac{7x+28}{(x+4)(x-1)}$

3.  $12(x-2); \frac{32x}{12(x-2)}, \frac{15x}{12(x-2)}$     4.  $(p-2)(p+2);$

$\frac{2}{(p-2)(p+2)}, \frac{p^2+5p-14}{(p-2)(p+2)}$     5.  $\frac{49}{5z}$     6.  $\frac{4z-42}{(z+3)(z-3)}$

7.  $\frac{y+c}{y-c}$     8.  $\frac{2}{y-5}$     9.  $\frac{9y-56}{(y-7)(y+5)}$     10.  $\frac{2x^2+54}{(x+5)(x-8)}$