Algebra 2 8.1

Simplify rational expressions

Simplify complex fractions

rational $\frac{3}{5}$ 29% 3 (not $\sqrt{\ }$ π e)

- simplify (a fraction)
- GCF greatest common factor

Is it ever OK to divide by zero? no

How to simplify fractions:

EX. 8/12

10/20

25/125

$\frac{2 \cdot 2}{2 \cdot 2 \cdot 3} \quad \frac{2}{3}$

$\frac{8 \div 4}{12 \div 4} = \frac{2}{3}$

$\frac{2 \cdot 5}{2 \cdot 2 \cdot 5}$

$\frac{5 \cdot 5}{5 \cdot 5 \cdot 5} = \frac{1}{5}$

$\frac{10 \div 5}{20 \div 5} = \frac{2 \div 2}{4 \div 2} \quad \frac{1}{2}$

$$\frac{8}{12} = \frac{2 \cdot \cancel{4}^{1}}{3 \cdot \cancel{4}_{1}} = \frac{2}{3}$$

GCF = 4

$$\frac{2 \cdot 2 \cdot 2}{2 \cdot 2 \cdot 3}$$

$$\frac{x^2 - 4x + 3}{x^2 - 6x + 5} \qquad \frac{(x-3)}{(x-5)}$$

3, −3, −1, −4

5, −5, −1, −6

Is there a GCF?

$$\frac{(x-3)(x-1)}{(x-5)(x-1)}$$

$$\frac{x-3}{x-5}$$

$x \neq 5$

$x - 5 = 0$

$+5 \quad +5$

Is there a GCF?

Example 1 Simplify a Rational Expression

a. Simplify $\frac{5x(x^2 + 4x + 3)}{(x - 6)(x^2 - 9)}$.

$\frac{5x(x+3)(x+1)}{(x-6)(x-3)(x+3)}$

$\frac{5x(x+1)}{(x-6)(x-3)}$

$x \neq 6$

$x \neq 3$

b. Under what conditions is this expression undefined?

Is division by zero ever OK?

Find factors...

$$\frac{x \cdot x(x-7)(x+2)}{4x(x+4)(x+2)}$$

Simplify

Is there a GCF?
Is division by zero OK?

Standardized Test Example 2 Use Elimination

For what value(s) is $\frac{x^2(x^2-5x-14)}{4x(x^2+6x+8)}$ undefined?

$$\frac{x(x-7)}{4(x+4)} \qquad x \neq -4 \qquad x+4=0$$

GuidedPractice

2. For what value(s) of x is $\frac{x(x^2 + 8x + 12)}{-6(x^2 - 3x - 10)}$ undefined?

Simplify

are there any common factors?

Example 3 Simplify Using −1

Simplify $\dfrac{(4w^2 - 3wy)(w + y)}{(3y - 4w)(5w + y)}$.

$$\frac{w(4w - 3y)(w+y)}{(3y - 4w)(5w+y)}$$

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

$$\frac{w(w+y)}{-1(5w+y)}$$

$$\frac{-w(w+y)}{5w+y}$$

Common factors?

GuidedPractice

Simplify each expression.

3A. $\dfrac{(xz - 4z)}{z^2(4 - x)}$

When is the expression not defined?

Only if they ask...

3B. $\frac{ab^2 - 5ab}{(5 + b)(5 - b)}$

Multiplication

$$\frac{2}{9}\cdot\frac{15}{4}=\frac{\overset{1}{\cancel{2}}\cdot\overset{1}{\cancel{3}}\cdot 5}{\underset{1}{\cancel{3}}\cdot 3\cdot\underset{1}{\cancel{2}}\cdot 2}=\frac{5}{3\cdot 2}=\frac{5}{6}$$

Division

$$\frac{3}{5}\div\frac{6}{35}=\frac{3}{5}\cdot\frac{35}{6}=\frac{\overset{1}{\cancel{3}}\cdot\overset{1}{\cancel{5}}\cdot 7}{\underset{1}{\cancel{5}}\cdot 2\cdot\underset{1}{\cancel{3}}}=\frac{7}{2}$$

To solve: multiply by the reciprocal...but why?

$\frac{2}{9}\cdot\frac{15}{4}=\frac{30\div 3}{36\div 3}\cdot\frac{10\div 2}{12\div 2}=\frac{5}{6}$

$\frac{30}{36}=\frac{2\cdot 3\cdot 5}{2\cdot 2\cdot 3\cdot 3}=\frac{5}{6}$

$\frac{\overset{1}{2}}{\underset{3}{9}}\cdot\frac{\overset{5}{15}}{\underset{2}{4}}=\frac{5}{6}$

$\frac{3}{5}\div\frac{6}{35}=\frac{3}{5}\cdot\frac{35}{6}=\frac{\frac{3}{5}\cdot\frac{35}{6}}{\frac{6}{35}\cdot\frac{35}{6}}=\frac{\frac{105}{30}}{1}=\frac{7}{2}$

Example 4 Multiply and Divide Rational Expressions

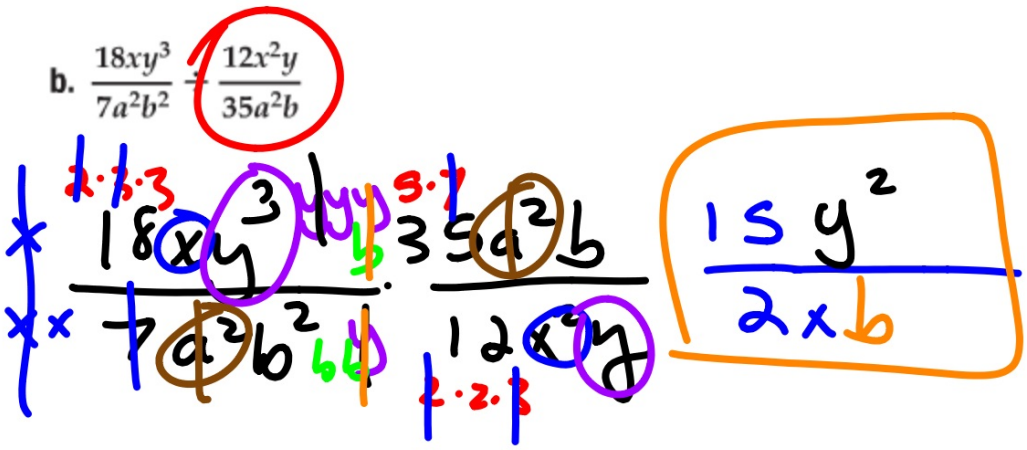
Simplify each expression.

a. $\frac{6c}{5d} \cdot \frac{15cd^2}{8a}$

$$\frac{2 \cdot 3c \; 3 \cdot 5cdd}{5d \; 2 \cdot 2 \cdot 2a}$$

$$\frac{9c^2d}{4a}$$

b. $\frac{18xy^3}{7a^2b^2} \div \frac{12x^2y}{35a^2b}$



$$\frac{15y^2}{2xb}$$

Guided Practice

4A. $\frac{12c^3d^2}{21ab} \cdot \frac{14a^2b}{8c^2d}$

4B. $\frac{6xy}{15ab^2} \cdot \frac{21a^3}{18x^4y}$

4C. $\frac{16mt^2}{21a^4b^3} \div \frac{24m^3}{7a^2b^2}$

4D. $\frac{12x^4y^2}{40a^4b^4} \div \frac{6x^2y^4}{16a^2x}$

8.1

13-37.