University of Caloocan City

College of Liberal Arts & Sciences

Mathematics Department

COLLEGE ALGEBRA
Learning Module #3

Topic	**SPECIAL PRODUCTS AND FACTORING**
Duration	**3 hours**
Lesson Proper	**Types of Special Products**

1. Product of Two Binomials

$$(ax+by)(cx+dy)=acx^2+(ad+bc)xy+bdy^2$$

Example #1: Find the product: $(2x-3y)(4x+5y)$

$$(2x-3y)(4x+5y)=(2)(4)x^2+(2\cdot 5-3\cdot 4)xy-(3)(5)y^2=8x^2-2xy-5y^2$$

2. Square of Binomials

$$(x+y)^2=x^2+2xy+y^2$$
$$(x-y)^2=x^2-2xy+y^2$$

- ***The result of the square of a binomial is a perfect square trinomial***

It is important to emphasize that in $(x+y)^2$: x refers to first term, and y refers to second term

Example#2: $(3x-7)^2=(3x)^2-2(3x)(7)+7^2=9x^2-42x+49$

Example#3: $(5x^3-9y^4)^2=(5x^3)^2-2(5x^3)(9y^4)+(9y^4)^2=25x^2-90x^3y^3+81y^8$

3. Product of the Sum and the Difference of the Same Two Terms:

$$(x+y)(x-y)=x^2-y^2$$

Example#4: $(4x+5y)(4x-5y)=(4x)^2-(5y)^2=16x^2-25y^2$

4. Cube of a Binomial

$$(x+y)^3=x^3+3x^2y+3xy^2+y^3$$
$$(x-y)^3=x^3-3x^2y+3xy^2-y^3$$

Example#5: $(a^2-4)^3=(a^2)^3-3(a^2)^2(4)+3(a^2)(4)^2-(4)^3$

5. Special Case Of Product of Binomial and Trinomial

$$(x+y)(x^2-xy+y^2)=x^3+y^3$$
$$(x-y)(x^2+xy+y^2)=x^3-y^3$$

Example#6: $(7a-4b)(49a^2+28ab+16b^2)=(7a)^3-(4b)^3=343a^3-64b^3$

Example#7: $(3c^2-5d^4)(9c^4+15c^2d^4+25d^8)=(3c^2)^3-(5d^4)^3=27c^6-125d^{12}$

	6. Square of Trinomial $(\boldsymbol{a+b+c})^{\boldsymbol{2}} = \boldsymbol{a^2+b^2+c^2+2ab+2ac+2bc}$ **Examples:** $\boldsymbol{(3x+y-5)^2 = (3x)^2+(y)^2+(-5)^2+2(3x)(y)+2(3x)(-5)+2(y)(-5)}$ $\boldsymbol{= 9x^2+y^2+25+6xy-30x-10y}$
Exercises	**Determine the product by identifying the type of special product to be used in the following:** 1. $(4x^3-9y^5)(4x^3+9y^5)$ 2. $(2a^4-y^5)(2a^4-y^5) =$ 3. $(2x-5y)^3$ 4. $(2x^3-3y^5)(x^3+4y^5)$ 5. $(5c-2d^3)(25c^2+10cd^3+4d^6)$ 6. $(6x-y-2z)^2$