

PLEASE SHOW ALL WORK. TOTAL TIME 2 HOURS. TOTAL 100 POINTS.

The first 2 problems involve the following data:

Annual fall temperatures in DC in 2020, 2010, 2000, 1990, 1980, 1970, 1960, and 1950:

62.1, 62.5, 58.2, 61.5, 61.9, 62.3, 59.5, 58.6

1. (15 points) Find the following:
 - (a) average (b) median (c) mode.
2. (10 points) If the standard deviation σ of the above data is found to be 1.65, what percentage of the data are within two standard deviations of the average that you found in problem 1?
NOTE: You DON'T NEED to calculate standard deviation. It is already given as 1.65.
3. (Extra credit 10 points) Say whether true or false and justify your answer:
 - a) Average temperatures in some years in the past were high, so global warming is not happening.
 - b) The population of the world grows as a linear function of time.
4. (20 points) (a) Say what kind of sequence is $1, \frac{3}{4}, \frac{9}{16}, \dots$ and why.
 - (b) Write the formula for the n -th term of the sequence
 - (c) Find the sum upto 10 terms. You don't need to calculate the whole thing, just simplify as much as you can.
 - (d) What happens if you try to find the infinite sum?
5. (15 points) Suppose installation of solar panels at a house cost 10,000 dollars and every year they get back 800 in credits and lower electricity bills.
Let the initial cost be -10000 and annual gain be $+800$. So the net cost after 1 year is $-10000 + 800 = -9200$.
 - (a) Write the net cost after 2 years, 3 years, and 4 years.
 - (b) Say why the net cost sequence is an arithmetic sequence and write the net cost after n years in terms of n .
 - (c) When does the net cost equal zero? (This is the time it takes for the cost to be paid back).
6. (10 points) Suppose you deposit 5000 dollars in a fund to save for the solar panels until you get 10,000 dollars. If the fund pays 8 percent interest compounded per year, when would you have 10000?
7. (a) (10 points) In a Lotto, 3 different numbers are picked from 9, and the 9 numbers are also all different. It only matters what numbers are picked. Their order does not matter. How many possible picks are there?
(b) (10 points) 1000 dollars are awarded to person who guesses all 3 numbers correctly. 500 dollars to person who guesses exactly 2 out of 3 (could be any two of the three) correctly. 100 dollars to person who guessed exactly 1 out of 3 (could be any one of the three) correctly. What is the average winning?