

Solving Exponential Equations using Logarithms

Ever since Kristaps Porzingis made it into the NBA, his original Team Latvia jersey, which was bought for _____ euro has been gaining value at _____% per year.



- Write a model for the value of the jersey $V(t)$ based on years t .
- Find the value of the jersey after 4 years.
- Find the number of years it will take for the jersey to reach a value of 400 euro.

You bought a new Bentley for \$_____. Each year, it's value is _____% of what it was in the previous year.

- Write a model for the value of the Bentley $B(y)$ based on years y .
- Find the value of the Bentley after 5 years.
- Find the number of years it will take for the Bentley to reach a value of \$1300.



A small village begins with _____ people. Each month, it loses _____% of its population to the COVID-19 virus.

- Write a model for the population $P(m)$ based on months m .
- Find the population after 1 year.
- Find the number of months it would take to reach a population of 95.



Applied Problem 1:

The number of drosophila (fruit flies) in a laboratory at the beginning of an experiment is 200. The population increases by 8.5% each day.

- Find the population at the end of the first and second days.
- Write an exponential function for the number of drosophila after x days.
- Find the number of days until the population reached 100 000 drosophila.

For a), fill this table:

Number of days (x)	Number of drosophila (D)
0	200
1	
2	

Applied Problem 2:

At the end of the year 2000 the population of a city was 300 000. The population then increased by 1.3% per year.

- Find the population at the end of 2001 and 2002.
- Write an exponential function for $P(t)$, the population after t years.
- Predict the year in which the population should exceed 350 000.

Applied Problem 3

A group of 15 snow foxes are introduced into a nature reserve. The number of snow foxes N can be modelled by the exponential equation $N = 15 \times 3^{0.4t}$ where t is the number of years since their introduction.

Find how many years after their introduction when there should be at least 100 snow foxes.



Applied Problem 4

The half-life of caffeine in the human body is approximately 5 hours.

Copy and complete the table for a student who consumes 120 mg of caffeine at 08:00 one morning.

Time	Time period (t hours)	Amount of caffeine (C mg)
08:00	$t = 0$	120
13:00	$t = 1$	60
18:00	$t = 2$	
23:00		

- Find the common ratio for the geometric sequence.
- Find the exponential equation for the half-life of caffeine in terms of t .
- Calculate the amount of caffeine in the student's body after 35 hours.
- The effect of caffeine is negligible below 0.02 mg. Determine the number of hours after which there is only a negligible effect from the caffeine.

Applied Problem 5:

Coco is training for a race and records her 10 km times each week. Before she starts training, she can run 10 km in 72 minutes.

Week (w)	Time (t , min) to run 10 km
1	70.56
2	69.149
3	67.766
4	66.411
5	65.082

