# Statistics

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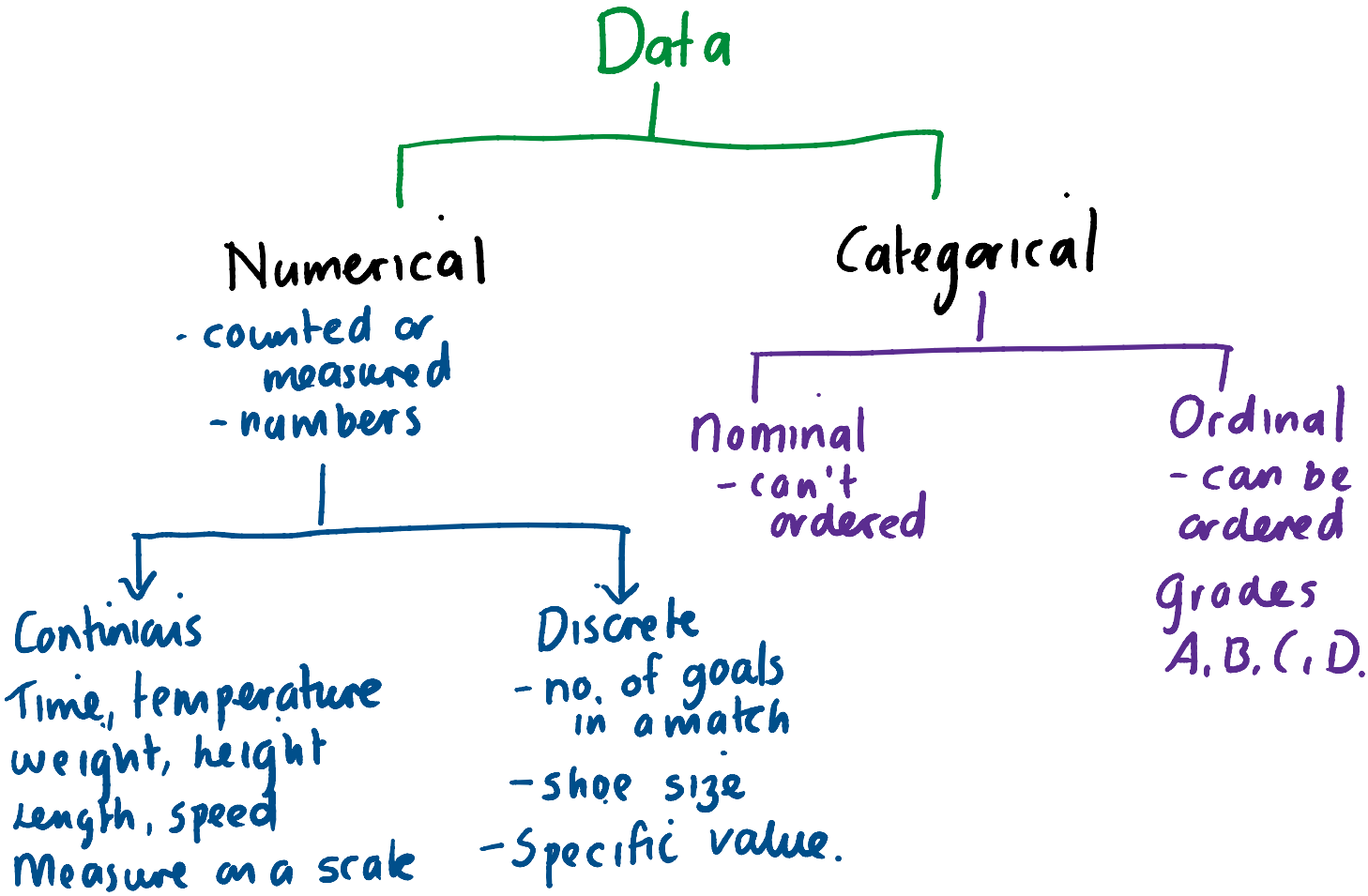


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PROJECT MATHS

# Text & Tests

## Leaving 3 Certificate

chapter 8

# Measures of Location and Spread

**Section 8.1** Mode – Median – Mean

## Example 1

The ages of students on a school bus are:

12, 15, 12, 13, 14, 16, 15, 11, 12
16, 15, 16, 14, 10, 13, 17, 15, 17

What is the mode?



## Example 2

Find the median of these numbers: 5, 8, 12, 4, 9, 3, 7, 2.

## Example 3

Find the mean of these numbers:

12, 14, 10, 17, 21, 22



## Example 4

Five girls and three boys took part in a quiz.

The mean mark for the girls was 54.
The mean mark for the boys was 62.

Find the mean mark for the whole group.

## Exercise 8.1

**1.** Find the mean of each of these arrays of numbers:

(i) 2, 6, 10, 14, 18

(ii) 0, 2, 8, 16, 6, 22

(iii) 3, 7, 8, 13, 4, 12, 9

(iv) 5, 12, 3, 4, 3, 6, 9

i) $\frac{50}{5} = 10$

ii) $\frac{54}{6} = 9$

iii) $\frac{56}{7} = 8$

iv) $\frac{42}{7} = 6$



## Exercise 8.1

**2.** Rewrite each of the following arrays of numbers in order of size and then write down

(i) the mode

(ii) the median.

(a) 8, 11, 2, 5, 8, 7, 8, 2, 5

(b) 3, 3, 7, 8, 7, 9, 8, 5, 7, 11, 12

mode = 8

mode 7

median.

2, 2, 5, 5, 7, 8, 8, 8, 11

3, 3, 5, 7, 7, 7, 8, 8, 9, 11, 12

n = 11

$\frac{n+1}{2}$ $n = 9$ $\frac{9+1}{2} = \frac{10}{2} = 5^{th}$ value.

$\frac{11+1}{2} = \frac{12}{2}$ $6^{th}$ value.

## Exercise 8.1

**3.** The speeds, in kilometres per hour, of 11 cars travelling on a road are shown:

41, 42, 31, 36, 42, 43, 42, 34, 41, 37, 45

(i) Find the median speed. (ii) Find the mean speed.

Median

31, 34, 36, 37, 41, 41, 42, 42, 42, 43, 45

$n = 11$

$\frac{11+1}{2} = \frac{12}{2} = 6^{th}$ value

39.45

39.5

40 km/hr

C/W Pg 210 Q4-6

Pg 211 Q 7 → 16.



## Exercise 8.1

**4.** A rugby team played 10 games.

Here are the numbers of points the team scored.

12, 22, 14, 11, 7, 18, 22, 14, 36, 14

(i) Write down the mode. = 14 points.

(ii) What is the median number of points scored?

(iii) Find the mean number of points scored.

$n = 10$

$\frac{10+1}{2} = \frac{11}{2} = 5.5$

$5^{th}$ $6^{th}$

7, 11, 12, 14, 14, 14, 18, 22, 22, 36

$5^{th}$ $6^{th}$

14 median.

iii) $\frac{170}{10} = 17$ points.

## Exercise 8.1

**5.** Rearrange the following marks in order and then write down the median in each case.

(i) 9, 5, 8, 3, 2, 7, 6

2, 3, 5, 6, 7, 8, 9

(ii) 8, 12, 18, 9, 14, 7, 10, 6

6, 7, 8, 9, 10, 12, 14, 18

$\frac{19}{2} = 9.5$



## Exercise 8.1

**6.** Write down seven different numbers with a median of 12.

## Exercise 8.1

**7.** The mean of four numbers is 7 and three of these numbers are 5, 12 and 9.

(i) Find the sum of the four numbers. (ii) Find the fourth number.

$$\text{Mean} = \frac{\text{Sum of values}}{\text{No. of values}}$$

$$7 = \frac{x}{4}$$

$28 = x$ Sum of the numbers

$5 + 12 + 9 = 26$

$28 - 26 = 2$



## Exercise 8.1

**8.** The mean of four numbers is 19. Three of them are 21, 25 and 16.
Find the fourth number.

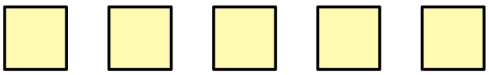
## Exercise 8.1

**9.** The mean of four sums of money is €4.90. When a fifth sum is added, the mean of the five sums is €5.34. Find the fifth sum of money.



## Exercise 8.1

**10.** Write five numbers so that
the mode is 4
the mean is 6
the median is 5.



## Exercise 8.1

**11.** (i) The mean of 3, 7, 8, 10 and $x$ is 6. Find $x$.

(ii) The mean of 1, $k$, 3, 6 and 8 is 7. Find $k$.



## Exercise 8.1

**12.** The mean of 5 numbers is 11.
When a sixth number is included the mean of the six numbers is 12.
Find the sixth number.

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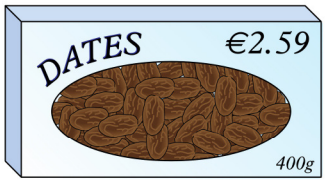
## Exercise 8.1

**13.** The mean weight of five dates was 50 g.
Kate ate one and the mean weight of the four remaining dates was 40 g.
What was the weight of the date that Kate ate?






## Exercise 8.1

**14.** Nicky's marks in four tests were:

8, 4, 5, 3

What mark did she get in her fifth and sixth tests if her modal mark was 4 and her mean mark was 5 after the six tests?

## Exercise 8.1

**15.** Matthew's marks in eight tests are shown below.
What mark did he score in the ninth test if his median mark was 6?

5 9 7 3 7 4 5 8

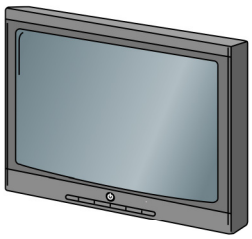


## Exercise 8.1

**16.** In a survey, a group of boys and girls wrote down how many hours of television they watched one week.

| **Boys** | 17 | 22 | 21 | 23 | 16 | 12 | **Girls** | 9 | 13 | 15 | 19 | 10 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 5 | 13 | 15 | 13 | 14 | | 9 | 8 | 12 | 14 | 15 | 11 |

(i) Find the mean time for the boys.
(ii) Find the mean time for the girls.
(iii) Find the median time for each group.
(iv) Do the boys spend more time watching television than the girls? Explain your answer.



**17.** The numbers 4, 8, 12, 17, $x$ are arranged in order of size.
If the mean of the numbers is equal to the median, find $x$.



Exercise 8.1

**18.** The mean height of a group of eight students is 165 cm.

(i) What is the total height of all eight students?

A ninth student joins the group. He is 168 cm tall.

(ii) What is the mean height of all nine students?

## Exercise 8.1

**19.** The mean of five numbers is 39.
Two of the numbers are 103 and 35 and each of the other three numbers is equal to $x$.
Find (i) the total of the five numbers
(ii) the value of $x$.



## Exercise 8.1

**20.** On four tests, each marked out of 100, my average was 85.
What is the lowest mark I could have scored on any one test?
A 0 B 40 C 60 D 81 E 85
Explain your answer.

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## Exercise 8.1

**21.** Fred went fishing each week.
Each week he recorded the number of fish caught.
After several weeks he calculated the following averages.

| |
|---|
| The **mean** number of fish caught per week was 9.3. |
| The **modal** number of fish caught per week was 12. |
| The **median** number of fish caught per week was 10. |

The next week he did not catch any fish.
This had never happened before.
Fred recalculated his averages.

(i) Which of these averages could not have been affected?
Give a reason for your answer.
(ii) Which of the averages was certainly affected?
Explain your answer.



## Answers 8.1

**1.** (i) 10 (ii) 9 (iii) 8 (iv) 6
**2.** (a) (i) 8 (ii) 7
(b) (i) 7 (ii) 7
**3.** (i) 41 km/hr (ii) 39.5 km/hr
**4.** (i) 14 (ii) 14 (iii) 17
**5.** (i) 6 (ii) 9.5
**6.** Example: 2, 6, 9, 12, 13, 13, 22
**7.** (i) 28 (ii) 2
**8.** 14
**9.** €7.10
**10.** Example: 4, 4, 5, 8, 9
**11.** (i) $x = 2$ (ii) $k = 17$
**12.** 17
**13.** 90 g
**14.** 4 and 6
**15.** 6
**16.** (i) $14\frac{1}{4}$ hours (ii) $12\frac{1}{4}$ hours
(iii) Boys: 14.5; Girls: 12 (iv) Yes
**17.** $x = 19$
**18.** (i) 1320 cm (ii) $165\frac{1}{3}$ cm
**19.** (i) 195 (ii) 19
**20.** B – 40
**21.** (i) Mode (ii) Mean