

1. Ozone readings (ppm) were taken at noon at Shannon Airport on 16 consecutive days and the results were recorded as follows:

1014131812221419
22131416 3 6 7 9

- (i) Compute the lower quartile, the upper quartile and the interquartile range
- (ii) Construct a box plot for the ozone readings
- (iii) Comment on the box plot are there mild or extreme outliers, is the data symmetrical etc.

2. A frequency distribution for bus travel times on a non quality bus corridor in Dublin during early morning

peak traffic is as follows:

Class Interval	Frequency	Relative Frequency
15-16	4	0.02
16-17	15	0.075
17-18	26	0.13
18-19	99	0.495
19-20	36	0.18
20-21	8	0.04
21-22	12	0.06

- (i) Use an Ogive * to compute the following percentiles (approx): 10th, 90th, 95th
- (ii) Calculate the mean and the median times for journey on this route at peak times.

Ogive = cumulative relative frequency

3. The following 64 ordered observations are a sample of daily weekday afternoon (3 to 7pm) lead concentrations . The data were recorded at an air monitoring station near a motorway in the autumn of 1994.

2.13.23.94.95.05.05.25.35.45.9
5.96.06.06.06.06.06.16.16.26.2
6.36.46.46.46.46.56.56.76.86.8
6.86.97.07.17.27.27.37.67.67.8
7.98.08.08.18.18.38.38.48.58.5
8.68.68.79.09.29.39.59.79.910.1
10.610.911.215.1

During the autumn of 1995, the weekday afternoon lead concentrations (in) near the same motorway were, upon ordering, as follows:

2.9 5.05.7 6.3 6.56.66.87.38.08.1
8.1 8.28.2 8.2 8.68.78.78.88.8
8.8 8.98.9 9.1 9.19.29.39.39.3
9.3 9.49.49.4 9.49.59.59.69.79.8
9.8 9.89.99.99.99.910.210.210.310.4
10.5 10.510.710.911.011.411.611.912.012.3
12.412.614.816.7

The mean and standard deviation of the 1995 data are 9.44 and 2.08 respectively. Compute the mean and standard deviation of the 1994 data. Compute the quartiles for both years.

Construct boxplots to compare the two sets of data. Analyse the increase in lead concentrations by interpreting the above displays and statistics.

Note: A new lane was completed and opened on this stretch of motorway in spring 1995.

4. The masses of 30 human males and 30 arabian stallions were observed. Their masses (in lbs) are given below

Humans

106, 120, 130, 138, 145, 151, 156, 161, 166, 171
 176, 180, 185, 189, 194, 198, 203, 208, 212, 217
 223, 228, 234, 240, 247, 255, 264, 276, 290, 313

Stallions

808, 824, 835, 843, 851, 857, 862, 868, 872, 877
 881, 886, 890, 894, 898, 902, 906, 910, 914, 919
 923, 928, 932, 938, 943, 949, 957, 965, 976, 992

- a) Draw histograms for these samples and compare them with respect to shape, centrality and relative dispersion.
- b) Calculate the medians of these samples (from the raw data).
5. A laptop manufacturer wishes to test a particular brand of CPU. A sample of 30 CPUs were selected and used to perform an intensive task for 1 hour. The temperature of each one was then recorded.

29.7	34.6	34.8	35.1	35.9	36.0	36.7	36.8	37.6	37.9
38.1	38.2	38.5	38.7	39.3	39.6	40.1	40.1	40.3	40.3
41.0	41.1	41.4	41.6	42.2	42.2	43.0	44.5	44.5	47.9

- (a) (Ignore) Construct a frequency table with 5 classes (use 29 as the first breakpoint).
- (b) (Ignore) Draw the histogram (use relative frequency).
- (c) Calculate the median.
- (d) Calculate the quartiles.
- (e) Using the lower/upper fences, identify any outliers.
- (f) Draw the boxplot.

(g) Is the data symmetric, left-skewed or right-skewed?

6. A blood factor was measured from 60 volunteers for a clinical research survey.. The results are given below. Illustrate the distribution of students IQs using a boxplot. Show your workings.

72.31 73.21 74.76 78.61 80.36 82.37 82.85 84.01 84.59 84.64
 84.66 85.31 85.71 85.82 85.96 86.70 87.49 88.61 88.75 89.18
 89.19 89.92 90.82 90.84 91.28 91.63 91.80 92.58 92.67 92.96
 94.44 96.35 96.77 100.69 101.96 102.19 102.74 104.18 104.54 104.60
 105.13 105.93 106.51 107.30 107.55 108.50 108.82 110.13 110.62 110.85
 111.10 113.39 113.67 114.52 115.36 116.10 116.67 119.47 123.20 125.80

7. Boxplots Question

(MA4102 Exam Question from 2011)

4	6	8	9	17	17	18	19	20	22
22	27	28	29	31	35	38	39	40	46
48	56	56	57	57	58	58	60	61	62
64	66	68	69	74	75	78	79	80	82

(a) lower fence?

(b) Upper fence?

(c) Any values above or below fences?

8. The masses of 30 human males and 30 arabian stallions were observed. Their masses (in lbs) are given below

Humans

106, 120, 130, 138, 145, 151, 156, 161, 166, 171
 176, 180, 185, 189, 194, 198, 203, 208, 212, 217
 223, 228, 234, 240, 247, 255, 264, 276, 290, 313

Stallions

808, 824, 835, 843, 851, 857, 862, 868, 872, 877
 881, 886, 890, 894, 898, 902, 906, 910, 914, 919
 923, 928, 932, 938, 943, 949, 957, 965, 976, 992

(i) Draw histograms for these samples and compare them with respect to shape, centrality and relative dispersion.

(ii) Calculate the medians of these samples (from the raw data).

9. The masses of 30 human males and 30 arabian stallions were observed. Their masses (in lbs) are given below

Humans

106, 120, 130, 138, 145, 151, 156, 161, 166, 171
176, 180, 185, 189, 194, 198, 203, 208, 212, 217
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Stallions

808, 824, 835, 843, 851, 857, 862, 868, 872, 877
881, 886, 890, 894, 898, 902, 906, 910, 914, 919
923, 928, 932, 938, 943, 949, 957, 965, 976, 992

- (i) Draw histograms for these samples and compare them with respect to shape, centrality and relative dispersion.
- (ii) Calculate the medians of these samples (from the raw data).
10. In an examination the scores of students who attend schools of type A are normally distributed about a mean of 55 with a standard deviation of 6. The scores of students who attend type B schools are normally distributed about a mean of 60 with a standard deviation of 5. Which type of school would have a higher proportion of students with marks above 70?

The heights for a group of forty rowing club members are tabulated as follows;

141	148	149	149	155	156	167	169	169	170
171	173	175	176	177	179	182	182	183	183
183	184	184	184	185	185	185	186	186	189
191	191	191	191	192	192	192	193	194	199

- (a) (6 marks) Summarize the data in the above table using a frequency table. Use 6 class intervals, with 140 as the lower limit of the first interval.
- (b) (6 marks) Draw a histogram for the above data.
- (c) (4 marks) Comment on the shape of the histogram. Based on the shape of the histogram, what is the best measure of centrality and variability?
- (d) (12 marks) Construct a box plot for the above data. Clearly demonstrate how all of the necessary values were computed.
11. A laptop manufacturer wishes to test a particular brand of CPU. A sample of 60 CPUs were selected and used to perform an intensive task for 1 hour. The temperature of each one was then recorded.

17.1 17.6 18.3 20.8 20.8 25.1 26.3 27.3 28.8 31.2
34.2 36.7 36.8 37.9 37.9 38.1 38.3 39.2 40.7 41.6
42.7 43.7 44.0 45.2 45.3 47.8 48.9 50.3 50.9 51.5
52.5 53.6 53.8 55.0 56.3 57.2 58.2 59.4 59.7 60.9
62.6 62.8 63.9 64.7 66.8 67.2 67.4 68.1 68.4 69.7
69.7 70.2 70.5 71.0 81.6 82.1 82.5 82.8 85.1 89.8

- (i) Construct a simple frequency table with 8 bins (or class intervals) (use 10 as the first breakpoint, and use “decades”).
 - (ii) Draw the histogram (use relative frequency).
 - (iii) Calculate the median.
 - (iv) Calculate the quartiles.
 - (v) Using the lower/upper fences, identify any outliers.
 - (vi) Draw the boxplot.
 - (vii) Is the data symmetric, left-skewed or right-skewed?
12. A laptop manufacturer wishes to test a particular brand of CPU. A sample of 30 CPUs were selected and used to perform an intensive task for 1 hour. The temperature of each one was then recorded.

29.7	34.6	34.8	35.1	35.9	36.0	36.7	36.8	37.6	37.9
38.1	38.2	38.5	38.7	39.3	39.6	40.1	40.1	40.3	40.3
41.0	41.1	41.4	41.6	42.2	42.2	43.0	44.5	44.5	47.9

- (a)** Construct a frequency table with 5 classes (use 29 as the first breakpoint). **(b)** Draw the histogram (use relative frequency). **(c)** Calculate the median. **(d)** Calculate the quartiles. **(e)** Using the lower/upper fences, identify any outliers. **(f)** Draw the boxplot. **(g)** Is the data symmetric, left-skewed or right-skewed?