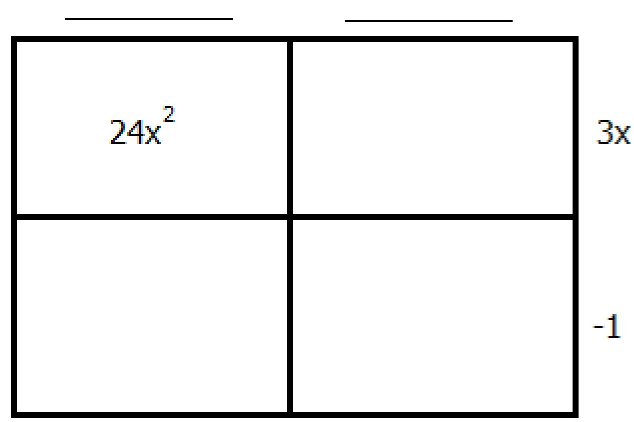
Think about the situation:

a) A rectangle has dimensions of $(3x+2)$ and (x^2+4x-5). Write an expression for the area of the rectangle.

b) Is it possible that a rectangle with one dimension of $(2x-3)$ has an area of $(2x^3-x^2+x-6)$?

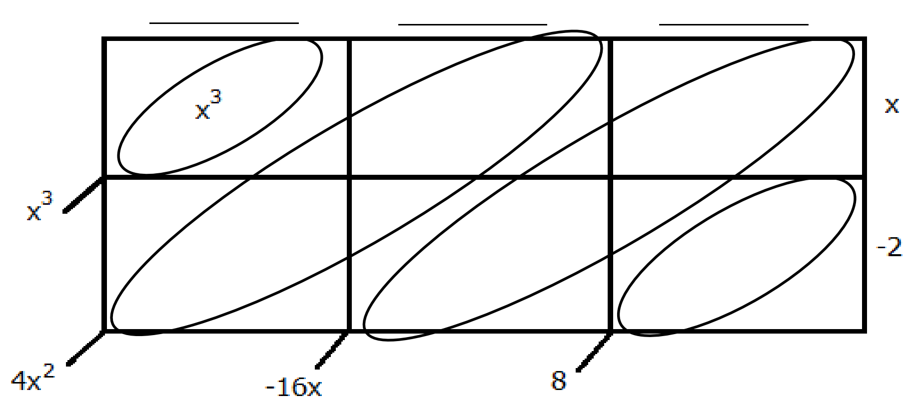
Investigation: Dividing Polynomials

1. Given the area of a rectangle is expressed by $24x^2+13x-7$ and one of the dimensions is $3x-1$, write the expression for the other dimension.
   a. The area model to the right can be used to determine the other dimension. Work with a partner to determine the missing sections of the area.



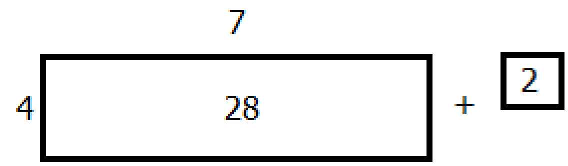
   b. What is the second dimension of the rectangle?
   c. Where are the like terms in the model located?
   d. Discuss how the work in part (a) is similar to the dividing $24x^2+13x-7$ by $3x-1$.

2. An area model can be used for polynomial division. Consider $(x^3+4x^2-16x+8) \div (x-2)$.
   a. Examine the following diagram. What is the purpose of grouping the diagonals?
   b. Work with a partner to determine the missing sections of the area model and the quotient.



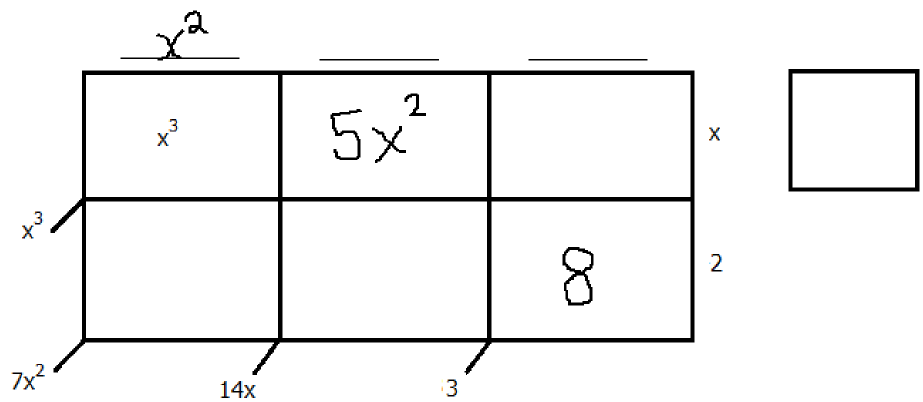
3. Complete each of the following.
   a. $(7x^3-17x^2+55x-21) \div (7x-3)$
   b. $(12x^3+4x^2+3x+2) \div (2x+1)$
   c. $(x^4-81) \div (x-3)$

There are instances when the divisor is not a factor and the division results in a remainder. For example, 30 ÷ 4 can be modeled with a rectangle that is 4 x 7 = 28 square units plus 2 square units. This quotient can be written as $7 + \frac{2}{4}$ units.



Use similar reasoning to explore remainders when dividing polynomials.

4. Examine the model for the quotient ($x^3 + 7x^2+14x+3$) ÷ (x+2).
   a. Fill in the missing information. Be prepared to explain your reasoning.



   a. Write the solution in the form $q(x) + \frac{r(x)}{d(x)}$ where q(x) is the quotient, r(x) is the remainder and d(x) is the divisor.

5. Use an area model to represent ($3x^3-5x^2+10x-3$) ÷ (3x+1).
   a. Is the area of the rectangle more than or less than $3x^3-5x^2+10x-3$? Justify your reasoning.
      i. If less, how many more square units are needed to have the correct area?
      ii. If more, how many square units need to be removed to have the correct area?
   b. Write the solution in the form $q(x) + \frac{r(x)}{d(x)}$ where q(x) is the quotient, r(x) is the remainder and d(x) is the divisor.

6. For each of the following, divide the polynomials. Write the solution in the form $q(x) + \frac{r(x)}{d(x)}$ where q(x) is the quotient, r(x) is the remainder and d(x) is the divisor.
   a. ($x^3-10x^2+20x+26$) ÷(x-5)
   b. ($2x^2+7x-39$) ÷ (2x-7)
   c. ($-5x^2+x^3+8x+4$) ÷ (x-1)

Summarize the Mathematics

In this investigation, you used an area model to represent polynomial division.

a) Explain how the model is used to determine the quotient.
b) Describe how to determine if there is a remainder and, if one exists, how to determine its value.
c) List any reminders that will help you use the area model effectively.