Date Completed: ________
Mentor Initials: ________

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ESM PREP

Exponential Equations (Basic)

1. Each year the value of an investment increases by 3.5% of the previous year's value. The initial value of the investment was \$400. Which equation gives the value of the investment y, in dollars, x years after the initial investment was made?

A) $y = 400(.35)^x$
B) $y = 400(1.035)^x$
C) $y = 400(1.35)^x$
D) $y = 400(3.5)^x$

2. $$P(t) = 4{,}200(1.025)^t$$

The function shown gives the balance of Adam's account $P(t)$, in dollars, t years after he opened the account, where t is an integer. Based on the function P, what is the percent increase of the balance of Adam's account between any two consecutive years?

A) 23%
B) 10.25%
C) 2.5%
D) 1.025%

3. At the beginning of a study, the number of bacteria in a population is 120,000. The number of bacteria doubles every hour for a limited period of time. For this period of time, which equation models the number of bacteria y in this population after x hours?

A) $y = 120{,}000^{2x}$
B) $y = x^2 + 120{,}000$
C) $y = 2x^2 + 120{,}000$
D) $y = 120{,}000(2)^x$

4. In the xy-plane, the y-intercept of the graph of $y = 500(3)^x$ is $(0, c)$, where c is a constant. What is the value of c?

A) 0
B) 3
C) 1
D) 500

5. $$C(t) = 1.95(1.094)^{t}$$

The equation above can be used to model the price of gasoline in California t years after 1965, where $0 \leq t \leq 55$. According to the model, what is the best interpretation of the value 1.95 in this context?

A) The model estimates that the price of gasoline was 1.95 dollars in 1965.
B) The model estimates that the price of gasoline was 1.95 dollars in 2020.
C) The model estimates that the price of gasoline increased by 1.95 dollars each year from 1965 to 2020.
D) The model estimates that the price of gasoline increased by 1.95% each year from 1965 to 2020.

6.

x	$f(x)$
0	3.2
1	1.6
2	0.8

The given table shows several values of x and the corresponding values of $f(x)$. If $f(x) = a(b)^x$, where a and b are constants, what is the value of a?

A) 0
B) .5
C) 1.6
D) 3.2

7. In 720, there were 458 knights in Europe. Each year from 720 to 789, the number of knights increased by approximately 3.1% over the previous year's number. Which equation best models the number of knights, k, in Europe x years after 720?

A) $k = (3.1)^x$
B) $k = (1.031)^x$
C) $k = 458(3.1)^x$
D) $k = 458(1.031)^x$

8. A radioactive substance decays at an annual rate of 11 percent. If the initial amount of the substance is 250 grams, which of the following functions f models the remaining amount of the substance, in grams, t years later?

A) $f(t) = 250(0.89)^t$
B) $f(t) = 250(0.11)^t$
C) $f(t) = 0.89(250)^t$
D) $f(t) = 250(1.11)^t$

9.

$$P = 195(1.004)^{\frac{t}{5}}$$

The equation above can be used to model the population, in thousands, of a certain city t years after 2010. According to the model, the population is predicted to increase by 0.4% every n months. What is the value of n?

A) 5
B) 10
C) 12
D) 60

10.

x	$f(x)$
0	4
1	12
2	36
3	108

The given table shows several values of x and the corresponding values of $f(x)$. Which of the following could define f?

A) $f(x) = 12^x$
B) $f(x) = 4(3^x)$
C) $f(x) = 3^{4x}$
D) $f(x) = 4^{3x}$

11. What is the y-intercept of the graph of $y = (5)^x$ in the xy-plane?

A) $(1, 5)$
B) $(1, 0)$
C) $(0, 1)$
D) $(5, 1)$

12.

t	$f(t)$
0	40
10	120
20	360
30	1080

The table shows the time t, in minutes, after the initial observation of a bacteria culture and the corresponding values of $f(t)$, the number of bacteria, in millions, in the culture. Which of the following functions best models $b(t)$?

A) $f(t) = 10(3)^{\frac{t}{40}}$
B) $f(t) = 10(3)^{40\text{t}}$
C) $f(t) = 40(3)^{10t}$
D) $f(t) = 40(3)^{\frac{t}{10}}$

13. The two quantities y and x are related such that $y = 7$ and $x = 0$. When the value of x increases by 1, the value of y is multiplied by 2. Which of the following represents this relationship?

A) $y = 7x^2$
B) $y = 7(x - 1)^2$
C) $y = 7(2)^x$
D) $y = 7(2)^{x-1}$

14. At the start of an experiment, approximately 20 thousand bacteria were present in a liquid growth solution. Over the next 8 hours, the number of bacteria approximately tripled every hour. Which of the following exponential equations best models the relationship between the number of bacteria B, in thousands, and the amount of time t, in hours, after the start of the experiment, where $t \leq 8$?

A) $B = 20 + 3^t$
B) $B = 20(3)^t$
C) $B = 3(20)^t$
D) $B = (60)^t$