Grade 8 Mathematics Worksheet

Data interpretation and range

Questions:

1. The following set of numbers are the percentages of 39 learners in a mathematics test.

65	39	24	83	48	81	54	78	72	62	56	68	100
91	67	58	91	63	55	83	57	84	57	83	58	56
47	59	69	61	55	82	38	49	75	84	95	77	8

a) Calculate the median mark for this set of results.

b) Discuss the range of this data.

c) Draw a box and whisker plot from this set of data.

d) Calculate the inter quartile range, and explain what it means for this set of data.

e) Discuss the distribution of the data from your box and whisker plot.

f) Sarah discovered that her mark is not 8% but 80%. Discuss what this would mean for the measures of central tendency of this set of data.

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Solution

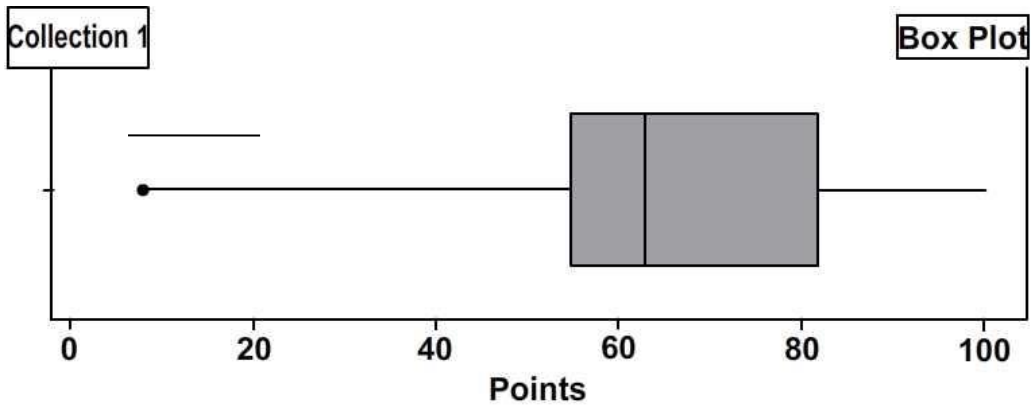
1. a) We need to order the data before we can find the median:

8	49	57	62	72	83	91
24	54	57	63	75	83	95
38	55	58	65	77	83	100
39	55	58	67	78	84	
47	56	59	68	81	84	
48	56	61	69	82	91	

There are 39 data points. So the median point is at point number $\frac{39+1}{2} = 20$. This means that 63 is the median of this set of data.

b) The range is 100 (maximum) – 8 (minimum) = 92.

c)



d) The inter quartile range is where the middle 50% of the data lies. In this case the IQR is between the 25th percentile and the 75th percentile. So this lies at data points:
$\frac{19+1}{2} = 10$ *and* $20 + \frac{19+1}{2} = 30$. The 10th data point is 55 and the 30th data point is 82. So this means that the IQR is 82 – 55 = 27. The middle 50% of the data lies between 82% and 55% .

e) The data is definitely skewed left, with the minimum value a possible outlier. We check for outlier by using Quartile 1 – 1,5 ×IQR = $55 - 1,5 \times 27 = 14,5$. This means that anything below 14,5% is an outlier, which makes 8% an outlier. The

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middle 50% is spread from 55% to 82%, with the top 25% of the marks between 82% and 100%.

f) If Sarah's mark was 8% (the outlier), then it is her mark that has a huge effect on the distribution. The biggest effect will be on the average, as we use the data value to find an average. To find the median we only use the position of the data point, and not its value. So the median will shift very slightly, whilst the average will change significantly since there is a contribution of 72 points (from 8% to 80%) more to the calculation for the average.

It is important to understand the effect of an outlier on the measures of central tendency. It is encouraged not to only talk about outliers, but to familiarise learners with the calculations that confirm the presence of outliers.