**Exponential Function**

Rule:

y = a(c)x Where a = initial value / y-intercept

Where c = base / change

Where x = exponent / time

The formula can also be viewed as:

y = a(c)bx Where b = # of time periods

y = start(change)time

y = a (1± $\frac{percent}{100}$)x Where + is used when the amount is increasing
 Where – is used when the amount is decreasing

**Finding the rule from a graph:**



**Step 1 – Identify the y-intercept / initial value**

$\frac{1}{4}$ or 0.25

**Step 2 – plug in initial value into base formula**

y = a(c)x

y = $\frac{1}{4}$(c)x

**Step 3 – plug in a given coordinate to solve for “c” value**

Two options: (-1, $\frac{1}{8}$ ) or (4,4)

y = $\frac{1}{4}$(c)x

4 = $\frac{1}{4}$ (c)4

$\frac{4}{\frac{1}{4}}$ = $\frac{\frac{1 }{4}(c)4}{\frac{1}{4}}$

Isolate the variable by diving both sides by the number in front of the variable

16 = c4

$\sqrt[4]{16}$ = c = 2

Therefore the rule is y = $\frac{1}{4}$(2)x

**Word Problems**

1. Today, a loaf of bread costs $3.49. If inflation averages 4% per year, then how much will a loaf cost in 50 years?

**Step 1 – Identify what we know**

* Initial value / start / a = 3.49
* Base amount / keep / c = 1 + 4%
* Exponent / time / x = 50
* Power / Answer / y = ????

**Step 2 – Plug values into base formula**

y = a (1± $\frac{percent}{100}$)x

y = 3.49 (1+ $\frac{4}{100}$)50

y = 3.49 (1 + 0.04)50

**Step 3 – Simplify and Solve. Remember to follow BEDMAS.**

y = 3.49 (1.04)50

y = 3.49 (7.10)

y = $24.80

1. You buy a car worth $28000. If the depreciation rate of the car is 18% per annum, how much will the car be worth in 5 years?

**Step 1 – Identify what we know**

* Initial value / start / a = 28000
* Base amount / keep / c = 1 - 18%
* Exponent / time / x = 5
* Power / Answer / y = ????

**Step 2 – Plug values into base formula**

y = a (1± $\frac{percent}{100}$)x

y = 28000 (1- $\frac{18}{100}$)5

y = 28000 (1- 0.18)5

**Step 3 – Simplify and Solve. Remember to follow BEDMAS.**

Y = 28000(0.82)5

Y = 28000(0.37)

Y = $10360

1. A certain strain of bacteria doubles every 6 hours. If a laboratory has 200 of these bacteria today, how many will there be in four days?
* Initial value / start / a = 200
* Base amount / keep / c = 2
* Periods $\frac{24 hours=1 day}{6 hours} $= 4
* Exponent / time / x = 4
* Power / Answer / y = ????

y = a(c)bx

y = 200(2)(4)(4)

y = 200(2)16

y = 200(65536)

y = 13 107 200

1. Each year the frog population of a small wooded area declines by 5% in contrast to the previous year. If this wooded area now has 2000 frogs, how many frogs will be present in 10 years time?

Answer

y = a (1± $\frac{percent}{100}$)x

y = 2000 (1- $\frac{5}{100}$)10

y = 2000 (1- 0.05)10

y = 2000 (0.95)10

y = 2000 (0.59)

y = 1180

* Initial value / start / a = 2000
* Base amount / keep / c = 1 - 5%
* Exponent / time / x = 10
* Power / Answer / y = ????
1. Among the options available to finance a purchase, credit cards are the ones that have the highest interest rates. If Diane makes a purchase worth $1200 with a credit card that has an interest rate of 1.5% each month, how much will she pay in interest if she can only clear her card a year later?

Answer

* Initial value / start / a = 1200

y = a (1± $\frac{percent}{100}$)x

y = 1200 (1+ $\frac{1.5}{100}$)12

y = 1200 (1 + 0.015)12

y = 1200 (1.015)12

y = 1200 (1.19)

y = $1434.74

* Base amount / keep / c = 1 + 1.5%
* Exponent / time / x = 12
* Power / Answer / y = ????
1. Under laboratory conditions, a mosquito population triples every 4 hours. If the initial population was 200 mosquitoes, then how many would there be after 2 days?

Answer

y = a(c)bx

y = 200(3)(6)(2)

y = 200(3)12

y = 200(531 441)

y = 106 288 200

* Initial value / start / a = 200
* Base amount / keep / c = 3
* Periods $\frac{24 hours=1 day}{4 hours} $= 6
* Exponent / time / x = 2
* Power / Answer / y = ????