Unit: Algebra and # Notes

Name ________________________ Dates Taught _________________

General Outcome			
10I.A.2	• Demonstrate an understanding of irrational numbers by representing, identifying, and simplifying irrational numbers and ordering irrational numbers.		
10I.A.2	• Express a radical as a mixed radical		
10I.A.2	• Express a mixed radical as an entire radical		
10I.A.3	• Demonstrate an understanding of powers with integral and rational exponents		

Comments : ____

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<u>Outcome 10I.A.2</u>: Number Systems and Approximating Irrationals

________________ numbers, _____, are all ____________________ ______________________.
ie. N = {1, 2, 3, . . . }

________________ numbers, _____, are all positive integers and ________.
ie. W = {0, 1, 2, 3, . . . }

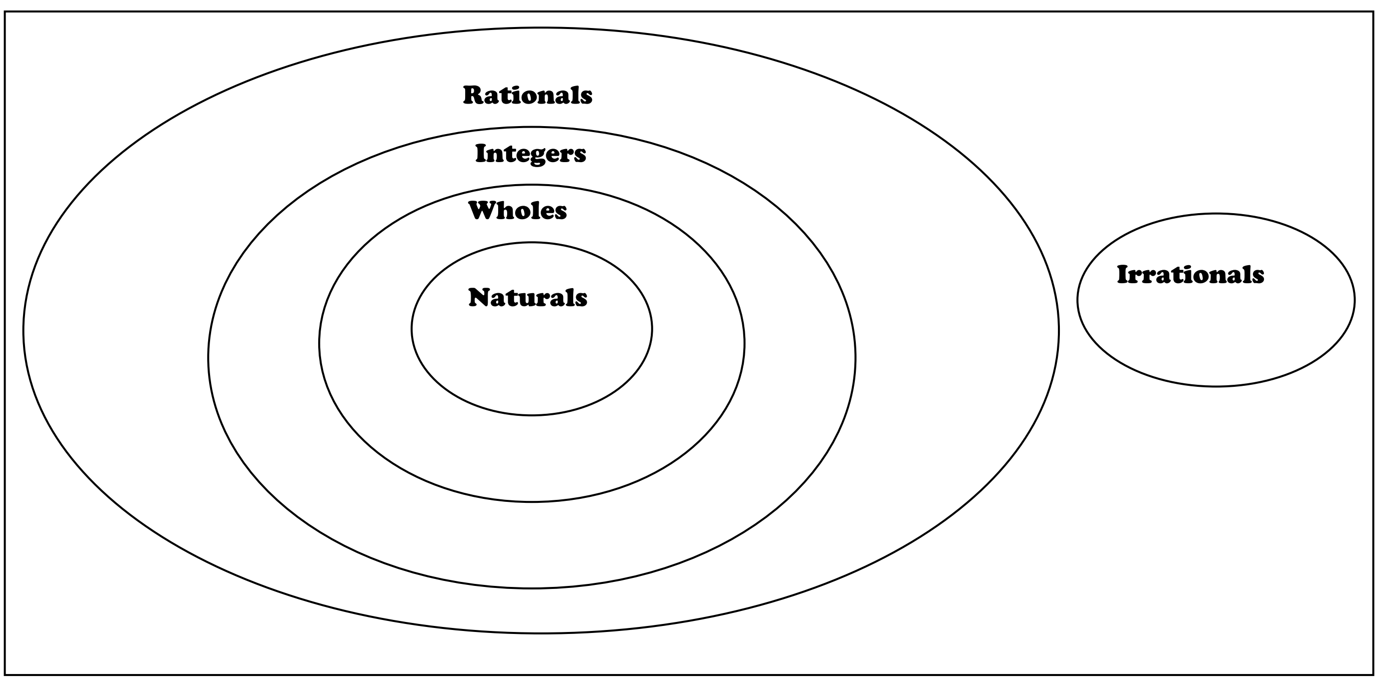
________________, _____, are whole numbers and their ____________________.
ie. I = {. . . -2, -1, 0, 1, 2, . . . }

________________ numbers, _____, are any numbers written in the form of a ______________
$\frac{a}{b}$, where a & b are __________________ and b _________. ie. $\left\{\frac{a}{b} | , b \in I, b \neq 0\right\}$

______________________ numbers, _____, are any number that ___________________ be written in the form $\frac{a}{b}$, where a & b are _______________ and b ◷**0**. ⓤ Q = Set of irrational numbers

___________ numbers, _____, are the _____________ of the ______________________ number set *and* the __________________________ number set.
ie. R = Q U Q

<u>Reals</u>



Word bank:					
cannot	fraction	integers	integers	integers	integers
irrational	irrational	natural	opposites	positive	rational
rational	real	union	whole	zero	

Examples:

1. Which Number System *best* represents the following numbers?

a) 2 ______________________ b) 0.25 ______________________

c) $\sqrt{35}$ ______________________ d) -5______________________

e) π ______________________ f) 0.131313…______________________

g) $\sqrt{25}$ ______________________ h) 0 ______________________

i) 0.123456789…______________________ j) $\frac{3}{4}$ ______________________

2. Write each number in decimal form (round to 2 decimal places). Some may already be written in decimal form.

a) 3 ______________________ b) 0.41 ______________________

c) $\sqrt{45}$ ______________________ d) -3______________________

e) π ______________________ f) 0.171717…______________________

g) $\sqrt{16}$ ______________________ h) 0 ______________________

i) 0.123456789…______________________ j) $\frac{3}{4}$ ______________________

Place the above numbers on a horizontal number line (below). Clearly label the number line and use an appropriate scale.

Homework: MPC20S, Exercise 20

Outcome 10I.A.3: Integral Exponents

Note: *a,b* and *x* are rational and variable basis while *m* and *n* are integral exponents.

Law:	Example:
Converting Negative Powers $a^{-n} = \frac{1}{a^n}, a \neq 0$	$3^{-2} =$ or $\frac{1}{2^{-3}} =$
Product of Powers $(a^m)(a^n) = a^{m+n}, a \neq 0$	$(6^3)(6^2) =$
Quotent of Powers $(a^m)/(a^n) = a^{m-n}, a \neq 0$	$(4^3)/(4^{-2}) =$
Power of a Power $(a^m)^n = a^{mn}$	$(7^2)^3 =$
Power of a Product $(ab)^m = a^m b^m$	$(3 \bullet 2)^3 =$
Power of a Quotient $(a/b)^m = a^m / b^m, b \neq 0$	$(3/2)^4 =$
Zero Exponent $a^0 = 1, a \neq 0$	$(2x)^0 =$ $-(2x)^0 =$

Extra Examples:

Example:	Method 1	Method 2
a) $(5^4)(5^{-2}) =$	Add the Exponents	Use Positive Exponents
b) $(.3^{-2}/.3^2) =$	Subtract the Exponents	Use Positive Exponents
c) $\left[(4x)^{-3}\right]^{-2} =$	Multiply the exponents	Use Positive Exponents

Homework: Page 67-68, Q

Outcome 10I.A.3: Rational Exponents

Note: *a,b* and *x,y* are rational and variable basis while *m* and *n* are integral exponents.

Law:	Example
Product of Powers $(a^m)(a^n) = a^{m+n}, a \neq 0$	$(2^{\frac{3}{5}})(2^{\frac{4}{5}}) =$
Quotent of Powers $(a^m)/(a^n) = a^{m-n}, a \neq 0$	$(6^{\frac{1}{3}})/(6^2) =$
Power of a Power $(a^m)^n = a^{mn}$	$(2^{\frac{2}{3}})^3 =$
Power of a Product $(ab)^m = a^m b^m$	$(27x^{\frac{1}{2}})^{\frac{1}{3}} =$
Power of a Quotient $(a/b)^m = a^m / b^m, b \neq 0$	$(\frac{x^2}{y^4})^{\frac{1}{2}} =$
Zero Exponent $a^0 = 1, a \neq 0$	$(5x)^0 =$ $\quad$ $-(5x)^0 =$

Note: A power with a rational exponent can be written with the exponent in decimal or fractional form. Eg. $3^{\frac{2}{4}} = 3^{.5}$.

Extra Examples:

Example:	Method 1	Method 2
a) $(4^{1.75}/4^{5/4}) =$	Convert to Fractions	Convert to Decimals
b) $(4^{.75}/4^{6/4})^3 =$	Subtract the Exponents	Apply Power of a Power
c) $(5^{\frac{1}{3}})(5^4) =$	d) $(8x^7)^{\frac{1}{3}} =$	e) $(25/16)^{-.7} =$

Homework: Page 72, Q #

Outcome 10I.A.2&3: Irrational Numbers and Radicals

Law:	Example(s):
$a^{\frac{1}{n}} = \sqrt[n]{a}, n \neq 0$	$3^{\frac{1}{4}} =$ Number expressed as a power $or \sqrt[3]{2} =$ Number expressed as a radical

In General: $\sqrt[r]{x^p} = \left(\sqrt[r]{x}\right)^p = x^{p/r}$

Extra Examples:

1. Express each power as an equivalent radical:

a) $24^{\frac{1}{2}} =$

b) $25^{\frac{3}{4}} =$

c) $(5x^4)^{\frac{1}{3}} =$

2. Express each radical as a power with a rational exponent:

a) $\sqrt{5^5} =$

b) $\sqrt[4]{6^3} =$

c) $\sqrt[m]{9^5} =$

Homework: MPC20S - Ex. #21, Page 76 Q # 1,2

Outcome 10I.A.2: Operations on Radicals *(Simplifying)*

- $\sqrt{2}$, $\sqrt{3}$, $\sqrt{5}$, $\sqrt{7}$, etc. are in ______________ form.
- $\sqrt{12}$ is _____ because it contains a ______________ ______________ (integer) factor.
  $\Rightarrow \quad \sqrt{12} = \sqrt{4 \bullet 3} = \sqrt{4} \bullet \sqrt{3} = 2 \bullet \sqrt{3}$

To simplify a radical (also known as writing as a mixed radical):

- Depending on the ____________ of the radical, look for a perfect ____________ (cube, etc.) *hidden* in the factors of the ______________.
- _______________ the perfect square (cube, etc.) by placing its root in _______________ of the radical sign.
- _______________ any constants in *front* of the radicand.
- Leave any __________________ without *integer* roots ______________ the radicand.

Word bank: combine	factors	front
inside not	numbers	radicand
remove simplest	square	square

Examples:

1. Simplify (express as a mixed radical) each radical:

a) $\sqrt{8} =$ b) $\sqrt{75} =$ c) $\sqrt[3]{54} =$

2. Express each mixed radical as an entire radical:

a) $3.5\sqrt{3} =$ b) $2\sqrt[3]{5} =$ c) $-2\sqrt[3]{4} =$

Homework: MPC20S – Ex #33, Page76, Q #