4.4 Multiplying Polynomials by Monomials

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4.4 MULTIPLYING POLYNOMIALS BY MONOMIALS

Name:_____   Block_____

Example #1: Determine each product.

a) $x(2x + 3)$

Method #1: Algebra Tiles	Method #2: Algebraically
$2x$ $+3$ x x^2 x^2 xxx Fill in dotted lines to represent the product. $2x^2 + 3x$	$x \cdot (2x + 3)$ — multiply x by EVERYTHING inside brackets $(x \cdot 2x) + (x \cdot 3)$ $(2 \cdot x \cdot x)$ $2x^2 + 3x$

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

Method #1: Algebra Tiles	Method #2: Algebraically
$2x^2 - 2x + 1$ -3 -1 $-x^2$ $-x^2$ -1 -1 $-x^2$ $-x^2$ -1 -1 $-x^2$ $-x^2$ -1 $(-)\cdot(+)=(-)$ $(-)\cdot(-)=(+)$ $-6x^2 + 6x - 3$	$-3(2x^2 - 2x + 1)$ $(-3 \cdot 2x^2) - (-3 \cdot 2x) + (-3 \cdot 1)$ $(-3 \cdot 2 \cdot x \cdot x)$ $-6x^2 - (-6x) + (-3)$ $(-)\cdot(-)=(+)$ $(+)\cdot(-)=(-)$ $= -6x^2 + 6x - 3$

1

The symbolic/algebraic process is called the **"DISTRIBUTIVE PROPERTY"**: → "expand the brackets"

OR…the Distributive Law: https://www.youtube.com/watch?v=0v-G6OwcKmU

$2x$ 1 term 2^+ terms $2x + x^2 - 3$

When multiplying a monomial by a polynomial multiply the monomial by

_____every_____ _____term_____ in the polynomial.
(inside brackets) Polynomial 2^+

binomial, trinomial
2   3

Example #2:

Calculate each product.

binomial $= 2^+ =$ polynomial.

a) $5(4m + 2)$

$5 \times (4m + 2)$

$(5 \times 4m) + (5 \times 2)$

$\boxed{20m + 10}$

b) $-3x(5x^2 + 4x - 5)$

$(-3x \cdot 5x^2) + (-3x \cdot 4x) - (-3x \cdot 5)$

$-15x^3 + (-12x^2) - (-15x)$

$\boxed{= -15x^3 - 12x^2 + 15x}$

c) $8x(2y - 3x)$

$(8x \cdot 2y) - (8x \cdot 3x)$

$(8 \cdot 2 \cdot x \cdot y) - (8 \cdot 3 \cdot x \cdot x)$

$\boxed{= 16xy - 24x^2}$

Often questions will require that **you first use the distributive property**, we often call this:

① **expanding**, and then …
② **simplifying**.

Example #3:

Expand and simplify.

a) $3(6x^2 - 2x - 1) - 4(2x^2 - 3x + 5)$

$(18x^2 - 6x - 3) - (8x^2 - 12x + 20)$

$18x^2 - 6x - 3 - 8x^2 + 12x - 20$

$18x^2 - 8x^2 - 6x + 12x - 3 - 20$

$\boxed{= 10x^2 + 6x - 23}$

Steps to solve:

① Expand using the distributive property

② Make sure you also distribute the negative sign when expanding an expression

③ Collect like terms

④ Combine like terms

b) $5k(k + 7) - (k^2 + 4)$

$5k^2 + 35k - (k^2 + 4)$

distribute the $(-)$ sign!

$5k^2 + 35k - k^2 - 4$

$5k^2 - k^2 + 35k - 4$

$\boxed{= 4k^2 + 35k - 4}$

collect like terms.

c) $\frac{1}{3}(6w + 9) - \frac{3}{4}(8w - 12)$

$\left(\frac{1}{3} \cdot \frac{6w}{1}\right) + \left(\frac{1}{3} \cdot \frac{9}{1}\right) - \left[\left(\frac{3}{4} \cdot \frac{8w}{1}\right) - \left(\frac{3}{4} \cdot \frac{12}{1}\right)\right]$

$\left(\frac{6w}{3} + \frac{9}{3}\right) - \left[\left(\frac{24w}{4}\right) - \left(\frac{36}{4}\right)\right]$

$(6 \div 3) \cdot w$

$\{2w + 3\} - [6w - 9]$

*distribute $(-)$ sign!!

$2w + 3 - 6w - (-9)$

$2w + 3 - 6w + 9$

$2w - 6w + 3 + 9$

$\boxed{= -4w + 12}$

HW

((PRACTICE)) (Polynomial)

Multiply a binomial or a trinomial by a monomial.

346. $-2(-3x + 1)$ 347. $-5(2x - 4)$ 348. $2y(7x - 6)$

Multiply a binomial or a trinomial by a monomial.

346. $-2(-3x + 1)$

Possible solution strategy:
-2 (-3x+1)
Distribute
$=-2(-3x)+(-2)(1)$
$=6x-2$

347. $-5(2x - 4)$
$-10x - (-20)$
$-10x + 20$

348. $2y(7x - 6)$
$14yx - 12y$

349. $-4(-9x + 3)$
$36x + (-12)$
$36x - 12$

Correct any errors if applicable.
350. $-8x(x - 3)$ $+24x$
$-8x^2 - 24x$

351. $3x(7x - 2y)$
$21x^2 - 6xy$

352. $7x\left(5x + \dfrac{4y}{7} - 3\right)$
$(7x \cdot 5x) + \left(\dfrac{7x}{1} \cdot \dfrac{4y}{7}\right) - (7x \cdot 3)$
$35x^2 + \dfrac{28xy}{7} - (21x)$
$35x^2 + 4xy - 21x$

353. $\dfrac{1}{2}x(16x - 4y - z)$
$\left(\dfrac{1}{2}x \cdot 16x\right) - \left(\dfrac{1}{2}x \cdot \dfrac{4}{1}y\right) - \left(\dfrac{1}{2}x \cdot z\right)$
$\left(\dfrac{1}{2}x \cdot \dfrac{16}{1}x\right) - \left(\dfrac{1}{2}x \cdot \dfrac{4}{1}y\right)$
$\dfrac{16}{2}x - \dfrac{4}{2}xy - \dfrac{1}{2}xz$
$(16 \div 2 = 8)$ $(4 \div 2 = 2)$
$8x - 2xy - \dfrac{1}{2}xz$

Correct any errors if applicable.
354. $2x(4x + 2 - 11z)$
$8x^2 + 4x + 22z$ $-22xz$
✓ X X
$-4x$

1) $8(2d^2 + 7dg + 9g^2)$
$= 16d^2 + 56dg + 72g^2$

6) $6k(9k^2 - 2kq + 7q^2)$
$= 54k^3 - 12k^2q + 42kq^2$

2) $7q(8q + 5y)$
$= 56q^2 + 35qy$

7) $4q(2q^2 - 6qp - 8p^2)$
$= 8q^3 - 24q^2p - 32qp^2$

Friday Oct 26 - Quiz (4.3-4.4)
Monday Oct 29 - 4.5 notes
Tuesday Oct 30 - Review + Practice Test
Wednesday Oct 31 - Chapter 4 Test