mcr 3u

Name: _____

Exponential Growth and Decay Word Problems

1. A population increases at each rate shown. Determine the growth factor for each rate of growth.
   a) 12% b) 6% c) 3.4% d) 8.2% e) 10.5%

2. A population has each growth factor. What is the rate of growth as a percent?
   a) 1.2 b) 1.05 c) 1.025 d) 1.004 e) 1.15

3. A population decreases at each rate shown. Determine the decay factor for each rate of decrease.
   a) 12% b) 6% c) 3.4% d) 8.2% e) 10.5%

4. A population has each decay factor. What is the percent decrease in the population?
   a) 0.8 b) 0.95 c) 0.975 d) 0.96 e) 0.45

5. The population, *P* million, of Alberta can be modelled by the equation $P = 2.238(1.014)^n$, where *n* is the number of years since 1981.
   a. What was the population of Alberta in 1981?
   b. At what annual rate, as a percent, has Alberta's population been increasing since 1981.
   c. Estimate the population in 2021. What assumption did you make?
   d. What factors might affect the accuracy of the model's estimation of the population?

6. Ontario's population in 1991 was approximately 10.1 million. The population has been increasing at a rate of 1.25% per year.
   a. Write an equation to represent the population of Ontario, *y*, people, as a function of the number of years, *x*, since 1991.
   b. Suppose the population continues to grow at this rate. Estimate the population in 2041.

7. A strain of bacteria doubles every hour. Suppose there were 4000 bacteria at the start.
   a. Write an equation to represent *y*, the number of bacteria *x* hours from now.
   b. How many bacteria would be present after each time?
      i) 4h ii) 6h iii) 9h

8. Mei Lin invested $600 in a GIC for several years. The interest rate was 5% compounded annually.
   a. Write an equation to represent the value, *y* dollars, of the GIC *x* years from now.
   b. Use the equation from part a. What is the value of the GIC after 7 years?

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9. A new car decreases in value exponentially after it is purchased. The value, V dollars, of a new car n years after it is purchased is given by the equation $V = 20000(0.84)^n$.
   a. What was the purchase price of the car?
   b. By what percent does the value of the car decrease each year?
   c. Estimate the value of the car 6 years after it was purchased.

10. There are currently 1000 deer in a provincial park. Write an equation to represent y, the number of deer in the park x years from now, when the population decreases at a rate of 3% per year.

11. When light passes through ice, its intensity is reduced by 4% for every 1 cm thickness of ice.
   a. Write an equation to express the percent of light, y, that penetrates x centimetres of ice.
   b. What percent of light penetrates a sheet of ice 4.5 cm thick?

12. A ball is dropped from a height of 4 m. After each bounce, the ball rises to 50% of its pervious height.
   a. What is the height of the ball after the third bounce?
   b. After how many bounces will the ball's height be 0.125 m? (HINT: find the same base to solve)

Answers:

1a) 1.12	b) 1.06	c) 1.034	d) 1.082	e) 1.105
2a) 20%	b) 5%	c) 2.5%	d) 0.4%	e) 15%
3a) 0.88	b) 0.94	c) 0.966	d) 0.918	e) 0.895
4a) 20%	b) 5%	c) 2.5%	d) 4%	e) 55%
5a) 2.238 million	b) 1.4%	c) 3.903 million	d) answers vary	
6a) $y = 10.1(1.0125)^x$	b) 18.8 million			
7a) $y = 4000(2)^x$	b) i) 64000	ii)256000	iii)2048000	
8a) $y = 600(1.05)^x$	b) $844.26			
9a) 20000	b) 16%	c) $7025.96		
10) $y = 1000(0.97)^x$				
11a) $y = 100(0.96)^x$	b) 83.22%			
12a) 0.5m	b) 5 bounces			