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) $F(x) = 2x + 3$

$2^x + 1$

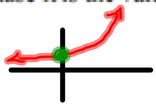
$2^3 + 1 = 9$

$2^4 + 1 = 17$

$$A = P\left(1 + \frac{R}{100}\right)^n$$

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.



• y intercept = initial value (P)

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 .

$$A = P\left(1 \pm \frac{R}{100}\right)^n$$

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

Parent function

Growth Factor

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

Initial value: 200

Growth factor: 1.12

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

✓ $A = P\left(1 + \frac{r}{100}\right)^n$

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

Initial value: 4000

Growth factor: $\boxed{1 - 12} = \frac{88}{100} = .88$

Equation:

$A = P\left(1 \pm \frac{R}{n}\right)^{nt}$

$A = 4000\left(\frac{.88}{12}\right)^{12 \cdot 1}$

$1 + \frac{12}{100}$

growth

$1 - \frac{12}{100}$

$1 - 0.88$

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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: 8,000,000

Growth factor: $1.03 = 1 + \frac{3}{100}$

Equation:

$A = 8{,}000{,}000(1.03)^n$

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

Initial value: 42

Growth factor: 0.85 (1 − .15)

Equation:

$$A = 42\left(\frac{0.85}{n}\right)^{nt}$$

t → # of years.

n → # of hours per year

n → # of hours per year

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) $C(t) = 240(1.986)^{\frac{t}{24}}$

Assign a value to $t = 2$

$10(1.029^{24})^t$

$C(2) = 10(1.029)^{24(2)} = 39.44$

(3) $C(2) = 10(1.986)^2 = 39.44$

(4) $C(2) = 240(1.986)^{\left(\frac{2}{24}\right)} = 254.12$

$240(1.986)\wedge(2 \div 24)$

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$3^8 = 6,561$

$(3^4)^2 = 6,561$

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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