Integrated Algebra B

Unit #3 Essential Skills (Number Theory)

Lesson 1: Real Number System, Properties, & PEMDAS

Objectives:

•Students will be able to identify rational and irrational numbers.

•Students will be able to decipher and apply the five properties of the Real number system.

•Students will understand and apply the rules of algebra (order of operations).

Vocabulary:

Rational Number	Distributive Property
Irrational Number	Identity Property
Commutative Property	Inverse Property
Associative Property	Order of Operations

Focus Questions:

What are the subset(s) of rational numbers? Are non-perfect squares irrational? Does every real number, except 0, have a reciprocal? What is the difference between the additive identity vs. the multiplicative identity? Using the order of operations, what is the 3rd step when simplifying the expression: $3(5 + 4^2) \div 7 - 7$?

Game Plan:

Do Now Diagnostic Test (pre-test) Real Number System Real Number Properties Order of Operations Focus Questions Homework: 3-1

The Real Number System

Natural (Counting) Numbers: 1, 2, 3	-3 -2 -1 0 1 2 3
Whole Numbers: 0, 1, 2, 3, 4	← + + + + + + + + + + + + + + + + + + +
Integers:3, -2, -1, 0, 1, 2, 3, 4	-3 -2 -1 0 1 2 3

Rational vs. Irrational

A <u>rational number</u> is a number that can be expressed as a ratio in the form $\frac{a}{b}$ where *a* and *b* are integers and $b \neq 0$. It can also be expressed as a repeating or terminating decimal.

An <u>irrational number</u> can not be written as a ratio of two numbers. Irrational numbers are non-repeating, non-terminating decimals.

TT (pi) is irrational; it is about 3.1415926535897932384... or 22/7

 $\sqrt{7}$ is irrational; it is about 2.6457513110645905905016157536393...

• Any non-perfect square is irrational. $(\sqrt{5},\sqrt{7},\sqrt{11},\sqrt{33})$



Practice:

True or False -3 is a whole number. $\sqrt{9}$ is an irrational number. 0 is a natural number (counting). 3 is a rational number. All real numbers are either rational or irrational numbers. Every whole number is a rational number. All natural numbers are integers. Sum it All Up: For each item, choose the letter that defines the item. A. can be written in the form a/b where a and b are integers and $b \neq 0$ B. non-repeating and non-terminating decimals C. has an integer as its square root D. the set of counting numbers plus 0 E. consists of the rational and irrational numbers

____irrational numbers

_____whole numbers

_____rational numbers

_____real numbers

_____perfect square numbers

Properties of Real Numbers

Property	Addition	Multiplication
Commutative "community"	a+b= b+a	(a)(b)= (b)(a)
Associative "regroup"	(a+b) +c= a + (b + c)	(a•b) • c= a • (b•c)
Identity "Back to itself"	a + 0= a	a(1)= a
Inverse "Undo"	a + (-a) = 0	$a \left(\frac{1}{a}\right) = 1$

Distributive "mail man"
a (b+c) = ab + ac a (b -c) = ab - ac

Examples:



Order of Operations

PEMDAS

The order of operations are the rules of algebra.		
P		
E		
M		



 \bullet^{*} Remember to perform multiplication/division & addition/subtraction from left to right.

Ex. $9 \div 3 \cdot 8 = 24 \leftarrow$ You must perform division first!

U-Try Practice:

9 - 3 + 6=	(7+2) ²	$\frac{2 \cdot 15}{2} =$
$\frac{14}{2^2(5+2)}$ =	-8 + -3	3 7-4 =
5! -3! =	5° + -7 =	$\sqrt{10-6} + \sqrt{64} =$
1.4 ³⁽²⁾ =	- -4 =	2(2) ² + 4(2) - 8 =
-2(-3) ² + 4(-3) =	$\frac{2! \cdot 4!}{3!} =$	_√49 ₌
(-2 + 6) ² + [2 ³ -1] =	2 ² • 3 ¹ • 5 ² • 11 ¹ =	-4 + 32 ÷ 4 - 2 =

Name:

3-1 Essential Skills

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1). State whether each number below is rational or irrational.

-2	√16	0	3 ¹ / ₂
-8	Π	1. 6	4.627803
√3	$\frac{\sqrt{2}}{2}$	<i>₋</i> √25	√2 ∙ √8

- 2). State the property illustrated in each of the following:
 - a) 5 + (-6) = (-6) + 5 ______ b) $(-7 \cdot 3)4 = -7(3 \cdot 4)$ ______ c) 8.5 + 0 = 8.5 ______ d) $-11 \cdot 1 = -11$ _____ e) $(\frac{5}{2}) (\frac{2}{5}) = 1$ ______

3). Does the commutative property hold for subtraction? **Explain** your answer and give an example to support it.

Back→

Evaluate each expression:

- 4). If r= 2 and s= -7, then find |r| |s|.
- 5). What is the value of $(b b^0)^{a+1}$ when a = -4 and b = 3?

6). What is the value of the expression $-4x^2 + 5x$ when x = -3?

7). What is the value of the expression $\sqrt{80+1} - |a| + b^2$ when a= -2 and b= -3?

8). What is the value of the expression
$$\frac{(x+1)!}{\sqrt{4}}$$
 when x = 4.