Name: ____________________ Exponential Functions – 02

Date: ______________________

$$y = ac^x$$

***y* – dependent var.**

***x* – independent var. (usually time in days, weeks, months, years)**

***a* – initial value (the amount you start with)**

***c* – rate of growth or decay (if 'c' is greater than 1.0 → y gets bigger as time goes by)**

(if 'c' is smaller, between 0 and 0.99 → y gets smaller as time goes by)

1. The world population in the year 2000 was approximately 6.08 billion people.
The annual rate of increase has been about 2.5% per year $= 100 + 0.025 = 1.025$
What should the world population be in the year 2020?

$y = 6.08\ (1.025)^{20}$

9.96

Answers:

- ***World population in the year 2020:*** 9.96 ***billion people***

2. A new Mac Pro is purchased for a sum of $ 2500.
Unfortunately, computers depreciate at the rate of 14% every year. $100 - 14 = \frac{86}{100} = 0.86$
How much will the computer be worth in 5 years?

$y = 2500\ (0.86)^5$

$y = 1176$

Answers:

- V***alue of the Mac Pro after 5 years:*** 1176.07

3. A baseball card bought for $ 50 increases by 4% in value each year.
How much will it be worth in 50 years?

$100 + 4 = \frac{104}{100} = 1.04$

$y = ac^x$

$y = 50(1.04)^{50}$

Answers:

- ***In 50 years, the card will be worth:*** 355.33 ***$***

4. The bear population in Quebec **depreciates** at a rate of 2.5 % per year.
There were 1571 bears in Quebec in 2002.
How many bears should there be in 2020?

$100 - 2.5 = \frac{97.5}{100} = 0.975$

$y = ac^x$

$y = 1571(0.975)^{18}$

Answers:

- ***The bear population in Quebec, in 2020, should be:*** 996 ***bears***

5. An investment of $ 25 000 increases at a rate of 10.5 % per year.
Find the value of the investment after 35 years.

$100 + 10.5 = \frac{110.5}{100} = 1.105$

$y = ac^x$

$y = 25000(1.105)^{35}$

Answers:

- ***Value of the investment in 35 years:*** 823 416.83

6. The population of foxes on the island of Montreal is decreasing at a rate of 3.5 % per year. This year (in January of 2016), there were **80 foxes** on the island.

a) In what year will the population first drop below 15 foxes.

Build the Rule:

- Variables: x = years y = foxes
- Initial value (a) 80 foxes
- Rate of growth / decay (c) $100 - 3.5 = \frac{96.5}{100} = 0.965$
- ***Rule:*** $y = 80(0.965)$

$y = 80(0.965)^1$
$y = 77.2$

$y = 80(0.965)^5$
$y = 66.9$

$y = 80(0.965)^{10}$
$y = 56.0$

$y = 80(0.965)^{20}$
$y = 39.2$

$y = 80(0.965)^{50}$
$y = 13.5$

$y = 80(0.965)^{47}$
$y = 15$

$1 \rightarrow 77.2$
$5 \rightarrow 66.9$
$10 \rightarrow 56.0$
$20 \rightarrow 39.2$
$50 \rightarrow 13.5$
$47 \rightarrow 15$

Answers:

- ***The fox population should drop below 15 foxes after*** 47 ***years.***
- ***The fox population should drop below 15 foxes in the year*** 2063 $\rightarrow$ $2016 + 47 = 2063$