Algebra Name Key

Unit 6 Review

Date____________

1) When you are simplifying exponents using the EXPONENT LAWS, remember the order that you need to follow: Please Make Delicious Ziti Now.

Which law does each letter stand for AND write the law's general form:

P - Power of a Power Law $\rightarrow (x^a)^b = x^{(a \cdot b)}$

M - Multiplication Law $\rightarrow x^a \cdot x^b = x^{(a+b)}$

D - Division Law $\rightarrow \frac{x^a}{x^b} = x^{(a-b)}$

Z - Zero Law $\rightarrow x^0 = 1$

N - Negative Power Law $\rightarrow x^{-a} = \frac{1}{x^a}$ and $\frac{1}{x^{-b}} = \frac{x^b}{1}$

Simplify. Your answer should contain only positive exponents.

2) $\frac{x^2y^2}{2x^{-3}y^{-3} \cdot 3x^2y^2} = \frac{x^2y^2}{6x^{-1}y^{-1}}$

$= \frac{x^2y^2x^1y^1}{6}$

$= \frac{x^3y^3}{6}$

3) $\frac{2a^2b^{-3} \cdot 3b^1a^{-3}}{3a^{-3}} = \frac{6a^{-1}b^{-2}}{3a^{-3}}$

$= \frac{6a^3}{3a^1b^2} = \frac{2a^2}{b^2}$

4) $\dfrac{2u^2v^4}{(u^{-2}v^{-4})^3} = \dfrac{2u^2v^4}{u^{-6}v^{-12}}$

$= 2u^2u^6v^4v^{12}$

$= 2u^8v^{16}$

5) $\dfrac{m^{-3}n^{-1}}{(2^1m^3n^3)^4} = \dfrac{m^{-3}n^{-1}}{2^4(m^3)^4(n^3)^4}$

$= \dfrac{m^{-3}n^{-1}}{16m^{12}n^{12}} = \dfrac{m^{-15}n^{-13}}{16}$

$= \dfrac{1}{16m^{15}n^{13}}$

6) $\dfrac{2x^1y^1}{2x^{-4}y^0\cdot(xy^0)^0} = \dfrac{2x^1y^1}{2x^{-4}\cdot 1\cdot 1}$

$= \dfrac{2x^1y^1\cdot x^4}{2}$

$= x^5y$

7) $\dfrac{(2^1x^3)^3\cdot(2^1x^2y^4)^{-3}}{2x^0y^{-2}} = \dfrac{2^3(x^3)^3\cdot 2^{-3}(x^2)^{-3}(y^4)^{-3}}{2^1\cdot 1\cdot y^{-2}}$

$= \dfrac{2^3\cdot x^9\cdot 2^{-3}x^{-6}\cdot y^{-12}}{2^1\cdot y^{-2}} = \dfrac{2^0\cdot x^3\cdot y^{-12}}{2\cdot y^{-2}}$

$= \dfrac{x^3y^{-10}}{2} = \dfrac{x^3}{2y^{10}}$

8) Write the exponential growth & decay function and explain what each variable represents.

$f(t) = A(1\pm r)^t$

t: time

A: principle "starting value"

r: rate → as a decimal

+: growth

−: decay

9) What form is the rate always written out in?

The rate is always written as a decimal.

10) When would you use + and when would you use -?

$+ \rightarrow$ Growth

$- \rightarrow$ Decay

11) If the number of rabbits increases at a rate of 7.5% per month and you want to see how many rabbits there will be after 2 years, then what value will you use for the time?

$t = 24$ months

12) If the formula is $f(4) = 5100 \cdot 0.87^4$, then what is the percent change?

$1 - r = 0.87$

$+r \qquad +r$

$1 = 0.87 + r$

$-0.87 \quad -0.87$

$0.13 = r \rightarrow 13\%$

13) The duck population in Central Park increases by 12% each year. There are 1,780 ducks in the park right now. How many ducks will there be in 3 years?

$A = 1780$

$r = 0.12$

$t = 3$

growth

$f(3) = 1780(1+0.12)^3$

$=$

14) Mister Mack won the lottery! He is going to invest $10,000 dollars into a stock that gains 3 % interest every month. How much money will he have in 12 months?

$A = 10{,}000$

$r = 0.03$

$t = 12$

growth

$f(12) = 10{,}000(1+0.03)^{12}$

$=$

15) The Bumble Bee population in North Dakota decreases at a rate of 32% a week in the fall. If there are 8,200 bees at the end of August how many will there be at the end of November (12 weeks later)?

$A = 8200$

$r = 0.32$

$t = 12$

decay

$f(12) = 8200(1-0.32)^{12}$

$=$

16) Sally bought a brand new Mac computer. She paid $2,800 for it. The computer depreciates at a rate of 11% a month. How much will the computer be worth in a year?

$A = 2{,}800$

$r = 0.11$

$t = 12$

decay

$f(12) = 2800(1-0.11)^{12}$

$=$

17) Identify each of the following as exponential growth or decay

a. y=4,000(1.27)4 Growth b/c 1.27 > 1

b. y=15(1 + 0.3)10 Growth b/c +

c. y=525(0.99)119 Decay b/c 0.99 < 1

d. y=1,587(1 – 0.61)4 Decay b/c –

e. y=8,295(0.3)12 Decay b/c 0.3 < 1

f. y=2(1.01)100 Growth b/c 1.01 > 1

g. y=431(.14)3 Decay b/c 0.14 < 1

h. y=9,152(1 + 0.2)21 Growth b/c +

i. y=72(0.81)19 Decay b/c 0.81 < 1

18) Provide a definition for what it means to SIMPLIFY A RADICAL. Please remember to include the two aspects that we extensively discussed in class.

① To get the smallest # within the radical ($\sqrt{\ }$).

② While the overall values remain the same.

19) Write the rules for combining radicals using each operation.

Addition & Subtraction -

→ Can only add or subtract if the number under the radical is the same.

→ If different, then simplify to try to get the same #.

Multiplication -

→ Multiply coefficients

→ Multiply #'s within radicals

→ Simplify

Division -

→ Multiply the top & bottom by the radical in the denominator.

→ Simplify.

Simplify.

20) $3\sqrt{5}+2\sqrt{45}$

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

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

$3\sqrt{5}+6\sqrt{5}$

$9\sqrt{5}$

21) $3\sqrt{45}+3\sqrt{20}$

$3\sqrt{9}\sqrt{5}+3\sqrt{4}\sqrt{5}$

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

$9\sqrt{5}+6\sqrt{5}$

$15\sqrt{5}$

22) $\sqrt{2}\cdot 3\sqrt{20}$

$3\sqrt{20\cdot 2}$

$3\sqrt{40}$

$3\sqrt{4}\sqrt{10}$

$3\cdot 2\sqrt{10}$

$6\sqrt{10}$

23) $-5\sqrt{3}\left(\sqrt{10}-4\sqrt{3}\right)$

$-5\sqrt{30} - -20\sqrt{9}$

$-5\sqrt{30}+20\cdot 3$

$-5\sqrt{30}+60$

24) $\dfrac{2\sqrt{3}}{\sqrt{2}}\cdot\dfrac{\sqrt{2}}{\sqrt{2}}$

$\dfrac{2\sqrt{6}}{\sqrt{4}}=\dfrac{2\sqrt{6}}{2}=\sqrt{6}$

25) $\dfrac{\sqrt{10}}{3\sqrt{6}}\cdot\dfrac{\sqrt{6}}{\sqrt{6}}=\dfrac{\sqrt{60}}{3\sqrt{36}}=\dfrac{\sqrt{4}\sqrt{15}}{3\cdot 6}$

$=\dfrac{2\sqrt{15}}{18}=\cancel{\sqrt{18}}$

$\dfrac{\sqrt{15}}{9}$

26) $\sqrt{28x^4} = \sqrt{28}\,\sqrt{x^4}$

$= \sqrt{4}\sqrt{7}\,\sqrt{x^4}$

$= 2\sqrt{7}\,x^2$

$= 2x^2\sqrt{7}$

27) $\sqrt{128r^3} = \sqrt{128}\,\sqrt{r^3}$

$= \sqrt{64}\,\sqrt{2}\,\sqrt{r^2}\,\sqrt{r^1}$

$= 8\sqrt{2}\,r\sqrt{r}$

$= 8r\sqrt{2r}$

28) $5\sqrt{200r^3} = 5\cdot\sqrt{200}\,\sqrt{r^3}$

$= 5\sqrt{100}\,\sqrt{2}\,\sqrt{r^2}\sqrt{r}$

$= 5\cdot 10\cdot\sqrt{2}\cdot r\cdot\sqrt{r}$

$= 50\,r\sqrt{2r}$

29) $-5\sqrt{50n^3} = -5\cdot\sqrt{50}\,\sqrt{n^3}$

$= -5\cdot\sqrt{25}\cdot\sqrt{2}\cdot\sqrt{n^2}\cdot\sqrt{n^1}$

$= -5\cdot 5\cdot\sqrt{2}\cdot n\cdot\sqrt{n}$

$= -25n\sqrt{2n}$

Challenge: Simplify.

30) $\dfrac{4+\sqrt{2}}{\sqrt{8}}\cdot\dfrac{\sqrt{8}}{\sqrt{8}}$

$\dfrac{4\sqrt{8}+\sqrt{16}}{\sqrt{64}} = \dfrac{4\sqrt{4}\sqrt{2}+4}{8}$

$= \dfrac{4\cdot 2\sqrt{2}+4}{8} = \dfrac{8\sqrt{2}+4}{8}$

$= \sqrt{2}+\frac{1}{2}$ or $\dfrac{2\sqrt{2}+1}{2}$

31) $\dfrac{\sqrt{5}-3}{5\sqrt{8}}\cdot\dfrac{\sqrt{8}}{\sqrt{8}} = \dfrac{\sqrt{40}-3\sqrt{8}}{5\sqrt{64}}$

$= \dfrac{\sqrt{4}\sqrt{10}-3\sqrt{8}}{5\cdot 8} = \dfrac{2\sqrt{10}-3\sqrt{4}\sqrt{2}}{40}$

$= \dfrac{2\sqrt{10}-6\sqrt{2}}{40}$

$= \dfrac{\sqrt{10}-3\sqrt{2}}{20}$