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: $2^3=8$ $\log_2 8=3$

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

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

start start

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

$100\% + 5\% = \frac{105}{100} = 1.05$

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=? x

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

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

time= 16

Check

$2000(1.05)^{16} = 4365.75$

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. 0.9 ↖ same as depreciating by 10%

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

S: 10000
K: 0.9
T: x
y: 6561

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

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

$$\frac{6561}{10000} = 0.6561$$

$$\frac{\text{Log Ans}}{\text{Log } 0.9} = 4$$

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

3 /year

S: 2

K: 2

T: x

y: 8192

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

$$= \frac{\log\left(\frac{8192}{2}\right)}{\log(2)} = \frac{12}{3} = 4 \text{ years}$$

4m | 4m | 4m

1yr

2 options

1 penny or $1000 after 30 days

Double every day

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

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

$$f(x) = 16\ (1.5)^x$$

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

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

Donny's

start = 5000

keep = 1.05

Linda's

start= 4000

keep = 1.10

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

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?