📈 Logistic Functions Worksheet

This worksheet is designed to help you practice working with logistic functions, which are often used to model situations with a limited carrying capacity, such as population growth in a confined environment or the spread of a disease. The general form of the logistic function we'll use is:

$f(x)=1+b\cdot a-xC$
Where:

- f(x) represents the population or quantity at time x.
- C is the **carrying capacity**, which is the maximum value the function can approach.
- b and a are constants that determine the rate of growth and the initial value.

Instructions: For each problem, solve for the missing variable or value. Show your work.

Problem 1

The population of a new species of algae in a pond is modeled by the function $P(t)=1+9\cdot2-t1000$, where P(t) is the number of algae after t days.

a) What is the carrying capacity of the pond for this algae?
b) What was the initial population of the algae? (Hint: Find P(0))
c) What will the population be after 3 days?

Problem 2

A rumor spreads through a small town of 5,000 people. The number of people who have heard the rumor is given by the function $H(t)=1+499\cdot0.5-t5000$, where H(t) is the number of people after t weeks.

a) What is the maximum number of people that can hear the rumor?
b) How many people had heard the rumor initially?
c) After how many weeks will 2,500 people have heard the rumor?

Problem 3

A company's sales of a new product are modeled by the function $S(x)=1+24\cdot3-x25000$, where S(x) is the number of units sold after x months.

a) What is the maximum number of units the company expects to sell?
b) How many units were sold in the first month? (Hint: Find S(1))