Unit 2A.1 – Adding and Subtracting Polynomials

Student Learning Targets:

- I can identify the terms, bases, exponents, coefficients, and factors in an expression.
- I can determine the real world context of the variables in an expression.
- I can identify the individual factors of a given term within an expression.
- I can explain the context of different parts of a formula.

Notes:

Notes (Continued for 2A.1):

Assignment 2A.1

Determine whether each expression is a polynomial. If it is a polynomial, find the degree, leading coefficient and determine whether it is a monomial, binomial, or trinomial.

1. $7ab + 6b^2 - 2a^3$
2. $2y - 5 + 3y^2$
3. $3x^2$
4. $\frac{4m}{3p}$
5. $5m^2p^3 + 6$
6. $5q^{-4} + 6q$

Write each polynomial in standard form. Identify the leading coefficient.

7. $2x^5 - 12 + 3x$
8. $-4d^4 + d^2$
9. $4z - 2z^2 - 5z^4$
10. $2a + 4a^3 - 5a^2 - 1$

Find the sum and difference.

11. $(6x^3 - 4) + (-2x^3 + 9)$
12. $(g^3 - 2g^2 + 5g + 6) - (g^2 + 2g)$
13. $(4 + 2a^2 - 2a) - (3a^2 - 8a + 7)$
14. $(8y - 4y^2) + (3y - 9y^2)$

Assignment 2A.1 (Continued)

15. $(-4z^3 - 2z + 8) - (4z^3 + 3z^2 - 5)$

16. $(-3d^2 - 8 + 2d) + (4d - 12 + d^2)$

17. $(y + 5) + (2y + 4y^2 - 2)$

18. $(3n^3 - 5n + n^2) - (-8n^2 + 3n^3)$

19. The equations $P = 7m + 137 \ and \ C = 4m + 78$ represent the number of cell phones P and digital cameras C sold in *m* months at an electronics store. Write an equation for the total monthly sales *T* of phones and cameras. Then predict the number of phones and cameras sold in 10 months.

20. The total number of students *T* who traveled for spring break consists of two groups: students who flew to their destinations *F* and students who drove to their destination *D*. The number (in thousands) of students who flew and the total number of students who flew or drove can be modeled by the following equations, where *n* is the number of years since 1995.

$$T = 14n + 21 \quad F = 8n + 7$$

   a. Write an equation that models the number of students who drove to their destination for this time period

   b. Predict the number of students who will drive to their destination in 2012.

   c. How many students will drive or fly to their destination in 2015?

21. The cost to rent a car for a day is $15 plus $0.15 for each mile driven.

   a. Write a polynomial that represents the cost of renting a car for *m* miles.

   b. If a car is driven 145 miles, how much would it cost to rent?

   c. If a car is driven 105 miles each day for four days, how much would it cost to rent a car?

   d. If a car is driven 220 miles each day for seven days, how much would it cost to rent a car?

Unit 2A.2 – Multiplying Polynomials

Student Learning Targets:

- I can understand that the product of two binomials is the sum of monomial terms.
- I can understand that an expression has different forms.
- I can justify the different forms based on mathematical properties.
- I can interpret different symbolic notation.

Notes:

Notes (Continued for 2A.2):

Assignment 2A.2

Find each product.

1. $5w(-3w^2 + 2w - 4)$

2. $2j^2(5j^3 - 15j^2 + 2j + 2)$

3. $4km^2(8km^2 + 2k^2m + 5k)$

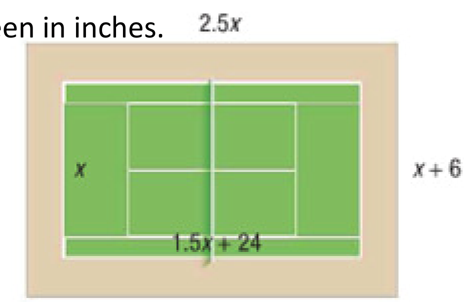
4. $-3p^4r^3(2p^2r^4 - 6p^6r^3 - 5)$

Simplify each expression.

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

6. $-5w^2(8w^2x - 11wx^2) + 6x(9wx^4 - 4w - 3x^2)$

7. Marlene is buying a new plasma television. The height of the screen of the television is one half the width plus 5 inches. The width is 30 inches. Find the height of the screen in inches.



8. The tennis club is building a new tennis court with a path around it.
   a. Write an expression for the area of the tennis court.
   b. Write an expression for the area of the path.
   c. If x = 36 feet, what is the perimeter of the outside of the path?

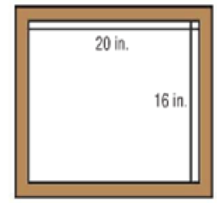
9. $(x + 5)(x + 2)$

10. $(b - 7)(b + 3)$

11. $(2a + 9)(5a - 6)$

12. $(3b - 4)(3b - 4$

13. Hugo is designing a frame as shown at the right. The frame has a width of x inches all the way around. Write an expression that represents the total area of the picture frame.



14. $(2a-9)(3a^2+4a-4)$

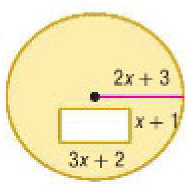
15. $(4y^2-3)(4y^2+7y+2)$

16. $(x^2-4x+5)(5x^2+3x-4)$

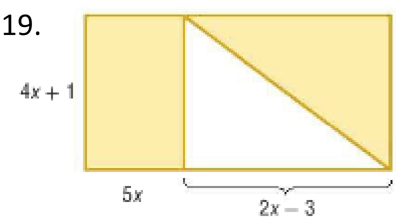
17. $(2n^2+3n-6)(5n^2-2n-8)$

Find an expression to represent the area of each shaded region

18.



19.



Find each product.

20. $(x+5)^2$

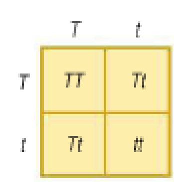
21. $(11-a)^2$

22. $(3m-4)(3m-4)$

23. $(a-3)(a+3)$

24. $(9x+6)(9x-6)$

25. $(2x+5)(2x+5)$



26. The ability to roll your tongue is inherited genetically from parents if either parent has the dominant trait *T*. Children of two parents without the trait will not be able to roll their tongues.
   a. Show how the combinations can be modeled by the square of a sum.
   b. Predict the percent of children that will have both dominant genes, one dominant gene, and both recessive genes.

Unit 2A.3 - Factoring the GCF Factoring $x^2 + bx + c$

Student Learning Targets:

- I can recognize the greatest common factor of each term.
- I can use the distributive property to factor polynomials.
- I can factor trinomials of the form $x^2 + bx + c$.

Notes:

Notes (Continued for 2A.3):

Assignment 2A.3

Find the greatest common factor (GCF) of the two terms.

1. $2x^2$ and $4x$

2. $10st$ and $15s^2$

3. $8j^2k$ and $24jk^2$

Use the Distributive Property to factor each polynomial.

4. 15x -3y

5. 21b – 15a

6. $27y^2 + 18y$

7. $8\mathrm{a}^2 - 16\mathrm{a}^3$

8. $5\mathrm{m}^3\mathrm{n} + 15\mathrm{mn}^2$

9. $34\mathrm{x}^2\mathrm{yz}^3 - 17\mathrm{xyz}$

10. $6r^2 - 6r^3 - 3r$

11. $2m^4 - 2m^2 + m$

12. $30n^3 + 5n^2 + 25n$

13. $64\mathrm{a}^2\mathrm{b}^3 - 16\mathrm{b}^2\mathrm{a}^3$

14. $-4a^2b - 8ab^2 + 2ab$

15. $12jk^2 + 6j^2k + 2j^2k^2$

Assignment 2A.3 (Continued)

Factor each polynomial. If the expression cannot be factored, say so or write *prime.*

16. $x^2 + 20x + 100$

17. $x^2 - x - 30$

18. $z^2 - 13z + 36$

19. $m^2 - 7m + 12$

20. $k^2 - 5k - 36$

21. $k^2 + 11k + 18$

22. $b^2 + 8b + 7$

23. $n^2 - 10n + 9$

24. $x^2 + 6x + 8$

25. $c^2 - 9c - 18$

26. $a + a^2 - 56$

27. $-15x + 50 + x^2$

28. $x^2 - 8x + 7$

29. $-12 + x + x^2$

30. $m^2 + 13m + 42$

Additional Problems: UM2: 1.6 pg. 49 #1-4, 12-19 MA2: 4.3 pg. 255 #3-14

Unit 2B.1 - Factoring $ax^2 + bx + c$

Student Learning Targets:

- I can factor trinomials of the form $ax^2 + bx + c$ where a>1.

When factoring an expression, first check to see whether the terms have a **greatest common factor**.

Notes:

Notes (Continued for 2B.1):

Assignment 2B.1

Factor each polynomial. If the expression cannot be factored, say so or write *prime.*

1. $3x^2 - 2x - 5$

2. $2n^2 + 5n + 2$

3. $3w^2 - 8w + 4$

4. $2m^2 + 11m + 5$

5. $5n^2 - 18n + 9$

6. $6m^2 + 37m + 6$

7. $4x^2 - 35x + 49$

8. $4t^2 - 15t - 25$

9. $5x^2 + 3x + 4$

10. $6b^2 - 38b - 144$

11. $15a^2 - 9a - 24$

12. $20x^2 - 104x - 96$

13. $18n^2 + 48n + 24$

14. $8x^2 + 38x - 10$

15. $12x^2 - 28x - 24$

Additional Problems: UM2: 1.7 pg. 55 #1-4, 10-21 MA2: 4.4 pg. 263 #3-12

Unit 2B.2 - Factoring: Special Product Factors

Student Learning Targets:

- I can factor perfect square trinomials.
- I can factor binomials that are the difference of squares.
- I can factor by grouping.

Notes:

When factoring an expression, first check to see whether the terms have a **greatest common factor**.

Notes (Continued for 2B.2):

Assignment 2B.2

Factor each polynomial completely.

1. $x^2 + 14x + 49$

2. $x^2 + 30x + 225$

3. $x^2 - 18x + 81$

4. $x^2 - 24x + 144$

5. $x^2 + 6x + 9$

6. $4x^2 - 20x + 25$

7. $x^2 - 16$

8. $x^2 - 25$

9. $x^2 - 81$

10. $x^2 - 16y^2$

11. $9x^2 - 25$

12. $x^4 - 16$

13. $4qr + 8r + 3q + 6$

14. $x^3 - 3x^2 + 2x - 6$

15. $7x^3 - 5x^2 + 28x - 20$

16. $2mk - 12m + 42 - 7k$

17. $3p - 2p^2 - 18p + 27$

18. The area of a square is represented by $9x^2 - 42x + 49$. Find the length of each side.

19. Given that the area of a rectangle is $36x^2 - 49$**,** write an expression for the rectangle's length and width.

20. A company makes square copper tiles with an area of $x^2 + 24x + 144$. Write an expression for the **perimeter** of a tile.

Additional Problems: UM2: 1.5 pg. 39 #5-8, 21-38, 1.8 pg. 60 #1-44

Unit 2B.3 - Factoring: Higher Order Factoring

Student Learning Targets:

- I can factor sums and difference of cubes.
- I can factor higher order polynomials completely.

<u>Special Factoring Patterns</u>

Sums of Two Cubes $\boldsymbol{a^3 + b^3 = (a + b)(a^2 - ab + b^2)}$

Difference of Two Cubes $\boldsymbol{a^3 - b^3 = (a - b)(a^2 + ab + b^2)}$

Notes:

Notes (Continued for 2B.3):

Assignment 2B.3

Factor each polynomial completely.

1. $x^3 + 1$

2. $x^3 + 125$

3. $x^3 - 216$

4. $x^3 - 27$

5. $x^3 - 512$

6. $x^3 + 1000$

7. $8x^3 + 1$

8. $x^3 - y^3$

9. $64x^3 + 8$

Factor each polynomial completely using any method.

10. $2p^8 + 10p^5 + 12p^2$

11. $4x^5 - 40x^3 + 36x$

12. $3x^5 + 15x - 18x^3$

13. $a^4 + 7a^2 + 6$

14. $32x^5 - 108x^2$

15. $18c^4 + 57c^3 - 10c^2$

Unit 2B.4 - Solve by Factoring and Using Real-World Situations

Student Learning Targets:

- I can solve quadratic equations by factoring.
- I can solve other polynomial equations by factoring.
- I can solve applied problems

Notes:

Notes (Continued for 2B.4):

Assignment 2B.4

Solve the already factored equation.

1. $x(x-1) = 0$ 2. $x^2(x+2) = 0$ 3. $(x-3)(x+5) = 0$

Solve the equation.

4. $x^2 - 8x + 12 = 0$ 5. $b^2 - 6b + 9 = 0$ 6. $c^2 + 5c + 4 = 0$

7. $n^2 - 6n = 0$ 8. $x^2 + 2x = 80$ 9. $-3y + 28 = y^2$

10. $16x^2 - 1 = 0$ 11. $11q^2 - 44 = 0$ 12. $15x^2 + 7x - 2 = 0$

13. $2x^2 - 4x - 8 = -x^2 + x$ 14. $x = 4x^2 - 15x$

Find the zeros of the function

15. $f(x) = 3x^2 - 8x + 5$ 16. $y = 3x^2 - 3x$

Problem Solving.

17. Zelda is building a deck in her backyard. The plans for the deck show that it is to be 24 feet by 24 feet. Zelda wants to reduce one dimension by a number of feet and increase the other dimension by the same number of feet. If the area of the reduced deck is 512 square feet, what are the dimensions of the deck?

18. A zoo has an aquarium shaped like a rectangular prism. It has a volume of 180 cubic feet. The height of the aquarium is 9 feet taller than the width, and the length is 4 feet shorter than the width. What are the dimensions of the aquarium?

19. Given that the area of a rectangle is $36x^2 - 49$, write and expression for rectangle's length and width?

20. Given that the area of a square is $x^2 + 16x + 64$, write and expression for square's length and width?

21. Given that the area of a square is $x^2 - 32x + 256$, write and expression for square's length and width?

22. A company makes square iron sheets with an area of $x^2 + 6x + 9$. Write an expression for the perimeter of the iron sheets.

Unit 2C .1 – Solve Quadratic Equations by Finding Square Roots

Student Learning Targets:

- I can simplify radical expressions.
- I can solve a quadratic formula for a variable of interest.
- I can solve quadratic equations, including complex solutions by taking the square root.

Notes:

Notes (Continued for 2C.1):

Assignment 2C.1

Simplify.

1. $\sqrt{28}$

2. $\sqrt{150}$

3. $\sqrt{3} \cdot \sqrt{27}$

4. $5\sqrt{24} \cdot 3\sqrt{10}$

5. $\sqrt{\frac{35}{36}}$

6. $\frac{8}{\sqrt{3}}$

7. $\frac{7}{\sqrt{12}}$

8. $\frac{1}{5+\sqrt{6}}$

9. $\frac{\sqrt{2}}{4+\sqrt{5}}$

10. $\frac{3+\sqrt{7}}{2-\sqrt{10}}$

Solve the equation.

11. $x^2 = 169$

12. $x^2 = 84$

13. $4x^2 = 448$

14. $-3x^2 = -213$

Assignment 2C.1 (Continued)

15. $7x^2 - 10 = 25$

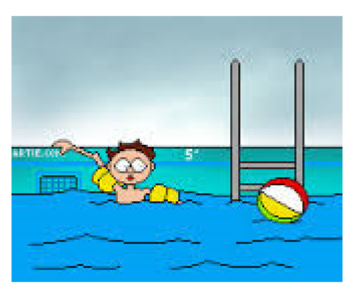
16. $\frac{x^2}{25} - 6 = -2$

17. $4(x-1)^2 = 8$

18. $7(x-4)^2 - 18 = 10$

19. $2(x+2)^2 - 5 = 8$

20. For a swimming pool with a rectangular base, Torricelli's law implies that the height *h* of water in the pool *t* seconds after it begins draining is given by $h = (\sqrt{h_o} - \frac{d^2 t}{lw})^2$ where *l* and *w* are the pool's length and width, *d* is the diameter of the drain, and h_o is the water's initial height. In terms of *l, w, d,* and h_o, what is the time required to drain the pool when it is completely filled?



Unit 2C.2 – Solve Quadratic Equations by Completing the Square

Student Learning Targets:

- I can solve quadratic equations by completing the square.

Notes:

Notes (Continued for 2C.2):

Assignment 2C.2

Solve the equation by finding square roots.

1. $x^2 + 4x + 4 = 9$

2. $x^2 + 16x + 64 = 36$

3. $x^2 - 22x + 121 = 13$

4. $x^2 + 8x + 16 = 45$

Find the value of *c* that makes the expression a perfect square trinomial. Then write the expression as the square of a binomial.

5. $x^2 + 6x + c$

6. $x^2 - 24x + c$

7. $x^2 + 50x + c$

8. $x^2 - 13x + c$

Solve the Equation by completing the square.

9. $x^2 + 4x = 10$

10. $x^2 + 8x = -1$

11. $x^2 + 12x + 18 = 0$

12. $x^2 - 2x + 25 = 0$

13. $x^2 - 18x + 86 = 0$

14. $x^2 + 20x + 90 = 0$

Unit 2C.3 – Solve Quadratic Equations Using the Quadratic Formula

Student Learning Targets:

- I can derive the quadratic formula from completing the square.
- I can solve quadratic equations by using the quadratic formula.
- I can interpret the discriminant.
- I can understand the meaning of a complex number.
- I can understand the meaning of roots.

Quadratic Formula $\dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Notes:

Notes (Continued for 2C.3):

Assignment 2C.3

Use the quadratic formula to solve the equations.

1. $x^2 - 4x - 5 = 0$

2. $x^2 - 6x + 7 = 0$

3. $x^2 + 8x + 19 = 0$

4. $6x^2 + 4x + 11 = 0$

5. $3x^2 - 12x = -12$

6. $6 - 2x^2 = 9x + 15$

7. $4 + 9x - 3x^2 = 2$

8. $x^2 = -14 - 3x$

Find the discriminant of the quadratic equation and give the number and type of solutions of the equation.

9. $x^2 + 7x + 11 = 0$

10. $8x^2 - 4x + 2 = 5x - 11$

11. $x^2 - 8x + 16 = 0$

Unit 2C.4 – Task Applied Problems

Student Learning Targets:

- I can use solve applied problems using square roots, completing the square, and the quadratic formula.

Modeling Dropped Objects: $h = -16t^2 + h_o$ (Without initial velocity)
$h = -16t^2 + v_{ot} + h_o$ (With initial velocity)

Notes:

Notes (Continued for 2C.4):

Assignment 2C.4

1. A cliff diver dives off a cliff 40 feet above water. Write an equation giving the diver's height *h* (in feet) above the water after *t* seconds. How long is the diver in the air?

2. On any planet, the height *h* (in feet) of a falling object *t* seconds after it is dropped can be modeled by $h = -\frac{g}{2}t^2 + h_o$ where h_o is the object's initial height (in feet) and *g* is the acceleration in feet per second squared) due to the planet's gravity. For each planet in the table, find the time it takes for a rock dropped from a height of 150 feet to hit the surface.

Planet	Earth	Mars	Jupiter	Saturn	Pluto
g (ft/sec^2	32	12	76	30	2

3. You want to transform a square gravel parking lot with 10 foot sides into a circular lot. You want to circle to have the same area as the square so that you do not have to buy any additional gravel.

a. Write an equation you can use to find the radius *r* of the circular lot.

b. What should the radius of the circular lot be?

4. While marching, a drum major tosses a baton into the air and catches it. The height *h* (in feet) of the baton after *t* seconds can be modeled by $h = -16t^2 + 32t + 6$. How long is the baton in the air?

5. The height *h* (in feet) of a volleyball *t* seconds after it is hit can be modeled by $h = -16t^2 + 48t + 4$. How long is the volleyball in the air?

6. A store sells about 40 video game systems each moth when it charges $200 per system. For each $10 increase in price, about 1 less system per month is sold. The store's revenue can be modeled by $y = (200 + 10x)(40 - x)$. When would the revenue be zero?

7. In a football game, a defensive player jumps up to block a pass by the opposing team's quarterback. The player bats the ball downward with his hand at an initial velocity of -50 feet per second when the ball is 7 feet above the ground. How long do the defensive player's teammates have to intercept the ball before it hits the ground?

8. The number S of ant species in Kyle Canyon, Nevada, can be modeled by the function $S = -0.000013E^2 + 0.042E - 21$ where E is the elevation (in meters). Predict the elevation (s) at which you would expect to find 10 species of ants.

9. Tell how there is not a quadratic equation $ax^2 + bx + c = 0$ such that *a, b,* and *c* are real numbers and 3*i* and -2*i* are solutions.