Number Systems and Lines Name _____

Day 2 INCLASS Date _____

1) What is a radical? : Symbol.
$\sqrt{}$ - radican

2) What is a root?
$\sqrt{4}$ 4th
$\sqrt{}$ sq rt.
$\sqrt[3]{}$ cube rt.
$\sqrt[5]{}$ 5th rt.

3) What do each of the following symbols represent?
$\sqrt{x}$ sq rt. $\sqrt[4]{x}$ 4th rt. (root)
$\sqrt[3]{x}$ cube rt. $\sqrt[100]{x}$ 100th rt.

4) Explain the difference between the following 2 expressions.
$\sqrt[3]{8}$ 3rd root cube root
$3\sqrt{8}$ 3 times or coefficient

5) From the warmup quiz we got: $\sqrt{25} \cdot \sqrt{9}$ — Communitive $a \cdot b = b \cdot a$
$5 \cdot 3 = 15$

Then, find $25 \cdot 9$

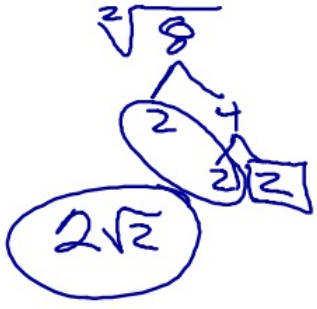
Make a conjecture: What is $\sqrt{25 \cdot 9}$? $= \sqrt{225}$
15

Rule:
$\sqrt{a} \cdot \sqrt{b} = \sqrt{a \cdot b}$

Knowing this rule helps us to simplify radicals (square roots, cube roots, etc) that are not rational. Such as $\sqrt{8}$

Lets try one together using this rule: $\sqrt{8}$ $= \sqrt{4 \cdot 2}$
$\sqrt{4} \cdot \sqrt{2}$
$2\sqrt{2}$

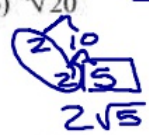
Another way to do these problems is using a factor tree.



4
9
16
25
36
49
64
81
100
121
144
169
196
225

Simplify each radical expression using factor tree or multiplication method.

6) $\sqrt{20}$ $= \sqrt{4 \cdot 5}$ $\sqrt{4} \cdot \sqrt{5}$ $2\sqrt{5}$



7) $\sqrt{75}$ $= \sqrt{25 \cdot 3}$ $\sqrt{25} \cdot \sqrt{3}$ $= 5\sqrt{3}$

8) $\sqrt{32}$ $= \sqrt{16 \cdot 2}$ $\sqrt{4}\,4\sqrt{2}$ $= 4\sqrt{2}$

9) $\sqrt{72}$ $= \sqrt{36 \cdot 2}$ $\sqrt{6}\,6\sqrt{2}$ $6\sqrt{2}$

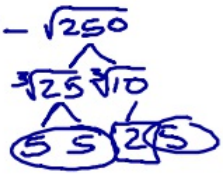
10) $\sqrt{175x^3}$ $= \sqrt{175 \cdot x^3}$ $\sqrt{175} \cdot \sqrt{x^3}$ $5x\sqrt{7x}$

11) $\sqrt{100r^2}$ $= \sqrt{100} \cdot \sqrt{r^2}$ $10 \cdot r$ $10r$

12) $\sqrt{12n^2}$ $= \sqrt{12} \cdot \sqrt{n^2}$ $\sqrt{4}\,\sqrt{3}$ $2n\sqrt{3}$

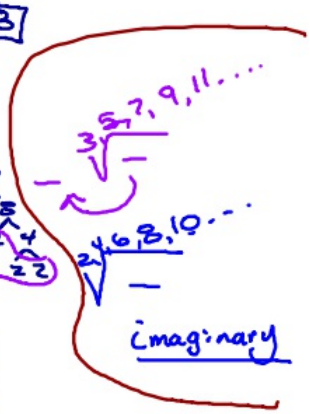
13) $\sqrt{54n^2}$ $= \sqrt{54} \cdot \sqrt{n^2}$ n $3n\sqrt{2 \cdot 3}$ $3n\sqrt{6}$

14) $\sqrt[3]{-250}$ $= -\sqrt[3]{250}$ $\sqrt[3]{25}\sqrt[3]{10}$ $-5\sqrt[3]{2}$

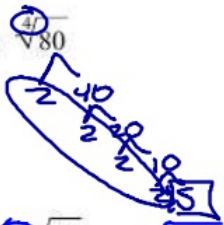


15) $\sqrt[3]{-64}$ $= -\sqrt[3]{64}$ $=$ $= -2 \cdot 2$ $= -4$

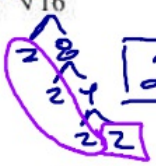
Think $4^3 = 64$



16) $\sqrt[4]{80}$ $2\sqrt[4]{5}$



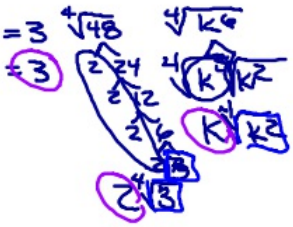
17) $\sqrt[3]{16}$ $2\sqrt{2}$



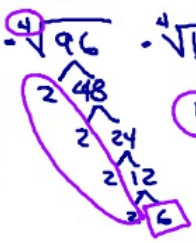
18) $3\sqrt{50}$ $= \sqrt{25} \cdot \sqrt{2}$ $3 \cdot 5\sqrt{2}$ $15\sqrt{2}$

19) $3\sqrt{54}$ $= 3 \cdot \sqrt{9 \cdot 6}$ $= 3 \cdot \sqrt{9} \cdot \sqrt{6}$ $= 3 \cdot 3 \cdot \sqrt{6}$ $= 9\sqrt{6}$

20) $3\sqrt[4]{48k^6}$ $= 3$ $\sqrt[4]{48}$ $\sqrt[4]{k^6}$ $3 \cdot 2 \cdot k\sqrt[4]{3k^2}$ $6k\sqrt[4]{3k^2}$



21) $5\sqrt[4]{96b^7}$ $= 5 \cdot \sqrt[4]{96} \cdot \sqrt[4]{b^7}$ $= 5 \cdot 2\sqrt[4]{6} \cdot b\sqrt[4]{b^3}$ $= 10b \cdot \sqrt[4]{6b^3}$



22) If your answer to an above problem is $3\sqrt{2}$, what would the question have been?

$3\sqrt{2} = \sqrt{(3\cdot3)\cdot2}$

$= \sqrt{9\cdot2}$

$= \sqrt{18}$

Simplify

23) If your answer to an above problem is $5x\sqrt{2}$, what would the question have been?

$5^2x^2 \Rightarrow \sqrt{5^2x^2\,2}$

$= \sqrt{25\cdot x^2\,2}$

$= \sqrt{50x^2}$

Undo the following problems (like in 22 and 23) by rewriting with no coefficients and everything under the square root.

24) $2y\sqrt{3}$ $= \sqrt{2^2y^2\cdot3}$

$= \sqrt{4\cdot3y^2}$

$= \sqrt{12y^2}$

25) $3y^2\sqrt{5}$ $= \sqrt{9\cdot y^4\cdot5}$

$= \sqrt{45y^4}$

26) $12\sqrt{x}$

$= \sqrt{144x}$

27) $xy\sqrt{3}$ $= \sqrt{x^2y^2\cdot3}$

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

28) Is $\sqrt{25} + \sqrt{4} = \sqrt{25+4}$?

$5 + 2 \neq \sqrt{29}$

How can we add square roots?

NO

Try this one: $3\sqrt{5} - 2\sqrt{5}$

1

$\frac{3\sqrt{5}}{\sqrt{5}} - \frac{2\sqrt{5}}{\sqrt{5}}$

$\sqrt{5}(3-2)$

$1\sqrt{5}$

Simplify.

29) $3\sqrt{6} + \sqrt{24}$

$3\sqrt{6} + 2\sqrt{6}$

$5\sqrt{6}$

$\sqrt{24}$

$\sqrt{4}\sqrt{6}$

$2\sqrt{6}$

30) $2\sqrt{5} + 4\sqrt{125}$

$2\sqrt{5} + 20\sqrt{5}$

$22\sqrt{5}$

$4\cdot\sqrt{125}$

$2\cdot5\sqrt{5}$

$4\cdot5\cdot\sqrt{5}$

$20\cdot\sqrt{5}$

31) $-\sqrt{8} + 2\sqrt{8}$

$-1+2=-1$

$-\sqrt{8}$

32) $-5\sqrt{3} - \sqrt{12}$

$-5\sqrt{3} - 2\sqrt{3}$

$-7\sqrt{3}$

$\sqrt{12}$

$\sqrt{4}\sqrt{3}$

$2\sqrt{3}$

33) $3\sqrt{2} + 3\sqrt{18} + 3\sqrt{45}$

$3\sqrt{2} + 9\sqrt{2} + 9\sqrt{5}$

$12\sqrt{2} + 9\sqrt{5}$

$3\sqrt{18}$

$3\sqrt{9}\sqrt{2}$

$3\cdot3\sqrt{2}$

$9\sqrt{2}$

$3\sqrt{45}$

$3\sqrt{9\cdot5}$

$3\cdot3\cdot\sqrt{5}$

$9\sqrt{5}$

34) $3\sqrt{24} + 3\sqrt{3} - \sqrt{12}$

$6\sqrt{6} + 3\sqrt{3} - 2\sqrt{3}$

$6\sqrt{6} + \sqrt{3}$

$3\sqrt{24}$

$=3\cdot2\sqrt{6}$

$=6\sqrt{6}$

$\sqrt{60}$

$\sqrt{4}\sqrt{15}$

$2\sqrt{15}$

35) $\sqrt{10}(\sqrt{6} + \sqrt{10})$

$\sqrt{10}\cdot\sqrt{6} + \sqrt{10}\cdot\sqrt{10}$

$\sqrt{60} + \sqrt{100}$

$2\sqrt{15} + 10$

36) $\sqrt{5}(\sqrt{3} + \sqrt{2})$

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

$\sqrt{15} + \sqrt{10}$