Unit 12 Notes
Polynomials and Factoring

Tentative Schedule

Day	Class Work	Assignment
Tues. 5/26 Wed. 5/27	Introduction to Polynomials Adding and Subtracting Polynomials	P.S. #12.1
Thurs. 5/28	Multiplying and Dividing Polynomials by Monomials	P.S. #12.2
Fri. 5/29 Mon. 6/1	Multiplying Polynomials by Polynomials	P.S. #12.3
Tues. 6/2	Review of Polynomials	P.S. #12.3b
Wed. 6/3 Thurs. 6/4	Factors and GCF	P.S.#12.4
Fri. 6/5	Factoring by GCF	P.S. #12.5
Mon. 6/8 Tues. 6/9	Factoring Trinomials	P.S. #12.6
Wed. 6/10	Practice!	P.S. #12.6b
Thurs. 6/11 Fri. 6/12	Review for Test #12	Review for Test #12
Mon. 6/15	Test #12	

Name: _____

Notes 12.1 - Introduction to Polynomials
Adding and Subtracting Polynomials

Monomial	
Binomial	
Trinomial	
Polynomial	
Degree	

For 1-6, determine of the following are a monomial, binomial, or a trinomial.

1. $3x^2$ **2.** $4x+4$ **3.** $7x^2+8x+1$

4. $8x^3+3x^2+x$ **5.** $17x$ **6.** $3x^2-2x$

For 7-12, put the polynomial in descending order and determine the degree.

7. $3x^4+5x^2+3$ **8.** $12x^5+2x+8$ **8.** $15x+3$

10. $4x^3+2x-8x^4$ **11.** $-13x+8x^4$ **12.** $5x^3-7x^5+2x^2-4+8x$

Finding sums of polynomials:

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

1.) Underline each _____ _____ in a different way.

2.) Every time you have a new like term, _____ _____.

3.) Make sure your answer is written in _____ _____.

1.) $(8y^2+2y)+(3y^2+7y)$

2.) $(3x^3-4x^2+4x-2)+(7x^3-9x^2+2x+4)$

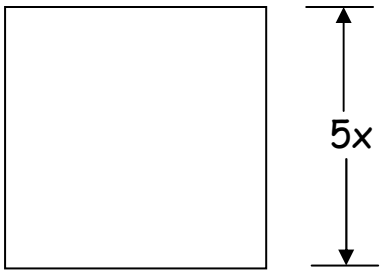
3.) $(6r^4+r+3)+(3r^3+2r^2+7)$

4.) $(12y^3-9y+8y+2)+(6y^2-12-3y+2y^2)$

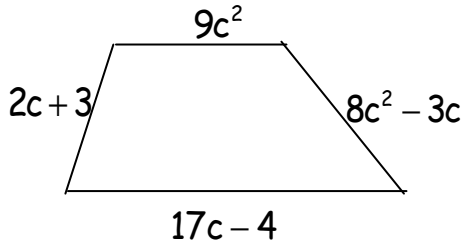
Perimeter: The _____ around a _____.

Find the perimeter of each.

5.)



6.)



Finding differences of polynomials:

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

1.) Make the subtraction sign in between each expression positive and _____ all the signs in the _____ expression.

2.) Underline each _____ _____ in a different way.

3.) Every time you have a new like term, _____ _____.

4.) Make sure your answer is written in _____ _____.

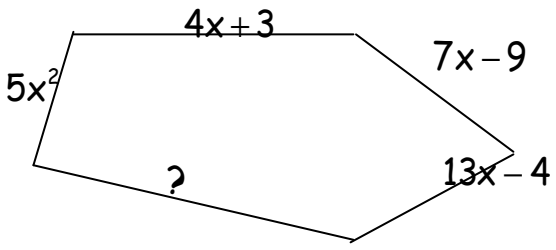
5.) $(8y^2 + 2y) - (3y^2 + 7y)$

6.) $(3x^3 - 4x^2 + 4x - 2) - (7x^3 - 9x^2 + 2x + 4)$

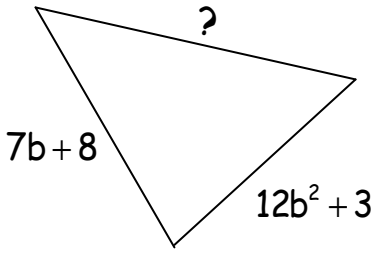
7.) $\left(6r^4 + r + 3\right) - \left(3r^3 + 2r^2 + 7\right)$

8.) $\left(12y^3 - 9y + 8y + 2\right) - \left(6y^2 - 12 - 3y + 2y^2\right)$

5. Perimeter = $12x^2 + 25x + 8$



6. Perimeter = $23b - 7$



P.S. #12.1 - Introduction to Polynomials and Combining Polynomials

Identify whether the following are monomials, binomials, or trinomials.

1. $3x$ **2.** $13x^3 + 5x + 3$ **3.** $4x + 5$

Write the following in descending order. Indicate the degree of the expression.

4. $3x + 9x^3 - 2$ **5.** $12x^4 - 14x + 3x^3$ **6.** $-3x^2 + 8x - 42x^7$

Simplify each expression by combining like terms.

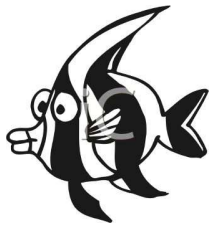
7. $2n - 3n$ **8.** $28 - a + 4a$ **9.** $-4 + 3b + 2 + 5b$

10. $x + 1.3 + 7x$ **11.** $-x + 7n - 3x + n$ **12.** $4 + 5z + z - 6.5$

13. $8 + x - 7x + m$ **14.** $2k - 5b - b - k$ **15.** $-y + 5 + 3y - 4$

Solve each equation.

16. $7x - 3x - 6 = 6$ **17.** $y + y + 2 = 18$



18. $4x - 7 = -2x + 41$ **19.** $3(x + 4) + 2x = 55$

Simplify:

20.) $(a^4b^3c^2)^5$ 21.) $\left(4x^5\right)^3$ 22.) $\left(2x^6\right)^5$

Find each sum or difference.

23. $(7y^2 + y) + (11y^2 + 4y)$

24. $(2x^3 - 5x^2 + 3x - 1) + (8x^3 - 8x^2 + 4x + 3)$

25. $(7a^3 + 3a^2 - a + 2) - (8a^2 - 3a - 4)$

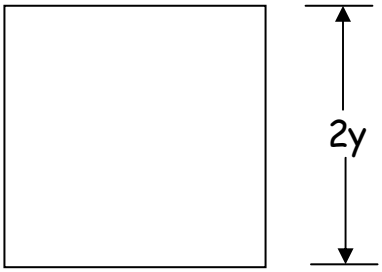
26. $(5y^3 + 7y) + (3y^3 + 9y^2) - (7y^3 + 2y)$

27. $(3 - 2x + 3x^2) + (7 + 6x - 2x^2)$

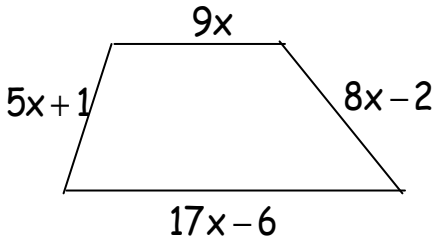
28. $(4x^3 - 2x^2 - 13) - (-4x^3 + 2 - 7x)$

Find the perimeter of each figure.

29.



30.



31. If the perimeter in question #30 is 71, how big is each side?

Evaluate:

32. $2a^2 \cdot 6a^5$

33. $\dfrac{12a^7}{6a^5}$

34. $7^4 \cdot 7^9$

35. $\left(4x^6\right)^2$

36. $3g^4 \cdot 2g^7$

37. $(4wx^2y^3z^4)(5w^2x^7y)$

Notes 12.2 – Multiplying Polynomials by Monomials

Reminder:

- When you multiply monomials, you must always _____ exponents.

Distribute:

- When you distribute, you must multiply the number on the _____ of the parentheses by _____ number on the _____ of the parentheses.

Try These:

1. 2(x + 8)

2. c(c + 4)

3. 3d(7d + 2)

4. $3a(2a^2 + 7ab)$

5. $13x^4(2x^7 + 3)$

6. $9j(-3j^2 + 2j - 7)$

7. $x(x+2) - 3x(x-6)$

8. $x^3(x+5) - x(x^3 - 9)$

9. If the length of a rectangle is $5L^2$ and the width of a rectangle is 7L + 2. What is the area of the rectangle?

You have to divide **everything** by what is in the denominator.

$$\frac{10x+15}{5}$$

Examples:

10. $\frac{2x+16}{2}$

11. $\frac{c^2+8c}{c}$

12. $\frac{12d^2+6d}{3d}$

13. $\frac{72x^3-32x^2+8x}{8x}$

14. $\frac{18r^4s-27r^3s^2}{9rs}$

15. $\frac{21c^3-12c^2+3c}{-3c}$

16. $\frac{14a^3-105a^2b}{7a}$

17. $\frac{3x^7\cdot 4x^9}{2x^3}$

18. $\frac{\left(x^4\right)^5\cdot 12x^5}{4x^7}$

P.S. #12.2 - Multiplying and Dividing Polynomials by Monomials

Find each product.

1. $3(x+4)$

2. $x(x-3)$

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

4. $t(5t^2+6t)$

5. $6x(-9x^3+6x-8)$

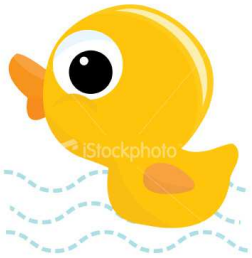
6. $2g^2(g^2+6g+5)$

7. $-3a(4a^2-5a+9)$

8. $7x^2(5x^2-3)$

9. $12c(-5c^2+3c-4)$

10. If the length of a rectangle is represented by $4n^2$ and the width is represented by $2n^2+4n$, find an expression for the area of the rectangle.



Find each quotient.

11. $\dfrac{27x^5}{-3x^4}$

12. $\dfrac{24a^2b^5}{12a^2b^3}$

13. $\dfrac{(4x^2y^4)(5x^5y)}{10x^2y}$

14. $\frac{12a^5 + 2a^3}{2a^3}$

15. $\frac{mn - n}{n}$

16. $\frac{25b^5 + 15b^4 - 5b^2}{5b^2}$

17. $\frac{4m^2n^2 + 6m^3n - 2m^2n^2}{2m^2n}$

18. $\frac{\pi r^2 + \pi r}{\pi r}$

19. $\frac{28g^4h^5j^2 - 14g^3h^6j^2}{-7g^3h^3j^2}$

20. Solve for x: -3x + 2 = 17

Challenge Problems
Solve for each variable. Please do on a separate sheet of paper.

21. $2(5w - 12) = 6(-2w + 3) + 2$

22. $y(y + 12) - 8y = 16 + y(y - 4)$

23. $a(a + 8) - a(a + 3) - 23 = 3a + 11$

24. $p(p - 12) + p(p + 2) + 25 = 2p(p + 5) - 15$

Notes 12.3 - Multiplying Polynomials by Polynomials

Multiply (x + 4)(x - 3).

Try these:

1. (p + 3)(p + 7)

2. (5h – 2)(3h + 8)

3. (c – 6)(c – 2)

4. (w – 3)(w + 3)

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

6. (5a – 8)(5a + 8)

7. $(7x-3)^2$

8. $(2x^2+5x-1)^2$

9. $(x+3)^2$

P.S. #12.3 - Multiplying Polynomials by Polynomials

1. $(x + 3)(x + 4)$

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

3. $(x - 7)(x - 2)$

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

5. $(5x + 2)(12x + 11)$

6. $(x - 3)(10x - 20)$

7. $(x + 5)^2$

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

9. $(5x^2 + 2x - 3)^2$

10. $(3x + 1)(2x^2 + x - 1)$

11. $(2x^2 + 7x - 1)^2$

12. Draw a smiley face because you are done with your homework! ☺

P.S. #12.3b - Polynomials

Evaluate.

1. $x^4 \cdot x^9$

2. $3a^7 \cdot 4a^5$

3. $(12c^3)^2$

4. $\frac{9d^7}{3d}$

5. $\frac{14x^2y^2z}{xy}$

6. $\frac{18z^7 \cdot 3z^4}{9z^8}$

7. $2x^5(x^8 + 9x^2)$

8. $15x^4(6x^9 + 3x^2 - 8x^{-2})$

9. $2(32x^9 + 12x^7)$

10. $\frac{24x+12}{6}$

11. $\frac{36a^3 + 8a^2}{4a}$

12. $\frac{15r^3 + 10r^2 + 20r + 5}{5}$

13. $(7x+3)(x+4)$

14. $(ab + cd)(ab - cd)$

15. $(2h^2 + 9)(3h^3 + h)$

16. (2x – 5)(2x + 5)

17. (4x + 2)(4x – 2)

18. (a – b)(a + b)

19. $(x+5)^2$

20. $(x-7)^2$

21. $(2x+3)^2$

Directions: The answer to each problem in Column A has a matching answer in Column B, although they may not be in the right order. Match up the like problems by simplifying, multiply, dividing, or adding the radical expressions.

A matches with _____ **B** matches with _____ **C** matches with _____
D matches with _____ **E** matches with _____ **F** matches with _____
G matches with _____ **H** matches with _____ **I** matches with _____

Column A	Column B
A. $\left(4x^3+8x-3x^2+11\right)+\left(-x^3-10-4x+5x^2\right)$	**1.** $6x\cdot 4x^5$
B. $(5x^2-11x+31)-(4x^2+3x-18)$	**2.** $\left(12x^3\right)^2$
C. $\left(4x+8\right)\left(x+1\right)$	**3.** $4\left(x^2+3x+2\right)$
D. $\dfrac{\left(36x^4\right)\left(8x^5\right)}{2x^3}$	**4.** $\left(ab+cd\right)\left(ab-cd\right)$

E. $3x\left(2x^4+9x^2+3\right)+2x^3$	**5.** $\left(2x+3\right)^2$
F. $\frac{128x^{25}}{2x^4}$	**6.** $\left(2x^2+9\right)\left(3x^3+x\right)$
G. $\frac{\left(8x^9\right)\left(9x^{11}\right)}{3x^{14}}$	**7.** $\frac{15x^3+10x^2+20x+5}{5}$
H. $\left(4x^2-9x\right)-\left(-21x-9\right)$	**8.** $(x-7)^2$
J. $\left(2a^2b^2+5c^2d^2\right)-\left(a^2b^2+6c^2d^2\right)$	**9.** $(4x^7)^3$

Notes 12.4 – Factors and GCF

GCF stands for _____ _____ _____

Find the GCF of the following. Then divide each number by the GCF.

1.) 18, 24

GCF: _____

Divided by the GCF: _____, _____

2.) 13, 26

GCF: _____

Divided by the GCF: _____, _____

Finding GCF's of monomials:

A. Find the _____ of the _____ (the number in front of the variable).

B. For each variable, look for the _____ _____ in common with each _____ given in each monomial.

3.) x^4, x^7

GCF: _____

Divided by the GCF: _____, _____

4.) $8x^3, 4x^2, 2xy$

GCF: _____

Divided by the GCF: _____, _____, _____

Practice Problems

1.) 2,4

GCF: _____

Divided by the GCF: _____, _____

2.) 14,21

GCF: _____

Divided by the GCF: _____, _____

3.) 12, 21, 9

GCF: _____

Divided by the GCF: _____, _____, _____

4.) 12, 16, 18

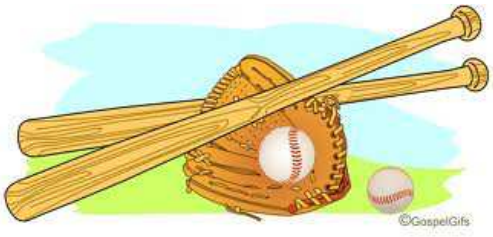
GCF: _____

Divided by the GCF: _____, _____, _____

5.) x^6, x^7, x^8

GCF: _____

Divided by the GCF: _____, _____, _____



6.) $3xy^3, 9x^2y^2, 18x^3y$

GCF: _____

Divided by the GCF: _____, _____, _____

7.) $4ab^2, 7abc$

GCF: _____

Divided by the GCF: _____, _____

P.S. #12.4 - Factors and GCF

Multiply the following.

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

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

3.) $(x-5)(x+5)$

Find the GCF of the following. Then divide by the GCF.

4.) 8, 12

GCF: _____

Divided by the GCF:

_____, _____

5.) 9, 24

GCF: _____

Divided by the GCF:

_____, _____

6.) 14, 21, 28

GCF: _____

Divided by the GCF:

_____, _____, _____

7.) 27, 90, 84

GCF: _____

Divided by the GCF:

_____, _____, _____

8.) $x^3, 5x^2$

GCF: _____

Divided by the GCF:

_____, _____

9.) $3x^3, 27x^2, 9x$

GCF: _____

Divided by the GCF:

_____, _____, _____

10.) $8x^4, 4x^2, -12x$

GCF: _____

Divided by the GCF:

_____, _____, _____

11.) $ab^3, 2a^2b^2$

GCF: _____

Divided by the GCF:

_____, _____

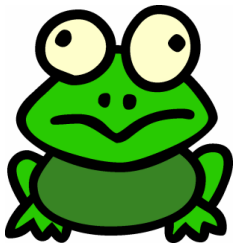
12.) $22x^3y^2z^2, 33x^2y^3z^2, 66x^2y^2z^3$

GCF: _____

Divided by the GCF:

_____, _____, _____

13.) Subtract: $(4x^2-8x+3)-(5x^2+9x-2)$



14.) Simplify: $(4x^7)^2$

15.) Divide: $\dfrac{9x^2+18x}{9x}$

Challenge Problems

1. 2128, 1596

GCF: _____

Divided by the GCF: _____, _____

2. 52, 39, 26

GCF: _____

Divided by the GCF: _____, _____, _____

3. 280, 504

GCF: _____

Divided by the GCF: _____, _____

4. $21xy^3, 36x^2y^2, 18x^3yz$

GCF: _____

Divided by the GCF: _____, _____ , _____

5. $42a^4b^3c, 63a^3b^2d, 84a^2bd$

GCF: _____

Divided by the GCF: _____, _____, _____

Notes 12.5 - Factoring by GCF

1.) Distribute: $3x(x^3+8x^2+4)$

2.) What is the GCF of each term in your answer?

Steps to Factoring by GCF:

1.) Find the _____.

2.) _____ by the _____.

3.) Write your answer as: _____.

3.) $4x^4+24x^3+12x$

4.) $3xy^3-9x^2y^2+18x^3y$

Practice Problems

1.) $5x+5$

2.) $12x-24$

3.) $16x^2-4x$

4.) $8x^3-4x^2+2x$

5.) $25x+30$

6.) $17x^2y^2z-38xy$

7.) $189x^3-108x^2+162x$

8.) $4x^2y+7xy$

P.S. #12.5 – Factoring by GCF

Factor the following.

1.) $5x - 30$

2.) $2x^2 - 30$

3.) $4x - 12$

4.) $-5x^2 - 20x$

5.) $3x^2 + 9$

6.) $10x^2 + 24x$

7.) $x^3 + 5x^2$

8.) $3x^3 + 27x^2 + 9x$

9.) $8x^4 + 4x^2 - 12x$

10.) $ab^3 + 2a^2b^2$

11.) $x^2 - 5x$

12.) $5xy + 25x$

13.) $22x^3y^2z^2 + 33x^2y^3z^2 + 66x^2y^2z^3$

14.) Bob reduced $-7x^2 + 14x$ to $-7x(x + 2)$. Is he correct? Explain your answer.

Challenge Problems:

1.) $21xy^3 + 36x^2y^2 + 18x^3yz$

2.) $52x^3y + 39x^2y - 26x$

3.) $42a^4b^3c + 63a^3b^2d - 84a^2bd$

4.) $2128x^3y^5 + 1596x^2y^{10}$

Notes 12.6 – Factoring Trinomials

Trinomial:

Multiply the following binomials.

1.) $(x+3)(x+5)$ 2.) $(x-4)(x-8)$ 3.) $(x-2)(x+12)$

What do you notice? _____

_____

Fill in the signs for the following factored expressions:

$x^2+9x+14$	$(x \quad 7)(x \quad 2)$
$x^2-12x+11$	$(x \quad 11)(x \quad 1)$
$x^2+2x-24$	$(x \quad 6)(x \quad 4)$
$x^2-8x-33$	$(x \quad 11)(x \quad 3)$

Factor the following trinomials.

1.) a^2+6a+8

2.) $12x^2+5x-2$

Practice Problems

3.) $b^2 + 10b + 21$

4.) $2x^2 + 7x + 3$

5.) $x^2 + 4x - 45$

6.) $3x^2 - 11x + 10$

7.) $x^2 + x - 12$

8.) $x^2 - x - 90$

9.) $3x^2 - 10x - 8$

10.) $5x^2 + 28x + 15$

P.S. #12.6 - Factoring Trinomials

Factor the following.

1.) $x^2 - x - 6$

2.) $x^2 - 5x - 24$

3.) $x^2 - 8x - 9$

4.) $x^2 + 6x + 8$

5.) $x^2 - 4x - 5$

6.) $n^2 + 3n - 54$

7.) $x^2 - 5x - 14$

8.) $x^2 + 2x - 15$

9.) $3x^2 - 9x$

10.) $x^2 + 5x$

11.) $24a^2b - 18abc$

12.) $6x^2 + 12x + 18$

13.) $32a^2b^3c^4 + 64a^4b^3c^2$

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

15.) $7x^2 + 23x + 6$

16.) $3y^2 + 7y - 10$

17.) $2x^2 - x - 6$

18.) $3x^2 - 22x + 24$