1. [9 points] Ecologists are testing the water in a local wetland during three weeks of heavy rainfall in the late summer. They test for acidity (pH), temperature (T), and dissolved oxygen content (DO), making one measurement per week at the same time and location each week.

To the right is a table of their measurements in week w of the water's pH, temperature T in degrees Celsius, and DO in milligrams per liter. Unfortunately, their pH measurement in week 2 was faulty and had to be discarded. Use the values in the table to answer the questions below.

w	1	2	3
pH	9	?	7
T	25	25	23
DO	6.5	7.5	8.5

a. [1 point] Based on the given data, could T be a linear function of w, an exponential function of w, or neither? *Circle the one correct answer below.*

COULD BE LINEAR COULD BE EXPONENTIAL **COULD NOT BE EITHER**

b. [1 point] Based on the given data, could DO be a linear function of w, an exponential function of w, or neither? *Circle the one correct answer below.*

COULD BE LINEAR COULD BE EXPONENTIAL COULD NOT BE EITHER

c. [2 points] Assuming pH is a linear function of w, find a formula $L(w)$ for it.

Solution: To find the equation for the linear function L, we can use the point-slope form, i.e.

$$L(w) - 9 = m(w - 1),$$

where the slope $m = (7-9)/(3-1) = -1$. So, $L(w) = 9 - (w-1) = 10 - w$.

Answer: $L(w) =$ $10 - w$

d. [3 points] Assuming pH is an exponential function of w, find a formula $E(w)$ for it.

Solution: Let us use the formula for the exponential function

$$E(w) = E_0 a^w, \quad \text{where} \quad a = \left(\frac{7}{9}\right)^{\frac{1}{3-1}} = \frac{\sqrt{7}}{3} \quad \text{and} \quad E_0 = E(0) = \frac{E(1)}{a} = \frac{9}{\sqrt{7}/3} = \frac{27}{\sqrt{7}}.$$

Answer: $E(w) =$ $\dfrac{27}{\sqrt{7}}\left(\dfrac{\sqrt{7}}{3}\right)^w$

e. [2 points] Let $L(w)$ be the linear function from part **c.**, and $E(w)$ the exponential function from part **d.** above. **For each of the three pairs of values listed below, circle the value that is larger**.

$L(0)$ OR **$E(0)$** **$L(2)$** OR $E(2)$ $L(4)$ OR **$E(4)$**