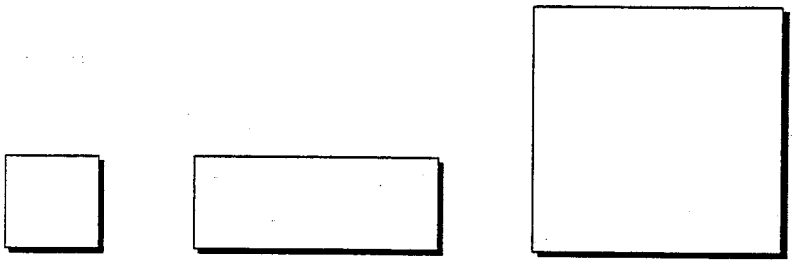
Leading MATH Success

Algebra Tiles

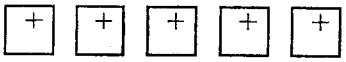


Algebra tiles enable students to use concrete materials and hands-on activities to develop conceptual understanding before moving to the abstract concepts of algebra.

Task 1: Part A - Adding Integers

Where do we use integers, i.e. positive and negative numbers?
_____ , _____

1 red tile represents (+1)
1 blue tile represents (-1)



represents (+5)

represents (-3)

1. Use tiles to show each of the following:

(+3) + (+4) = (+7)	(-1) + (-3) = (-4)	(+5) + (-2) = (+3)
(+4) + (-6) = (-2)	(+2) + (-3) + (-5) + (+4) = (-2)	

2. Use tiles to complete each integer sentence:

(+4) + (-3) = ?	(-5) + (+3) = ?	(+1) + (-5) + (-2) = ?

3. **Use both positive and negative tiles to create 2 different addition sentences that add to (+4):**

_____ + _____ = (+4)	_____ + _____ = (+4)

4. **Use both positive and negative tiles to create 2 different addition sentences that add to 0:**

_____ + _____ = 0	_____ + _____ = 0

5. **Create a problem that involves the calculation:**

(-5) + (+8) = (+3)

Solve your problem. Draw your results.

Hint: Where do we use positive and negative numbers?

6. **Is this statement <u>always true</u>, <u>sometimes true</u>, or <u>never true</u>?**

"A negative # + a positive # = a positive #."

Hint: You may use drawings, examples, and/or words to explain.

Task 1: Part B – Subtracting Integers

Remember – there are many ways to represent zero.

1. Use tiles to show each of the following.

(+5) – (+2) = (+3)	(+3) – (+5) = (-2)	(-4) – (+2) = (-6)
(-3) – (-2) = (-1)	(-3) – (-5) = (+2)	(-4) – (-5) – (+1) = 0

2. Use tiles to complete each integer sentence:

(+4) – (+6) = ?	(-5) – (-1) = ?	(-1) – (-4) = ?

3. **Use both positive and negative tiles to create 2 different subtraction sentences that result in (+4):**

_____ - _____ = (+4)	_____ - _____ = (+4)

4. **Create a problem that involves the calculation:**
   (+5) - (-8) = (+13)
   Solve your problem. Draw your results.

Hint: Remember - subtraction means finding the difference between two numbers. Think of temperature, degrees of latitude, money, etc.

5. **Is this statement <u>always true</u>, <u>sometimes true</u>, or <u>never true</u>?**
   "A negative # – a negative # = a positive #."

Hint: You may use drawings, examples, and/or words to explain.

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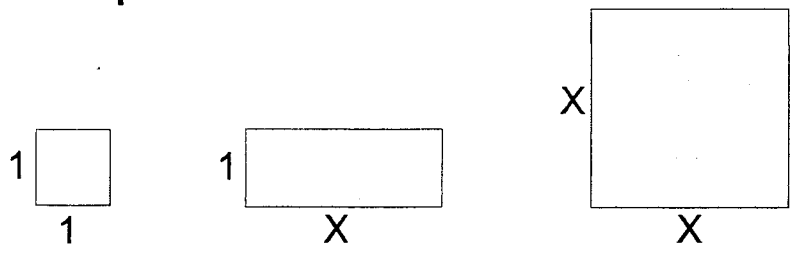
Task 2: Algebra Tiles and Area

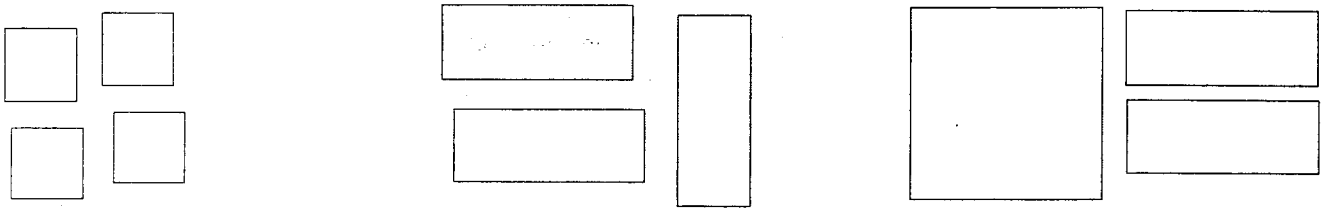
If we give dimensions to each algebra tile, we can determine the area of each shape.



Area:_____ Area:_____ Area:_____

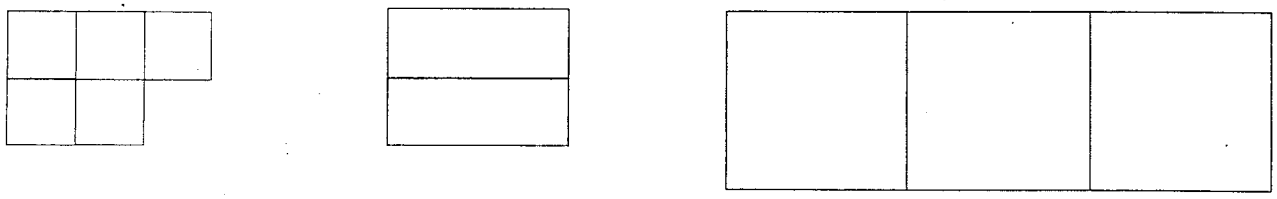
1. Build these groups of tiles. State the total area of each group:

a) **b)** **c)**

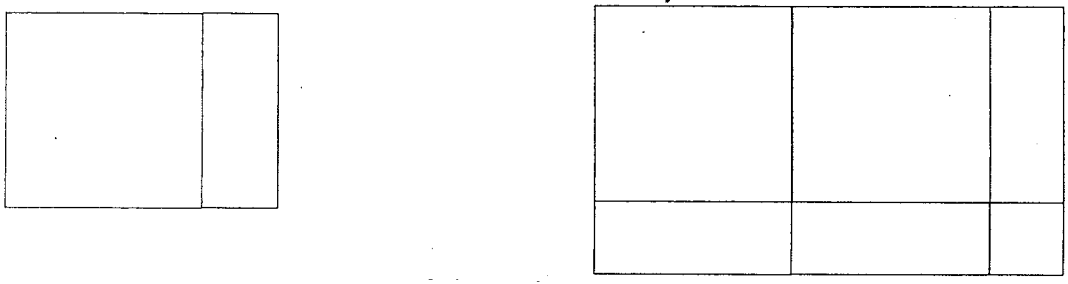


2. Build these algebra tile shapes. State the total area of each shape:

a) **b)** **c)**



d) **e)**



3. Use tiles to make a shape with these areas:

a) $4x^2$ b) $4x$ c) $2x + 4$

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Task 3: Adding and Subtracting Algebraic Expressions

1. Use tiles to represent the following expression: $3x + 1$
   Use tiles to represent the following expression: $2x + 5$

   If you add these expressions, what is the result? _____

   Note: You have just done the following algebraic problem:
   Simplify: $(3x + 1) + (2x + 5)$
   $= 3x + 1 + 2x + 5 =$ _____

   What happened to the brackets?

2. Use tiles to represent the following expression: $2x^2 + 3x + 1$
   Use tiles to represent the following expression: $x^2 + 4x + 3$

   If you add these expressions, what is the result? _____

   Note: You have just done the following algebraic problem:
   Simplify: $(2x^2 + 3x + 1) + (x^2 + 4x + 3)$
   $= 2x^2 + 3x + 1 + x^2 + 4x + 3 =$ _____

3. Look at problem #1 and #2. In your own words, state a "rule" for adding algebraic expressions:

   My rule for adding algebraic expressions:

4. Use your rule from #3 to do the following:

   Simplify: $2x^2 + 4x + 3 + x + 2 =$ _____

   Check your answer using algebra tiles. Did it check? _____

5. Just for fun – fill in the missing terms. Use your tiles to prove your answer.

   Simplify: $2x^2 +$ ____ $+ 3 +$ _____ $+ 4x + 2 = 5x^2 + 7x + 5$

6. Use tiles to represent the following expression: $2x^2 + 3x + 5$
   Use tiles to represent the following expression: $x^2 + 2x + 3$

   What is the result if you subtract (take away) the terms (tiles) of the second expression from the first? _____

Note: You have just done the following algebraic problem:
Simplify: $(2x^2 + 3x + 5) - (x^2 + 2x + 3)$
$= 2x^2 + 3x + 5 - x^2 - 2x - 3 =$ _____

Explain what happened to the minus sign.

7. Simplify: $(2x^2 + 5x + 6) - (2x^2 + 3x + 3)$
   $=$ _____
   $=$ _____

   Check using algebra tiles.

8. Just for fun – fill in the missing terms. Use your tiles to prove your answer.

   Simplify: $2x^2 +$ ____ $+ 3 -$ _____ $- 4x - 2 = x^2 + x + 1$

9. Simplify: $5x^2 + 8x + 3 - 2x^2 - 5x - 2 =$ _____

10. Make up 2 questions using addition and/or subtraction that would give the answer $\boldsymbol{2x^2 + 3x + 5}$:

    a)

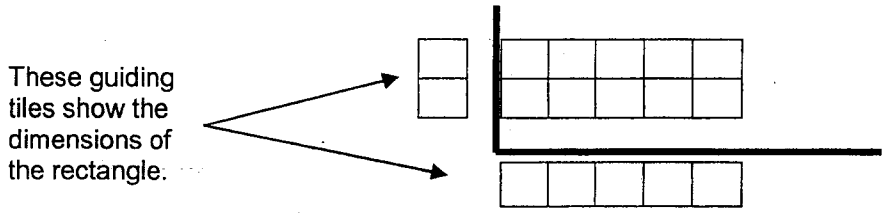
    b)

Compare your questions with a partner. How many different questions are possible?

Task 4: Multiplying Algebraic Expressions

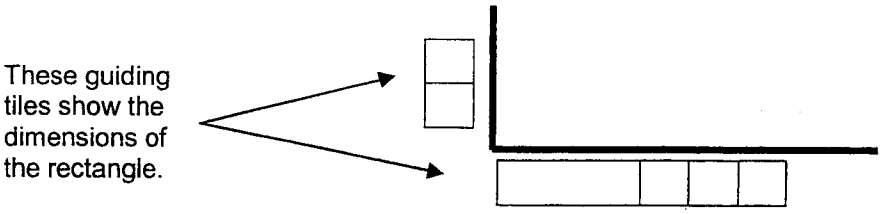
Recall: Algebra tiles can be used to represent the area of rectangles.

1. Consider the expression 2 x 5.
   This means "2 sets of 5" or "find the area of a rectangle with dimensions 2 by 5". We can find the area using algebra tiles:



   Area = _____ units^2

2. Consider the question: Simplify 2(x + 3).
   This also means "2 sets of (x + 3)" or "find the area of a rectangle with dimensions 2 by (x + 3)". We can find the area using algebra tiles:



Make your rectangle by using the appropriate tiles. They should fit perfectly.

   Area = _____ units^2

3. Simplify **3(2x + 1)** using algebra tiles. Remember – this is like finding the area of a rectangle with dimensions _____ by _____.

   Area = _____ units^2. Check your answer with a partner.

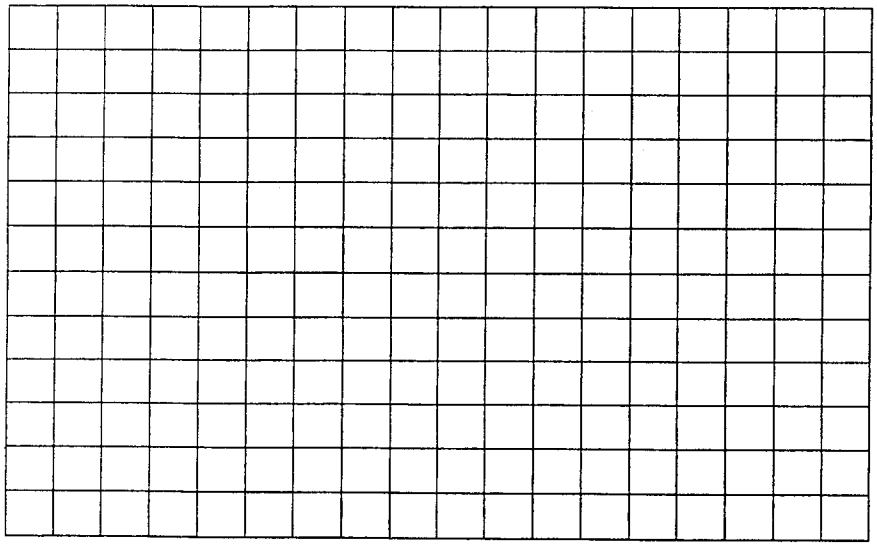
4. Do you see a pattern? Use your pattern to simplify:
   4(3x + 2) = _____

Check your answer with tiles.

Task 5: Factoring Algebraic Expressions

If you know the dimensions of a rectangle, you can determine the area of the rectangle. In this task you will investigate the reverse: **if you are given the area of a rectangle, can you determine the dimensions of the rectangle?**

1. **You are making a rectangular vegetable garden. You know you need an area of 12 m^2. What are the possible dimensions for your garden?**



You may want to draw a model of the garden. Is there more than one way to do this?

2. **A rectangle has an area of 6x units^2. What are the possible dimensions for the rectangle? Use tiles. Draw your results.**

Is there more than one answer?

3. **A rectangle has an area of (4x + 8) units^2. What are the possible dimensions for the rectangle? Use tiles. Draw your results.**

Is there more than one answer?

4. **A rectangle has an area of $(x^2 + 3x)$ units^2. What are the possible dimensions for the rectangle? Use tiles. Draw your results.**

Is there more than one answer?

5. **A rectangle has an area of $(4x + 1)$ units^2. What are the possible dimensions for the rectangle?**

How are your results different from #2, #3, and #4?

6. **Find the factors of the following expression. Use tiles. Draw your results.**

$2x^2 + 3x$

"Find the dimensions of a rectangle given its area" means the same as "find the factors of an algebraic expression".

7. **Your classmate Ravi suddenly says, "I think I see a pattern – I can find the factors of an expression without using tiles!"**

What do you think Ravi's pattern is?

Hint: You may use drawings, examples, and/or words to explain.