**WORKSHEET FOR 11-B**

**APPLICATIONS OF EXPONENTIAL AND LOGARITHMIC FUNCTIONS**

**Exponential Growth**

**Task 1:** Supposethat in a count of bacteria experiment; there are G0 bacteria in a colony. The number of bacteria will be a-times more in every hour. If the count lasts t hours, find the number of bacteria t hours later.

At t=0🡪 G(0)=G0 (initial amount of bacteria)

1 hour later 🡪

2 hours later🡪

3 hours later🡪

…

t hours later🡪

**Ex:** In a count of bacteria experiment; there are 100 bacteria in a colony. The number of bacteria will be a-times more in every hour. If the count starts at 10:00 am, find a growth model and find the number of bacteria at 17:00pm.

**Population Growth:** Consider a community with initial population P0, suppose that the rate of increase in population for each year r, where 0<r<1. Then;

After 1 year population will be:

After 2 years population will be:

After 3 years population will be:

…………………………….

After t years population will be:

**Ex:** In a certain country, if the population was 55.000.000 in 1975. It is increased with the rate,1.25%. Find the population of this county in 2025.

**Simple interest Formula:**

**EX:** If 4000 YTL is barrowed for 39 weeks at an annual rate of 15%, how much interest is due at the end of the 39 weeks?

**Compound Interest**

Suppose P is invested at annual percentage rate r compounded annually.

Initial money 🡪 S0=P

After one year 🡪 S1= …..

After t years🡪

Suppose P is invested at rate r compounded semi annually.

Initial money🡪 S0=P

After half-year🡪 S0,5=…

After t years🡪

Suppose P is invested at rate r compounded monthly.

Initial money🡪 S0=P

After a month🡪 S0,1=…

**After 1 year🡪**

**After t years🡪**

**!!! General formula for compounded interest**

**EX:** If 3000 dollar is invested for 4 years at 9% compounded annually, how much interest is earned?

**EX:** How many years later 11.500 TL reach to 20.00 TL if it is compounded monthly at the rate of 8.3%?

**Continuous Compound Interest**

**Jacob Bernoulli’s Assumption**

Suppose that you have an account that starts with 1YTL and pays 100% interest per year.

|  |  |  |
| --- | --- | --- |
| Compounded  | # periods per year | Future value |
| Annually |  |  |
| Semi-annually |  |  |
| Monthly |  |  |
| Daily |  |  |
| Hourly |  |  |
| Each Minute |  |  |

What do you expect, if the interval of the period gets smaller and smaller?

What will be the future value, if P YTL is invested for “t” years at a nominal rate “r”, compounded continuously?

NOTE: Jacob Bernoulli discovered this constant by studying a question about compound interest. Leonhard Euler started to use the letter *e* for the constant in 1721 or 1728.

**EX:** How long does it take an investment of 10000YTL to double if it is invested at 8% compounded continuously?

**EX:** How long will 3850 TL reach to double in value if the yearly interest rate is 7,5%?