WARM UP

My brother's hockey card, initially worth $1, has apparently been doubling in value as the years have passed. My brother received this baseball card when he was 5 years old. He is now 19. How much is his card worth today?

Jan 26-11:27 AM

Exponential Function

Rule: $y = a(c)^x$

Where: a = initial value / y-intercept / start

c = base / keep

x = exponent / time

The formula can also be viewed as:

$y = a(c)^{bx}$ Where: b = # of time periods

$y = start(keep)^{time}$

$y = a\left(1 \pm \frac{percent}{100}\right)^x$ Where: + is used when the amount is increasing

− is used when the amount is decreasing

Feb 9-5:47 PM

Exponential Function (basic)

Ex. Candiac has a population of 34 500 people. If the population increases by 5% per year, what will the population be in 6 years?

start, time

$y = \text{start}\,(\text{keep})^{\text{time}}$

$y = ?$

$\text{start} = 34\,500$

$\text{keep} = 1 + \frac{5}{100} = 1.05$

$\text{time} = 6$

BEDMAS

$y = 34500\,(1.05)^6$

$y = 46233$ people

Jan 26-11:18 AM

Exponential Fn (doubling/tripling)

Ex. If there are 20 bacteria in a petri dish and this bacteria triples every 6 hours, how many bacteria will there be after 2 days (48 hours)?

keep

$y = \text{start}\,(\text{keep})^{\text{time}}$

$y = ?$

$\text{start} = 20$

$\text{keep} = 3$

$\text{time} = \frac{48}{6} = 8$

$y = 20\,(3)^8$

$y = 131220$ bacteria

Jan 26-11:56 AM

How To Find the 'Start' value

Ex. Today my collector baseball card is worth $1842.30. I have had this card for 7 years. My card has gained 4% value per year ever since I bought it.

How much was my card worth when I bought it? (ie what is the start value?)

$y = \text{start}\ (\text{keep})^{\text{time}}$

$y = 1842.30$

start = ?

keep = $1 + \frac{4}{100} = 1.04$

time = 7

$y = \text{start}\ (\text{keep})^{\text{time}}$

$1842.30 = \text{start}\ (1.04)^7$

$1842.30 = \text{start}\ (1.3159)$

$\frac{1842.30}{1.3159} = \text{start}$

$1399.95 = \text{start}$

The value of my card was $1399.95

Jan 26-1:08 PM

How to find the 'keep'

Ex. To fill up my car cost $50 three years ago. Now it costs $56.28. What is the increase in the rate? (finding the keep)

$y = \text{start}\ (\text{keep})^{\text{time}}$

$y = 56.28$

start = 50

keep = ?

time = 3

$y = \text{start}\ (\text{keep})^{\text{time}}$

$56.28 = 50\ (\text{keep})^3$

$\frac{56.28}{50} = \text{keep}^3$

lets call keep x

$1.1256 = x^3$

$\sqrt[3]{1.1256} = x$

$x = 1.04$

$\therefore$ keep is 1.04 so the rate is 4%

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NEW

How to Find the 'time' in exponential

Ex. My car was worth $35 000 when I bought it. It depreciated by 14%. It is now worth $16 464.95. How many years ago did I buy it?

Now instead of guessing and checking, you will use your calculators to solve the problem.

$y = \text{start}\,(\text{keep})^{\text{time}}$

$y = 16\,464.95$

start = 35000

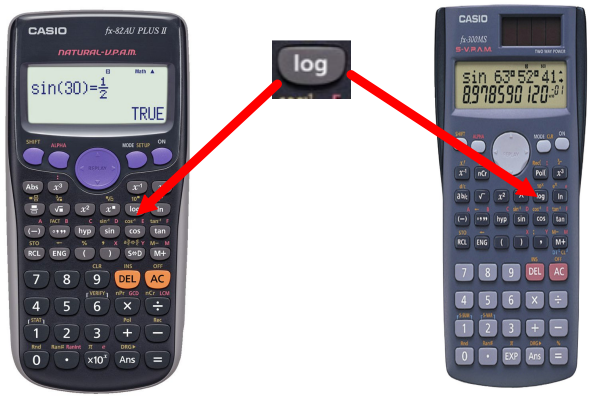
keep = $1 - \frac{14}{100} = 0.86$

time = ?

$$16464.95 = 35000\,(0.86)^{\text{time}}$$

Jan 26-12:04 PM

We will be using the 'log' button on the calculator



Jan 26-12:15 PM

Ex. My car was worth $35 000 when I bought it. It depreciated by 14%. It is now worth $16 464.95. How many years ago did I buy it?

$$y = \text{start} \times \text{keep}^{\text{time}}$$

$$\text{time} = \frac{\log\left(\frac{y}{\text{start}}\right)}{\log(\text{keep})}$$

plug in what you are given into formula

y= $16 464.95
start = $35 000
keep = 0.86

$$\text{time} = \frac{\log\left(\frac{16\,464.95}{35\,000}\right)}{\log(0.86)}$$

$$\text{time} = \frac{\log 0.4704...}{\log 0.86}$$

steps to do on your calculator

log (0.4704) ÷ log (0.86)=

time = 5 years

Jan 26-12:41 PM

Ex. 1 After studying the evolution of a population of 2000 gulls, biologists concluded that the population increased by 15 % every two years. What will the population be in 5 years?

y: ?

Start: 2000

Keep: 1 + 15% = 1.15

time: $\frac{5}{2} = 2.5$

$y = 2000(1.15)^{2.5}$

$= 2836$

Feb 10-12:25 PM

Ex 1. Johnny starts an ant colony with 200 ants. The pet shop owner told him that, if fed properly, the population would increase by 20% every month. The colony that Johnny bought is rated as having a maximum capacity of 15000 ants.

How many months will Johnny have his ant colony before the population exceeds its capacity?

y: 15000

s: 200

k: 1 + 20% = 1.2

t: x

$$\text{time} = \frac{\log\left(\frac{y}{\text{start}}\right)}{\log(\text{keep})}$$

$$= \frac{\log\left(\frac{15000}{200}\right)}{\log(1.2)}$$

$$= 23.68$$

$$\sim 24 \text{ mths}$$

Feb 14-11:51 AM

Ex. 2 The mouse population in the biology lab originally numbered 10. The mice were mistakenly released and the lab technician claimed their population, if unchecked, would double every 4 months.

How many years would it take this population to reach 1000?

y: 1000

s: 10

k: 2

t: 3x

$$\text{time} = \frac{\log\left(\frac{y}{\text{start}}\right)}{\log(\text{keep})}$$

$$3x = \frac{\log\left(\frac{1000}{10}\right)}{\log(2)}$$

$$\frac{3x}{3} = \frac{6.64}{3}$$

$$x = 2.21 \text{ yrs}$$

Feb 9-7:17 PM

Ex. 3 After studying the evolution of a population of 2000 gulls, biologists concluded that the population increased by 15% every two years. If this rate of growth is maintained, how long will it take for this gull population to double?

y: 4000

S: 2000

K: $1+15\% = 1.15$

t: $\frac{x}{2}$

$$\text{time} = \frac{\log\left(\frac{y}{\text{start}}\right)}{\log(\text{keep})}$$

$$\frac{x}{2} = \frac{\log\left(\frac{4000}{2000}\right)}{\log(1.15)}$$

$$2\left(\frac{x}{2}\right) = (4.96)2$$

$$x = 9.92$$

Feb 9-7:20 PM

Feb 11-11:30 AM