Year 10 Term 2 Homework

Student Name: ____________	**Grade**: ____________
Date: ____________	**Score**: ____________

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6 Year 10 Term 2 Week 6 Homework

6.1 Data analysis and evaluation

6.1.1 Data analysis review

- Graphs and tables are used to represent both numerical and categorical data in a way that makes the data easier to understand and analyse.
- The frequency histogram is a type of column graph.
- The frequency polygon is a type of line graph. When the polygon and histogram are drawn on the same set of axes, the polygon joins the midpoints of the tops of the columns.
- The dot plot is a simplified version of the histogram.
- The stem-and-leaf plot is a similar to a histogram that has been drawn on its side.

6.1.2 Measures of location

- The mean is the sum of the scores divided by the number of scores.

$$Mean = \frac{sum\ of\ the\ scores}{number\ of\ scores}$$

- The mean of the data in a frequency distribution table is given by:

$$\bar{x} = \frac{\sum f_x}{\sum f}$$

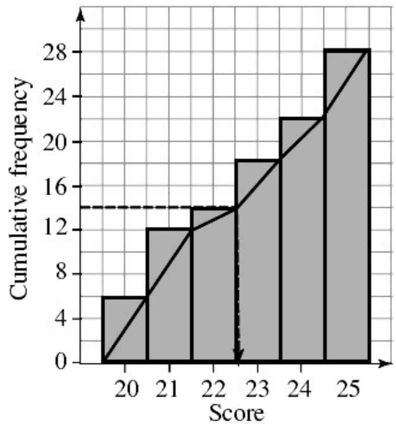
  where

  - $\bar{x}$ is the mean.
  - $\sum f_x$ is the sum of the scores.
  - $\sum f$ is the number of scores.

- The median is the central value in a distribution, when the scores have been arranged in ascending order. $\frac{n+1}{2}th$ if the score if n is odd or the average of the $\frac{n}{2}th$ and $(\frac{n}{2}+1)th$ scores if n is even.
- The mode is the score with the highest frequency.
- The range is a measure of spread, it is the difference between the highest and lowest scores in a distribution.
- The Cumulative frequency column in a frequency distribution gives a progressive total of the frequencies.

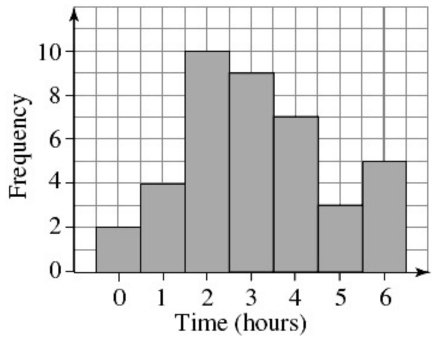
Example 6.1.1 Draw a cumulative frequency histogram and ogive for the scores in the table shown below and use the ogive to find the median.

x	20	21	22	23	24	25
f	6	6	2	4	4	6



$\therefore$ *the median is 22.5.*

Exercise 6.1.1 The histogram shows the number of hours that a group of children spent watching television each day.



1. *How many children watch television for 4 hours each day?* ______________________

2. *How many children watch for 3 hours or less per day?* ______________________

3. *How many children were surveyed?* ______________________

4. *How many more children watch television for 2 hours per day than watch for 5 hours?*

____

5. *What percentage of the child watch television for 5 hours or more per day?*

____

Exercise 6.1.2 The stem-and-leaf plot shows the heights (in cm) of students in a basketball team.

Stem	Leaf
16	4 5 7 8
17	0 1 1 2 3 5 6 8
18	1 2 2 3 4 4 4 5 7 9
19	3 4 6 6 7 8
20	0 2

1. *How many students are in the team?* __________

2. *What is the difference between the tallest and the shortest player in the team?*

   ____

3. *What is the most common height?* __________

4. *How many players are taller than 1.85 metres?* __________

Exercise 6.1.3 Find the mean, median, mode and range for each set of scores, correct to 1 decimal place.

a

x	1	2	3	4	5	6
f	5	2	10	14	17	19

b

x	12	13	14	15	16	17
f	15	13	6	4	7	4

Exercise 6.1.4

1. *The mean of a set of 24 scores is 9. Find the sum of the scores.*

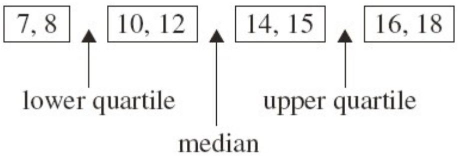
2. *The mean of three scores is 16. If two of the scores are 15 and 9, find the third score.*

3. *A set of 43 scores has a mean of 62. Find the new mean after a score of 40 is added to the set.*

6.1.3 The interquartile range

- The range is the difference between the highest and lowest scores in a distribution.
- The interquartile range is the difference between the upper and lower quartiles. Where the lower or first quartile is the value up to which one-quarter of data lies. While the upper or third quartile is the score up to which three-quarters of the data lies.

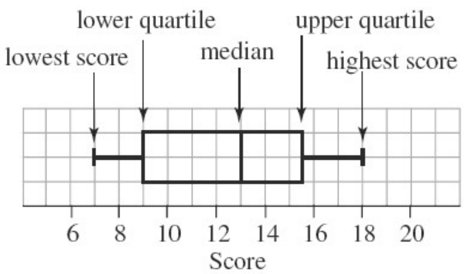
Example 6.1.2 If a set of scores are arranged in ascending order: 7, 8 10, 12, 14, 15 16, 18, find the interquartile range of the distribution.



1. *The lower quartile* $Q_1 = \frac{8+10}{2} = 9$
2. *The median* $Q_2 = \frac{12+14}{2} = 13$
3. *The upper quartile* $Q_3 = \frac{15+16}{2} = 15.5$
4. $\therefore$ *the interquartile range* = $Q_3 - Q_1 = 15.5 - 9 = 6.5$

6.1.4 Box-and-whisker plots

The data on the above example can be shown graphically in the form of a box-and-whisker plot (box-plot). It is also referred to as a five-point summary.



Exercise 6.1.5 Consider the scores 17, 18, 20, 25, 27, 28, 30, 33, 37.

1. *Find the range.* ____________________
2. *Find the interquartile range.* ____________________
3. *Draw a box-and-whisker plot for the data.*

6.1.5 The standard deviation (σ_n)

- The standard deviation (σ_n) is a measure of the spread of the scores about the mean and it is defined as:

$$\sigma_n = \sqrt{\frac{\sum (x-\bar{x})^2}{n}}$$

- The larger the standard deviation, the more widely spread are the scores from the mean.
- The smaller the standard deviation, the more bunched up are the scores about the mean.

Example 6.1.3 Find the standard deviation of the scores below, without use of a calculator. 17, 18, 20, 21, 24, 25, 29.

Score (x)	$x - \bar{x}$	$(x - \bar{x})^2$
17	–5	25
18	–4	16
20	–2	4
21	–1	1
24	2	4
25	3	9
29	7	49

From the table above $\sigma_n = \sqrt{\frac{\sum (x-\bar{x})^2}{n}} = \sqrt{\frac{108}{7}} = 3.9$

Exercise 6.1.6 Consider a set of scores shown below, find correct to 1 decimal place where necessary:

Score	Freq.
95	1
96	15
97	10
98	9
99	4
100	12

1. *the mean* ____________________
2. *the median* ____________________
3. *the mode* ____________________
4. *and the standard deviation* ____________________

6.1.6 Miscellaneous exercises

Exercise 6.1.7

1. *Find (x, y) satisfying:*

   (a) $\frac{2}{x} + \frac{2}{y} = 6$
   $\frac{3}{x} + \frac{2}{y} = 3$

   (b) $xy = 12$
   $x + 3y = 13$

Exercise 6.1.8

1. *Which value is bigger:* 2^{500} *or* 5^{200}*? Explain*

2. *If* $\frac{x-y}{x+y} = \frac{3}{5}$, *find the value of* $\frac{x^2}{y^2}$.

Exercise 6.1.9

1. *The mean of five numbers is 39. Two of the numbers are 133 and 35 and each of the other three numbers is equal to x. Find the total of the five numbers and hence find the value of x.*

2. *The mean of a set of eight numbers is 3 and the mean of a different set of twelve numbers is x. Given that the mean of the combined set of numbers is 9, calculate x.*

3. *The number of goals scored by a netball team in seven matches was 12, 22, 19, 14, 23, 25 and 12.*

   (a) *Write down the mean score, the modal score and the median score.*

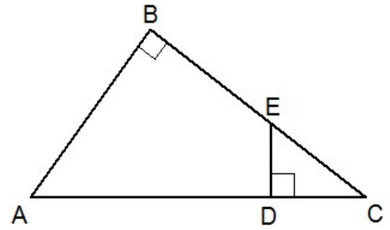
   (b) *Find the number of goals the team needs to score in its next match in order that its mean score in the eight matches is exactly 17.*

4. *The mean of a set of eight numbers is 17.5. If six of the numbers are 12, 14, 17, 19, 22 and 26, find the mean of the other two numbers.*

6.2 Maths Challenge

Exercise 6.2.1

1. *In the diagram shown below,* $AB = 18\,cm, \;\; AC = 30\,cm \;\; DE = 12\,cm$*. Find the length of* AD *and* BE*.*



2. *Charles went to school when it was 8:00 a.m. shown at the clock at home. On his way to school, he looked at the clock in the church and it was 8:20 am. When he reached school, he noted that the time shown at the clock in the school hall was 8:32 a.m. After staying for 6 hours and 10 minutes at school, he went back home. On his way back, he looked at the church clock again and it was 2:52 p.m. and that the clock at home was 3:16 p.m. when he arrived home. Charles was told that only the time shown at the clock in his home was correct, and if we assume that the speed of Charles remained constant during his journey, find the difference between both times shown at church clock and the school hall clock and the time shown at the clock at home respectively.*