Mastery Algebra 1 Sample Mastery Quiz 7-1 Name: KEY

Per: ____ ☐

7-1 Zero and Negative Exponents

Simplify each expression completely. Leave your answer in fraction form, if necessary. (1 pt each)

1. $y^{-3} = \frac{1}{y^3}$

2. $x^0 = 1$

3. $4t^{-2} = \frac{4}{1} \cdot \frac{1}{t^2} = \frac{4}{t^2}$

4. $\frac{2}{y^{-5}} = \frac{2}{1} \cdot \frac{1}{y^{-5}} = \frac{2}{1} \cdot \frac{y^5}{1} = 2y^5$

5. $\frac{3^{-2}}{w} = \frac{1}{3^2} \cdot \frac{1}{w} = \frac{1}{9w}$

6. $2^{-4}x^2y^{-5} = \frac{1}{2^4} \cdot \frac{x^2}{1} \cdot \frac{1}{y^5} = \frac{x^2}{16y^5}$

8. Suppose the population of a certain type of fox in Yellowstone National Park increases by 5% every year. This is modeled by the expression $P = 500(1.05)^y$, where y is the number of years since 2010.

a. About how many foxes are predicted in the year 2020?

$P = 500(1.05)^{10}$

≈ 814.45

About 814 foxes are predicted in 2020.

(2)

b. About how many foxes were there in the year 2000?

$P = 500(1.05)^{-15}$

≈ 240.51

There were about 241 foxes in 2000.

(2)

Mastery Algebra 1 Sample Mastery Quiz 7-2 Name: KEY

Per: ____ ☐

7-2 Multiplying Powers With the Same Base

Simplify each expression completely. Leave your answer in fraction form, if necessary. (1 pt each)

1. $x^7 \cdot x^{-1}$ = x^6

2. $y^{-5} \cdot y^2$ = y^{-3} = $\frac{1}{y^3}$

3. $2z^3 \cdot z^{-4} \cdot 5z^4$
= $(2 \cdot 5)(z^{3-4+4})$
= $10z^3$

4. $(-2a^3)(-a)$
= $-2(-1)(a^{3+1})$
= $2a^4$

5. $(4b^{-2})(-2b^{-3})$
= $4(-2)(b^{-2-3})$
= $-8b^{-5}$ = $\frac{-8}{b^5}$

6. $(-5h^{-3})(-2h^{-4})$
= $-5(-2)(h^{-3-4})$
= $10h^{-7}$ = $\frac{10}{h^7}$

7. Simplify each expression. Write your answer in scientific notation.

a. $(7 \times 10^{-2})(2 \times 10^5)$
= $(7 \times 2)(10^{-2+5})$
= 14×10^3
= 1.4×10^4

b. $(0.1 \times 10^7)(0.3 \times 10^8)$
= $(0.1)(0.3)(10^{7+8})$
= $.03 \times 10^{15}$
= 3×10^{13}

8. A gallon of water contains about 12.7×10^{25} molecules. The Mississippi River discharges about 2.69×10^7 gal every minute. About how many molecules is this?

$(12.7 \times 10^{25})(2.69 \times 10^7)$
= $(12.7 \times 2.69)(10^{25+7})$
= 34.163×10^{32}
= 3.4163×10^{33}

(2)

The Mississippi River discharges about 3.4163×10^{33} molecules every minute.

Mastery Algebra 1 Sample Mastery Quiz 7-3 Name: KEY

Per: ____ ☐

7-3 More Multiplication Properties of Exponents

Simplify each expression completely. Leave your answer in fraction form, if necessary. (1 pt each)

1. $(a^2)^6 = \boxed{a^{12}}$

2. $(a^{-2})^3 = a^{-6} = \boxed{\frac{1}{a^6}}$

3. $(x^{-3})^{-4} = \boxed{x^{12}}$

4. $(2a^{-7})^3$

$= 2^3 \cdot a^{-21}$

$= \boxed{\frac{8}{a^{21}}}$

5. $(6x^{-4})^{-2}$

$= 6^{-2}x^8$

$= \boxed{\frac{x^8}{36}}$

6. $(n^3)^3(2n^{-1})^{-4}$

$= n^9 \cdot 2^{-4}n^4$

$= \boxed{\frac{n^{13}}{16}}$

7. Simplify each expression. Write your answer in scientific notation.

a. $(4 \times 10^5)^4$

$= (4 \times 10^5)(4 \times 10^5)$

$= 4(4) \times 10^{5+5}$

$= 16 \times 10^{10}$

$= \boxed{1.6 \times 10^{11}}$

(2)

b. $(4 \times 10^{-5})^6$

$= 4^6 \times 10^{-30}$

$= 4096 \times 10^{-30}$

$= \boxed{4.096 \times 10^{-27}}$

(2)

Mastery Algebra 1 Sample Mastery Quiz 7-4 Name: KEY

Per: ____ ☐

7-4 Division Properties of Exponents

Simplify each expression completely. Leave your answer in fraction form, if necessary. (1 pt each)

1. $\frac{a^2}{a^4} = a^{-2} = \boxed{\frac{1}{a^2}}$

2. $\frac{2x^2y^4}{3x^3y^2} = \boxed{\frac{2y^2}{3x}}$

3. $\left(\frac{c}{2c^0}\right)^2 = \left(\frac{c}{2}\right)^2 = \boxed{\frac{c^2}{4}}$

4. $\left(\frac{3b^2}{c^2}\right)^{-4} = \frac{3^{-4}b^{-8}}{c^{-8}} = \boxed{\frac{c^8}{81b^8}}$

5. $\frac{(x^2y^2)(-2y^7)}{(xy^4)(14y^2)} = \frac{-2x^2y^9}{14xy^6} = \boxed{\frac{-xy^3}{7}}$

6. $\left(\frac{2x^3}{y^{-4}y}\right)^{-2} = \left(\frac{2x^7}{y}\right)^{-2} = \frac{2^{-2}x^{-14}}{y^{-2}} = \boxed{\frac{y^2}{4x^{14}}}$

7. Simplify the expression. Write your answer in scientific notation.

$\frac{3.066 \times 10^8}{7.3 \times 10^3} = \left(\frac{3.066}{7.3}\right) \times \left(\frac{10^8}{10^3}\right)$

$= 0.42 \times 10^5$

$= \boxed{4.2 \times 10^4}$

(2)

8. The population of Earth is about ~~6639~~ 6.6468 $\times 10^9$. Land surface of Earth is about ~~1.483 $\times 10^8$~~ .573 $\times 10^8$ sq mi sq km. What is the population density for the surface area of the Earth? in people per square km. (Leave your answer in scientific notation.)

$\frac{6.6468 \times 10^9}{.573 \times 10^8} = \left(\frac{6.6468}{0.573}\right) \times \left(\frac{10^9}{10^8}\right) = 11.6 \times 10^1$

$= 1.16 \times 10^2$

The population density of the earth is about 1.16×10^2 people per square mile.

(2)

Mastery Algebra 1 Sample Mastery Quiz 7-5 Name: KEY

Per: ____ ☐

7-5 Rational Exponents and Radicals

Find the value of each expression. (1 point each)

1. $\sqrt[4]{81} = 3$

2. $25^{\frac{1}{2}} = 5$

3. $16^{\frac{3}{2}} = 64$

Write each expression in radical form. (1 point each)

4. $b^{\frac{1}{3}} = \sqrt[3]{b}$

5. $a^{\frac{3}{5}} = \left(\sqrt[5]{a}\right)^3$ (or $\sqrt[5]{a^3}$)

6. $36x^{\frac{1}{2}} = 36\sqrt{x}$

7. $(27c)^{\frac{2}{3}} = 27^{\frac{2}{3}} c^{\frac{2}{3}} = 3^2\left(\sqrt[3]{c}\right)^2 = 9\left(\sqrt[3]{c}\right)^2$ or $9\sqrt[3]{c^2}$

Write each expression in exponential form. (1point each)

8. $\sqrt[3]{x^4} = x^{\frac{4}{3}}$

9. $\sqrt{(2y)^5} = (2y)^{\frac{5}{2}}$

10. $\sqrt[3]{8z^4} = 8^{\frac{1}{3}} z^{\frac{4}{3}} = \sqrt[3]{8}\sqrt[3]{z^4} = 2\sqrt[3]{z^4}$ or $2\left(\sqrt[3]{z}\right)^4$

Mastery Algebra 1 Sample Mastery Quiz 7-6 Name: _____ Per: ____ ☐

7-6 Graphing Exponential Functions

Determine whether each rule represents exponential growth or decay. Explain how you know.

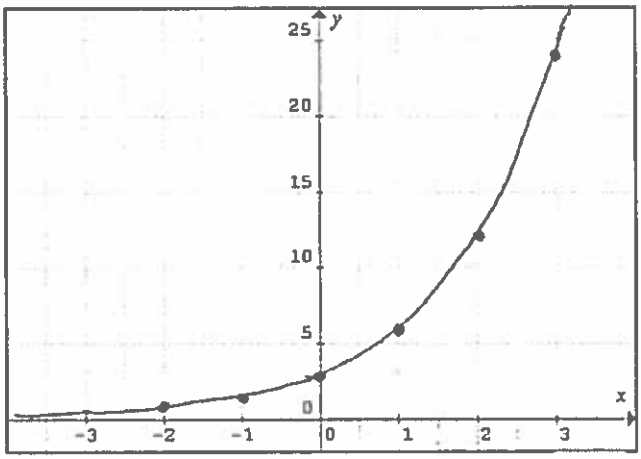
1. $y = 4 \cdot 3^x$

Exponential growth. The base (3) is greater than one.

(2)

3. Graph the exponential function $y = 3 \cdot 2^x$

x	Work	y
-2	$3 \cdot 2^{-2} = 3 \cdot \frac{1}{4}$	$\frac{3}{4}$
-1	$3 \cdot 2^{-1} = 3 \cdot \frac{1}{2}$	$\frac{3}{2}$
0	$3 \cdot 2^0 = 3 \cdot 1$	3
1	$3 \cdot 2^1 = 3 \cdot 2$	6
2	$3 \cdot 2^2 = 3 \cdot 4$	12
3	$3 \cdot 2^3 = 3 \cdot 8$	24



(4)

4. A computer valued at $1900 loses 25% of its value each year.

a. Write a function rule that models the value of the computer.

Value = $1900(.75)^y$

(1)

b. Find the value of the computer after 3 years.

Value = $1900(.75)^3$

$\approx$ \$83.95

(1)

5. Suppose the population of a certain insect is modeled by the function $f(x) = 1600 \cdot 2^x$, where x is the number of years. How many insects will there be after 3 years? (Round to the nearest whole number)

$f(3) = 1600(2)^3$

$= 1600(8) = 12{,}800$

After 3 years, there will be 12,800 insects

(2)