# 2.4 Measures of Central Tendency

# Descriptive Statistics

Mean: average

Median: middle value, from list of least to greatest

Mode: value which occurs most often

A measure of "central tendency" is a number that is representative of a set of data. It speaks for the data set as a whole – in the "aggregate". Three common measures are used:

mean $\bar{x}$: add all the values in the set and divide by the number of values
- the mean is greatly affected [skewed] by extreme values in the data

median: the middle value of a set of ordered data
- if there is an odd number of values, it is the middle value
- if there is an even number of values, it is the average of the two middle values
- the median is not affected by extreme values in the data: stable

mode: the most frequent value of a set of data

Hours slept the night before a final exam:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3 | 5 | 5 | 3 | 4 | 3 | 5 | 1 | 2 | 3 |
| 4 | 3 | 2 | 0 | 3 | 2 | 1 | 3 | 1 | 10 |

Mean: $\bar{x} = 3.15$ Median: 3 Mode: 3

Weights of Women's Running shoes:

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9.1 | 11.3 | 10.9 | 12.3 | 11.1 | 10.6 | 12.5 | 13.5 | 11.0 | 13.0 | 10.8 | 11.0 | 9.7 |
| 11.0 | 10.5 | 10.4 | 10.0 | 14.0 | 11.5 | 11.5 | 10.5 | 10.5 | 10.3 | 11.7 | 11.6 | |

Mean: 11.212 Median: 11 Mode: 10.5 and 11

IB Practice A

In the following ordered data, the mean is 6 and the median is 5.

2, b, 3, a, 6, 9, 10, 12

a) Find the value of a.
b) Find the value of b.

a) $5 = \frac{a+6}{2}$

$10 = a+6$

$a = 4$

b) $\frac{2+b+3+4+6+9+10+12}{8} = 6$

$b + 46 = 48$

$b = 2$

IB Practice B

Peter has marked 80 exams. He calculated the mean for the exams to be 62.1
Maria has marked 60 exams with a mean mark of 56.8.

a) Peter discovers an error in his marking. He gives ~~two extra marks~~ +22 to eleven of his exams. Calculate the new value of the mean for Peter's exams.

b) After the corrections have been made and the marks changed, Peter and Maria put all their exams together. Calculate the value of the mean for all the exams.

a) Points he had: $62.1(80) = 4968$ pts

$+22$

$4990 \div 80$

$= 62.375$ pts.

b) $$\frac{62.375(80) + 56.8(60)}{140}$$

$= 59.985$

$\approx 60.0$

Data:

| Recovery Time from Injury [weeks] | Number of Athletes | Total of the Data |
|---|---|---|
| 1 | 5 | 5 |
| 2 | 8 | 13 |
| 3 | 12 | 25 |
| 4 | 19 | 44 |
| 5 | 7 | 51 |
| 6 | 4 | 55 |
| 7 | 3 | 58 |
| 8 | 2 | 60 |

Mean: 3.82

Median: 4

Mode: 4

| Distance Walked | Number of Walkers | Total of the Data |
|---|---|---|
| 1-5 | 14 | 14 |
| 6-10 | 9 | 23 |
| 11-15 | 11 | 34 |
| 16-20 | 10 | 44 |
| 21-25 | 6 | 50 |

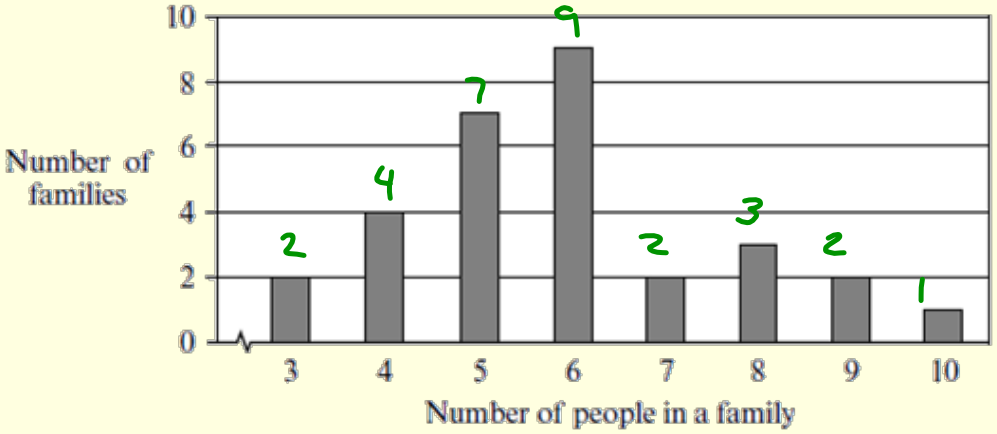
Mean: 11.5

Median: 13

Mode: 1-5 (3)

IB Practice C:

The bar chart below shows the number of people in a selection of families.




(a) How many families are represented? 30 families

(b) Write down the mode of the distribution. 6 people families

(c) Find, correct to the nearest whole number, the mean number of people in a family.

| # in Fam | # of Families |
|---|---|
| 3 | 2 |
| 4 | 4 |
| 5 | 7 |
| 6 | 9 |
| 7 | 2 |
| 8 | 3 |
| 9 | 2 |
| 10 | 1 |

$\bar{x} = 5.9$

$\approx$ 6 people

## IB Practice D:

Twenty students are asked how many detentions they received during the previous week at school. The results are summarised in the frequency distribution table below.

| Number of detentions $x$ | Number of students $f$ | $fx$ |
|---|---|---|
| 0 | 6 | 6 |
| 1 | 3 | 9 |
| 2 | 10 | 19 |
| 3 | 1 | 20 |
| Total | 20 | |

(a) What is the modal number of detentions received? 2

(b) (i) Complete the table.

(ii) Find the mean number of detentions received. 1.3

IB Practice E:

David looked at a passage from a book. He recorded the number of words in each sentence as shown in the following frequency table.

a) Find the class interval in which the median lies. 100 data values

50th - 51st →

11–15

b) Estimate, correct to the nearest whole number, the mean number of words in a sentence.

13 words

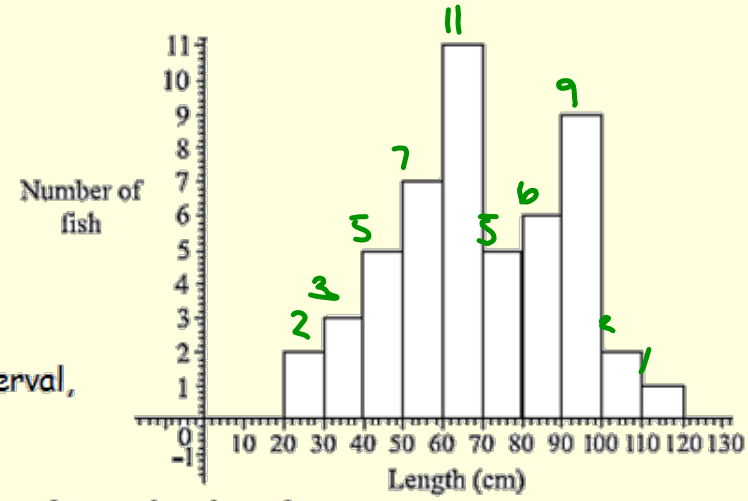
| Class interval (number of words) | Frequency $f$ |
|---|---|
| 1 – 5 | 16 |
| 6 – 10 | 28 |
| 11 – 15 | 26 |
| 16 – 20 | 14 |
| 21 – 25 | 10 |
| 26 – 30 | 3 |
| 31 – 35 | 1 |
| 36 – 40 | 0 |
| 41 – 45 | 2 |

IB Practice F:

The figure below shows the lengths in centimeters of fish found in the net of a small boat.

a) Find the total number of fish in the net.

51 fish




b) Find

(i) the modal length interval,

60-70 cm

(ii) the interval containing the median length,

26th fish: 60-70 cm

(iii) an estimate of the mean length.

69.5 cm

# Homework:

WS 1-11 all