MES44QC-LESSON 14 Mr. Pineda

Aim: How can we use an exponential function to solve problems involving growth/decay?

Do Now:

The table below represents the function F.

x	3	4	6	7	8
$F(x)$	9	17	65	129	257

The equation that represents this function is

(1) $F(x) = 3^x$
(2) $F(x) = 3x$
(3) $F(x) = 2^x + 1$
(4) $F(x) = 2x + 3$

I – Exponential Growth or Decay – $Y= a(b)^x$

1. Because a is the y-intercept it plays a very important role in word problems involving exponential growth. a is known as the **initial value** because it is the value of the function when $x = 0$ or at the beginning of time.

2. b determines how fast the function increases or decreasing. For this reason, b is known as the **growth factor.** The growth factor is determined by starting with 100% and then adding or subtracting the percentage that the function if being increased by or subtracting the percentage that the function is being decreased by. Finally you take your growth factor as a percentage and change it into a decimal before plugging it into $y = a(b)^x$.

3. You deposit $200 into a bank account. Every year that account increases by 12 %. [EXAMPLE]

   Initial value: 200

   Growth factor: 1.12

   Equation: $y=200(1.12)^x$

4. The population of an apartment building is 4,000 people. Every month the population goes down by 12%.

   Initial value:

   Growth factor:

   Equation:

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5. The New York Mets sign a new player for $8,000,000 and his salary goes up by 3% every year.

Initial value:

Growth factor:

Equation:

6. A certain stock was worth $42 at the beginning of the day. Every hour the stock goes down by 15%.

Initial value:

Growth factor:

Equation:

Regents Questions

1. The growth of a certain organism can be modeled by $C(t) = 10(1.029)^{24t}$, where $C(t)$ is the total number of cells after t hours. Which function is approximately equivalent to $C(t)$?

(1) $C(t) = 240(.083)^{24t}$ (3) $C(t) = 10(1.986)^t$

(2) $C(t) = 10(.083)^t$ (4) $C(t) = 240(1.986)^{\frac{t}{24}}$

2. A student invests $500 for 3 years in a savings account that earns 4% interest per year. No further deposits or withdrawals are made during this time. Which statement does *not* yield the correct balance in the account at the end of 3 years?

(1) $500(1.04)^3$
(2) $500(1 - .04)^3$
(3) $500(1 + .04)(1 + .04)(1 + .04)$
(4) $500 + 500(.04) + 520(.04) + 540.8(.04)$

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Homework # 14

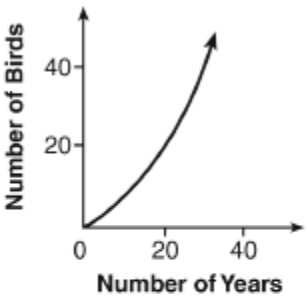
1. A laboratory technician studied the population growth of a colony of bacteria. He recorded the number of bacteria every other day, as shown in the partial table below.

t (time, in days)	0	2	4
f(t) (bacteria)	25	15,625	9,765,625

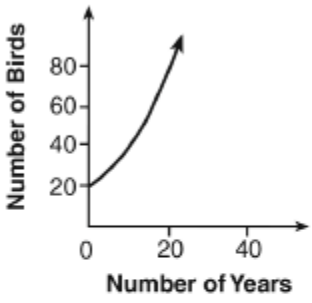
Which function would accurately model the technician's data?

(1) $f(t) = 25^t$
(2) $f(t) = 25^{t+1}$
(3) $f(t) = 25t$
(4) $f(t) = 25(t + 1)$

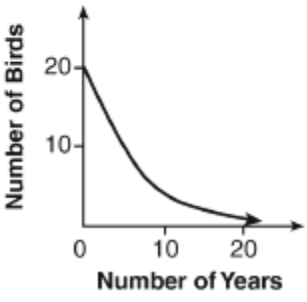
2. A population that initially has 20 birds approximately doubles every 10 years. Which graph represents this population growth?



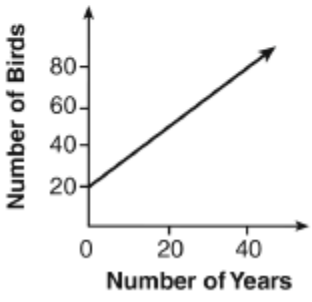
(1)



(3)



(2)



(4)

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3. The country of Benin in West Africa has a population of 9.05 million people. The population is growing at a rate of 3.1% each year. Which function can be used to find the population 7 years from now?

(1) $f(t) = (9.05 \times 10^6)(1 - 0.31)^7$
(2) $f(t) = (9.05 \times 10^6)(1 + 0.31)^7$
(3) $f(t) = (9.05 \times 10^6)(1 + 0.031)^7$
(4) $f(t) = (9.05 \times 10^6)(1 - 0.031)^7$

4. The table below shows the temperature, $T(m)$, of a cup of hot chocolate that is allowed to chill over several minutes, m.

Time, m (minutes)	0	2	4	6	8
Temperature, T(m) (°F)	150	108	78	56	41

Which expression best fits the data for $T(m)$?

(1) $150(0.85)^m$
(2) $150(1.15)^m$
(3) $150(0.85)^{m-1}$
(4) $150(1.15)^{m-1}$

5. Milton has his money invested in a stock portfolio. The value, $v(x)$, of his portfolio can be modeled with the function $v(x) = 30{,}000(0.78)^x$, where x is the number of years since he made his investment. Which statement describes the rate of change of the value of his portfolio?

(1) It decreases 78% per year.
(2) It decreases 22% per year.
(3) It increases 78% per year.
(4) It increases 22% per year.

6. If a population of 100 cells triples every hour, which function represents $p(t)$, the population after t hours?

(1) $p(t) = 3(100)^t$
(2) $p(t) = 100(3)^t$
(3) $p(t) = 3t + 100$
(4) $p(t) = 100t + 3$

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7. Mario's \$15,000 car depreciates in value at a rate of 19% per year. The value, V, after t years can be modeled by the function $V = 15{,}000(0.81)^t$. Which function is equivalent to the original function?

(1) $V = 15{,}000(0.9)^{9t}$ (3) $V = 15{,}000(0.9)^{\frac{t}{9}}$

(2) $V = 15{,}000(0.9)^{2t}$ (4) $V = 15{,}000(0.9)^{\frac{t}{2}}$

8. The Ebola virus has an infection rate of 11% per day as compared to the SARS virus, which has a rate of 4% per day.

If there were one case of Ebola and 30 cases of SARS initially reported to authorities and cases are reported each day, which statement is true?

(1) At day 10 and day 53 there are more Ebola cases.
(2) At day 10 and day 53 there are more SARS cases.
(3) At day 10 there are more SARS cases, but at day 53 there are more Ebola cases.
(4) At day 10 there are more Ebola cases, but at day 53 there are more SARS cases.

Answers to Homework # 14

Please select the best choice for each question. Answers may be reapeated.

1) (1)

2) (2)

3) (3)

4) (4)

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