AP Statistics   Name: _____

Histograms, *z*-score practice   𝒜.𝑀.𝒟.𝒢.

Given the per gallon tax rate for each of the 50 states plus the District of Columbia, current as of April, 2020 (note that sales tax is not included in these figures). Put the cost per gallon into your calculator as a list and use that to answer the questions on the next page.

State	Rate	State	Rate	State	Rate
Alabama	$0.28/gallon	Alaska	$0.0895 / gallon	Maine	$0.31404 / gallon	Oklahoma	$0.20 / gallon

State	Rate	State	Rate	State	Rate
Alaska	$0.0895 / gallon	Maine	$0.31404 / gallon	Oklahoma	$0.20 / gallon
Arizona	$0.19 / gallon	Maryland	$0.368905 / gallon	Oregon	$0.36 / gallon
Arkansas	$0.248 / gallon	Massachusetts	$0.24 / gallon	Pennsylvania	$0.586 / gallon
California	$0.533 / gallon	Michigan	$0.263 / gallon	Rhode Island	$0.35119 / gallon
Colorado	$0.2325 / gallon	Minnesota	$0.286 / gallon	South Carolina	$0.2275 / gallon
Connecticut	$0.25 / gallon	Mississippi	$0.184 / gallon	South Dakota	$0.30 / gallon
Connecticut	$0.25 / gallon	Missouri	$0.1742 / gallon	Tennessee	$0.274 / gallon
				Texas	$0.20 / gallon
Delaware	$0.23 / gallon	Montana	$0.3275 / gallon	Utah	$0.3175 / gallon
District of Columbia	$0.235 / gallon	Nebraska	$0.306 / gallon	Vermont	$0.3073 / gallon
Florida	$0.34396 / gallon	Nevada	$0.23805 / gallon	Virginia	$0.162 / gallon
Georgia	$0.279 / gallon	New Hampshire	$0.23825 / gallon	Washington	$0.519952 / gallon
Hawaii	$0.16 / gallon	New Jersey	$0.414 / gallon	West Virginia	$0.357 / gallon
Idaho	$0.33 / gallon	New Mexico	$0.18875 / gallon	Wisconsin	$0.329 / gallon
Illinois	$0.391/ gallon	New York	$0.4045 / gallon	Wyoming	$0.24 / gallon
Indiana	$0.30 / gallon	North Carolina	$0.3635 / gallon		
Iowa	$0.305 / gallon	North Dakota	$0.23025 / gallon		
Kansas	$0.2403 / gallon	Ohio	$0.385 / gallon		
Kentucky	$0.26 / gallon				
Louisiana	$0.20125 / gallon				

1) Use your calculator to create a boxplot of the data in your list. Draw your boxplot below, making sure you label the minimum, Q_1, median, Q_3, and the maximum.

2) What is the interquartile range (IQR)? What is 1.5 times the IQR? What numbers would be the thresholds for your outliers?

3) Do you have any outliers? Give a brief description of the shape of the distribution. Graph the data as a histogram (using $x$min $= 0$, $x$max $= 0.60$, and $x$scl $= 0.05$) if you need a better look at the shape.

4) Use your 1Var Stats function on the calculator to find the mean and standard deviation. If the data were normally distributed, where would most (68%) of the data lie?

5) Assume average age in the United States is a normal distribution, and $\mu = 39.5$ years old, and $\sigma = 18$ years.

   a. List your current age (approximating a decimal value by using months past your last birthday divided by 12), and figure out how many standard deviations from the population mean that you are.

   b. Assume your grandparent is 75.5 years old. How many standard deviations is that from the population mean?

   c. The oldest person in the US is Thelma Sutcliffe, who turns 115 tomorrow (October 1st, 2021). How many standard deviations from the population mean is she?

6) Assume the unweighted GPAs in a school are normally distributed. If the average GPA is 3.125 and the standard deviation is 0.375, respond to the prompts below.

   a. Your unweighted GPA is 4.0, how many standard deviations from the population mean are you?

   b. If a college has a minimum GPA requirement from high school of 3.0 to be eligible to apply, how many standard deviations off of the mean is that number?

   c. A school administrator proposes that anyone with under a 2.0 GPA should be monitored and provided assistance. How many standard deviations out from the mean is this? Does this seem like a reasonable threshold? Why or why not?

   d. It turns out that the value you generated in part c corresponds to 0.1350 % of the student body. If the school has 2000 students, approximately how many should be qualified for assistance?

2. (2016 Q1) Natural gas is used in some households to heat the home, to heat the water, and to cook. A utility company sent the following bar chart to a household to show the amount of natural gas, measured in therms (a unit of heat energy), that thehousehold used last year. The chart shows the number of therms and the average monthly temperature in degrees Fahrenheit, for each month of the year.
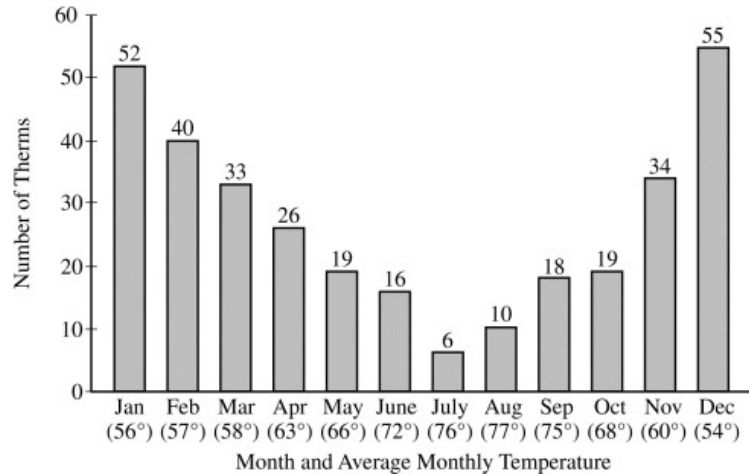
(a) Describe how the number of therms used each month changed over the year.

(b) Construct an appropriate scatterplot that shows the relationship between number of therms used and the average monthly temperature.
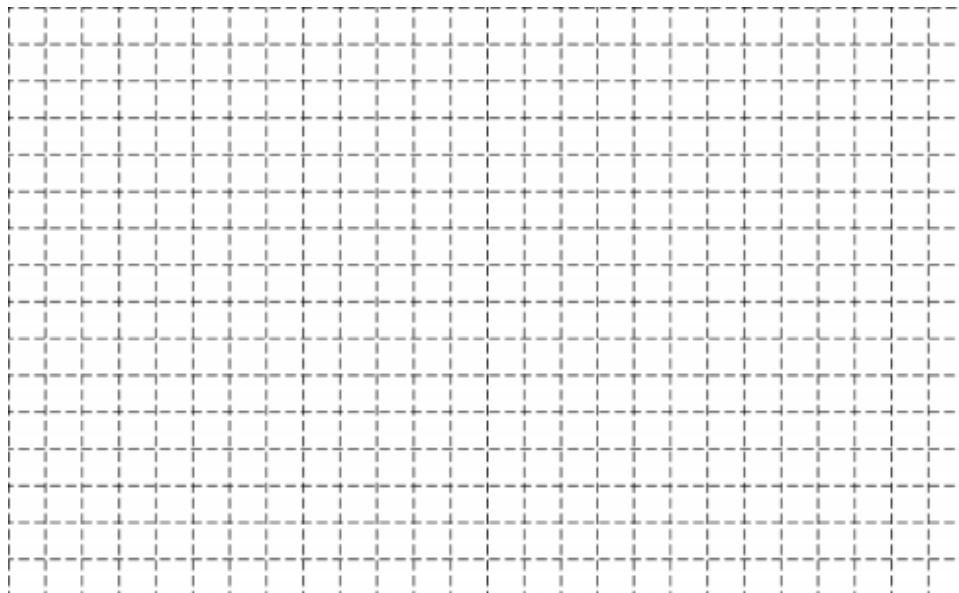
(c) Describe what your graph in part (b) reveals about the relationship between the number of therms used and the average monthly temperature that is not revealed on the bar chart sent by the utility company.