UNIT 4

EXTENDING THE NUMBER SYSTEM

Name: _____

Unit 4 Standards

Extend the properties of exponents to rational exponents.

MGSE9-12.N.RN.2 Rewrite expressions involving radicals (i.e., simplify and/or use the operations of addition, subtraction, and multiplication, with radicals within expressions limited to square roots).

Use properties of rational and irrational numbers.

MGSE9-12.N.RN.3 Explain why the sum or product of rational numbers is rational; why the sum of a rational number and an irrational number is irrational; and why the product of a nonzero rational number and an irrational number is irrational.

Perform arithmetic operations on polynomials

MGSE9-12.A.APR.1 Add, subtract, and multiply polynomials; understand that polynomials form a system analogous to the integers in that they are closed under these operations.

Learning Targets

1. I can simplify a radical expression.
2. I can perform operations on radicals.

3. I can identify rational and irrational numbers.
4. I can explain why the sum or product of rational numbers is rational.
5. I can explain why the sum of a rational number and irrational number is irrational.
6. I can explain why the product of a nonzero rational number and an irrational number is irrational.

7. I can add polynomials.
8. I can subtract polynomials.
9. I can multiply polynomials.
10. I can apply operations of polynomials to find the perimeter, area, and volume of geometric figures.

Review of Simplifying Radicals:

1. $\sqrt{54}$
2. $\sqrt{27}$
3. $\sqrt{96}$
4. $\sqrt{32}$

5. $\frac{5}{\sqrt{3}}$
6. $\frac{3}{4\sqrt{2}}$
7. $\frac{3}{\sqrt{2}}$
8. $\frac{5}{2\sqrt{3}}$

Adding and Subtracting Radicals:

9. $3\sqrt{6} - 4\sqrt{6}$
10. $-3\sqrt{7} + 4\sqrt{7}$
11. $-11\sqrt{21} - 11\sqrt{21}$

12. $-9\sqrt{15} + 10\sqrt{15}$
13. $-10\sqrt{7} + 12\sqrt{7}$
14. $-3\sqrt{17} - 4\sqrt{17}$

15. $-10\sqrt{11} - 11\sqrt{11}$
16. $3\sqrt{6} - 4\sqrt{6}$
17. $-3\sqrt{6} + 3\sqrt{6}$

18. $2\sqrt{6} + 3\sqrt{54}$

19. $-2\sqrt{3} + 3\sqrt{27}$

20. $2\sqrt{6} - 2\sqrt{24}$

21. $-\sqrt{12} + 3\sqrt{3}$

22. $3\sqrt{3} - \sqrt{27}$

23. $3\sqrt{8} + 3\sqrt{2}$

24. $-3\sqrt{20} - \sqrt{5}$

25. $2\sqrt{45} - 2\sqrt{5}$

26. $3\sqrt{18} - 2\sqrt{2}$

Multiplying Radicals:

27. $\sqrt{2} * \sqrt{5}$

28. $\sqrt{6} * \sqrt{8}$

29. $\sqrt{5} * \sqrt{12}$

30. $\sqrt{12} * \sqrt{8}$

31. $\sqrt{8} * \sqrt{4}$

32. $\sqrt{5} * \sqrt{7}$

Rational and Irrational Numbers:

Rational Numbers:

Irrational Numbers:

Determine whether the following are Rational or Irrational:

1. 0.21
2. $\frac{3}{12}$
3. 8.33865267…
4. 3.14141414…
5. 12.52
6. 0
7. π
8. $\sqrt{19}$
9. $\sqrt{64}$
10. $\sqrt{2} - \sqrt{2}$
11. $\frac{3}{12} + \frac{5}{2}$
12. 777.77777…
13. –1
14. 1.25698712302…
15. $\frac{\pi}{\pi}$
16. –0.515
17. 30
18. $-\frac{2}{3}$
19. $\sqrt{100}$
20. $\sqrt{3} * \sqrt{3}$

Directions: Use these values to complete level 1 and level 2 below:

A = 0 D = $\sqrt{16}$
B = $\sqrt{5}$ E = 16
C = 10 F = $\sqrt{20}$

LEVEL 1: Identify whether each of the following are rational or irrational.

A: _____ B: _____

C: _____ D: _____

E: _____ F: _____

LEVEL 2: Identify whether each of the following are rational or irrational.

D + E: _____ B · C: _____

A + B: _____ B · F: _____

C + E: _____ C · D: _____

B + F: _____ A · C: _____

What happens when you…

Add a Rational Number and an Irrational Number?

Add a Rational Number and a Rational Number?

Multiply a Rational Number by a Rational Number?

Multiply an Irrational Number by a non-zero Rational Number?

Multiply an Irrational Number by an Irrational Number?

Adding Polynomials

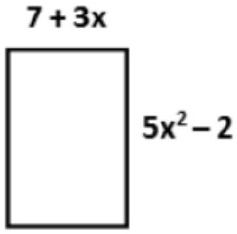
Ex. 1 $(5x - 8) + (7x + 10)$

Ex. 2 $(-a^2 + 2a - 8) + (2a^2 - 9a + 15)$

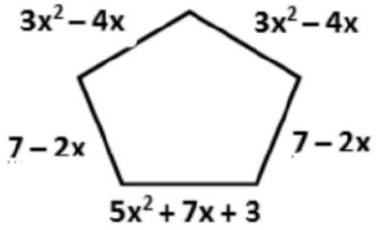
Ex 3 $(5x^3 - 4x^2 + 6) + (2x^3 + 2x^2 - 3x - 1)$

Ex. 3 Find the sum of $2x^2 + 8x + 4$ and $x^2 - 8x - 2$

Ex. 5 Find the Perimeter of the following:



Ex. 6 Find the Perimeter of the following:



Subtracting Polynomials:

Ex. 7 $(-6x - 4) - (2x + 6)$

Ex. 8 $(-7m^3 - m^2 - m) - (-10m^3 - m - 1)$

Ex. 9 $(4m^2 + 9m) - (2m^2 + 6)$

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

Adding and Subtracting Polynomials Practice (put answers in standard form):

1. $(4x^2 + x + 6) + (7x - 10)$

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

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

4. $(14p^4 + 7p^2) + (8p^3 + 7p^2 - p)$

5. $(14 - 6x) + (8x - 5)$

6. $(3x^4 + 3x^2 - 3) - (6x^5 - 9x^3 + 2)$

7. $(5x^2 + 2x + 1) + (4x^2 + 3x - 8)$

8. $(14x - 6) + (8x - 5) + (x + 4) + (2x + 1)$

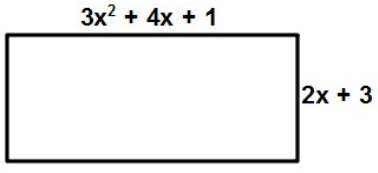
9. $(-x^2 + 5x - 12) + (2x^2 - 6)$

10. $(2x^2 + 3x - 4) + (3x^2 - 4x + 9) + (-3x^2 + 3x + 7)$

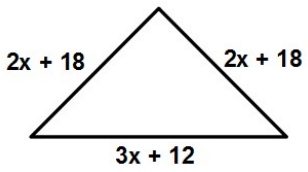
11. $(5x^2 - 6x - 1) - (4x^2 - 2x + 1)$

12. $(9p^4 + 2p^2) + (2p^3 - 6p^2 - 7)$

13. Find the Perimeter:



14. Find the Perimeter:



Multiplying Polynomials - Distribution:

Ex. 1: $5(2x + 5)$

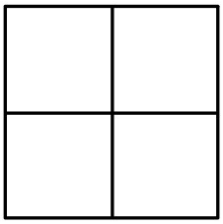
Ex. 2: $2x(4x + 6)$

Ex. 3: $-4(2x^2 - 6x - 3)$

Ex. 4: $3x(-x^2 + 8x - 2)$

Multiplying Polynomials – FOIL and the Box Method:

Ex. 5: $(x + 2)(x + 3)$ FOIL (Distribution) Box Method



Ex. 6: $(x - 3)(x^2 + 3x + 2)$ FOIL (Distribution) Box Method

Ex. 7 $(x^2 - 1)(x + 3)$

Ex. 8 $(x - 4)(-x^2 + 7x - 3)$

Ex. 9 $(x - 7)^2$

Ex. 10 $(x - 5)^3$

You Practice:

1. $(x + 1)(x + 1)$

2. $7x(x - 5)$

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

4. $2x(x + 6)$

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

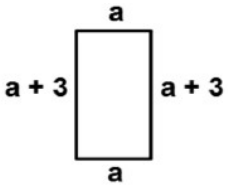
6. $(2x + 3)(-x + 2)$

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

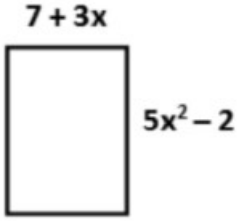
8. $(4x + 4)(5x - 5)$

Polynomial Multiplication with Application:

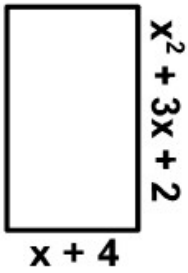
Ex. 1 Find the Area of the following:



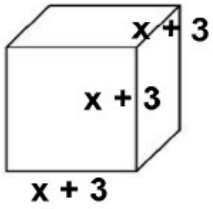
Ex. 2 Find the Area of the following:



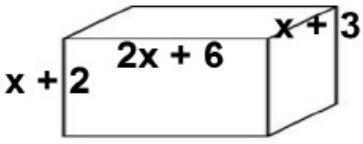
Ex. 3 Find the Area of the following:



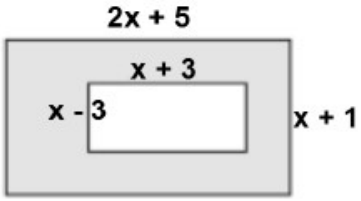
Ex. 4 Find the Volume of the following:



Ex. 5 Find the Volume of the following:

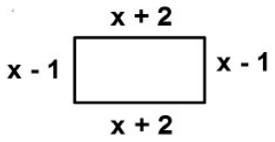


Ex. 6 Find the Area of the <u>shaded</u> region:

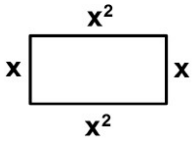


You Practice:

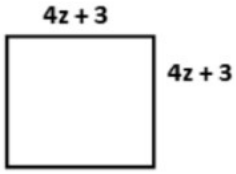
1. Find the Area of the following:



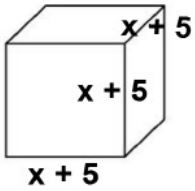
2. Find the Area of the following:



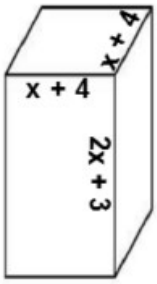
3. Find the Area of the following:



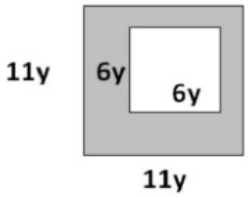
4. Find the Volume of the following:



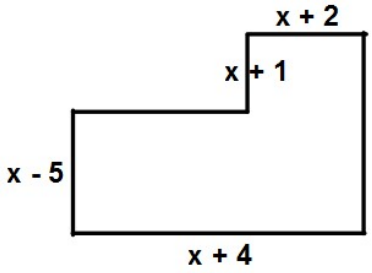
5. Find the Volume of the following:



6. Find the Area of the <u>shaded</u> region:



Challenge Question: Find the Perimeter.



AG – Unit 4 REVIEW: Polynomials and Radicals

Name _____

Period _____ **Date** _____

Add, subtract, or multiply the following as indicated. Write your answer in standard form.

1. $(2x + 5) + (6x – 2)$

2. $(10x + 2) – (6x + 5)$

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

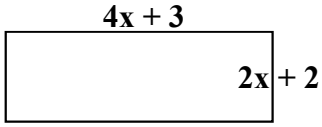
4. $(x + 4)(2x – 8)$

5. $(x + 2)(x^2 + 5x + 4)$

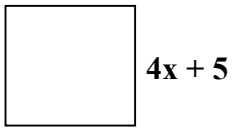
6. $(7x^2 + 2x + 1) – (–5x^2 – 6x – 2)$

Find the Perimeter or Area of the following:

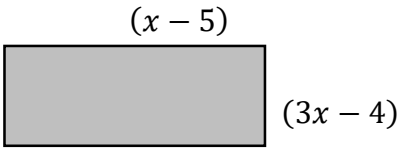
10. Find the Perimeter:



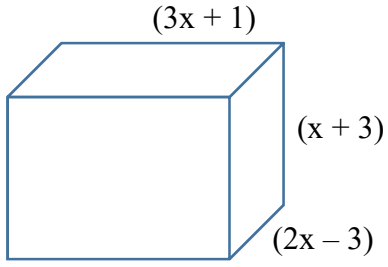
11. Find the Area:



12. Find the Area:

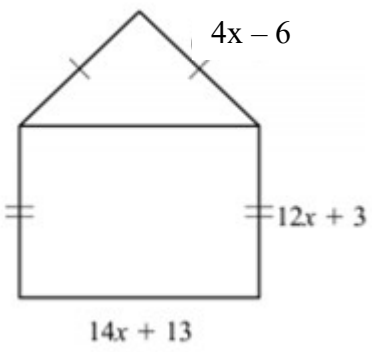


13. Find the volume (no parentheses in answer).



14. **A model of a house is shown.**

What is the perimeter, in units, of the model?



15. If $2x^2 - 5x + 7$ is subtracted from $4x^2 + 2x - 11$, what is the coefficient of x in the result?

(A) 2

(B) 7

(C) -3

(D) -18

16. What is the resulting polynomial when $3x + 7$ is multiplied by $2x - 6$?

(A) $5x + 1$

(B) $6x - 42$

(C) $6x^2 - 4x - 42$

(D) $6x^2 + 9x - 42$

17. Which of the following is an irrational number?

(A) The sum of 3 and 0.111....

(B) The product of $2\sqrt{3}$ and width $\frac{1}{\sqrt{3}}$

(C) The product of $\sqrt{16}$ and $\sqrt{9}$

(D) The sum of $\sqrt{3}$ and $0.\overline{3}$

18. Which of the following is not a rational number?

(A) The product of 2 and $0.\overline{3}$

(B) The sum of $2+\sqrt{3}$ and $5-\sqrt{3}$

(C) The sum of $\frac{3}{7}$ and $\frac{1}{2}$

(D) The product of 2 and $\sqrt{2}$

Will the end result be rational or irrational?

19. Irrational (Rational)

20. Irrational + Irrational

21. Irrational (Irrational)

Simplify the following Radicals without a calculator. No decimals allowed.

22. $\sqrt{8}$

23. $\sqrt{45}$

24. $\sqrt{72}$

25. $\frac{15}{\sqrt{5}}$

26. $\frac{1}{3\sqrt{2}}$

27. $-10\sqrt{7} - 17\sqrt{7}$

28. $-2\sqrt{3} + 5\sqrt{27}$

29. $\sqrt{12} * \sqrt{4}$