Name: ____________________________________ Date: __________________

POLYNOMIAL LONG DIVISION
COMMON CORE ALGEBRA II

We have worked to simplify rational expressions (polynomials divided by polynomials). In this lesson, we will look more closely at the division of two polynomials and how it is analogous to the division of two integers.

***Exercise* #1:** Consider the division problem $1519 \div 7$, which could also be written as $\frac{1519}{7}$ and $7\overline{)1519}$.

(a) Find the result of this division using the standard long division algorithm. Is there a remainder in this division?

(b) Rewrite your result from (a) as an equivalent multiplication equation.

(c) Now evaluate $\frac{1522}{7}$ using long division. Write your answer in $a + \text{R}b$ form and in $a + \frac{b}{c}$ form,

(d) Write your answer from part (c) as an equivalent multiplication equation.

***Exercise* #2:** Now let's see how this works out when we divide two polynomials.

(a) Simplify $\frac{2x^2 + 15x + 18}{x + 6}$ by performing polynomial long division.

(b) Rewrite the result you found in (a) as an equivalent multiplication equation.

(c) Write $\frac{2x^2 + 15x + 20}{x + 6}$ in the form $q(x) + \frac{r}{(x+6)}$, where $q(x)$ is a polynomial and r is a constant, by performing polynomial long division. Also, write the result an equivalent multiplication equation.

So, when we divide two polynomials, we always get another polynomial and a remainder. This is known as writing the rational expression in **quotient-remainder form.**

***Exercise* #3:** Write each of the following rational expressions in the form $q(x)+\frac{r}{(x-a)}$ form.

(a) $\frac{x^2+2x-5}{x-3}$

(b) $\frac{2x^2-23x+17}{x-10}$

Sometimes we can use the structure of an expression instead of polynomial long division.

***Exercise* #4:** Consider the expression $\frac{x+8}{x+3}$. We would like to write this as $a+\frac{b}{x+3}$.

(a) Write the numerator as an equivalent expression involving the expression $x+3$.

(b) Use the fact that division distributes over addition to write the final answer.

We can extend what we did in the last problem to more challenging structure problems.

***Exercise* #5:** Write each of the following in the form of $a+\frac{b}{x-r}$.

(a) $\frac{4x+13}{x+2}$

(b) $\frac{3x-5}{x-4}$

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POLYNOMIAL LONG DIVISION
COMMON CORE ALGEBRA II HOMEWORK

FLUENCY

1. Write each of the following rational expressions in the form $a+\dfrac{r}{x-b}$. Do these by rewriting your numerator as was done in Exercises #4 and #5.

(a) $\dfrac{x+6}{x+2}$

(b) $\dfrac{x-10}{x-3}$

(c) $\dfrac{2x+5}{x+2}$

(d) $\dfrac{5x-2}{x-4}$

2. If the expression $\dfrac{10x+11}{2x+1}$ was placed in the form $5+\dfrac{a}{2x+1}$, then which of the following would be the value of *a*?

(1) 6

(2) -7

(3) 3

(4) -5

____

3. Use polynomial long division to simplify each of the following ratios. There should be a zero remainder.

(a) $\dfrac{x^2+5x-24}{x-3}$

(b) $\dfrac{6x^2+11x-10}{3x-2}$

4. Use polynomial long division to write each of the following ratios in $q(x)+\frac{r}{x-a}$ form, where $q(x)$ is a polynomial and r is the remainder.

(a) $\frac{x^2-6x+11}{x-4}$

(b) $\frac{x^2+2x-25}{x+7}$

(c) $\frac{3x^2+17x+25}{x+4}$

(d) $\frac{5x^2-41x+3}{x-8}$

5. Write each of the following in $q(x)+\frac{r}{x-a}$. The polynomial $q(x)$ will now be a quadratic.

(a) $\frac{x^3+7x^2+17x+41}{x+5}$

(b) $\frac{2x^3-11x^2+22x-25}{x-3}$