

Lesson 19: Dividing Polynomials—What If There Is a Remainder?

Classwork

Opening Exercise

Caden, Denise and Breanna wrote the rational number $\frac{13}{4}$ as a mixed number in different ways.

1. Read over their work and write the pros and cons of each method.

	Cadan’s Method	Denise’s Method	Breanna’s Method
Method		$\frac{13}{4} = \frac{12+1}{4} = \frac{12}{4} + \frac{1}{4} = 3 + \frac{1}{4} = 3\frac{1}{4}$	
Model	Number Line	Fractions	Long Division
Pros			
Cons			

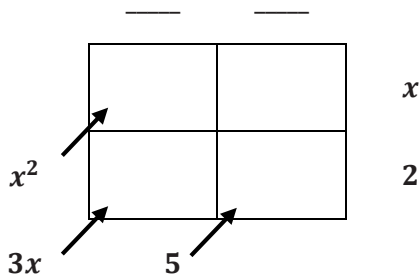
In Unit 1, you learned to divide one polynomial by another, but in each case there was no remainder. In this lesson you'll extend your knowledge of division to include dividing algebraic expressions with remainders. We'll focus on two methods: Long Division and Reverse Tabular Method.

2. Long Division Method – Find the quotient of $\frac{x^2+3x+5}{x+2}$.

$$\frac{x^2 + 3x + 5}{x + 2} = (\underline{\quad} + \underline{\quad}) + \frac{\quad}{x + 2}$$

Remainder

3. Reverse Tabular Method – Find the quotient of $\frac{x^2+3x+5}{x+2}$.



$$\frac{x^2 + 3x + 5}{x + 2} = (\underline{\quad} + \underline{\quad}) + \frac{\quad}{x + 2}$$

Remainder

4. Find each quotient using long division.

A. $\frac{x+4}{x+1}$

B. $\frac{x^3 - x^2 + 3x - 1}{x+3}$

C. $\frac{x^2 - 21}{x+4}$

5. Find each quotient by using the reverse tabular method.

A. $\frac{x^2 + 4x + 10}{x - 8}$

B. $\frac{2x - 7}{x - 3}$

C. $\frac{x^2 - 2x - 19}{x - 1}$

6. Each problem below has an error. Circle where the error occurred and then write the correct step.

A. $\frac{3x^2 - 6x - 10}{x - 2}$

$$\begin{array}{r} 3x - 12 \text{ r. } -34 \\ x - 2 \overline{) 3x^2 - 6x - 10} \\ \underline{3x^2 - 6x} \\ -12x - 10 \\ \underline{-12x + 24} \\ 34 \end{array}$$

B. $\frac{6x^3 - 5x^2 - 3x - 8}{3x - 1}$

$$\begin{array}{r} 2x^2 - 3x - 2 \text{ r. } -10 \\ 3x - 1 \overline{) 6x^3 - 5x^2 - 3x - 8} \\ \underline{6x^3 - 2x^2} \\ -3x^2 - 3x \\ \underline{-3x^2 + 3x} \\ -6x - 8 \\ \underline{-6x + 2} \\ -10 \end{array}$$

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

	$4x$	0	
$4x^2$	$4x^2$	0	x
$0x$	$4x$	0	1
		-3	

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

D. $\frac{x^2 - 7x + 6}{x - 2}$

	x	-5	
x^2	x^2	$-5x$	x
$-7x$	$-2x$	10	-2
		$6 = 10 - 4$	

$$\frac{x^2 - 7x + 6}{x - 2} = (x - 5) + \frac{10}{x - 2}$$

C.
$$\frac{x^3 + 1}{x + 1}$$

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

D.
$$\frac{x^2 - 13x + 36}{x - 4}$$

$$\frac{x^2 - 13x + 30}{x - 4}$$

Find each quotient by using the reverse tabular method.

2.
$$\frac{x^3 - 9x^2 + 5x + 2}{x - 1}$$

3.
$$\frac{x^2 + x + 10}{x + 12}$$

4.
$$\frac{2x + 6}{x - 8}$$

5.
$$\frac{x^2 + 8}{x + 3}$$

Find each quotient by using long division.

6.
$$\frac{x^4 - 9x^2 + 10x}{x + 2}$$

7.
$$\frac{x^5 - 35}{x - 2}$$

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

9.
$$\frac{x^3 + 2x^2 + 8x + 1}{x+5}$$

10.
$$\frac{x^3 + 2x + 11}{x-1}$$

11.
$$\frac{x^4 + 3x^3 - 2x^2 + 6x - 15}{x}$$