

Algebra 1

Unit 1

Relationships between
Quantities and Expressions

Day 1

What Are Our Learning Goals?

MGSE9–12.A.SSE.1 Interpret expressions that represent a quantity in terms of its context.

MGSE9–12.A.SSE.1a Interpret parts of an expression, such as terms, factors, and coefficients, in context.

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Perform arithmetic operations on polynomials

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H.O.T. Questions



- How do I interpret parts of an expression in terms of context?
- How are polynomial operations related to operations in the real number system?
- How can polynomials be used to express realistic situations?

Whole Class Discussion

Rationale for the format of this math class
Standards-based classroom
21st Century skills
H.O.T. questions
Standards for Mathematical Practice.

(See Day "0" of School presentation)

Opening

Structure of Expressions


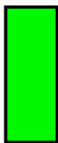

$$2x^2 - 3x - 7$$

Terms	$2x^2, -3x, -7$
How many terms?	three; trinomial
Factors	2 and x^2 , -3 and x
Coefficients	2 and -3
Leading Coefficient	2
Constant	-7
Degree	Second

Opening Algebra Tiles

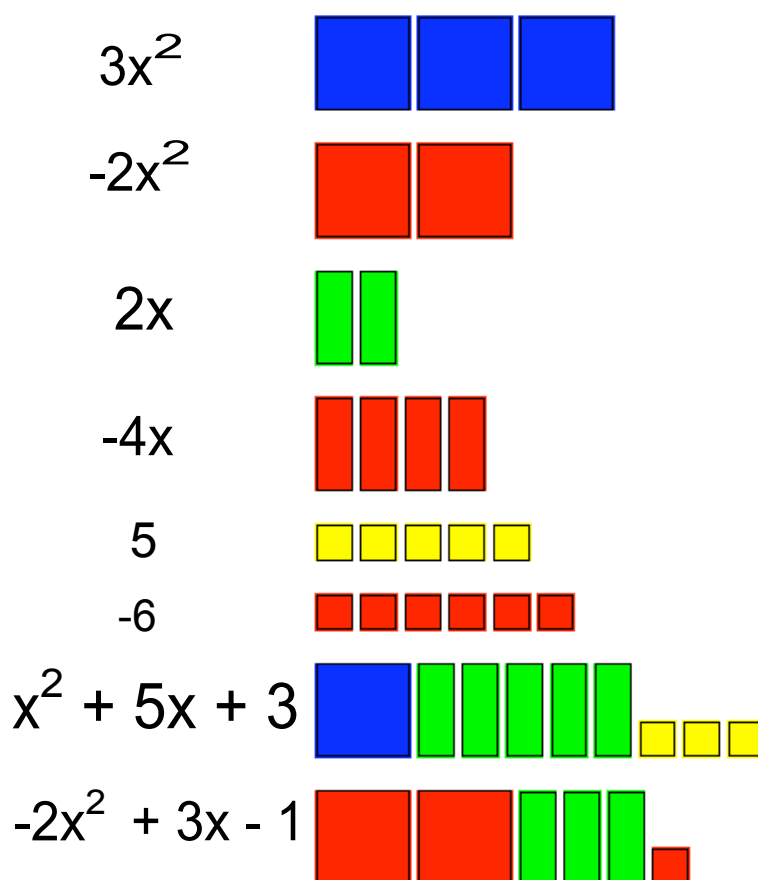
<http://mathbits.com/MathBits/AlgebraTiles/AlgebraTiles/AlgebraTiles.html>



<i>Tile</i>	<i>Dimensions</i>	<i>Area</i>	<i>Color</i>
	1 by 1	$(1)(1) = 1$	Yellow
	1 by x	$(1)(x) = x$	Green
	x by x	$(x)(x) = x^2$	Blue

Note: "Negative" tiles have the same dimensions, but are red instead.

How do we represent algebraic expressions with algebra tiles?



Represent the following expressions using algebra tiles:

1. $-2x + 3$

4. $3x^2 + 3x$

2. $-5x^2 + 6x - 1$

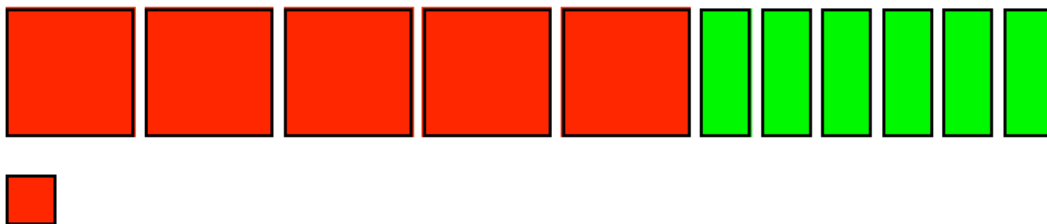
5. $-5x - 5$

3. $x^2 - 4x$

1. $-2x + 3$



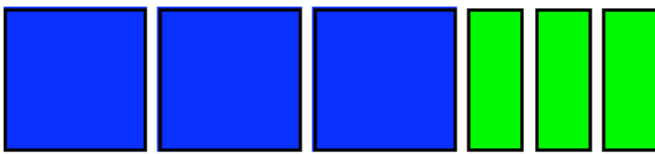
2. $-5x^2 + 6x - 1$



3. $x^2 - 4x$



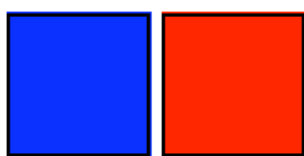
4. $3x^2 + 3x$





5. $-5x - 5$



Zero Pairs (Additive Inverses) - can be removed from the group without changing the value of a polynomial because zero pairs/additive inverses add up to zero.


$$= x^2 - x^2 = 0$$


$$= x - x = 0$$


$$= 1 - 1 = 0$$

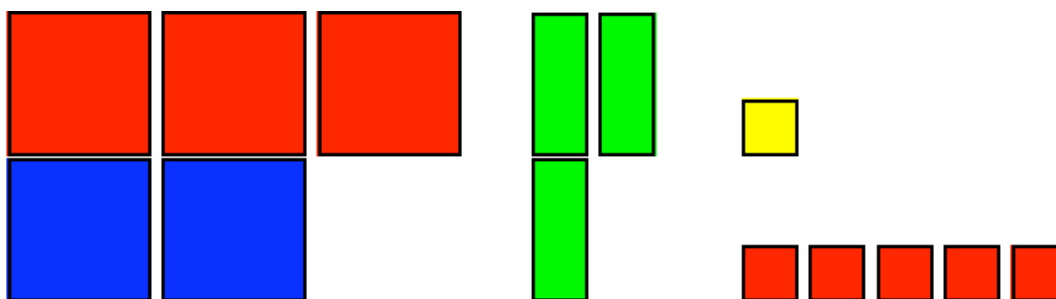
Adding Polynomials

Represent the following using algebra tiles:

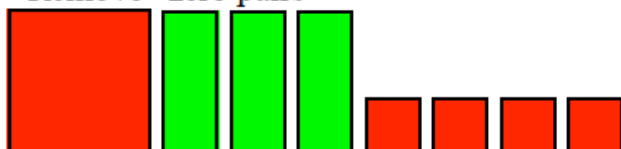
$$(-3x^2 + 2x + 2) + (2x^2 + x - 5)$$

Represent the following using algebra tiles:

$$(-3x^2 + 2x + 2) + (2x^2 + x - 5)$$



- Remove "zero pairs"



The simplified polynomial is: $-x^2 + 3x - 4$

$$\begin{array}{r} -3x^2 + 2x + 2 \\ 2x^2 + x - 5 \\ \hline -x^2 + 3x - 3 \end{array}$$

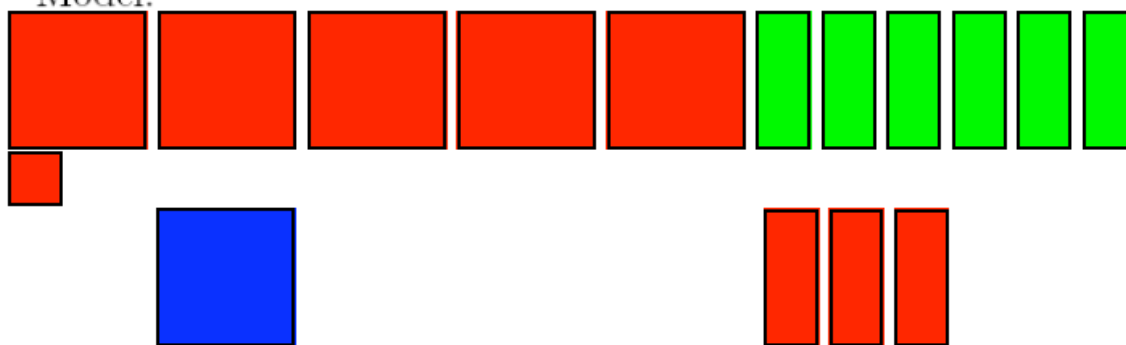
Represent the following with algebra tiles:

$$(-5x^2 + 6x - 1) + (x^2 - 3x)$$

Represent the following with algebra tiles:

$$(-5x^2 + 6x - 1) + (x^2 - 3x)$$

Model:



Answer: $-4x^2 + 3x - 1$

Subtracting Polynomials

Represent the following using algebra tiles

$$(x^2 - 2x + 1) - (-3x^2 - 4x - 1)$$

Subtracting Polynomials

Represent the following using algebra tiles

$$(x^2 - 2x + 1) - (-3x^2 - 4x - 1)$$

Model:



Answer: $4x^2 + 2x + 2$

Notice that for the second expression (the minued), we flipped each tile upside down because subtracting means "adding the opposite", which is the same as distributing the negative.

$-3x^2$ became $3x^2$, $-4x$ became $4x$, and -1 became 1 .

In other words, we first represented the inverse of the second expression and then combined the two expressions.

Subtracting Polynomials

Represent the following using algebra tiles

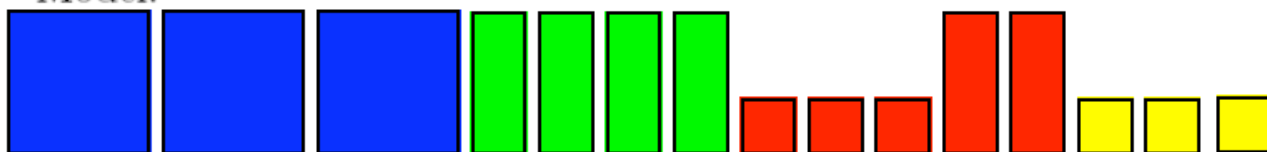
$$(3x^2 + 4x - 3) - (2x - 3)$$

Subtracting Polynomials

Represent the following using algebra tiles

$$(3x^2 + 4x - 3) - (2x - 3)$$

Model:

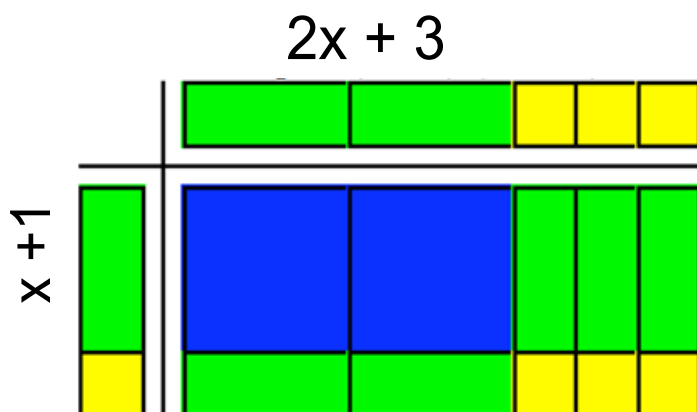


$$\text{Answer: } 3x^2 + 2x$$

Multiplying Polynomials

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

- Use the "L" bracket template to represent the multiplication problem.
- Lay out the tiles on the outside the bracket to represent the factors we are multiplying.
- $x + 1$ could be length, and $2x + 3$ could be width (or the other way around).
- Now fill in the rectangle space with tiles to represent the area.
- Remember when we multiply two factors, we, basically, find the area of a rectangle.

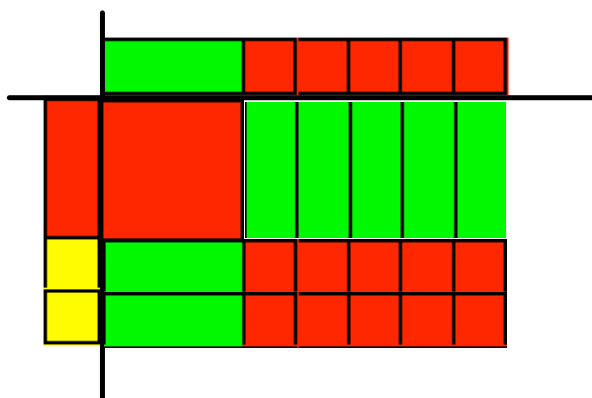


The answer: $2x^2 + 5x + 3$

Multiplying Polynomials

Represent the following using algebra tiles:

$$(-x + 2)(x - 5)$$



Answer: $-x^2 + 7x - 10$

Multiplying Polynomials

Represent the following using algebra tiles:

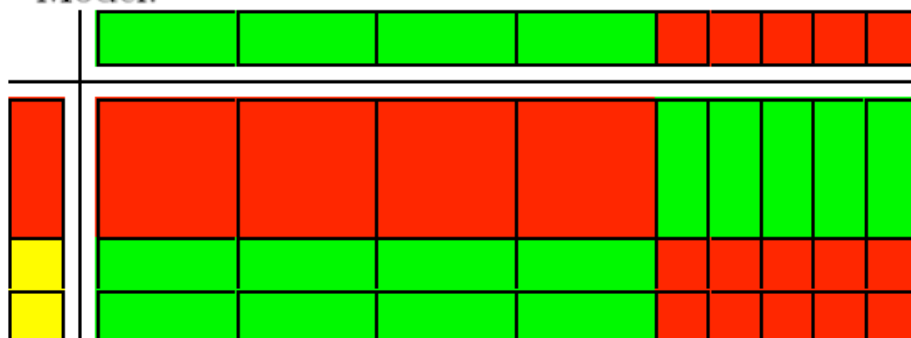
$$(-x + 2)(4x - 5)$$

Multiplying Polynomials

Represent the following using algebra tiles:

$$(-x + 2)(4x - 5)$$

Model:



$$\text{Answer: } -4x^2 + 12x - 10$$

Work Period

Begin The Modeling Framework Task.

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Modeling (Performance Task)

Name _____

Date _____

Perform arithmetic operations on polynomials

MGSE9–12.A.APR.1 Add, subtract, and multiply polynomials; understand that polynomials form a system analogous to the integers in that they are closed under these operations.

Interpret the structure of expressions

MGSE9–12.A.SSE.1a Interpret parts of an expression, such as terms, factors, and coefficients, in context.

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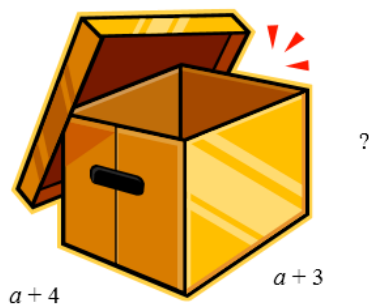
Reason quantitatively and use units to solve problems.

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Problem A **Extension Problem**

The volume in cubic units of the box is $a^3 + 8a^2 + 19a + 12$. Its length is $a + 4$ units and its width is $a + 3$ units. What is its height?



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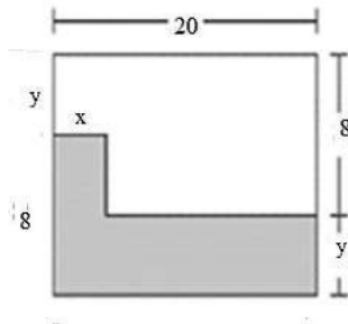
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Problem B

What is an illustration of $(x + 2)(x + 4)$?

Problem C: This rectangle shows the floor plan of an office. The shaded part of the plan is an area that is getting new tile. Write an algebraic expression that represents the area of the office that is getting new tile.



Problem D

What is the rectangle modeling?

	5	+	x
2	10	2x	
+			
x	5x	x ²	

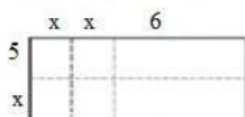
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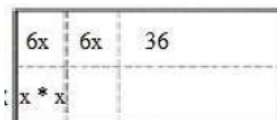
Problem E

What is the product of the expression represented by the model below?



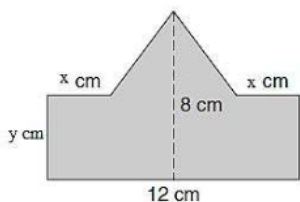
Problem F

Write the dimensions for the rectangle below.



Problem G

Find the area, including units, of the shape below.



Closing

**Answer the lesson's H.O.T. question
Share solutions and strategies.**

H.O.T. Questions



- How do I interpret parts of an expression in terms of context?
- How are polynomial operations related to operations in the real number system?
- How can polynomials be used to express realistic situations?

Homework

Part 1: Classify each as **M** (monomial), **B** (binomial), **T** (trinomial), **P** (polynomial), or **C** (constant).

1.) _____ $2x + 1$

2.) _____ $17x^2 + 11$

3.) _____ $8x^3 + 2x^2 + 3x - 7$

Part 2: Standard Form of Polynomials

4.) Circle the problems that are in standard form. If it is not in standard form, re-write in standard form.

a. $x^3 - 11x^2$ _____

b. $2 + 3x + 4x^2 + 3x^3$ _____

5. Given: $2x^3 - 5x^2 - 2x + 12$

How many terms are there? _____

What is the leading coefficient? _____

What is the coefficient of the 3rd term? _____

What is the constant? _____

Part 3: Add these polynomials. Only combine terms that are alike (have the same exponent).

6.) $14x + 5$

$+10x + 5$

7.) $(19x^2 + 12x + 12) + (7x^2 + 10x + 13) =$

Part 4: Subtract these polynomials.

8.) $(6x + 14)$

$-(9x + 5)$

9.) $(17x^2 + 7x - 14) - (-6x^2 - 5x - 18) =$

10) $(-2x^2 - 5x + 12) - (x^2 + 3x + 12) =$

Algebra 1

Unit 1

Day 2

Warm-Up

Same or different?

$$(x + 1)^2, \quad x^2 + 1, \text{ and } 2(x + 1)?$$

Use Algebra Tiles to justify your point.

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Opening

Whole Class Discussion -
What have we learned so far?

Work Period

Continue the Modeling Task.

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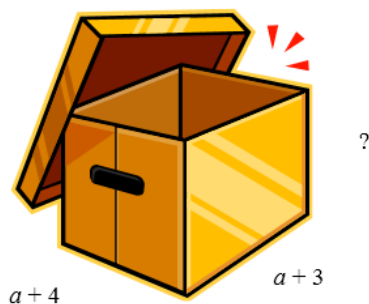
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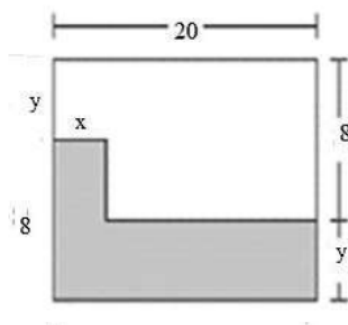
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Problem B

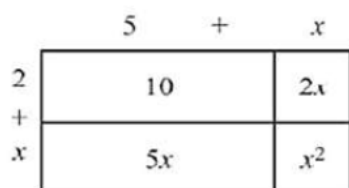
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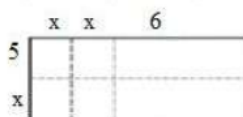
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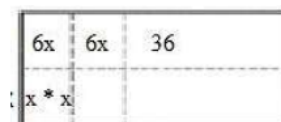
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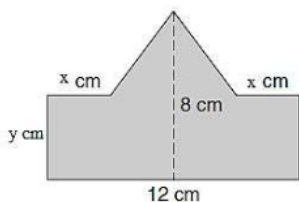
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H.O.T. Questions

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Homework

Part 1: Multiplying Monomials

1.) $2x(4x^2)$

2.) $-3x^3(4x^2)$

3.) $17x^2(2x^5)$

4.) $-12x^2(-2x)$

5.) $4(x + 2)$

Part 2: Multiplying Binomials

1.) $(x + 2)(-x + 3)$

2.) $(2x - 5)(x - 15)$

3.) $(5x - 11)(5x - 11)$

4.) $(6x + 22)(-10x + 5)$

$(11x - 2)(11x + 2)$

