LESSON PLAN

Course: Grade 12 U Advanced Functions **Lesson : 1 - 1**

Unit/Chapter: Polynomial Skills **Topic: Expanding**

- ***introductions:*** **handout MHF 4U outline**
  math rewrite policy

- ***note:*** **Expanding**

$$\begin{aligned} 2(2x-3)^2 &= 2(2x-3)(2x-3) \\ &= (4x-6)(2x-3) \\ &= 8x^2-12x-12x+18 \\ &= 8x^2-24x+18 \end{aligned}$$

or

$$\begin{aligned} &2\left[4x^2-6x-6x+9\right] \\ &= 2\left(4x^2-12x+9\right) \\ &= 8x^2-24x+18 \end{aligned}$$

It is important to note that you must decide which method works best for you. Once a method is chosen, you must use it consistently.

$$\begin{aligned} (2x-1)^3 &= (2x-1)(2x-1)(2x-1) \\ &= \left[4x^2-2x-2x+1\right](2x-1) \\ &= \left[4x^2-4x+1\right](2x-1) \\ &= 8x^3-4x^2-8x^2+4x+2x-1 \\ &= 8x^3-12x^2+6x-1 \end{aligned}$$

$$\begin{aligned} (2x^2-3x+4)(x^2+4x-5) &= 2x^4+8x^3-10x^2-3x^3-12x^2+15x+4x^2+16x-20 \\ &= 2x^4+5x^3-18x^2+31x-20 \end{aligned}$$

- ***homework assignment:*** **Foundations of Math 12** p. 13-15
  exercise 1.1 # 5 & 9 (odd letters)
  exercise 1.2 # 2 – 4 (odd letters)

Exercise 1.1

5. Expand and simplify.

(a) $(x + 7)(x + 2) + (x - 3)(x - 1)$
(b) $(x - 5)(x + 1) - (x + 4)(x - 3)$
(c) $5(t - 3)(t + 3) - 2(t - 1)(t + 6)$
(d) $4(y + 3)(y + 2) - 6(y - 1) + 8$
(e) $3(m + 1)^2 - 2(m - 1)^2$
(f) $2(x - 3)^2 - 2(x + 3)^2 - 2(x - 3)(x + 3)$
(g) $6(r - 4)(r - 3) - (r - 2)(r - 1) - r^2$

9. Expand and simplify.

(a) $2(3x + y)(x - 2y) + (x + y)^2$
(b) $(5y - 2z)^2 - (3y - 4z)(y + z)$
(c) $3(2x - 3y)(2x + 3y) - (x - y)^2$
(d) $(5x - y)(2x + y) - (x - 3y)(x + y)$
(e) $2(3t + r)(t - 3r) - 3(t + r)(2t + 5r)$
(f) $3(2x - y)^2 - 3(2x - y)^2 + y^2$

Exercise 1.2

2. Find the following products.

(a) $(3t - 1)(t^2 - t - 2)$
(b) $(2t + 1)(3t^2 + 2t - 1)$
(c) $(3m - 4)(m^2 - 3m + 2)$
(d) $(1 - 2r)(3 - 5r - 4r^2)$
(e) $(4x + 5)(2x^2 - 3x - 3)$
(f) $(y^2 - y + 5)(y^2 - 2y - 3)$
(g) $(3x^2 - 2x - 2)(2x^2 + 6x + 7)$
(h) $(5t^2 + 3t - 2)(2t^2 - t + 4)$
(i) $(1 - 3t + 4t^2)(2 - t - t^2)$

3. Expand and simplify.

(a) $(x^2 - 2x - 3)(x^2 + x + 1)$
(b) $(2t^2 - t + 1)(t^2 + 2t + 3)$
(c) $(m^2 - m - 1)^2$
(d) $(3r^2 - 4r + 1)(r^2 + 5r - 2)$
(e) $(3x^2 - x - 5)^2$

4. Expand and simplify.

(a) $(x - 3)(x - 2)(x - 1)$
(b) $(x + 3)(x + 4)(x - 2)$
(c) $(t + 1)(t + 2)(t - 7)$
(d) $(2x - 3)(x + 4)(3x + 5)$

Answers:

1. (a) One obtains a five-pointed star in both cases.
   (c) The number of points in the star equals the number of sides in the pentagon (5 in both cases).
2. If one doubles the turn in a regular hexagon one obtains an equilateral triangle of side 50 units (the triangle is traversed by the turtle twice).
   If one triples the turn in a regular hexagon one obtains a straight line of length 50 units (the line is traversed by the turtle six times).

EXERCISE 1.1

1. (a) monomial, 4 (b) monomial, 8 (c) monomial, 3 (d) binomial, 2
   (e) trinomial, 2 (f) binomial, 13 (g) binomial, 7 (h) trinomial, 7
   (i) monomial, 6 (j) binomial, 4 (k) binomial, 9 (l) trinomial, 6
   (m) binomial, 3 (n) monomial, 21 (o) trinomial, 8 (p) binomial, 14
2. (a) $5x^5 + 6x^3 + 4x^2$
   (b) $5x^4 + 3x^3 + 7x^2 + 5x$
   (c) $4x^3y^3 + 9x^2y^3 + 5x^3y$
   (d) $-3x^5y^2 - 3x^4y^2 + 2x^3y + 2x^2y$
   (e) $-4xy^3 + 5x^3 + 8xy + 21$
   (f) $11x^5y^2 - 5m^6 - x^5 + 4x^3y$
   (g) $2m^4n^3 - 5m^6 + 2x^4$
   (h) $y^4 - 5x^3 + 3xy - 3x + 2$
3. (a) $x^2 + x - 30$ (b) $3t^2 + 7t + 2$ (c) $12y^2 - 25y + 7$ (d) $4r^2 - 1$
   (e) $x^2 + 6x + 9$ (f) $x^2 - 8x + 16$ (g) $9x^2 + 48x + 64$ (h) $16t^2 - 72t + 81$
   (i) $9m^2 - 121$ (j) $14x^2 + 41x - 3$
4. (a) $2x^2 - xy - 3y^2$ (b) $s^2 + 2st - 3t^2$ (c) $4x^2 + 20xy + 25y^2$
   (d) $49t^2 - 42tm + 9m^2$ (e) $4 - 16t^2$ (f) $x^2 - y^2$
   (g) $-3x^2 - 6xy - 3y^2$ (h) $x^2 - 2xy + y^2$ (i) $9p^2 - 4q^2$
   (j) $16x^2 - 25y^2$
5. (a) $2x^2 + 5x + 17$ (b) $-5x + 7$ (c) $3t^2 - 10t - 33$
   (d) $4y^2 + 14y + 38$ (e) $m^2 + 10m + 1$ (f) $-2x^2 - 24x + 18$
   (g) $4r^2 - 39r + 70$
6. (a) $x^2 + 22x + 117$ (b) $x^2 + 34x + 289$
7. (a) $-x^2 - 3x + 8$ (b) $28t^2 - 8t - 2$ (c) $-6y^2 - 6y - 33$
   (d) $-5m^2 + 25m + 78$ (e) $-13x^2 + 32x - 1$ (f) $36t^2 - 6t + 9$
8. (a) $6x^2 + 15x - 9$ (b) $4x^2 + 20x + 25$
9. (a) $7x^2 - 8xy - 3y^2$ (b) $22y^2 - 19yz + 8z^2$ (c) $11x^2 + 2xy - 28y^2$
   (d) $9x^2 + 5xy + 2y^2$ (e) $-37tr - 21r^2$ (f) y^2

EXERCISE 1.2

1. (a) $x^3 + 3x^2 + 3x + 1$ (b) $x^3 - 5x^2 + 5x + 2$ (c) $2x^3 + 7x^2 + 5x + 6$
   (d) $3x^3 - 7x^2 - x + 5$ (e) $x^3 - x^2 + x - 21$
2. (a) $3t^3 - 4t^2 - 5t + 2$ (b) $6t^3 + 7t^2 - 1$ (c) $3m^3 - 13m^2 + 18m - 8$
   (d) $8r^3 + 6r^2 - 11r + 3$ (e) $8x^3 - 2x^2 - 27x - 15$
3. (a) $x^4 - x^3 - 4x^2 - 5x - 3$ (b) $2t^4 + 3t^3 + 5t^2 - t + 3$
   (c) $m^4 - 2m^3 - m^2 + 2m + 1$ (d) $3r^4 + 11r^3 - 25r^2 + 13r - 2$
   (e) $9x^4 - 6x^3 - 29x^2 + 10x + 25$ (f) $y^4 - 3y^3 + 4y^2 - 7y - 15$
   (g) $6x^4 + 14x^3 + 5x^2 - 26x - 14$ (h) $10t^4 + t^3 + 13t^2 + 14t - 8$
   (i) $-4t^4 - t^3 + 10t^2 - 7t + 2$
4. (a) $x^3 - 6x^2 + 11x - 6$ (b) $x^3 + 5x^2 - 2x - 24$
   (c) $t^3 - 4t^2 - 19t - 14$ (d) $6x^3 + 25x^2 - 11x - 60$

EXERCISE 1.3

1. (a) $3(x + 3)$ (b) $7(x - 2)$ (c) $s(13t + 8)$ (d) $x(2y + 5)$
   (e) $t(3t - 4)$ (f) $mn(2 - 3t)$ (g) $6(s - 1)$ (h) $3x(t - 2y + 1)$
2. (a) $3x(x + 1)(x - 3)$ (b) $4t^3(9t - 4)$ (c) $xy(18x - 9y + xy)$
   (d) $x^4(x^3 - x^2 + x - 1)$ (e) $2m(nt - 3n + 4)$ (f) $2t^4(3 - 2t)$
   (g) $x^7y^6(x^2y^2 - 1 + xy^3)$ (h) $5mn(2m - 3n - mn)$
3. (a) $7a(bc - 2b + 3)$ (b) $2x^2(x^4 - 2x^2 - 1)$ (c) $13rs(3t - 1)$
   (d) $5a^2b(5 - 7b - 8ab^2)$ (e) $abc(27 - d)$ (f) $4x^6(x + 2 - 3x^2)$
   (g) $xy(24y - 1 - 8x)$ (h) $6x^2y^2(2y - 3x - 4)$
4. (a) $(a + b)(2x + 3)$ (b) $(m + n)(4t + 5s)$ (c) $(x - 3)(5w + 1)$ (d) $(x + 2)(x + 1)$