

## Lesson 22: Equivalent Rational Expressions

### Classwork

#### Opening Exercise

On your own or with a partner, write two fractions that are equivalent to  $\frac{1}{3}$ , and use the slips of paper to create visual models to justify your response.

#### Example 1

Consider the following rational expression:  $\frac{2(a-1)-2}{6(a-1)-3a}$ . Turn to your neighbor and discuss the following: For what values of  $a$  is the expression undefined?

**Exercise 1**

Reduce the following rational expressions to lowest terms, and identify the values of the variable(s) that must be excluded to prevent division by zero.

a.  $\frac{2(x+1)+2}{(2x+3)(x+1)-1}$

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

c.  $\frac{3-x}{x^2-9}$

d.  $\frac{3x-3y}{y^2-2xy+x^2}$

## Lesson Summary

- If  $a$ ,  $b$ , and  $n$  are integers with  $n \neq 0$  and  $b \neq 0$ , then

$$\frac{na}{nb} = \frac{a}{b}$$

- The rule for rational expressions is the same as the rule for integers but requires the domain of the rational expression to be restricted (i.e., no value of the variable that can make the denominator of the original rational expression zero is allowed).

## Problem Set

- Find an equivalent rational expression in lowest terms, and identify the value(s) of the variable that must be excluded to prevent division by zero.

a.  $\frac{16n}{20n}$

b.  $\frac{x^3y}{y^4x}$

c.  $\frac{2n-8n^2}{4n}$

d.  $\frac{db+dc}{db}$

e.  $\frac{x^2-9b^2}{x^2-2xb-3b^2}$

f.  $\frac{3n^2-5n-2}{2n-4}$

g.  $\frac{3x-2y}{9x^2-4y^2}$

h.  $\frac{4a^2-12ab}{a^2-6ab+9b^2}$

i.  $\frac{y-x}{x-y}$

j.  $\frac{a^2-b^2}{b+a}$

k.  $\frac{4x-2y}{3y-6x}$

l.  $\frac{9-x^2}{(x-3)^3}$

m.  $\frac{x^2-5x+6}{8-2x-x^2}$

n.  $\frac{a-b}{xa-xb-a+b}$

o.  $\frac{(x+y)^2-9a^2}{2x+2y-6a}$

p.  $\frac{8x^3-y^3}{4x^2-y^2}$

- Write a rational expression with denominator  $6b$  that is equivalent to

a.  $\frac{a}{b}$ .

b. one-half of  $\frac{a}{b}$ .

c.  $\frac{1}{3}$ .

- Remember that algebra is just another way to perform arithmetic, but with variables replacing numbers.

a. Simplify the following rational expression:  $\frac{(x^2y)^2(xy)^3z^2}{(xy^2)^2yz}$ .

b. Simplify the following rational expression without using a calculator:  $\frac{12^2 \cdot 6^3 \cdot 5^2}{18^2 \cdot 15}$ .

- How are the calculations in parts (a) and (b) similar? How are they different? Which expression was easier to simplify?