Lesson 4: Dividing Polynomials

Opening Exercise - Discussion

1. Ryan says he can use the reverse of the tabular method to divide polynomials. What do you think Ryan means by this?

2. Multiply these polynomials using the tabular method.

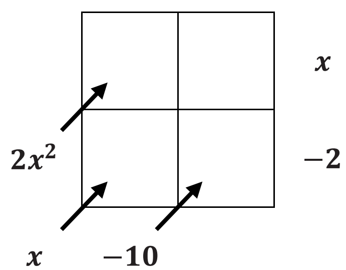
$$(2x+5)(x^2+5x+1)$$

$$(2x+5)\left(x^2+5x+1\right) = \_\_\_\_\_\_ + \_\_\_\_\_\_ + \_\_\_\_\_\_ + \_\_\_\_\_\_$$

3. Rewrite the equation above as a division problem.

Exploratory Challenge

4. A. Reverse the tabular method of multiplication to find the quotient: $\dfrac{2x^2+x-10}{x-2}$. A model has been started for you.



B. We can say: $\dfrac{2x^2+x-10}{x-2} = \_\_\_\_\_\_ + \_\_\_\_\_\_$ and $(x-2)(\_\_\_\_\_\_ + \_\_\_\_\_\_) = 2x^2+x-10$.

5. A. Create your own table and use the *reverse tabular method* to find the quotient.

$$\frac{x^4+4x^3+3x^2+4x+2}{x^2+1}$$

It will be easier to determine the quotient, if you change $x^2 + 1$ to $x^2 + 0x + 1$.

B. $\dfrac{x^4+4x^3+3x^2+4x+2}{x^2+1} = \_\_\_\_\_\_ + \_\_\_\_\_\_ + \_\_\_\_\_\_$ and $(x^2+1)(\_\_\_\_\_\_ + \_\_\_\_\_\_ + \_\_\_\_\_\_) = x^4+4x^3+3x^2+4x+2$

6. In the last problem, you knew how many rows to use because of the denominator (dividend), but how do you know how many columns to use? Discuss this with your group and write up your ideas below.

The number of columns needed depends on ____

____

____

____

7. Test your conjecture. Use the *reverse tabular method* to find the quotient. How many columns will you need? How many rows?

$$\frac{3x^5 - 2x^4 + 6x^3 - 4x^2 - 24x + 16}{x^2 + 4}$$

$\frac{3x^5 - 2x^4 + 6x^3 - 4x^2 - 24x + 16}{x^2 + 4} =$ ____________________ & $(x^2 + 4)($____________________$) = 3x^5 - 2x^4 + 6x^3 - 4x^2 - 24x + 16$

Lesson Summary

Dividing polynomials can be done using the reverse tabular method.

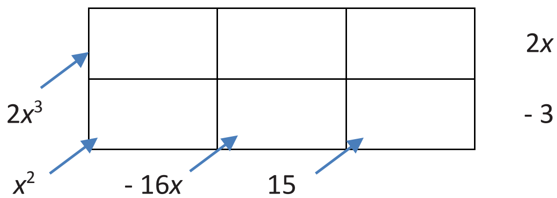
Some things to keep in mind when you use this method are:

1. Rewrite the polynomials with any ________________ terms. $3x^2 - 7 \rightarrow 3x^2 + 0x - 7$
2. Create a table that has enough rows and columns so that you can combine like terms ______________________.
3. You can start with the ______________ term in the lower right corner or the first term in the upper left corner. Feel free to move between the two.
4. Check your ___________ when you are finished.

Homework Problem Set

Use the reverse tabular method to solve these division problems. After each problem, write the division problem as a multiplication problem. The first one has been started for you.

1. $\dfrac{2x^3 + x^2 - 16x + 15}{2x - 3}$



$2x^3 + x^2 - 16x + 15 = (2x - 3)(\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)$

2. $\dfrac{3x^5 + 12x^4 + 11x^3 + 2x^2 - 4x - 2}{3x^2 - 1}$

3. $\dfrac{x^3 - 4x^2 + 7x - 28}{x^2 + 0x + 7}$

4. $\dfrac{x^3 + 2x^2 + 2x + 1}{x + 1}$

5. $$\frac{x^4 + 2x^3 + 2x^2 + 2x + 1}{x + 1}$$

6. $$\frac{x^4 - 2x^3 - 29x - 12}{x^3 + 2x^2 + 8x + 3}$$

7. $$\frac{6x^5 + 4x^4 - 6x^3 + 14x^2 - 8}{6x + 4}$$

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

9. In Homework Practice Set #4 you should have gotten an answer of $x^2 + x + 1$ and in Homework Practice Set #5 you should have gotten an answer of $x^3 + x^2 + x + 1$.

   A. Use those answers and the patterns in the original problems to predict the quotient of $\frac{x^5+2x^4+2x^3+2x^2+2x+1}{x+1}$.

   B. Explain your prediction.

   C. Then check your prediction using the reverse tabular method.

Challenge

10. Use the results of Homework Practice Set #9 to predict the quotient of $\frac{x^6+x^5+2x^4+2x^3+2x^2+x+1}{x^2+1}$. Explain your prediction. Then check your prediction using the reverse tabular method.

11. Consider the following quotients:

$$\frac{4x^2 + 8x + 3}{2x + 1} \text{ and } \frac{483}{21}$$

A. How are these expressions related?

B. Find each quotient.

$$\frac{4x^2 + 8x + 3}{2x + 1}$$

$$\frac{483}{21}$$

C. Explain the connection between the quotients.