Finding the time

Method 1: Trial and Error

Method 2: Calculator "log"

Apr 27-12:16 PM

Using your calculator to find time...

Find the **log** button: it's the inverse of exponential... working backwards

To find an exponent

Example: $2^3=8$ $\quad$ $\text{Log}_2 8=3$

On the calculator $\quad$ $\frac{\log 8}{\log 2} = 3$

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

isolate: $\text{keep}^{\text{time}}$

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

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

Nov 30-6:22 PM

Finding the time with the calculator

How many years before an investment of 2000 with an annual appreciation of 5% reaches $4365.75

Rule for time

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

y=4365.75

start= 2000

keep = 1.05

time=?

time= log(y/start)/log(keep)

$$\text{time} = \frac{\log(4365.75/2000)}{\log(1.05)}$$

time= 16

Nov 30-6:21 PM

Ex . Farah purchased a new car five years ago for $25 000 and the car has depreciated in value by 15% per year. She would like to sell the car today in order to purchase a used vehicle for $10 000. The used car she is intending to purchase is anticipated to retain 90% of its previous year's value each year.

keep

If Farah intends to sell the used car when it is worth $6561, how long will she own it for?

① S: 25000

K: 1 − 0.15 = 0.85

T: 5

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

$= 25000(0.85^5)$

$= 11{,}092.63$

② S: 10000

K: 0.9

y: 6561

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

$$= \frac{\log\left(\frac{6561}{10000}\right)}{\log(0.9)}$$

$= 4$

Dec 15-10:38 AM

Ex. If the population of rabbits doubles (keep) every 4 months, when will there be 8192 rabbits if there were only 2 (start) rabbits at the beginning?

S: 2

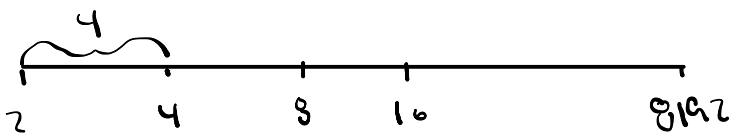
K: 2

y: 8192

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

$$= \frac{\log\left(\frac{8192}{2}\right)}{\log(2)}$$

$= 12 \times 4 = 48$ months



Dec 15-10:40 AM

Ex. A community of 90 penguins increases (+) in population by 4% per year. When will there be a population of 144 penguins?

S: 90

K: $1 + 4\% = 1.04$

y: 144

$t = x$

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

$$= \frac{\log\left(\frac{144}{90}\right)}{\log(1.04)}$$

$$= \frac{\log(1.6)}{\log(1.04)}$$

$= 11.98$

Dec 16-4:27 PM

Ex. Jim bought a cottage a few years ago. He has been analyzing the water in the well every year.

$f(\cancel{x}) = 16\,(1.5)^x$

y

In 2012, there were 54 bacteria. In what year will there be more than 615 bacteria for the first time?

① $54 = 16\,(1.5)^x$

Dec 16-4:29 PM

Ex. Linda and Donny each win a lottery

Linda wins 5000 and invests it at 5% interest. Donny wins 4000 and invests it at 10 % interest

When will Donny have the same amount as Linda ?

The times will match and so will the y's

$5000(1.05)^{time} = 4000\,(1.10)^{time}$

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

The time when they will be the same:

time = log (start a/start b)/log (keep b/keep a)

answer: next page

Nov 30-6:29 PM

Donny's

start = 5000

keep = 1.05

Linda's

start= 4000

keep = 1.10

$$\text{Time} = \frac{\log(\text{Donny's Start}/\text{Linda's start})}{\log(\text{Linda's keep}/\text{Donny's keep})}$$

Nov 30-6:50 PM

3. A lab technician notes that the number of type A bacteria doubles every hour whereas the number of type B bacteria triples every hour. At the outset there are 1000 of type A bacteria and 500 of type B bacteria. Which of the two bacteria will be more numerous after five hours?

Dec 16-4:31 PM