

Exponential Population Growth

Questions and Lesson on Exponential Population growth @

www.mathwarehouse.com/exponential-growth/exponential-models-in-real-world.php

The general formula for exponential growth of a population

Population =

4) If the starting population of 5 rabbits grows at 200% each year, how many will there be 20 years?

5) If the starting population of 5 rabbits grows at 200% each year, how many will there be 50 years?



Frogs

6) A population of 100 frogs increases at an annual rate of 22%. How many frogs will there be in 5 years?

Using this same model for the exponential growth of the frogs, what will be the frog population in

7) 10 years

8) 50 years

9) A type of bacteria has a very high exponential growth rate at 80% every hour. If there are 10 bacteria, determine how many there will be in 5 hours, 1 day, and 1 week?

a) 5 hours:

c) 1 Week

b) 1 Day

10) A species of extremely rare, deep water fish has an extremely rarely have children. If there are a 821 of this type of fish and their growth rate is 2% each month, how many will there be in half of a year, in 10 years and 100 years?

a) Half a year

b) 10 years

c) 100 years

II. New York State Math B Regents Questions

1) The population of Henderson City was 3,381,000 in 1994, and is growing at an annual rate of 1.8%. If this growth continues, what will the approximate population of Henderson City be in the year 2000.

- (1) 3,696,000 (3) 3,798,000
(2) 3,763,000 (4) 3,831,000

2) A culture of bacteria contained 3,842,700 cells on one day and is growing at a daily rate of 6.8%. How many cells would be present 4 days later?

- (1) 4,999,442 (3) 5,043,878
(2) 5,339,404 (4) 15,370,800

3) From the January 2007 Test:

Since January 1980, the population of the city of Brownville has grown according to the mathematical model $y = 720,500(1.022)^x$, where x is the number of years since January 1980.

Explain what the numbers 720,500 and 1.022 represent in this model

IV. Finding Percent growth

1) If a population of rats was 10 in January and 15 in February, what is the percent growth of these rats?

2) If there are 20 foxes in the forest this year, and 21 in one year, what percent is the percent growth of the foxes?

3) If there are 20 foxes in the forest this year, and 21 in one year, what percent is the percent growth of the foxes?

4) Two years ago there were 30 goldfish in the pond, and this year there are 40. What is the annual percent growth?

5) Three years ago there were 10 apes and the population is now 19, what is the annual percent growth?

6) Last year there were 10 goldfish in the pond, and this year there is 5. How would you describe the percent 'growth' of this population?

V Calculators and Exponential Regressions

(Refer to Exponential Regressions worksheet for step by step guide)

1) What exponential function best describes the following points

$(-1, .6)$, $(0, 2.05)$, $(1, 5.8)$, $(2, 18.5)$, $(3, 53)$

2)

The table below expresses the total population of a species of crocodiles at the same Zoo. What exponential function best represents this species' population growth

| Year | Population |
|------|------------|
| 1 | 2 |
| 10 | 5 |
| 20 | 12 |
| 30 | 22 |
| 40 | 25 |

3) The table on the right shows the total population of a species of bird at the Bronx Zoo. What exponential function best represents this species' population growth?

| Year | Population |
|------|------------|
| 1 | 22 |
| 2 | 25 |
| 3 | 31 |
| 4 | 39 |
| 5 | 42 |

4) Use the equation that you found to determine how many birds there will be in the 6th year and in the 7th year

6th year :___

7th year:___

Create a Species and Determine its rate of Growth!

Task #1) What is the name of your species/animal? _____

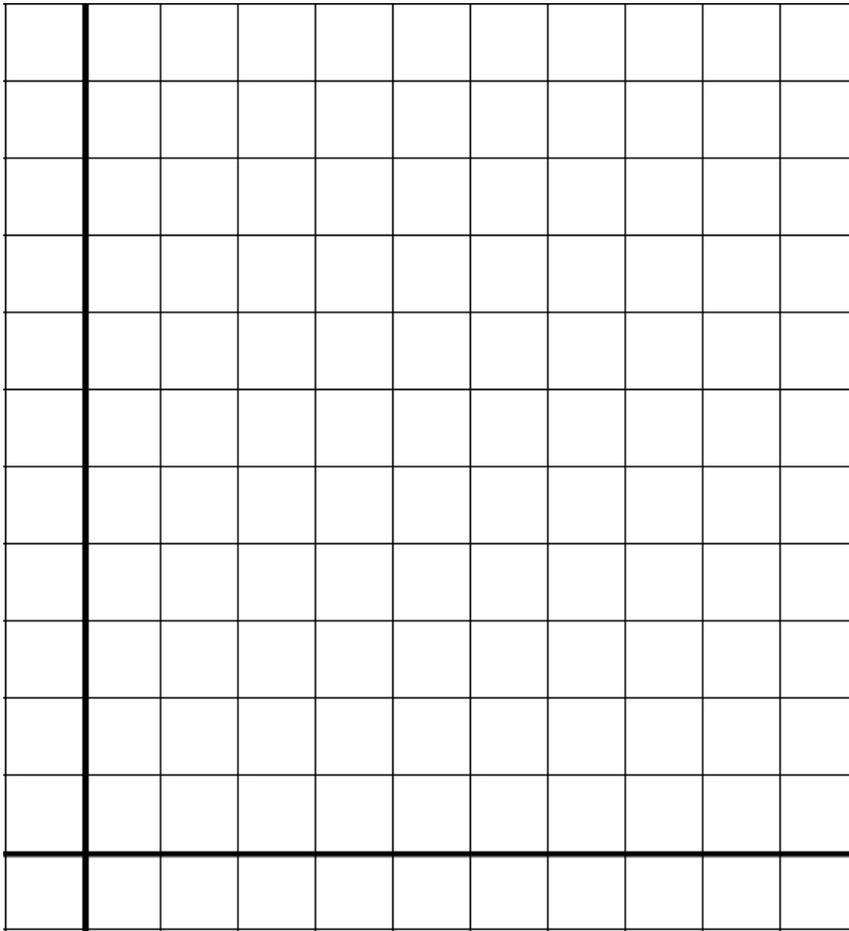
Task #2) At this point in time (today), what is the total population of your species?

Task #3) Pick a number between 5 and 80 to be the percent of growth
Percent growth = _____% every month

Task #4) Write an equation that models the exponential growth of this species
Population = _____

Task #5) Determine what will be the population of your species in
1 month: _____ 6 months: _____
2 months: _____ 1 year: _____

Task #6) Graph this exponential growth equation



Exponential Regressions on TI's

Tested on TI-83, TI-83- Plus and TI-84 Plus Silver Edition

1) Press the STAT

```

00000 CALC TESTS
1:Edit...
2:SortA(
3:SortD(
4:ClrList
5:SetUpEditor
    
```

2) Press Enter:

| L1 | L2 | L3 | 1 |
|-------|-------|-------|---|
| ----- | ----- | ----- | |

L1(1) =

3) Enter your x and y values into the Screen (This example will use the ordered the values in the picture →)

| L1 | L2 | L3 | 2 |
|-------|-------|-------|---|
| -1 | 6 | ----- | |
| 0 | 2.05 | | |
| 1 | 8.8 | | |
| 2 | 18.5 | | |
| 3 | 33 | | |
| ----- | ----- | | |

L2(6) =

4) Press STAT And scroll right once to highlight "CALC" :

```

EDIT 00000 TESTS
1:1-Var Stats
2:2-Var Stats
3:Med-Med
4:LinReg(ax+b)
5:QuadReg
6:CubicReg
7:QuartReg
    
```

5) Scroll down to item '0' which says ExpReg

```

EDIT 00000 TESTS
4:LinReg(ax+b)
5:QuadReg
6:CubicReg
7:QuartReg
8:LinReg(a+bx)
9:LnReg
0:ExpReg
    
```

6) Hit enter twice (first time just gets ExpReg on screen; on second, the TI actually calculates the exponential regression) to see the exponential regression. If you used the numbers on the page up, above you should see the following screen

```

ExpReg
y=a*b^x
a=1.923930724
b=3.053280546
    
```

7) Therefore, the exponential equation that best fits this data is $y = 1.923930724(3.053280546)^x$

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