Algebra 1 TEAM Test
Unit 7 Exponential Growth and Decay

Names: _____
Period: _____

HSN.RN.A.2	Mastery (4)	Proficient (3)	Nearly Proficient (2)	Needs Improvement (1)
Radicals and Rational Exponents	Student re-writes all of the exponential expressions accurately computes the value without the use of a calculator. Work is easy to read and neatly organized.	Student re-writes 4 of the exponential expressions accurately and accurately computes most values without the use of a calculator. Work is easy to read and neatly organized.	Student re-writes 4 of the exponential expressions accurately and computes 3 without using a calculator. Minor errors maybe present.	Shows little understanding of how to re-write rational and negative exponents

3. Write each expression below in radical form and compute the value without using a calculator.

a. $64^{2/3}$ **b.** $25^{5/2}$ **c.** $81^{7/4}$

Write each expression below as an equivalent expression without negative exponents.

d. 3^{-2} **e.** m^{-4} **f.** $\left(\frac{3}{5x}\right)^{-1}$

	Mastery (4)	Proficient (3)	Nearly Proficient (2)	Needs Improvement (1)
Review	Student answers all three problems correctly and verifies the solution when appropriate. Work is easy to follow and neatly organized.	Student answers two of the three problems correctly. Work is easy to follow and neatly organized.	Student understands one of the 3 problems, minor errors may be present.	Students shows little understanding of any of the problems.

4.

a. Simplify

$$\left(\frac{r^2 s}{r s^3 t}\right)^3$$

b. Solve and verify

$$5x^2 + 43 = (x - 1)(5x + 6)$$

c. Write an equation or system of equations to solve this problem.

An adult ticket to the amusement park costs $24.95 and a child's ticket costs $15.95. A group of 10 people paid $186.50 to enter the park. How many were adults?

d. Solve the system of equations

$$-4x + y = 5$$
$$2x = -y - 13$$

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HSF.LE.A.2 & HSF.LE.B.5	Mastery (4)	Proficient (3)	Nearly Proficient (2)	Needs Improvement (1)
Constructing and Interpreting Exponential Functions	Students gets all 4 of the problems correct and the work is neatly organized and easy to follow.	Student gets 3 of the 4 problems correct and the work is neatly organized and easy to follow.	Student understands 2 of the 4 problems, minor errors may be present, and attempts the other two.	Student shows little understanding of constructing or interpreting exponential functions.

1. Below are situations that can be described using exponential functions. For each situation identify the multiplier that should be used and the initial value, then write an exponential equation in the form $y = ab^x$ that represents the growth or decay.

a. The number of bacteria present in a colony is 180 at noon, and it increases at a rate of 22% per hour

b. The function has a y-intercept of (0, 10) and a multiplier of 1.2

c. The function passes through the points (2, 48) and (5, 750)

d. A 2006 Mazda Miata which is worth $19,000 but is depreciating 10% per year

a. Find the exponential equation that models this situation.

b. Use the equation to find the value of the car after 7 years.

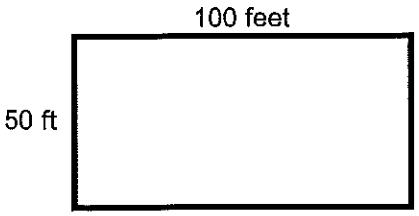
HSF.LE.A.1.c	Mastery (4)	Proficient (3)	Nearly Proficient (2)	Needs Improvement (1)
Recognizing Exponential Growth and Decay	Student answers all three of the questions accurately with a thorough explanation of their reasoning. Work is easy to read and neatly organized.	Student answers 2 of the three questions accurately with a thorough explanation of their reasoning. Work is easy to read and neatly organized.	Student fills in the table correctly and describes the rate of change accurately or answers problem c) using an exponential equation. Minor errors may be present.	Student is unable to make sense of any of the three problems.

2. You are in a rectangular shaped room with a length of 100 feet and a width of 50 feet. The walls of the room suddenly begin to move in! Every minute, 4/5 of the length remains and 4/5 of the width remains.

# of minutes since the walls began moving in	Area that remains
1	
2	
3	
4	

a. Fill in the **table of values** that compares the number of minutes since the walls began moving in to the **area** in square feet that remains. **Describe the rate of change for the area.**

b. As the area of the room decreases, so would the perimeter. Which decreases at a faster rate, the area or the perimeter? Explain your reasoning.



c. Let's say you started with a rectangular room that had an area of **10000 square feet**, and every minute the area decreased by 40%, would the area be less than 1 square foot after 17 minutes? Explain your reasoning.

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HSF.LE.A.2 & HSF.LE.B.5	Mastery (4)	Proficient (3)	Nearly Proficient (2)	Needs Improvement (1)
Constructing and Interpreting Exponential Functions	Students gets all 4 of the problems correct and the work is neatly organized and easy to follow.	Student gets 3 of the 4 problems correct and the work is neatly organized and easy to follow.	Student understands 2 of the 4 problems, minor errors may be present, and attempts the other two.	Student shows little understanding of constructing or interpreting exponential functions.

1. Below are situations that can be described using exponential functions. For each situation identify the multiplier that should be used and the initial value, then write an exponential equation in the form $y = ab^x$ that represents the growth or decay.

a= Initial Value $y=ab^x$ b= multiplier

a. The number of bacteria present in a colony is 180 at noon, and it increases at a rate of 22% per hour

a=180 100% + 22% = 122% b=1.22 $y = 180(1.22)^x$

b. The function has a y-intercept of (0, 10) and a multiplier of 1.2

a=10 b=1.2 $y=10(1.2)^x$

c. The function passes through the points (2, 48) and (5, 750)

a= 7.68 b= 2.5 $y=7.68(2.5)^x$

c)

x	y
0	7.68 ÷2.5
1	192 ÷2.5
2	48 ×6
3	×6
4	×6
5	750 ×6

$48bbb = 750$

$\frac{48bbb}{48} = \frac{750}{48}$

$bbb = 15.625$

$b^3 = 15.625$

$\sqrt[3]{b^3} = \sqrt[3]{15.625}$

$b = 2.5$

d. A 2006 Mazda Miata which is worth $19,000 but is depreciating 10% per year

a. Find the exponential equation that models this situation.

a= 19,000 100% - 10% = 90% ∴ b=.9 $y=19{,}000(.9)^x$

b. Use the equation to find the value of the car after 7 years.

$y=(19{,}000)(.9)^7 = 9087.64$

HSF.LE.A.1.c	Mastery (4)	Proficient (3)	Nearly Proficient (2)	Needs Improvement (1)
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2. You are in a rectangular shaped room with a length of 100 feet and a width of 50 feet. The walls of the room suddenly begin to move in! Every minute, 4/5 of the length remains and 4/5 of the width remains.

100 × 50 = 5000 Initial Value

# of minutes since the walls began moving in	Area that remains
1	3200
2	2048
3	1311
4	839

w
10
32

a. Fill in the **table of values** that compares the number of minutes since the walls began moving in to the **area** in square feet that remains. **Describe the rate of change for the area.**

3200 b=.2048 $y=5000(.64)^x$

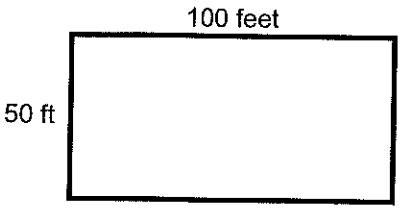
b=.64

b. As the area of the room decreases, so would the perimeter. Which decreases at a faster rate, the area or the perimeter? Explain your reasoning.

Area $y=5000(.64)^x$ b=.64 ⇒ .36 or 36% being removed

Perimeter $y=300(.8)^x$ b=.8 ⇒ .2 or 20% being removed

Area going down at faster rate



c. Let's say you started with a rectangular room that had an area of **10000 square feet**, and every minute the area decreased by 40%, would the area be less than 1 square foot after 17 minutes? Explain your reasoning.

100% - 40% = 60% b=.6

$y=10{,}000(.6)^x$ At x=19 area is less than one foot.

Note: a b c 25% of test

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Radicals and Rational Exponents	Student re-writes all of the exponential expressions accurately computes the value without the use of a calculator. Work is easy to read and neatly organized.	Student re-writes 4 of the exponential expressions accurately and accurately computes most values without the use of a calculator. Work is easy to read and neatly organized.	Student re-writes 4 of the exponential expressions accurately and computes 3 without using a calculator. Minor errors maybe present.	Shows little understanding of how to re-write rational and negative exponents

3. Write each expression below in radical form and compute the value without using a calculator.

a. $64^{2/3}$ $\left(\sqrt[3]{64}\right)^2$ 4^2 16

b. $25^{5/2}$ ← root, Power $\left(\sqrt[2]{25}\right)^5$ 5^5 3125

c. $81^{7/4}$ ← root, Power $\left(\sqrt[4]{81}\right)^7$ 3^7 2187

Write each expression below as an equivalent expression without negative exponents.

change sign
cross line

d. 3^{-2} $\frac{1}{3^2} = \frac{1}{9}$

e. m^{-4} $\frac{1}{m^4}$

f. $\left(\frac{3}{5x}\right)^{-1} = \frac{3^{-1}}{(5x)^{-1}} = \frac{5x}{3}$

	Mastery (4)	Proficient (3)	Nearly Proficient (2)	Needs Improvement (1)
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4.

a. Simplify

$$\left(\frac{r^2 s}{r s^3 t}\right)^3$$

$$\left(\frac{r^2 s^1}{r^1 s^3 t^1}\right)^3 = \frac{r^{2\cdot 3} s^{1\cdot 3}}{r^{1\cdot 3} s^{3\cdot 3} t^{1\cdot 3}} = \frac{r^6 s^3}{r^3 s^9 t^3} = \boxed{\frac{r^3}{s^6 t^3}}$$

b. Solve and verify

$$5x^2 + 43 = (x - 1)(5x + 6)$$

	$5x$	6
x	$5x^2$	$6x$
-1	$-5x$	-6

$\cancel{5x^2} + 43 = \cancel{5x^2} + 6x - 5x - 6$
$-5x^2 \quad -5x^2$
$43 = x - 6$
$+6 \quad +6$
$\boxed{49 = x}$

c. Write an equation or system of equations to solve this problem.

An adult ticket to the amusement park costs $24.95 and a child's ticket costs $15.95. A group of 10 people paid $186.50 to enter the park. How many were adults?

Let A = Adult Let c = Child
$A + C = 10$ equation 1
$A(24.95) + C(15.95) = 186.50$ equation 2

d. Solve the system of equations

$$-4x + y = 5$$
$$2x = -y - 13$$

rewrite equation
$-4x + y = 5$
$+4x \quad +4x$
$y = 5 + 4x$

substitute
$2x = -(5 + 4x) - 13$
$2x = -5 - 4x - 13$
$2x = -18 - 4x$
$+4x \quad +4x$
$6x = -18$ $\boxed{x = -3}$

plug & substitute
$y = 5 + 4(-3)$
$y = 5 - 12$
$\boxed{y = -7}$