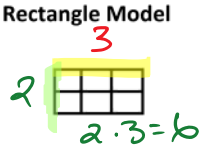
Lesson 2

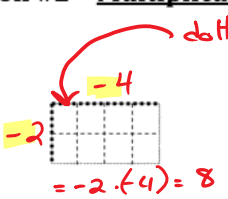
October 31, 2018 12:30 PM

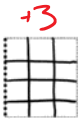
Name: _____

Lesson #2 – Multiplication Models

I. Rectangle Model







II. Breaking Numbers

a) 16 × 27

$(10+6)\cdot(20+7)$

$= 200 + 70 + 120 + 42 = 432$

b) Area Model: 23 × 14 $(10+4)$

	10	4
20	20·10 = 200	20·4 = 80
3	30	12

23 $(20+3)$

Add up boxes

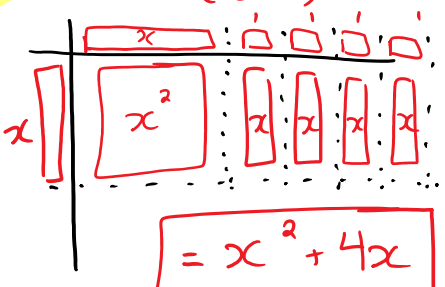
$200 + 80 + 30 + 12$

$= 322$

III. Algebra Tiles - build on the area model using

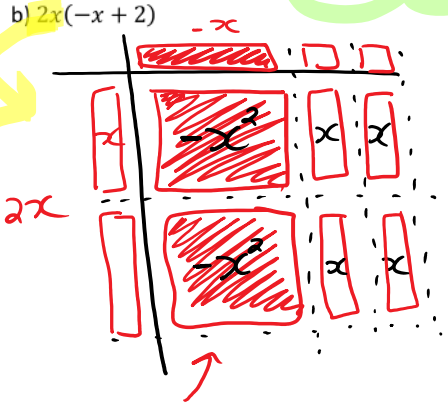
Legend: x^2 x 1

a) $x(x+4)$ $(x+4)$



$= x^2 + 4x$

b) $2x(-x+2)$

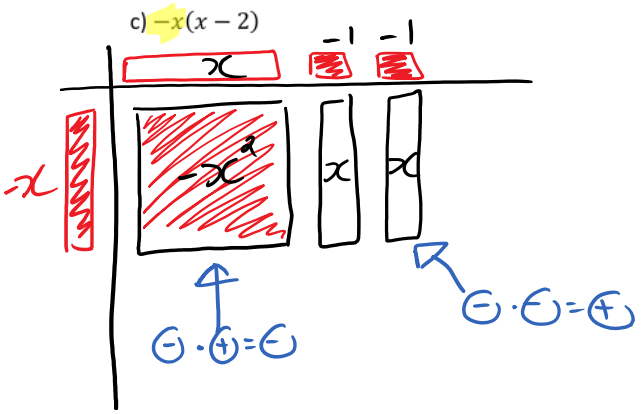


Fill in Area ↵ mind ⊕/⊖

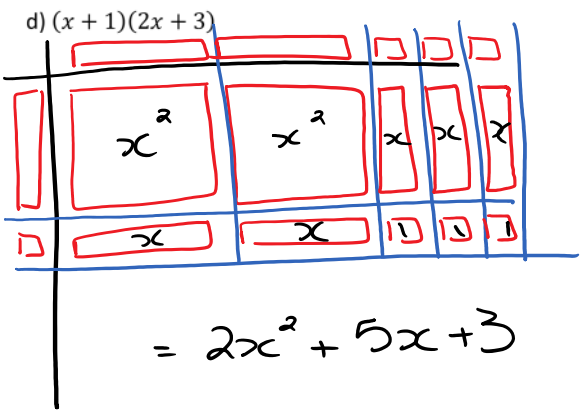
$=$ Area

$= -2x^2 + 4x$

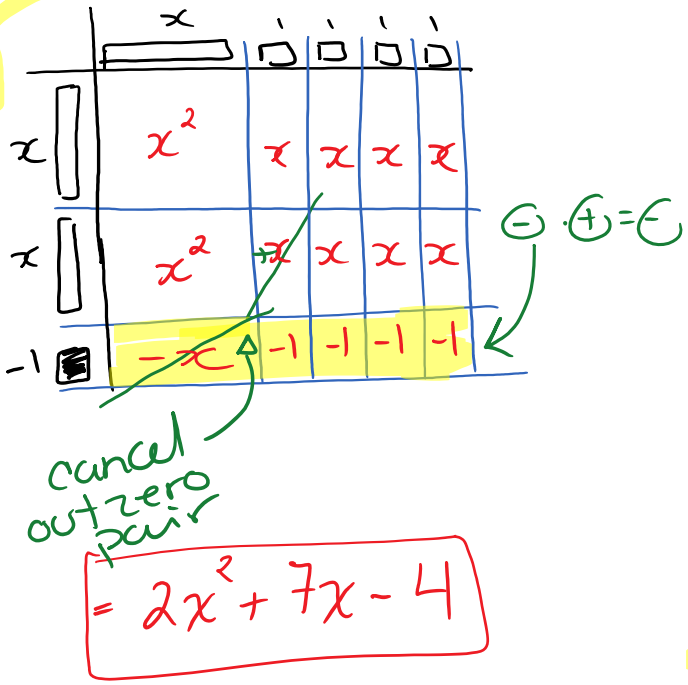
c) $-x(x-2)$



d) $(x+1)(2x+3)$



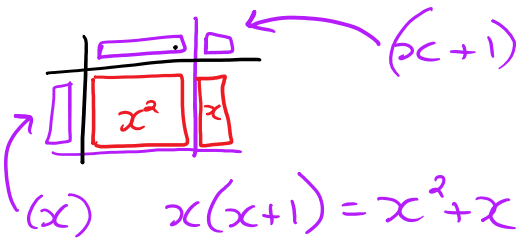
f) $(2x-1)(x+4)$



cancel out zero pair

$= 2x^2 + 7x - 4$

g) Draw a model that has an area of $x^2 + x$



Write a quotient that represents this model

÷

$A = L \cdot w$

Quotient statement is solving for 1 of side lengths.

$L = \frac{A}{w}$ or $W = \frac{A}{L}$

$(x+1) = \frac{x^2+x}{x}$ or $x = \frac{x^2+x}{(x+1)}$

ASSIGNMENT # 2
Pages 12-19 Questions #54-107

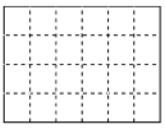
Multiplication and the Area Model

Sometimes it is convenient to use a tool from one aspect of mathematics to study another.

To find the product of two numbers, we can consider the numbers as side lengths of a rectangle.

How are side lengths, rectangles, and products related? The Area Model

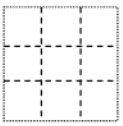
The product of the two sides is the area of a rectangle. $A = lw$

Consider: 

Length =___ Width =___

54. Show why $3 \times 3 = 9$ using the area model.

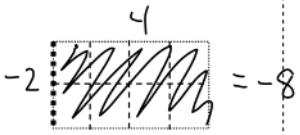
Solution:



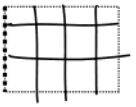
55. Show why $3 \times 4 = 12$ using the area model.

56. Calculate 5×4 using the area model.

57. How might we show $-2 \times 4 = -8$ using the area model?

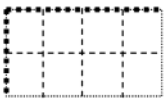


58. Calculate -3×4 using the area model.



59. Calculate -5×4 using the area model.

60. How might we show $-2 \times -4 = 8$ using the area model?



61. Calculate -3×-4 using the area model.

62. Calculate -5×-4 using the area model.

There are some limitations when using the area model to show multiplication. The properties of multiplying integers (+,+), (+,-), (-,-) need to be interpreted by the reader.

63. Show how you could break apart the following numbers to find the product.

$21 \times 12 =$

$= (20 + 1) \times (10 + 2)$
$= 200 + 40 + 10 + 2$
$= 252$

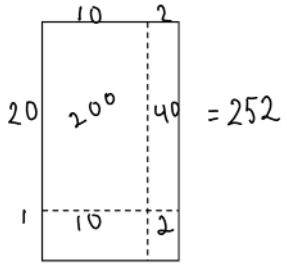
64. Show how you could break apart the following numbers to find the product.

$32 \times 14 =$

65. Show how you could break apart the following numbers to find the product.

$17 \times 24 =$

66. Draw a rectangle with side lengths of 21 units and 12 units. Model the multiplication above using the rectangle.



67. Draw a rectangle with side lengths of 32 units and 14 units. Model the multiplication above using the rectangle.

68. Draw a rectangle with side lengths of 17 units and 24 units. Model the multiplication above using the rectangle.

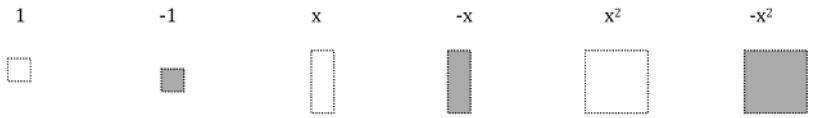
69. Use an area model to multiply the following without using a calculator.
23×15

70. Use an area model to multiply the following without using a calculator.
52×48

71. Use an area model to multiply the following without using a calculator.
73×73

Algebra tiles and the area model: Multiplication/Division of algebraic expressions.

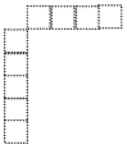
First we must agree that the following shapes will have the indicated meaning.



We must also remember the result when we multiply:

- Two positives = Positive
- Two negatives = Positive
- One positive and one negative = Negative

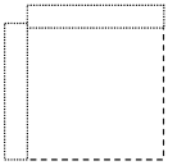
72. Write an equation represented by the diagram below and then multiply the two monomials using the area model.



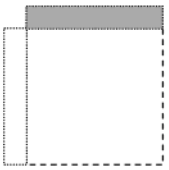
73. Write an equation represented by the diagram below and then multiply the two monomials using the area model.

74. Write an equation represented by the diagram below and then multiply the two monomials using the area model.

75. Write an equation represented by the diagram below and then multiply the two monomials using the area model.

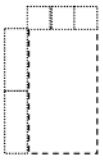


76. If the shaded rectangle represents a negative value, find the product of the two monomials.

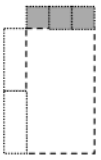


77. Write an equation represented by the diagram below and then multiply the two monomials using the area model.

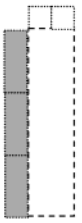
78. Write an equation represented by the diagram below and then multiply the two polynomials using the area model.



79. Write an equation represented by the diagram below and then multiply the two polynomials using the area model.



80. Write an equation represented by the diagram below and then multiply the two polynomials using the area model.



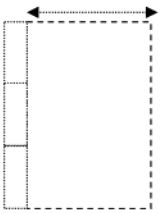
81. Write a quotient that can be represented by the diagram below and then find the missing side length using the area model.

Area $= 6x$

Length:_____

82. Write a quotient that can be represented by the diagram below and then find the missing side length using the area model.

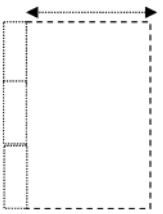
Area $= 6x^2$



Length:_____

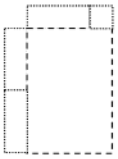
83. Write a quotient that can be represented by the diagram below and then find the missing side length using the area model.

Area $= -6x^2$

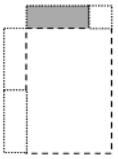


Length:_____

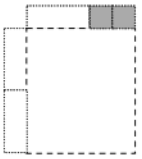
84. Write an equation represented by the diagram below and then multiply the two polynomials using the area model.



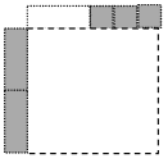
85. Write an equation represented by the diagram below and then multiply the two polynomials using the area model.



86. Write an equation represented by the diagram below and then multiply the two polynomials using the area model.



87. Write an equation represented by the diagram below and then multiply the two expressions using the area model.



88. Draw and use an area model to find the product:
$(2)(2x + 1)$

89. Draw and use an area model to find the product:
$(2x)(x - 3)$

90. Draw and use an area model to find the product:
$(x)(x+3)$

91. Draw and use an area model to find the product:
$(-x)(x+3)$

92. Draw and use an area model to find the product:
$(-3x)(2x+3)$

93. Write a quotient that can be represented by the diagram below and then find the missing side length using the area model.

Area $= x^2 + 3x$

Length:_____

94. Write a quotient that can be represented by the diagram below and then find the missing side length using the area model.

Area $= -x^2 - 3x$

Length:_____

95. Write a quotient that can be represented by the diagram below and then find the missing side length using the area model.

Area $= 2x^2 - 8x$

Length:_____

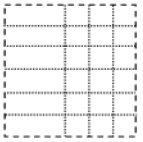
96. Find the area, length and width that can be represented by the diagram.

Area:

Length:

Width:

97. Find the area, length and width that can be represented by the diagram.

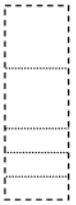


Area:

Length:

Width:

98. Find the area, length and width that can be represented by the diagram.



Area:

Length:

Width:

Multiplying & Dividing Monomials without TILES

When multiplying expressions that have more than one variable or degrees higher than 2, algebra tiles are not as useful.

Multiplying Monomials:

Eg.1.

$(2x^2)(7x)$ Multiply numerical coefficients.

$= 2 \times 7 \times x \times x^2$ Multiply variables using exponent laws.

$= 14x^3$

Eg.2.

$(-4a^2b)(3ab^3)$

$= -4 \times 3 \times a^2 \times a \times b \times b^3$

$= -12a^3b^4$

Dividing Monomials:

Eg.1.

$\frac{20x^3y^4}{-5x^2y^2}$ Divide the numerical coefficients.

$= \frac{20}{-5}\frac{x^3}{x^2}\frac{y^4}{y^2}$ Divide variables using exponent laws.

$= -4xy^2$

Eg.2.

$\frac{-36m^3n^4p^2}{-9m^3np}$

$= \frac{-36}{-9}\frac{m^3}{m^3}\frac{n^4}{n}\frac{p^2}{p}$

$= 4n^3p$

Revisit the exponent laws if

Multiply or Divide the following.

99. $(-2ab^3)(-3ab^5)$

100. $(5x^2y^3)(-2x^3y^5)$

101. $4x(-3x^3)$

102. $\left(\frac{1}{2}ab^2\right)\left(\frac{3}{4}a^3b\right)$

103. $\frac{-75s^2t^5}{15s^2t^2}$

104. $\frac{-45x^3yz^2}{-9x^2y}$

105. $\frac{24x^3y^2}{18xy^3}$

106. $(2cd)(-2c^2d^3)(5c)$

$2 \cdot c \cdot d \cdot -2 \cdot c^2 \cdot d^3 \cdot 5 \cdot c$

$= -20c^4d^4$

107. $\frac{(3xy)(4x^3y^2)}{2x^2y}$