Fractions and Polynomials

Lesson objectives

- I know how to add and subtract fractions without a calculator
- I know how to multiply and divide fractions without a calculator
- I know how to multiply polynomials of any size together

1.1

Lesson objectives | Teachers' notes | Lesson notes

Nelson Page 88 #s 1, 4ace, 5ace, 6ef, 8af, 11 & 12

Fraction Rules

- Adding or Subtracting Fractions:
- find a common denominator
- add/subtract the numerators and keep the denominator the same
- reduce

$$\frac{2}{5}+\frac{3}{7}$$

$\times 7$ $\times 5$

$$\frac{14}{35}+\frac{15}{35}$$

$$=\frac{29}{35}$$

$$\frac{5}{6}-\frac{11}{16}$$

$\times 8$ $\times 3$

$$\frac{40}{48}-\frac{33}{48}$$

$$=\frac{7}{48}$$

Fraction Rules

- Multiplying Fractions:

- change from mixed numbers to improper fractions
- multiply the numerators
- multiply the denominators
- reduce

$$2\frac{1}{3} \times \frac{3}{14} \qquad\qquad 1\frac{3}{5} \times 1\frac{7}{8}$$

$$= \frac{\cancel{7}^{\,1}}{\cancel{3}_{\,1}} \times \frac{\cancel{3}^{\,1}}{\cancel{14}_{\,2}} \qquad\qquad = \frac{{}^{1}\cancel{8}}{\cancel{5}_{\,1}} \times \frac{\cancel{15}^{\,3}}{\cancel{8}_{\,1}}$$

$$= \frac{1}{2} \qquad\qquad = 3$$

Fraction Rules

- Dividing Fractions:

- change from mixed numbers to improper fractions
- find the reciprocal (flip) of the SECOND fraction
- using the multiplying fractions rule, multiply the first fraction with the reciprocal of the second
- reduce

$$2\frac{4}{5} \div 3\frac{1}{3} \qquad\qquad 1\frac{3}{4} \div 1\frac{5}{16}$$

$$= \frac{14}{5} \div \frac{10}{3} \qquad\qquad = \frac{7}{4} \div \frac{21}{16}$$

$$= \frac{{}^{7}\cancel{14}}{5} \times \frac{3}{\cancel{10}_{\,5}} \qquad\qquad = \frac{{}^{1}\cancel{7}}{\cancel{4}_{\,1}} \times \frac{\cancel{16}^{\,4}}{\cancel{21}_{\,3}}$$

$$= \frac{21}{25} \qquad\qquad = \frac{4}{3} = 1\frac{1}{3}$$

Fractions

$\frac{10}{12} + \frac{4}{9} =$

$\frac{4}{5} + \frac{1}{2} =$

$\frac{2}{10} + \frac{6}{11} =$

$\frac{2}{8} + \frac{3}{5} =$

$\frac{1}{5} + \frac{9}{11} = 1\frac{1}{55}$

$\frac{5}{6} + \frac{6}{10} = 1\frac{13}{30}$

$\frac{10}{12} \times \frac{4}{10} =$

$\frac{12}{13} \times \frac{1}{4} =$

$\frac{6}{10} \times \frac{5}{12} = \frac{1}{4}$

$\frac{2}{12} \times \frac{11}{12} =$

$\frac{4}{13} \times \frac{1}{2} =$

$\frac{1}{2} \times \frac{4}{6} = \frac{1}{3}$

Fractions

$\frac{1}{3} \div \frac{3}{5} =$

$\frac{4}{5} \div \frac{1}{2} =$

$\frac{1}{2} \div \frac{1}{6} = 3$

$\frac{2}{5} \div \frac{2}{4} = \frac{4}{5}$

$\frac{1}{2} \div \frac{3}{5} =$

$\frac{1}{2} \div \frac{2}{6} =$

Simplifying Fractions

When we simplify fractions, we can cancel factors that are common in the numerator and the denominator

Recall that a factor is something that is multiplied not added or subtracted.

Example
Which of the following is correct?

a) $\frac{6}{8} = \frac{3\times\cancel{2}}{4\times\cancel{2}} = \frac{3}{4}$ ✓

b) $\frac{4}{5} = \frac{1+\cancel{3}}{2+\cancel{3}} = \frac{1}{2}$ ✗

Based on the example above is the following correct?

$\frac{\cancel{x}+1}{\cancel{x}+2} = \frac{1}{2}$ No!

Adding and Subtracting Polynomials

- When we add and subtract polynomials we can only simplify like terms (terms with the same variable and the same exponent).

- When we simplify we keep the variable and exponent and add or subtract the coefficients.

*** Recall when we subtract a bracket we need to change the sign of everything in the brackets.

Adding and Subtracting Polynomials

Important Vocabulary

- **Algebraic term**: part of an algebraic expression; often separated from the rest of the expression by an addition or subtraction symbol

(i.e. $2x^2 + 3x + 4$ has 3 terms $2x^2$, $3x$ and 4)

- **Monomial**: an algebraic expression with 1 term

- **Binomial**: an algebraic expression with 2 terms

- **Trinomial**: an algebraic expression with 3 terms

Adding and Subtracting Polynomials

- **Degree of a term**: for a term with one variable, the degree is the variable's exponent. When there is more than one variable, the degree is the sum of the exponents of the powers of the variables.

(i.e: x^4, x^3y, and x^2y^2 all have degree 4)

Adding and Subtracting Polynomials

Simplify these

a) $(3x + 4) - (x + 2)$

$= 3x + 4 - x - 2$

$= 2x + 2$

b) $(2x - 5) - (3x - 1)$

$= 2x - 5 - 3x + 1$

$= -x - 4$

Equivalent Expressions

Two polynomial expressions or functions are equivalent if:

- They simplify algebraically to give the same function or expression, or
- They produce the same graph

Two polynomial expressions or functions are**NOT** equivalent if:

- They result in different values when they are evaluated with the same numbers substituted for the variable(s)

Equivalent Expressions

Smudger and Bunter are hosting a dinner for 300 guests.
Cheers Banquet Hall has quoted the following:

$500, plus $10 per person for food
$200, plus $20 per person for drinks

and a discount of $5 per person if the number of guests exceeds 200.

Smudger and Bunter have created two different functions for the total cost, where *n* represents the # of guests and $n > 200$

Smudger's $C_1(n) = (10n + 500) + (20n + 200) - 5n$
Bunter's $C_2(n) = (10n + 20n - 5n) + (500 + 200)$

Are they equivalent? Yes $(25n + 700)$

Are the expressions $(x+y)^2$ and x^2+y^2 equivalent? No

$x^2 + 2xy + y^2 \neq x^2 + y^2$