NAME:

Part A: Exponential Story Problems

Write an exponential function for each situation. **Show your work for c and d on a separate sheet of paper.**

1) Mary is investing in an account. She puts \$2000 in an account that earns 4% each year.

a) Is this growth or decay? Why?

growth "earns"

b) Write a function to model the value of the account after x years.

$a = 2000$ $A(t) = 2000(1.04)^t$

$r = 0.04$

$b = 1 + 0.04 = 1.04$

c) Find the value of the account after 5 years.

$t = 5 \rightarrow 2000(1.04)^5 = 2433.31$

2) Samantha bought a car for \$23,000. The car depreciates in value by 12% each year.

a) Is this growth or decay? Why?

b) Write a function to model the value of the car after x years.

$a = 23000$ $r = 12\% = -0.12$

$b = 1 - 0.12 = 0.88$

$A(t) = 23000(0.88)^t$

c) Find the value of the car after 2 years.

17811.20

3) Bilal bought a house for \$120,000. It appreciates in value by 3.2% each year.

a) Is this growth or decay? Why?

appreciates

b) Write a function to model the value of the house after x years.

$a = 120000$ $A(t) = 12000(1.032)^t$

$b = 1 + 0.032 = 1.032$

c) Find the value of the house after 5 years.

$t = 5 \rightarrow 12000(1.032)^5 = 140469$

4) The small town of Rosea has a population of 45,000 people. It grows at a rate of 2.3% per year.

a) Is this growth or decay? Why?

b) Write a function to model the population of the town after x years.

$a = 45000$ $r = 2.3\% \Rightarrow 0.023$

$45000(1.023)^t$ $b = 1 + 0.023 = 1.02$

c) Find the population after 20 years.

$45000(1.023)^{20} = 70912.80$ people

5) An initial dose of 20 mg of medication decays at a rate of 40% each hour.

a) Is this growth or decay? Why?

b) Write a function to model the amount of medication in x hours.

$A(t) = 20(0.6)^t$

$a = 20$

$r = 0.4$ $b = 1 - 0.4 = 0.6$

c) Find the amount of medication in 3 hours.

$t = 3 \rightarrow 20(0.6)^3 = 4.32$

d) In how many hours will there be less than 1 mg left in the blood stream?

$\boxed{t = 6 \text{ hours}}$

Graph →

look at TABLE for y less than 1

6) Cancer cells in a particular type of tumor increase at a rate of 12% each week. Suppose you start with 1 cancer cell.

a) Is this growth or decay? Why?

b) Write a function to model the number of cancer cells after x weeks.

$a(t) = 1(1.12)^t$

c) Find the number of cells after 1 year. = 52 weeks = t

$1(1.12)^{52} = 362.52$ cells

d) Find how many weeks it will take for there to be more than 100,000 cancer cells.

$t = 102$ weeks

$100000 = 1(1.12)^t$ → look at table.

7) Sarah decided for her New Year's Resolution that she was going to start exercising and started with 10 minutes. She said "I'll do 10% more each day."

a) Is this growth or decay? Why?

b) Write a function to model the # of minutes after x days.

$a = 10$ minutes $10(1.10)^t$

$r = 10\% = 0.10$ $b = 1 + 0.1 = 1.10$

c) Find the # of minutes she is exercising after a week.

$t = 7$ days $10(1.10)^7 = 19.4872$ min

d) Find how many days it will take for her to be exercising 24 hours a day!

$\boxed{t = 53 \text{ days}}$

minutes → $24 \times 60 = 1440$ minutes

(look for MINUTES in table not hours)

8) Leila buys some office furniture for \$5000 for her business. A depreciation table shows that it depreciates in value by 9% each year.

a) Is this growth or decay? Why?

b) Write a function to model the value of the furniture after x years.

$b = 1 - 0.09$ $5000(0.91)^t$

c) Find the value of the furniture after 3 years.

$5000(0.91)^3 = 3767.86$

d) Find how many years it will take for the furniture to be worth \$1000.

$t = 17$ years

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PART B: Determining Growth and Decay Factors

Use the given information to determine the rate of growth or decay, r, and the growth/decay factor, b. For the story problems, define the variables x and y and write an equation. $r = b - 1$ $b = 1 + r$

	Growth or decay?	Rate (r)	Factor (b)	Equation?
1. $y = 6(1.3)^x$	Growth	$r = 0.3 = 30\%$	$b = 1.3$	
2. $y = 13{,}000(0.84)^x$	Decay	$r = -0.16 = -16\%$	$b = 0.84$	
3. $y = 98(1.06)^x$	Growth	$r = 0.06 = 6\%$	$b = 1.06$	
4. $y = 0.2(3)^x$	Growth	$r = 2 = 200\%$	$b = 3$	
5. A $15,000 car depreciates at a rate of 8% per year. x= years y= car value	Decay	$r = -0.08$	$b = 1 - 0.08$ $b = 0.92$	$15000(0.92)^x$
6. Francois bought a Monet painting for $100,000. It appreciates in value by 8% each year. x= years y= painting value	Growth	$r = 0.08$	$b = 1 + 0.08$ $b = 1.08$	$100000(1.08)^x$
7. The population of a town of 30,000 increases at a rate of 3% per year. Write an equation to model the situation. x= years y= population	Growth	$r = 0.03$	$b = 1 + 0.03$ $b = 1.03$	$30000(1.03)^x$
8. Frank turns into a Zombie and infects other people at a rate of 100% each week (every zombie infects one other person per week) x= weeks y= zombies	Growth	$r = 100\%$ $r = 1$	$b = 1 + 1$ $b = 2$	$1(2)^x$
9. Shenia bought a computer for $3000. It depreciates at a rate of 22% each year. x= years y= computer value	Decay	$r = -0.22$	$b = 1 - 0.22$ $b = 0.78$	$3000(0.78)^x$
10. A bird population starts at 45 in a particular region and is increasing at a rate of 5% each year. x= years y= bird population	Growth	$r = 0.05$	$b = 1 + 0.05$ $b = 1.05$	$45(1.05)^x$