Foundations and Pre-Calculus 10

Unit 1 Lesson 3 – Multiplying Polynomial by a Monomial

Distributive Property

In Class example 1 we showed that:

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

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

$2x(x-2) =$ $2x^2 - 4x$,

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

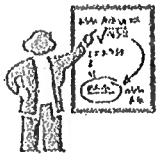
In each case we wrote a **product of polynomials as a sum or differences of terms.**

In this process we **expanded** the polynomial expression by using the distributive property, $a(b+c) = ab + ac$.

To MULTIPLY or EXPAND polynomials

everything in the front times everything in the back

Class Ex. 3:



Expand and simplify.

a) $(-3x^2y)(5x^2y^3)$

$-15x^4y^4$

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

$-6x + 12$

b) $-3(x-5)$

$-3(x) = -3x$ $-3x + 15$

$-3(-5) = -15$

$-3x + 15$

d) $-5(3x^2+4x-9)$

$-5(3x^2) = -15x^2$

$-5(4x) = -20x$

$-5(-9) = 45$

$-15x^2 - 20x + 45$

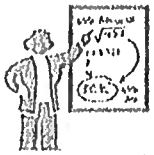
c) $(2x^3+5)(2x)$

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

$4x^4+10x$

f) ~~$2a(5x-7y+2b)$~~

Class Ex. 4:



Expand and simplify

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

$6x^2-12x-2x-6$

$6x^2-14x-6$

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

$-3x^2+9x-6+4+4x^2$

x^2+9x-2

c) $9+2(3x+7)$

$9+6x+14$

$6x+23$

d) ~~$4-2x(3x-9)$~~

e) $3x(5x^2-10x-5)-2x(x+5)$

$15x^3-30x^2-15x-2x^2-10x$

$15x^3-32x^2-25x$

f) $-2x(4x^2-7x-9)-(5-9x^2)$

$=-8x^3+14x^2+18x-5+9x^2$

$=-8x^3+25x^2+18x-5$

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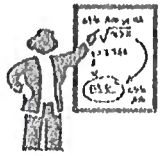
Lesson 4 – Multiplying Polynomials I & II

Learning objectives: The students will extend the strategies for multiplying binomials to multiplying polynomials and special products $(a+b)^2$

With larger polynomials the acronym FOIL does not work since it reflects the skills used for multiplying binomials by binomials.

But when multiplying binomials by trinomials the concept of **multiplying every term in one polynomial by all terms in the other polynomial is used!**

Class Ex. 1:



Expand!

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

2) $(3x+2)(x^2-7x+5)$

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

Class Ex. 2 :

An rectangle has the dimensions $3x+2$ by x^2+4x+4. Determine the area.

Distributive Property

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

Expand and ~~simplify~~.

1) $(x^2+2a)(2x^2+3xa-a^2)$ $= 2x^4+3x^3a-x^2a^2+4ax^2+6xa^2-a$

2) $(x+2)(x^2-5x+9) = x^3-5x^2+9x+2x^2-10x+18$

$= x^3-3x^2-x+18$

Expand and Simplify!

3) $4(x+5)(x+9)-(3x+2)(x-3)$

$= 4(x^2+9x+5x+45)-(3x^2-9x+2x-6)$

$= 4(x^2+14x+45)-(3x^2-7x-6)$

$= 4x^2+56x+135-3x^2+7x+6 = \boxed{x^2+63x+141}$

Product of 3 binomials

When multiplying 3 binomials together always multiply the last two binomials 1st....

Front
Outside
Inside
Last

Examples:

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

$x^2+4x+2x+8$

$(x+5)(x^2+6x+8)$

$x^3+6x^2+8x+5x^2+30x+40$

$x^3+11x^2+38x+40$

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

$6x^2-3x+4x-2$

$(x+5)(6x^2+x-2) \Rightarrow 6x^3+x^2-2x+30x^2+5x-10$

$6x^3+31x^2+3x-10$

3) $(a+3b)(2a+b)(3a+3b)$

$2a^2+ab+6ab+3b^2$

$(2a^2+7ab+3b^2)(3a+3b)$

$6a^3+21a^2b+9ab^2+6a^2b+21ab^2+9b^3$

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

$6a^3+27a^2b+30ab^2+9b^3$

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

$=(4x^2+2x+2x+1)(2x+1) = (4x^2+4x+1)(2x+1)$

$8x^3+4x^2+8x^2+4x$
$+2x+1$

$=8x^3+12x^2+6x+1$

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Multiplying Polynomials I

Class Ex. 1:

Expand and Simplify!

1) $(x+5)^2$

$=(x+5)(x+5)$
$=x^2+5x+5x+25$
$=x^2+10x+25$

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

$=(2x+5)(2x+5)$
$=4x^2+10x+10x+25$
$=4x^2+20x+25$

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

$=(2x-5a)(2x-5a)$
$=4x^2-10ax-10ax+25a^2$
$=4x^2-20ax+25a^2$

4) $(3a-5)(3a-5)$

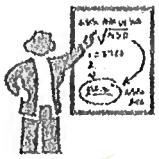
$9a^2-15a-15a+25$

$=9a^2-30a+25$

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

$=(2x-3b)(2x-3b)$
$=4x^2-6xb-6xb+9b^2$ $=4x^2-12xb+9b^2$

Class Ex. 2:



Expand and Simplify!

6) $(x-4)(x+5)-(x+2)(x+7)$

$x^2+7x+2x+14$
$x^2+9x+14$

$x^2+5x-4x-20$

$(x^2+x-20)-(x^2+9x+14)$

$x^2+x-20 \quad -x^2-9x-14$

$-8x-34$

7) $3(x+5)(x-9)-(x+3)$

$=3(x^2-9x+5x-45)-x-3$
$=3(x^2-4x-45)-x-3)$
$=3x^2-12x-135-x-3$ $=3x^2-13x-138$

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Multiplying Polynomials II

Products of binomials and Trinomials

With larger polynomials the acronym FOIL does not work since it reflects the skills used for multiplying binomials by binomials.

But when multiplying binomials by trinomials the concept of _____

Class Ex. 1: **Expand!**

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

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

$= (2x+1)(4x^2+2x+2x+1)$

$= (2x+1)(4x^2+4x+1)$

$= 8x^3+8x^2+2x+4x^2+4x+1 = 8x^3+12x^2+6x+$

2) $(3x+2)(x^2-7x+5)$

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

$12x^3+9$

$= 12x^3-9x^2a+3xa^2-2x^2a+6xa^2-2a^3$

$= 12x^3-11x^2a+9xa^2-2a^3$

odd only

Name:_____ Foundations & Pre-Calculus Score:_____/40
Date:_____ of Mathematics 10
Multiplying Polynomials I Assignment

Section A: (1 mark)

Expand.

1) $(x+7)^2$

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

3) $(x-8)^2$

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

5) $(3a-b)^2$

6) $(5x+2y)^2$

7) $(4a+2c)(4a+2c)$

8) $(5x+3n)(5x-3n)$

9) $(2c-3d)(2c+3d)$

10) $(5-2x^2)(5+2x^2)$

Section B: (2 marks)

11) $5(2x-3)(x-6)$

12) $2(4x-3)(3x-4)$

13) $7(5a-3)(6a+1)$

14) $-8(7a+3)^2$

15) $5(2x+1)^2$

16) $5(3a-2c)(a+3c)$

Name:_____ Foundations & Pre-Calculus Score:_____/40
Date:_____ of Mathematics 10
Multiplying Polynomials I Assignment

17) $-4(a+2c)(2a-3b)$

Section C: (2 marks)

18) $(x-5)(x+5)-(x+2)(x+8)$

19) $(x-4)(x+6)+(x+2)(x+8)$

20) $(9c+4)(4c-9)-(6a-5)^2$

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

Section D: (3 marks)

22) $5x(3x^2-7x+1)-(4x+3x^2)(5x-8)$

23) $5(2a-3)(2a+5)+3(x+7)(x+2)$

24) $8(5-3x)(2+5x)-3(1+x)^2$

25) $3(a-1)^2-2(2a-1)^2$

odd #'s only

Name:_____
Date:_____

Foundations & Pre-Calculus of Mathematics 10
Multiplying Polynomials I Assignment

Score:_____/40

Section A: (1 mark)

Expand.

1) $(x+7)^2$

$x^2+14x+49$

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

$9x^2-6x+1$

3) $(x-8)^2$

$x^2-16x+64$

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

5) $(3a-b)^2$

$9a^2-6ab+b^2$

6) $(5x+2y)^2$

7) $(4a+2c)(4a+2c)$

$16a^2+16ac+4c^2$

8) $(5x+3n)(5x-3n)$

9) $(2c-3d)(2c+3d)$

$4c^2-9d^2$

10) $(5-2x^2)(5+2x^2)$

Section B: (2 marks)

11) $5(2x-3)(x-6)$

$10x^2-75x+90$

12) $2(4x-3)(3x-4)$

13) $7(5a-3)(6a+1)$

$210a^2-91a-21$

14) $-8(7a+3)^2$

15) $5(2x+1)^2$

$20x^2+20x+5$

16) $5(3a-2c)(a+3c)$

Name:_____ Foundations & Pre-Calculus Score:_____/40
Date:_____ of Mathematics 10
Multiplying Polynomials I Assignment

22) $5x(3x^2-7x+1)-(4x+3x^2)(5x-8)$

17) $-4(a+2c)(2a-3b)$

$-8a^2+12ab-16ac+24bc$

23) $5(2a-3)(2a+5)+3(x+7)(x+2)$

$23x^2+47x-35$

$=5(4a^2+10a-6a-15)+3(x^2+9x+14$

$=20a^2+20a-75+3x^2+27x+4$

Section C: (2 marks)

18) $(x-5)(x+5)-(x+2)(x+8)$

24) $8(5-3x)(2+5x)-3(1+x)^2$

19) $(x-4)(x+6)+(x+2)(x+8)$

$2x^2+12x-8$

25) $3(a-1)^2-2(2a-1)^2$

$-5a^2+2a+1$

20) $(9c+4)(4c-9)-(6a-5)^2$

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

$(x^2-10x+25)+(x^2+10x+25)$

$=x^2-10x+25+x^2+10x+25$

$=2x^2+50$

Section D: (3 marks)