LESSON 2

MULTIPLYING POLYNOMIALS

      To multiply polynomials, multiply each term in one polynomial by each term in the other polynomial, collect like terms, if necessary, then add those answers together, and simplify if needed.

A. Multiplying Monomials (1 term $\times$ 1 term)

Example 1: (3x)(5y)

        $3 \times 5 = 15$, **and** $x \times y = xy$

        Therefore, we have **15xy.**

B. Multiplying a Monomial by a Binomial (1 term $\times$ 2 terms)

Example 2: 2a(4b – 2)

        $2a \times 4b = 8ab$, $2a \times$ -2 = -4a

        Therefore, we have **8ab – 4a**

C. Multiplying a Binomial by a Binomial (2 term $\times$ 2 terms)

Example 3: (x + 3)(x – 4)

        $x \times x = x^2$, $x \times$ -4 = -4x, 3 $\times$ x = 3x, 3 $\times$ -4 = -12

Putting them all together we have, **x^2 – 4x + 3x – 12**

Collecting like terms we have, **x^2 – x – 12.**

D. Multiplying a Binomial by a Trinomial (2 term $\times$ 3 terms)

Example 4: (x + 2y)(3x − 4y + 5)

        $x \times 3x = 3x^2$, $x \times$ -4y = -4xy, $x \times$ 5 = 5x, next multiply by **2y**

        $2y \times 3x = 6xy$, $2y \times$ -4y = -8y^2, $2y \times$ 5 = 10y

Putting them all together we have, **$3x^2$ - 4xy + 5x + 6xy - 8y^2 + 10y**

Collecting like terms we have, **$3x^2$ + 5x + 2xy + 10y - 8y^2**

E. Multiplying a Trinomial by a Trinomial (3 term $\times$ 3 terms)

Example 5: (2a^2 + 6a + 3)(7a^2 – 2a + 2)

        $2a^2 \times 7a^2 = 14a^4$, $2a^2 \times$ -2a = -4a^3, $2a^2 \times$ 2 = 4a^2, next multiply by **6a**

        6a $\times$ 7a^2 = 42a^3, 6a $\times$ -2a = -12a^2, 6a $\times$ 2 = 12a, next multiply by 3

        3 $\times$ 7a^2 = 21a^2, 3 $\times$ -2a = -6a, 3 $\times$ 2-4a^3 = 6

Putting them all together we have, **14a^4 - 4a^3 + 4a^2 + 42a^3 - 12a^2 + 12a + 21a^2 - 6a + 6**

Putting them all together we have, **14a^4 + 38a^3 + 13a^2 + 6a + 6.**

Example 6: $(5p^2 + 3p + 3)(3p^2 + 2p + 1)$

      A simpler method.

$$15p^4 + 10p^3 + 5p^2$$
$$9p^3 + 6p^2 + 3p$$
$$9p^2 + 6p + 3$$
$$- - - - - - - - - - - - - -$$
$$15p^4 + 19p^3 + 20p^2 + 9p + 3$$
$$- - - - - - - - - - - - - -$$

LESSON 2 EXERCISE

Find each product.

1) $6(p - 7)$

2) $4k(8k + 4)$

3) $2(6x + 3)$

4) $3n^2(6n + 7)$

5) $5m^4(4m + 4)$

6) $3(4r - 7)$

7) $(4n + 6)(8n + 8)$

8) $(2x + 1)(x - 4)$

9) $(8b + 3)(7b - 5)$

10) $(r + 8)(4r + 8)$

11) $(4x + 5)(2x + 3)$

12) $(7n - 6)(n + 7)$

13) $(3v - 4)(5v - 2)$

14) $(6a + 4)(a - 8)$

15) $(6x - 7)(4x + 1)$

16) $(5x - 6)(4x - 1)$

17) $(5x + y)(6x - 4y)$

18) $(2u + 3v)(8u - 7v)$

19) $(x + 3y)(3x + 4y)$

20) $(8u + 6v)(5u - 8v)$

21) $(7x + 5y)(8x + 3y)$

22) $(5a + 8b)(a - 3b)$

23) $(r - 7)(6r^2 - r + 5)$

24) $(4x + 8)(4x^2 + 3x + 5)$

25) $(6n - 4)(2n^2 - 2n + 5)$

26) $(2b - 3)(4b^2 + 4b + 4)$

27) $(6x + 3y)(6x^2 - 7xy + 4y^2)$

28) $(3m - 2n)(7m^2 + 6mn + 4n$

29) $(8n^2 + 4n + 6)(6n^2 - 5n + 6)$

30) $(2a^2 + 6a + 3)(7a^2 - 6a + 1)$

SOLUTIONS

LESSON 1 EXERCISE

1) $\left(5x^2 - 6x + 5\right) + \left(3x^2 - 2x - 1\right)$

$\quad 5x^2 - 6x + 5$

$+\ 3x^2 - 2x - 1$

$\underline{\hspace{3cm}}$

$\quad 8x^2 - 8x + 4$

$\underline{\hspace{3cm}}$

2) $\left(2x^2 + 3x - 4\right) + \left(4x^2 + 6x + 8\right)$

$\quad 2x^2 + 3x - 4$

$+\ 4x^2 + 6x + 8$

$\underline{\hspace{3cm}}$

$\quad 6x^2 + 9x + 4$

$\underline{\hspace{3cm}}$

3) $\left(8x^2 - x + 10\right) + \left(-7x^2 + 4x - 6\right)$

$8x^2 - x + 10$

$+$

$-7x^2 + 4x - 6$

$\underline{\hspace{3cm}}$

$\quad x^2 + 3x + 4$

$\underline{\hspace{3cm}}$

4) $\left(7x^2 + 3x - 8\right) + \left(-4x^2 - x + 10\right)$

$7x^2 + 3x - 8$

$+$

$-4x^2 - x + 10$

$\underline{\hspace{3cm}}$

$3x^2 + 2x + 2$

$\underline{\hspace{3cm}}$

5) $\left(6x^2 - 7x + 4\right) + \left(2x^2 - 6x + 8\right)$

$6x^2 - 7x + 4$

$+$

$2x^2 - 6x + 8$

$\underline{\hspace{3cm}}$

$8x^2 - 13x + 12$

$\underline{\hspace{3cm}}$

6) $\left(5x^2 + 3x - 3\right) + \left(2x^2 - 5x - 4\right)$

$5x^2 + 3x - 3$

$+$

$2x^2 - 5x - 4$

$\underline{\hspace{3cm}}$

$7x^2 - 2x - 7$

$\underline{\hspace{3cm}}$

7) $\left(13x^2 + 7x - 7\right) + \left(5x^2 + 4x - 2\right)$

$13x^2 + 7 - 7$

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

$\underline{\hspace{3cm}}$

$18x^2 + 11x - 9$

$\underline{\hspace{3cm}}$

8) $\left(12x^2 - 4x + 6\right) + \left(-5x^2 + 6x + 3\right)$

$12x^2 - 4x + 6$

$+$

$-5x^2 + 6x + 3$

$\underline{\hspace{3cm}}$

$7x^2 + 2x + 9$

$\underline{\hspace{3cm}}$

9) $\left(9x^2 + 6x + 4\right) + \left(3x^2 - 3x + 3\right)$

3

$9x^2 + 6x + 4$

$+$

$3x^2 - 3x + 3$

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$12x^2 + 3x + 7$

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10) $\left(15x^2 - 10x + 6\right) + \left(-9x^2 + 5x + 5\right)$

$15x^2 - 10x + 6$

$+$

$-9x^2 + 5x + 5$

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$6x^2 - 5x + 11$

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11) $\left(14x^2 + 13x - 8\right) - \left(8x^2 - 15x + 6\right)$

$14x^2 + 13x - 8$

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$8x^2 - 15x + 6$

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$6x^2 + 28x - 14$

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12) $\left(12x^2 + 8x - 3\right) - \left(-5x^2 + 6x - 2\right)$

$12x^2 + 8x - 3$

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$-5x^2 + 6x - 2$

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$17x^2 + 2x - 1$

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13) $\left(19x^2 + 9x - 16\right) - \left(7x^2 + 20x + 4\right)$

$19x^2 + 9x - 16$

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$7x^2 + 20 + 4$

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$12x^2 - 11x - 20$

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14) $\left(16x^2 - 8x + 3\right) - \left(-8x^2 - 5x - 12\right)$

$16x^2 - 8x + 3$

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$-8x^2 - 5x - 12$

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$24x^2 - 3x + 15$

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15) $\left(-15x^2 - 6x - 5\right) - \left(-18x^2 - 10x - 8\right)$

$-15x^2 - 6x - 5$

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$-18x^2 - 10x - 8$

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$3x^2 + 4x + 3$

_____

16) $\left(18x^2 + 5x - 7\right) - \left(12x^2 + 3x - 9\right)$

$18x^2 + 5x - 7$

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$12x^2 + 3x - 9$

_____

$6x^2 + 2x + 2$

_____

17) $\left(-14x^2 - 10x + 8\right) - \left(-16x^2 - 8x - 6\right)$

$-14x^2 - 10x + 8$

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$-16x^2 - 8x - 6$

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$2x^2 - 2x + 14$

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18) $\left(17x^2 + 8x + 5\right) - \left(12x^2 - 5x + 3\right)$

$17x^2 + 8x + 5$

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$12x^2 - 5x + 3$

_____

$5x^2 + 13x + 2$

_____

19) $\left(3x^2 - 4x - 4\right) - \left(-6x^2 - 7x + 5\right)$

$3x^2 - 4x - 4$

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$-6x^2 - 7x + 5$

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$9x^2 + 3x - 9$

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20) $\left(8x^2 + 7x + 2\right) - \left(4x^2 + 2x - 1\right)$

$8x^2 + 7x + 2$

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$4x^2 + 2x - 1$

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$4x^2 + 5x + 3$

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LESSON 2 EXERCISE

1. $6p - 42$
2. $32k^2 + 16k$
3. $32k^2 + 16k$
4. $18n^3 + 21n^2$
5. $20m^5 + 20m^4$
6. $12r - 21$
7. $32n^2 + 80n + 48$
8. $2x^2 - 7x - 4$
9. $55b^2 - 19b - 15$
10. $4r^2 + 40r + 64$
11. $8x^2 + 22x + 15$
12. $7n^2 + 43n - 42$
13. $15v^2 - 26 + 8$
14. $6a^2 - 44a - 32$
15. $24x^2 - 22x - 7$

16. $20x^2 - 29x + 6$
17. $30x^2 - 14xy - 4y^2$
18. $16u^2 + 10uv - 21v^2$
19. $3x^2 + 13xy + 12y^2$
20. $40u^2 - 34uv - 48v^2$
21. $56x^2 + 61xy + 15y^2$
22. $5a^2 - 7ab - 24b^2$
23. $6r^3 - 43r^2 + 12r - 35$
24. $16x^3 + 44x^2 + 44x + 40$
25. $12n^3 - 20n^2 + 38n - 20$
26. $8b^3 - 4b^2 - 4b - 12$
27. $36x^3 - 24x^2y + 3xy^2 + 12y^3$
28. $21m^3 + 4m^2n - 8n^3$
29. $48m^4 - 16n^3 + 64n^2 - 6n + 36$
30. $14a^4 + 30a^3 - 13a^2 - 12a + 3$