Polynomial Operations Lesson #2:
Multiplying a Polynomial by a Monomial

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Using Algebra Tiles

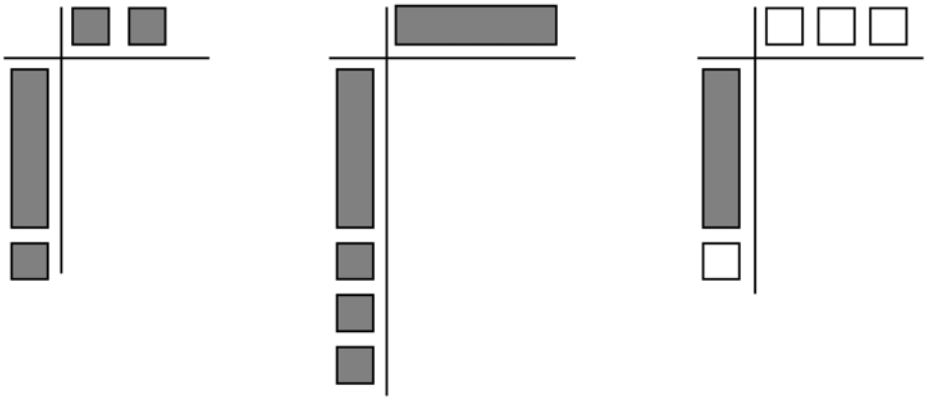
In previous math courses, we learned how to multiply
i) two monomials, and **ii)** a monomial and a binomial or trinomial.

We can use algebra tiles to illustrate the process of multiplying a monomial by a polynomial.

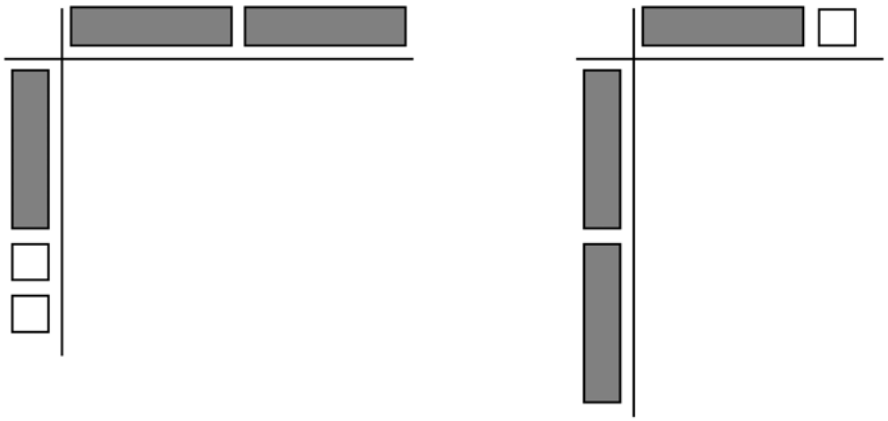
Shaded tiles represent positive quantities and unshaded tiles represent negative quantities.

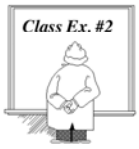
Complete the diagram to determine the product.

a) $2(x+1) =$ $2x+2$ **b)** $x(x+3) =$ x^2+3x **c)** $-3(x-1) =$ $-3x+3$



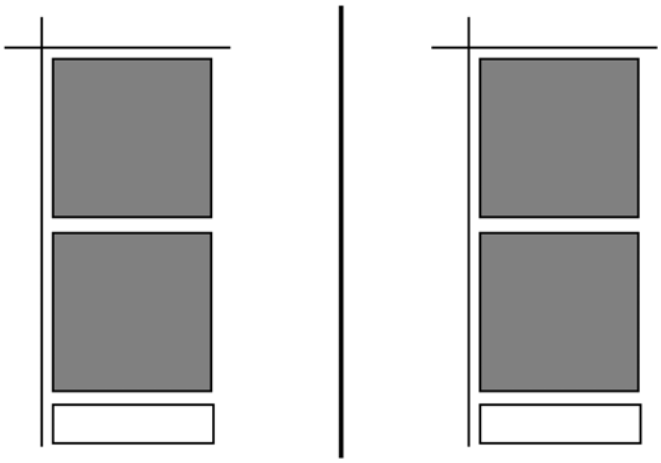
d) $2x(x-2) =$ $2x^2-4x$ **e)** $(x-1)(2x) =$ $2x^2-2x$





Each diagram below illustrates the result of the product of a monomial and a binomial.

Diagram 1 Diagram 2



a) State the polynomial represented in each of the diagrams.

b) Complete the left side and the top of Diagram 1 and write the polynomial product.

c) Complete Diagram 2 to illustrate and write a different polynomial product than in b).

d) Write each product as a sum or difference of terms.

e) Verify the polynomial products in d) when $x = 3$.

Complete Assignment Questions #1 - #3

The Distributive Property

In Class Example #1 we have shown that:

$2(x+1) =$ _____ , $x(x+3) =$ _____ , $2x(x-2) =$ _____ ,

$-3(x-1)$ _____ , and $(x-1)(2x) =$ _____ .

These above are examples of the **distributive property**

$a(b+c) = ab + ac$ or $(b+c)(a) = ba + ca \Rightarrow ab + ac.$

The distributive property can be extended to any number of terms.

Using Numerical Values to Verify the Distributive Property

Consider the expression $-2(3-5)$.

i) Evaluate $-2(3-5)$ by calculating the value inside the brackets first and then multiplying by -2.

$-2(-2)$

$= 4$

ii) Evaluate $-2(3-5)$ by using the distributive property.

$(-2)(3) - 2(-5)$

$= -6 + 10$

$= 4$

iii) Comment on your results from i) and ii).

Use the distributive property to determine the following products.

a) $4(3x+1)$

$4(3x) + 4(1)$

$= 12x + 4$

b) $-5(2x^2 + x - 6)$

$= -10x^2 - 5x + 30$

c) $(x^3 - 2)x^2$

$= x^5 - 2x^2$

d) $-3x(7x - 2y + z)$

$= -21x^2 + 6xy - 3xz$

In the example above we have written a product of polynomials as a sum or difference of terms.

In this process we expanded the polynomial expressions by using the distributive property, $a(b+c) = ab + ac$ and the exponent rule, $x^a \times x^b = x^{a+b}$.

Expand and simplify.

a) $6 - 4(8x + 1)$

$= 6 - 32x - 4$

$= 2 - 32x$

$= -32x + 2$

b) $4(2x - 3) - 2(x - 6)$

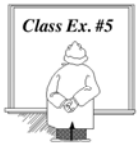
$= 8x - 12 - 2x + 12$

$= 6x$

c) $5x(3x^2 - 7x + 1) - (4x + 3x^2)$

$= 15x^3 - 35x^2 + 5x - 4x - 3x^2$

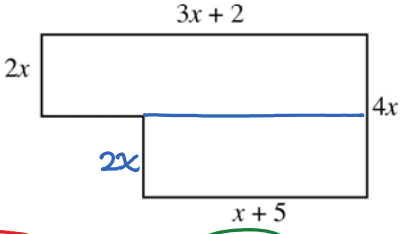
$= 15x^3 - 38x^2 + x$



Determine a simplified expression for the area of the given shape by

i) adding the areas of two rectangles. **ii)** subtracting the areas of two rectangles.

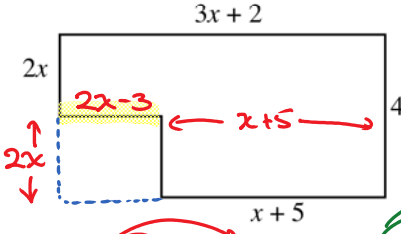
$A = lw$



$A = 2x(3x+2) + 2x(x+5)$

$A = 6x^2 + 4x + 2x^2 + 10x$

$A = 8x^2 + 14x$



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

$= 3x + 2 - x - 5$

$= 2x - 3$

$A = 4x(3x+2) - 2x(2x-3)$

$A = 12x^2 + 8x - 4x^2 + 6x$

$A = 8x^2 + 14x$

Complete Assignment Questions #4 - #11