Lesson 5: Multiplication of Polynomials - Part Two

Friday, August 31, 2018 2:35 AM

Polynomial Operations Lesson #5:
Multiplication of Polynomials - Part Two

In this lesson, we deal with more involved polynomial multiplication including multiplying a binomial by a trinomial and the product of three binomials.

Product of a Binomial and a Trinomial

A rectangle has length $(5x + 2)$ cm and width $(x^2 + 2x + 1)$ cm.
Determine the area of the rectangle (in cm^2) by completing each of the following solutions.

Area = length × width = $(5x+2)(x^2+2x+1)$

i) *use a diagram*

	$5x$	2
x^2	$5x^3$	$2x^2$
$2x$	$10x^2$	$4x$
1	$5x$	2

$5x^3+12x^2+9x+2$

ii) *use the distributive property*

$(5x + 2)(x^2 + 2x + 1)$
$= 5x(x^2 + 2x + 1) + 2(x^2 + 2x + 1)$
$= 5x^3+10x^2+5x+2x^2+4x+2$
$= 5x^3+12x^2+9x+2$

Expand and simplify.

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

$= x^2(2x^3+x-5)-4(2x^3+x-5)$
$= 2x^5+x^3-5x^2-8x^3-4x+20$
$= 2x^5-7x^3-5x^2-4x+20$

b) $(2y^2 - 3y - 7)(y - 6)$

	y	-6
$2y^2$	$2y^3$	$-12y^2$
$-3y$	$-3y^2$	$18y$
-7	$-7y$	42

$= 2y^3-15y^2+11y+42$

Expand and simplify $4(a - 4)(a^2 - 3a - 6) - (4a - 3)(4a + 3)$.

$4(a(a^2-3a-6)-4(a^2-3a-6))-(4a(4a+3)-3(4a+3))$
$=4(a^3-3a^2-6a-4a^2+12a+24)-(16a^2+12a-12a-9$
$=4(a^3-7a^2+6a+24)-(16a^2-9)$
$=4a^3-28a^2+24a+96-16a^2+9$
$=4a^3-44a^2+24a+105$

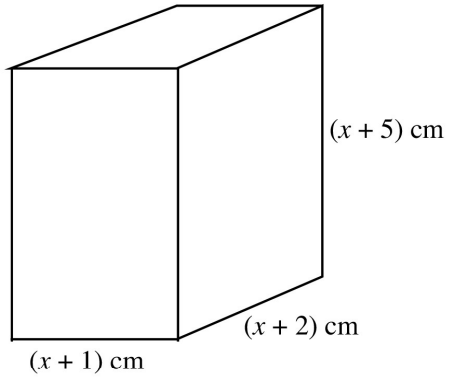
Complete Assignment Questions #1 - #3

Product of Three Binomials

In this section, we extend the multiplication of binomials to consider three factors. This leads to applications involving the volume of a rectangular prism.

Class Ex. #4

Consider the rectangular prism shown.



a) Write an expression which represents the volume of the prism in cm^3.

$V = lwh$

$V = (x+1)(x+2)(x+5)$

b) Expand the expression in a) to write the volume in the form $V = ax^3 + bx^2 + cx + d$.

$= (x+1)(x+2)(x+5)$

$= (x^2+2x+x+2)(x+5)$

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

	x	5
x^2	x^3	$5x^2$
$3x$	$3x^2$	$15x$
2	$2x$	10

$= x^3+8x^2+17x+10$ cm^3

Class Ex. #5

Expand and simplify.

$2 \cdot 3 \cdot 2 = 12$ $3 \cdot 2 \cdot 2 = 12$

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

	$2x$	-1
x	$2x^2$	$-x$
4	$8x$	-4

$(x-3)(2x^2+7x-4)$

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

	$2x^2$	$7x$	-4
x	$2x^3$	$7x^2$	$-4x$
-3	$-6x^2$	$-21x$	12

$= 2x^3+x^2-25x+12$

c) Comment on the results to a) and b).

same answer because $2 \cdot 3 \cdot 4 = 24$, $3 \cdot 2 \cdot 4 = 24$, $4 \cdot 3 \cdot 2 = 24$

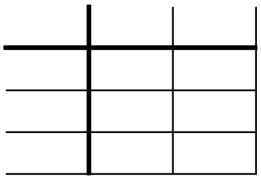
Complete Assignment Questions #4 - #9

Assignment #1-8 /8 L1-5 HW check Wednesday

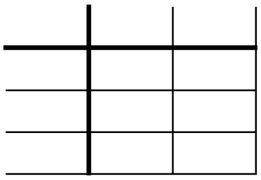
Quiz Nov 16 Friday L4-6
Review Nov 19
Test Nov 21

1. Use a diagram to determine the expansion.

a) $(y-5)(y^2+2y+4)$



b) $(3m+7)(m^2-3m+6)$



2. Use the distributive law to determine the expansion.

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

b) $(2a+5)(a^2-7a-9)$

3. Expand and simplify.

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

b) $(-m^2-m+1)(m+1)$

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

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

4. Expand and simplify.

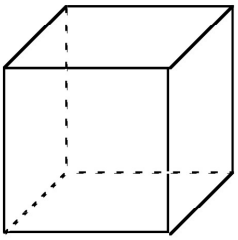
a) $(x+1)(x+2)(3x+5)$

b) $(h-4)(2h-3)(3h-1)$

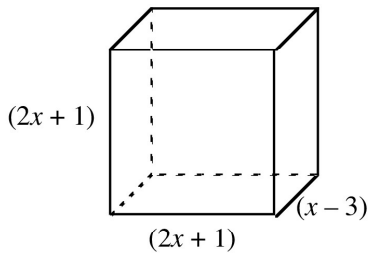
c) $(a+3b)(2a-5b)(2a+5b)$

d) $(3x+7y)(4x-3y)(x-4y)$

5. Calculate the volume of the cube shown below.



6. Calculate the volume of the rectangular prism illustrated.



7. Simplify

a) $-3(a^2+2)(3a^2-a-1)$

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

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

Use the following information to answer the next question.

A student attempts to expand $(a+2)^3$.
His work is shown below.

$(a+2)^3$

$= (a+2)(a+2)(a+2)$ Line 1

$= (a+2)(a^2+4)$ Line 2

$= a^3+2a^2+4a+8$ Line 3

Multiple Choice **8.** Which of the following statements is true?

A. The student made an error in Line 1.

B. The student made an error in Line 2.

C. The student made an error in Line 3.

D. The student's expansion is correct.

Numerical Response **9.** Subtracting the product of $(3x-1)$ and $(2x^2-4x+3)$ from the sum of $(2x^3-7x^2-6)$ and (x^2+6x-3) results in a polynomial of the form ax^3+bx^2+cx+d. The value of $b-2c$ is _____ .

(Record your answer in the numerical response box from left to right)

Answer Key

1. **a)** $y^3-3y^2-6y-20$ **b)** $3m^3-2m^2-3m+42$

2. **a)** $x^3-10x^2+27x-12$ **b)** $2a^3-9a^2-53a-45$

3. **a)** $2x^5-10x^3-x^2-28x+7$ **b)** $-m^3-2m^2+1$
c) $4a^3-15a^2b+7ab^2+6b^3$ **d)** $30x^3+22x^2-36x-16$

4. **a)** $3x^3+14x^2+21x+10$ **b)** $6h^3-35h^2+47h-12$
c) $4a^3+12a^2b-25ab^2-75b^3$ **d)** $12x^3-29x^2y-97xy^2+84y^3$

5. $8z^3+36z^2+54z+27$

6. $4x^3-8x^2-11x-3$

7. **a)** $-9a^4+3a^3-15a^2+6a+6$ **b)** $-2x^4-x^3+10x^2+8x-3$
c) $-27x^3+86x^2-52x+10$

8. B **9.**

2	2		