Name: Key

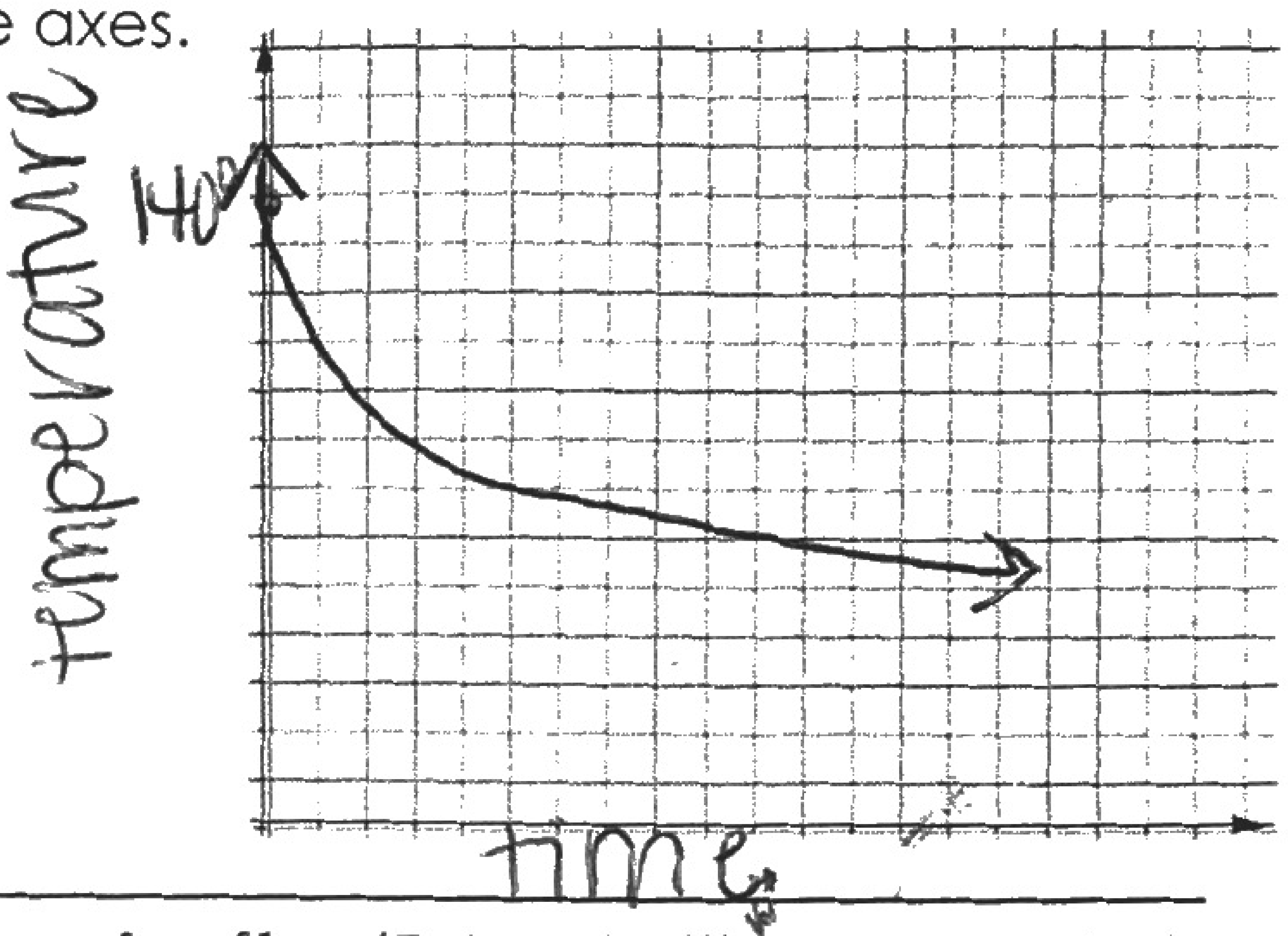
Date: ____________

1. Suppose your teacher poured a cup of hot coffee at the beginning of class, set it on her desk, and then forgot about it. What would happen to the temperature of the coffee over time? Why do you think this is so? It would decrease b/c it's sitting at room temperature.

   Is there a minimum temperature for the coffee? Why?

   Room temperature since it's a liquid.

2. Sketch a graph of the coffee's temperature over time. Be sure to label the axes.



3. The following table shows the temperature of a cup of coffee (Fahrenheit) over a period of time (minutes). Fill in the 3rd column. Assume that the temperature in the room is 70° F.

Time (t)	Temperature of Liquid (*L*)	Temperature of Liquid (*L*) – Room Temperature (*T*)	First Differences (ΔT)	Successive Ratios
1	140°	140−70=70		
2	137.7°	137.7−70=67.7	67.7−70 = −2.3	$\frac{67.7}{70}$ = 0.967
3	135.4°	135.4−70=65.4	65.4−67.7=−2.3	$\frac{65.4}{67.7}$ = 0.966
4	133.2°	63.2	−2.2	0.966
5	131.1°	61.1	−2.1	0.967
6	129.0°	59	−2.1	0.966
7	127.0°	57	−2	0.966
8	125.1°	55.1	−1.9	0.967
9	123.3°	53.3	−1.8	0.967
10	121.5°	51.5	−1.8	0.966
11	119.8°	49.8	−1.7	0.967
12	118.1°	48.1	−1.7	0.966
13	116.5°	46.5	−1.6	0.967
14	114.9°	44.9	−1.6	0.966
15	113.4°	43.4	−1.5	0.967
16	111.9°	41.9	−1.5	0.966
17	110.5°	40.5	−1.4	0.967
18	109.2°	39.2	−1.3	0.968
19	106.6°	36.6	−2.6	0.934
20	105.4°	35.4	−1.2	0.967
21	104.2°	34.2	−1.2	0.966
22	103.0°	33	−1.2	0.965
23	101.9°	31.9	−1.1	0.967
24	100.8°	30.8	−1.1	0.966

graphing calc:

stat → edit → temp in L1. highlight L2 → 2nd → #1(L1) − 70 $\boxed{\text{enter}}$

4. Complete the table by finding the first differences and the successive ratios.
   - To find the first differences, just subtract the ~~pervios~~ previous temperature from the one you are on.
   - To find the successive rations, divide the temperature you are on by the ~~pervious~~ previous temperature.

5. Is the relationship between time and temperature linear or exponential?

   exponential

   How do you know?

   there appears to be a common ratio of 0.966 (ish)

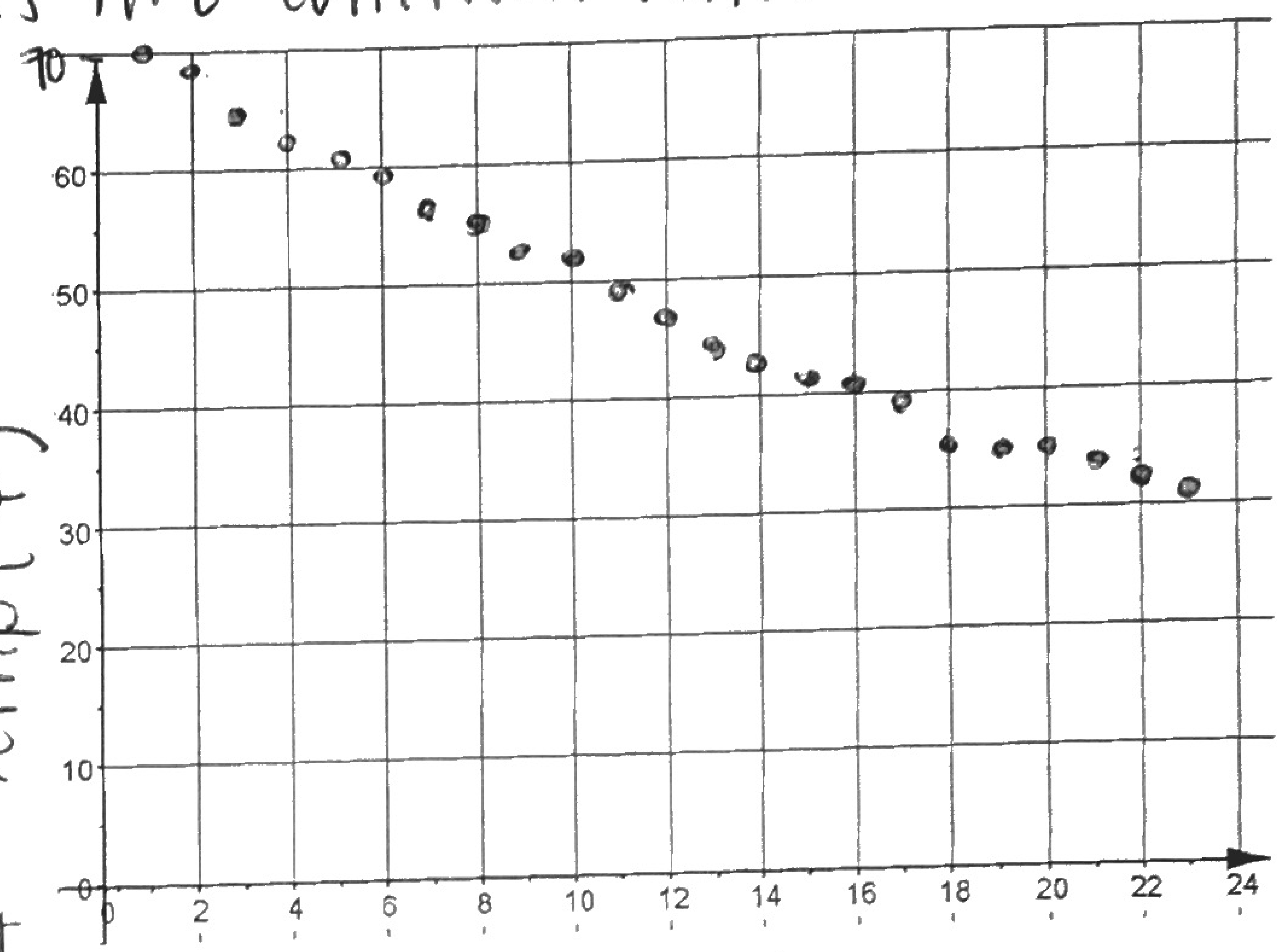
6. Use the information in the table to build a recursive rule for the difference in temperature from room temperature for each successive temperature reading.

   $a_n = a_{n-1}(r)$, $a_1 =$ ___ $\rightarrow$ $T_n = 0.966\,T_{n-1}$, $T_1 = 70$

7. What does the constant in the recursive rule represent?

   0.966 represents the common ratio

8. Sketch a scatterplot of temperature vs. time.



9. How does your scatterplot compare to the graph you sketched at the beginning? Explain any differences.

   in #2 we graphed the actual temp. now we're graphing the differences between the temp. of the liquid and the room temp. same graph but shifted down.

10. How does your scatterplot support the type of relationship you chose in Question 5?

    the graph's decreasing at a non-constant rate.

11. The general form for an exponential function is $y = a(b)^x$, where **a** represents the initial condition and **b** represents the successive ratio, or base of the exponential function. Using data from your table, write a function rule to describe the temperature of the coffee (**y**) as a function of time (**x**).

    $y = 70(0.966)^x$

12. What do the constants in the function rule represent?

    70 is the initial temperature of the coffee. 0.966 is the constant successive ratio of temp. measurements.

13. Graph the function rule over the data in your scatterplot

    (create a line through the scatterplot)

14. If you repeated the experiment in a room that was much cooler, what changes in the data would you expect?

    the temp. of the coffee would decrease more quickly, resulting in a lower successive ratio.