Day 3: Classifying Numbers and Simplifying Radicals

Date_____

Classifying Real Numbers

1) Irrational Numbers

2) Rational Numbers

3) Integers

4) Whole

5) Natural

Name the set or sets to which each number belongs.

6) -6 $\mathbb{Q}, \mathbb{Z}, (\mathbb{R})$

7) $\frac{13}{10}$ $\mathbb{Q}$

8) 0 $\mathbb{Q}, \mathbb{Z}, \mathbb{W}, (\mathbb{R})$

9) 2 $\mathbb{Q}, \mathbb{Z}, \mathbb{W}, \mathbb{N}$

10) $\sqrt{81} = 9$ $\mathbb{Q}, \mathbb{Z}, \mathbb{W}, \mathbb{N}$

11) $\frac{0}{-2} = 0$ $\mathbb{Q}, \mathbb{Z}, \mathbb{W}$

12) $\sqrt{\frac{279}{3}} = \sqrt{93}$ $\mathbb{IR}$

13) $\sqrt{225} = 15$
$\mathbb{Q}, \mathbb{Z}, \mathbb{W}, \mathbb{N}$

14) $\frac{176}{64}$ $\frac{88}{32} = \frac{44}{16}$ $\frac{22}{8} = \frac{11}{4}$
$\mathbb{Q}$

15) 3π $\mathbb{IR}$

Addition Properties

16) What happens when we add TWO RATIONAL numbers together?

$\frac{1}{2} + \frac{1}{3} =$

$\frac{3}{6} + \frac{2}{6} = \frac{5}{6}$ Q

What happens when we add a RATIONAL number and an IRRATIONAL number?

$3 + \pi$ IR

What happens when we add TWO IRRATIONAL numbers?

$\pi \cdot \sqrt{7}$ IR

Product (multiplication) Properties

17) What happens when we multiply TWO RATIONAL numbers together?

$\frac{1}{2} \cdot \frac{1}{3} = \frac{1}{6}$ Q

What happens when we multiply a RATIONAL number and an IRRATIONAL number?

$3 \cdot \pi$ = IR

What happens when we multiply TWO IRRATIONAL numbers?

= IR

Is the following rational or irrational?

18) $\sqrt{36} + \frac{45}{63}$

$6 + \frac{5}{7}$

$\frac{42}{7} + \frac{5}{7} = \frac{47}{7}$ Q

19) $\sqrt{42} \cdot \sqrt{9}$

$\sqrt{6}\sqrt{7} \cdot 3$ (IR)

20) $\frac{63}{9} \cdot \sqrt{25}$

$7 \cdot 5 = 35$ Q

21) $\frac{75}{15} + \sqrt{16}$ N Q

$5 + 4 = 9$

Simplifying Radicals

22) What is a Radical? $\sqrt{}$ Root function

How do we simplify?

a. Factor the number (make a Factor Tree)
b. Find groups of numbers in the amount of the root (ex: if a square root find groups of 2, if a cube root find groups of 3, if a 4th root find groups of 4, etc)
c. Any groups come out of the radical
d. Any numbers that don't group together stay inside the radical
e. Multiply everything outside together
f. Multiply everything inside together

$\sqrt{4}$
$\sqrt{9}$
$\sqrt{16}$
$\sqrt{25}$
36
49
64
81
100

Simplify the radical expression.

23) $\sqrt{245}$

$\sqrt{5 \cdot 49}$
$\sqrt{5} \cdot \sqrt{49}$
$\sqrt{5} \cdot 7 = 7\sqrt{5}$

24) $\sqrt{8}$

$\sqrt{4 \cdot 2}$
$\sqrt{4} \cdot \sqrt{2}$
$2\sqrt{2}$

25) $\sqrt{192}$

$\sqrt{64 \cdot 3}$
$\sqrt{64} \cdot \sqrt{3}$
$8\sqrt{3}$

26) $\sqrt{24}$

$\sqrt{4\ 6}$
$\sqrt{4} \cdot \sqrt{6}$
$2\sqrt{6}$

27) $\sqrt[4]{112}$

2 | 56
2 | 28
2 | 14
7

$2\sqrt{7}$

28) $\sqrt[3]{750}$

2 | 375
3 | 125
5 | 25
5 | 5

$5\sqrt{2 \cdot 3}$
$5\sqrt{6}$

29) $3\sqrt{384}$

$3 \cdot \sqrt{64 \cdot 6}$
$3 \cdot \sqrt{64} \cdot \sqrt{6}$
$3 \cdot 8 \cdot \sqrt{6}$
$24\sqrt{6}$

30) $2\sqrt{36}$

$2 \cdot 6 = 12$

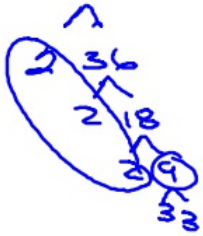
What if there are variables (letters)?

31) a. Write out how many of the variable there are
b. Group them like we did the number factors

Simplify the radical expression.

32) $\sqrt{16p}$ $= \sqrt{16} \cdot \sqrt{p}$
$4 \cdot \sqrt{p}$

33) $\sqrt[3]{72k}$ $= \sqrt[3]{72} \cdot \sqrt{k}$



$= 2\sqrt{9k}$

34) $\sqrt{128x^4}$ $= \sqrt{128} \cdot \sqrt{x^4}$

$\sqrt{64} \cdot \sqrt{2}$
$8 \cdot \sqrt{2}$

$\sqrt{x}$ $\sqrt{x^3}$
$\sqrt{x}$ $\sqrt{x^2}$
x x

$X \cdot X$

$8 \cdot \sqrt{2} \cdot x \cdot x$
$8\sqrt{2}x^2$
$8x^2\sqrt{2}$

35) $\sqrt{45a^4}$ $= \sqrt{45} \cdot \sqrt{a^4}$

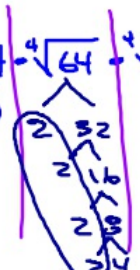
$\sqrt{9} \cdot \sqrt{5}$
$3 \cdot \sqrt{5}$

a a^3
a a^2
a a

$3 \cdot a \cdot a \cdot \sqrt{5}$
$3a^2\sqrt{5}$

36) $4\sqrt[4]{64a^3b^6}$ $= 4 \cdot \sqrt[4]{64} \cdot \sqrt[4]{a^3} \cdot \sqrt[4]{b^6}$

$8\sqrt[4]{4a^3b^2}$



$4 \cdot 2 \cdot \sqrt[4]{4} \cdot \sqrt[4]{a^3} \cdot b\sqrt[4]{b^2}$

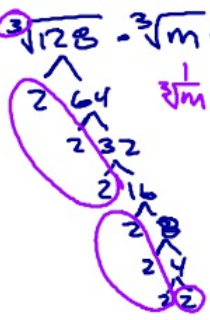
37) $7\sqrt[3]{875n^2}$ $= 7 \cdot \sqrt[3]{875} \cdot \sqrt[3]{n^2}$

n n

$7 \cdot 5 \cdot \sqrt[3]{7} \cdot \sqrt[3]{n^2}$ $= 35\sqrt[3]{7n^2}$

38) $-7\sqrt[3]{128m^3n^4}$ $= -7 \cdot \sqrt[3]{128} \cdot \sqrt[3]{m} \cdot \sqrt[3]{n^4}$

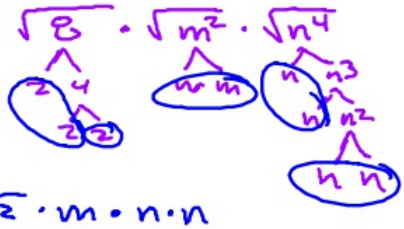
$\sqrt[3]{m}$ $n\sqrt[3]{n}$



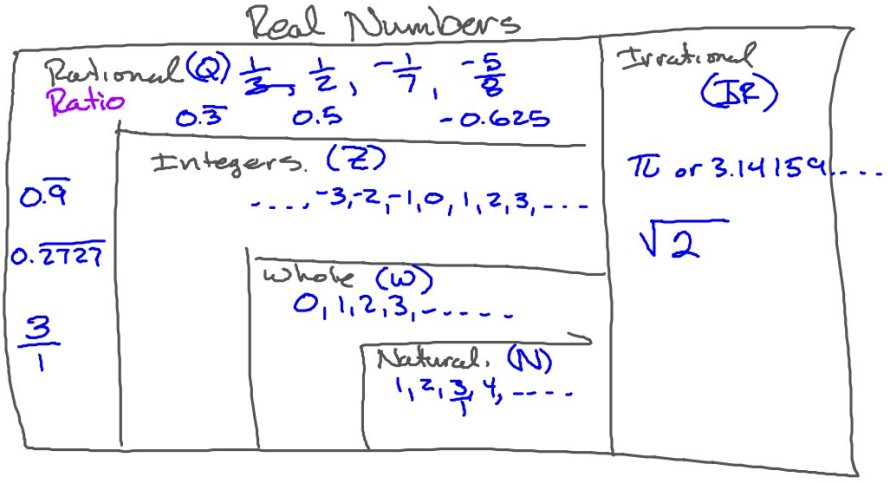
$2 \cdot 2 \cdot \sqrt[3]{2} \cdot \sqrt[3]{m} \cdot n\sqrt[3]{n}$
$4n\sqrt[3]{2mn}$

39) $-2\sqrt{8m^2n^4}$

$-2 \cdot \sqrt{8} \cdot \sqrt{m^2} \cdot \sqrt{n^4}$



$-2 \cdot 2 \cdot \sqrt{2} \cdot m \cdot n \cdot n$
$-4mn^2\sqrt{2}$


Real Numbers
Rational (Q)
Ratio
$\frac{1}{3}$, $\frac{1}{2}$, $-\frac{1}{7}$, $-\frac{5}{8}$
$0.\overline{3}$
0.5
-0.625
Integers. (Z)
..., -3, -2, -1, 0, 1, 2, 3, ...
$0.\overline{9}$
$0.\overline{2727}$
$\frac{3}{1}$
Whole (W)
0, 1, 2, 3, ...
Natural. (N)
1, 2, 3, 4, ...
Irrational
(IR)
π or 3.14159...
$\sqrt{2}$