Key

Unit 6 Day 9 Notes: Exponential Growth

Here's a data table, write an exponential equation to fit this data: $y = a \cdot b^x$

x	-1	0	1	2	3	4
y	$\frac{5}{3}$	5	15	45	135	405

a

×3 ×3 ×3 ×3 ×3 ← b

$y = 5 \cdot 3^x$

Let's try an application:

3 = b

A population of 10 rabbits is released into a wildlife region. The population triples each year for 5 years. Fill out the table below to figure out how many rabbits there would be after 5 years and answer the questions.

Time(x)	0	1	2	3	4	5
Population(y)	10	30	90	270	810	2430

×3 ×3 ×3 ×3 ×3

a) What would the population be after 5 years?

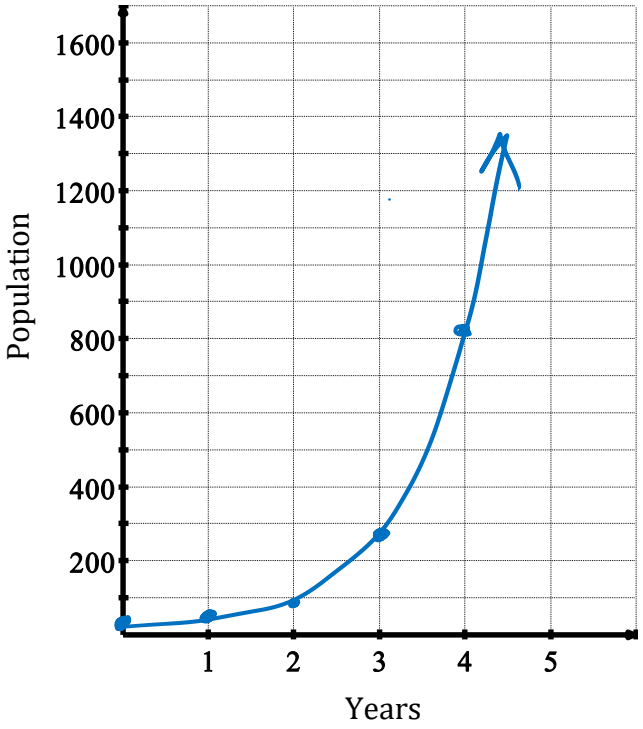
2430 rabbits

b) Did the rabbit population grow constantly?

No → exponential growth

c) Write the equation that predicts the population of rabbits based on the number of years that have passed.

$y = 10 \cdot 3^x$



d) Do you think this equation holds true for any value of x? No, can't grow forever (predators, hunters, starvation)

e) Draw an appropriate graph.

Compare

$y = a(b)^x$ $\qquad$ $y = a(1+r)^t$ (r: growth rate)

– "b" and "1+r" both tell you whether it's decay or growth

↓ doubles, triples ...

↓ when you are given a percentage for your rate (%)

– "x" and "t" are both time

Name the **rate of growth** (or growth rate) and **starting amount.**

"r" $\qquad$ "a"

$y = 5(1+.02)^t$ ⟷ SAME ⟷ $y = 5(1.02)^t$ ($1+.02$)

↓ $r = .02 = 2\%$

↓ $a = 5$ starting amount

$y = 10(1.05)^t$ ($1+.05$)

↓ $r = .05 = 5\%$

↓ $a = 10$

$y = 10(1.5)^t$ ($1+.5$)

↓ $r = .5 = 50\%$

↓ $a = 10$

Another application: $a = 10$ $\qquad$ $r = .5$

If you start with 10 rabbits and the population grows at a rate of 50% per year (notice this is much slower than the example on the front).

a) Write an equation to model this situation

$y = 10(1+.5)^t$ / $y = 10(1.5)^t$

b) Predict how many rabbits there will be after 5 years. $= t$

$y = 10(1.5)^5$

$= 76$ rabbits