Last Name:

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SCIPER:

Practice Problems: Exercise 2 – Microengineering 110

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1. The wearing out of some gears was measured in $10^{-4}mm^3$, when using different lubrication oils having different viscosities in mPa-s.   The data produced the following table:

Viscosity (mPa-s)	Wear (10^-4 mm^3)					
20.4	58.8	30.8	27.3	29.9	17.7	76.5
30.2	44.5	47.1	48.7	41.6	32.8	18.3
89.4	73.3	57.1	66	93.8	133.2	81.1
252.6	30.6	24.2	16.6	38.9	28.7	23.6

Assuming that outliers are defined by the following rules:
- Lower outlier(s) < Q1–(1.5×IQR)
- Upper outlier(s) > Q3+(1.5×IQR)

a. Calculate the mean and median for each data set (i.e., at each different viscosity)

    i. 20.4mPa-s

       Mean:
       Median:

    ii. 30.2mPa-s

       Mean:
       Median:

    iii. 89.4mPa-s

       Mean:
       Medan:

    iv. 252.6mPa-s

       Mean:
       Median:

b. Do any of the data sets have a singular mode?

c. In class, you learned how to calculate Q1 and Q3.   One specific issue to consider is what to do when the index falls between two numbers (which is the case in this problem; since there are only 6 data points for each data set, Q1 and Q3 don't fall at an integer location).   In the DF.QUANT method shown in class, we interpolate.   This is the appropriate method to use for such small data sets.

Using interpolation, what are the values of Q1, Q3, and IQR for each data set?

   i. 20.4mPa-s

      Q1:
      Q3:
      IQR:

   ii. 30.2mPa-s

      Q1:
      Q3:
      IQR:

   iii. 89.4mPa-s

      Q1:
      Q3:
      IQR:

   iv. 252.6mPa-s

      Q1:
      Q3:
      IQR:

d. Using this method, how many outliers are there in the entire data set (i.e,, the sum of outliers for all viscosities)

e. Another method used to calculate quartiles, which is more appropriate for large data sets, is to round up or down the index when it is a non-integer. This is the method used, for example, at the following website:

https://www.calculatorsoup.com/calculators/statistics/mean-median-mode.php

Repeat the calculations that you did in parts c and d, and determine the number of outliers using this website.