12.3 Dividing Polynomials Using Algebra Tiles

MATERIALS • algebra tiles TEKS *a.1, a.6*

QUESTION How can you divide polynomials using algebra tiles?

In the equation $36 \div 5 = 7\frac{1}{5}$, the dividend is 36, the divisor is 5, the quotient is 7, and the remainder is 1. This equation illustrates the following rule:

$$\text{Dividend} \div \text{Divisor} = \text{Quotient} + \frac{\text{Remainder}}{\text{Divisor}}$$

This rule can also be applied when dividing polynomials.

EXPLORE Divide polynomials

Divide $2x^2 + 3x + 5$ by $x + 1$.

STEP 1 ***Model using algebra tiles***

Think of $2x^2 + 3x + 5$ as the area of a figure. Try to arrange the tiles to form a rectangle with $x + 1$ as one of the side lengths.

Notice that the other side length is $2x + 1$, but there are four 1-tiles remaining.

STEP 2 ***Write equation***

The divisor is $x + 1$, the quotient is $2x + 1$, and the remainder is 4.

So, $(2x^2 + 3x + 5) \div (x + 1) = 2x + 1 + \frac{4}{x + 1}$.

DRAW CONCLUSIONS Use your observations to complete these exercises

1. To check that $36 \div 5 = 7\frac{1}{5}$, you can evaluate $5 \cdot 7 + 1$ to obtain 36. Use this method to check the division equation in Step 2 above.

Use algebra tiles to divide the polynomials. Include a drawing of your model.

2. $(2x^2 + 7x + 6) \div (x + 2)$
3. $(2x^2 + 9x + 10) \div (x + 3)$
4. $(4x^2 + 4x + 5) \div (2x + 1)$
5. $(2x^2 + 5x + 7) \div (2x + 3)$
6. $(3x^2 + 7x + 3) \div (x + 2)$
7. $(4x^2 + 6x + 5) \div (x + 1)$
8. **REASONING** For which of the division problems in Exercises 2–7 is the divisor a factor of the dividend? How do you know?