Algebra 2 Notes Name Key

0.1 Apply Properties of Real Numbers

THE SETS OF REAL NUMBERS $\mathbb{R}$

Rational Numbers $\mathbb{Q}$ $\pm .75$ $\pm .3\overline{3}$ $\pm \frac{1}{3}$ $\pm 3/4$

- can be written as a ratio (fraction)
- decimals that terminate or repeat

Integers $\mathbb{Z}$ ... $\pm 4, \pm 3, \pm 2, \pm 1, 0$

$\pm$ whole

Whole Numbers $\mathbb{W}$

0, 1, 2, 3, 4, 5 ...

Irrational Numbers $\mathbb{I}$

- cannot be written as a fraction of integers $\frac{a}{b}$
- decimals that do not terminate and have NO repeating pattern

Ex:

π: 3.141592...

$\sqrt{2}$: 1.414213...

Examples: Name ALL the sets of numbers to which each number belongs.

1. 3.5 $\mathbb{R}, \mathbb{Q}$	2. 0 $\mathbb{R}, \mathbb{Q}, \mathbb{Z}, \mathbb{W}$	3. -0.75 $\mathbb{R}, \mathbb{Q}$
4. π $\mathbb{R}, \mathbb{I}$	5. $\frac{5}{9}$ $\mathbb{R}, \mathbb{Q}$	6. 1.414213562... $\mathbb{R}, \mathbb{I}$
7. $\sqrt{49}$ $\mathbb{R}, \mathbb{Q}, \mathbb{Z}, \mathbb{W}$	8. $-\sqrt{15}$ $\mathbb{R}, \mathbb{I}$	9. 0.333 not $1/3$! $\mathbb{R}, \mathbb{Q}$ $\frac{333}{1000}$

PROPERTIES OF ADDITION AND MULTIPLCATION

	Addition (explain in words)	Multiplication (explain in words)
Commutative	I can change the order. $a+b+c = b+c+a$ $4+2=2+4$	I can change the order. $a \cdot b = b \cdot a$ $3 \cdot 4 = 4 \cdot 3$
Associative	I can regroup. $(4+1)+5 = 4+(1+5)$	I can regroup. $4(3x) = (4 \cdot 3)(x)$
Identity	adding 0 does not change the original value. $7+0=7$ $a+0=a$	multiplying by 1 does not change the original value. $2 \cdot 1 = 2$ $x \cdot 1 = x$
Inverse	Adding the opposite results in 0 (identity). $a+(-a)=0$ $4+(-4)=0$	multiplying by the reciprocal results in 1. $4 \cdot \frac{1}{4} = 1$ $\frac{b}{a} \cdot \frac{a}{b} = 1$ (identity)
Distributive	$a(b+c) = ab + ac$ the Quantity outside is multiplied by each term inside.	

Examples: Name the property illustrated in each.

1. $5(x+y) = 5x+5y$ Distributive	2. $\left(-\frac{1}{13}\right)(-13) = 1$ Inverse multiplication
3. $7x+(9x+8) = (7x+9x)+8$ associative addition	4. $0+12n = 12n$ identity addition
5. $(-7)+7 = 0$ inverse addition	6. $5+3x = 1(5+3x)$ identity multiplication
7. $3(2x)y = 3 \cdot 2(xy)$ associative multiplication	8. $4x \cdot 7y = 4 \cdot 7 \cdot x \cdot y$ commutive multiplication

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1.2 Evaluate and Simplify Algebraic Expressions

$a^b = c$

a is the base. b is the exponent. a^b is the power.

The **Exponent** represents the number of times the base is used as a factor.

Exponents represent repeated multiplication.

5^1 means 5 5^2 means $5 \cdot 5$ 25 5^3 means $5 \cdot 5 \cdot 5$ 125

Exponents are applied immediately to the left!!!!

-3^2 means $-1 \cdot 3^2$ $-1 \cdot 3 \cdot 3$ $= -9$ $(-3)^2$ means $(-3)(-3) = 9$

* negative is not squared

Evaluate the following. Use $a = 4$, $b = -2$, $c = 3$. * Use Parantheses!

1. a^c
$(4)^{(3)}$
$4 \cdot 4 \cdot 4$
64

2. b^c
$(-2)^{(3)}$
$(-2)(-2)(-2)$
-8

3. $-b^2$
$-1\,(-2)^{(2)}$
$-1\,(-2)(-2)$
-4

4. $(-b)^2$
$(-(-2))^2$
$(2)^2$
$(2)(2)$
4

Absolute Value: The distance a number is from 0.

Distance is always positive.

$|3| = 3$ $|-6| = 6$ $|10| = 10$ $-|5| = -5$
$-1|5|$

Simplifying Expressions: An expression is simplified when there are no grouping symbols remaining and all like terms are combined. In other words, apply the distributive property when necessary and add/subtract like term coefficients.

* Like terms:
same variable
same exponent

1. $3(y + 2) + 4(2y - 5)$
$3y + 6 + 8y - 20$
$11y - 14$

2. $4(2y - 7) - 3(-y + 4) + 6y$
$8y - 28 + 3y - 12 + 6y$
$17y - 40$

The Order of Operations

1. Simplify inside grouping symbols
   ( ) [ ] { } $\sqrt{\ }$ $\frac{(a)}{(b)}$
   | |
2. Evaluate all exponents
3. Division / Multiplication
   Left to Right!!!
4. Addition / Subtraction
   Left to Right!!!

1. $10 + 2^2 \div 2 - 6 + 1$

$10 + 4 \div 2 - 6 + 1$

$10 + 2 - 6 + 1$

$12 - 6 + 1$

$6 + 1$

7

2. $[21 - (9 - 2)] \div 2 + 5$

$[21 - 7] \div 2 + 5$

$14 \div 2 + 5$

$7 + 5$

12

3. $\frac{1}{3} - \frac{12 \cdot (77 \div 11)}{-3 + 3 \cdot 4}$

$\frac{1}{3} - \frac{12 \cdot 7}{-3+12}$

$\frac{1}{3} - \frac{84}{9}$

$\frac{1}{3} - \frac{28}{3}$

$\frac{-27}{3} \rightarrow -9$

Use $a = -5$, $b = 10$, $c = \frac{1}{2}$ to evaluate:

4. $a + b \div c$

$(-5) + (10) \div (\frac{1}{2})$

$-5 + 10 \cdot 2$

$-5 + 20$

15

5. $b - |4c - a|$

$(10) - |4(\frac{1}{2}) - (-5)|$

$10 - |2 + 5|$

$10 - |7|$

$10 - 7$

3

6. $(-a)^2 - 2a$

$(-(-5))^2 - 2(-5)$

$(5)^2 + 10$

$25 + 10$

35

Simplify:

7. $3(m-4) - 2(3m+6)$

$3m - 12 - 6m - 12$

$-3m - 24$

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

$-5x^2 - 10x - 6x^2 + 12 - 16$

$-11x^2 - 10x - 4$