

Student Name

Mathematics Stage 4

DATA
ANALYSIS

Book 1 Calculate and compare the
mean, median, and range for
simple datasets

Version: 260207
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CONTENTS

Overview 2

Summary Statistics 5

Range 7

Mode 10

Mean 12

Median 20

Summary Statistics from a List..... 23

Median Position..... 31

Analysing Stem-and-Leaf Plots 33

Analysing Dot Plots 37

Mean from a Frequency Table..... 41

Median from a Frequency Table..... 46

Summary Statistics from a Frequency Table 50

Comparing Datasets using Summary Statistics 59

Summary Statistics Using Spreadsheets 64

OVERVIEW

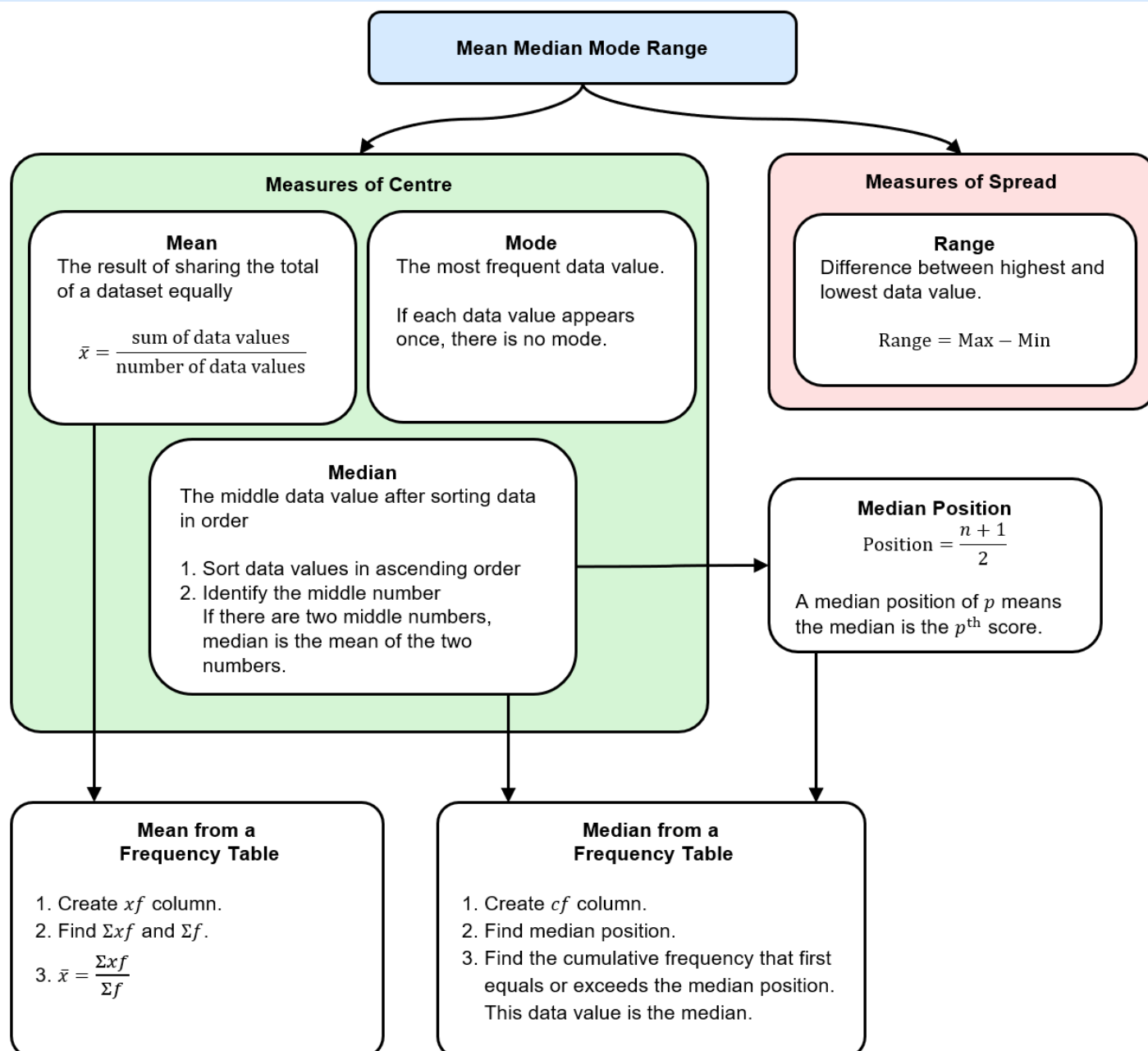
SYLLABUS CONTENT

MA4-DAT-C-02 analyses simple datasets using measures of centre, range and shape of the data

Calculate and compare the mean, median, mode and range for simple datasets

- Calculate the mean ($\bar{x}$) of a set of data using digital tools
- Calculate and describe the mean, median, mode and range of a dataset
- Classify the mean, median and/or mode as measure(s) of centre to represent the average or typical value of a dataset
- Describe and interpret data displays using mean, median and range
- Identify and describe datasets as having no modes (uniform), one mode (unimodal), 2 modes (bimodal) or multiple modes (multimodal)
- Identify the range as a measure of spread to describe variation in a dataset
- Compare simple datasets using the mean, median, mode and range

SUMMARY



REVIEW OF PRIOR KNOWLEDGE

1 Write down the maximum and minimum number in each list.

a 34, 72, 38

b 51, 9, 83, 112

c 1050, 150, 500, 950

Maximum:

Minimum:

d -17, 23, -22

e 0.073, 0.5, 1.33, 1.6

f 6, 10, 10, 5, 7

2 Work out these subtractions.

a $95 - 76$

b $140 - 83$

c $295 - 273$

d $17 - (-3)$

3 Order these numbers from smallest to largest.

a 345, 712, 341, 502

b 423, 71, 20.1, 5

c 21, 18, -17, 2, -6

4 Find the sum of these sets of numbers.

a 7, 8, 12

b 10, 12, 16, 18, 22, 26

c 100, 94, 103, 97, 110, 108

d 6.3, 6.8, 9.1, 5.7, 6.6, 5.9

5 Work out these divisions. Answer as a decimal.

a $78 \div 2$

b $78 \div 3$

c $78 \div 4$

d $78 \div 5$

e $107 \div 5$

f $107 \div 10$

g $107 \div 8$

h $114.8 \div 4$

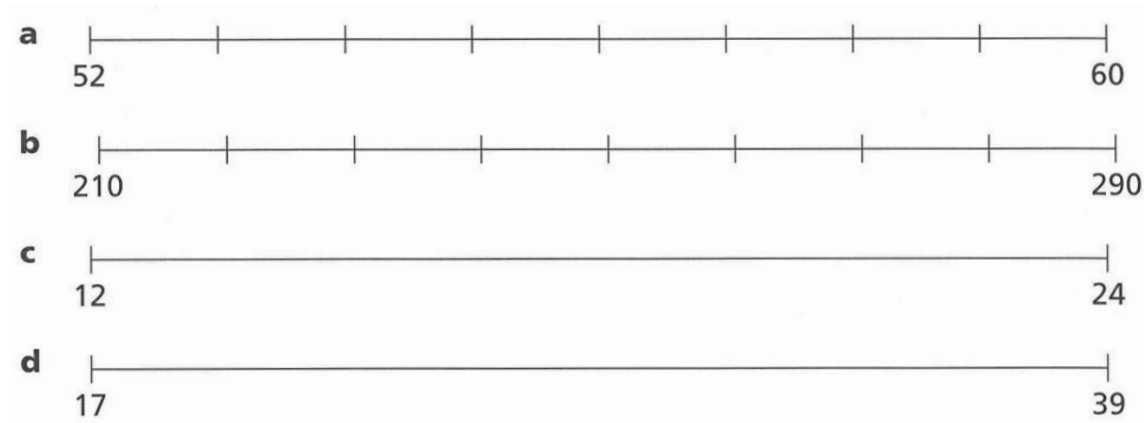
6 Work out the following.

a $\frac{13+17}{6}$

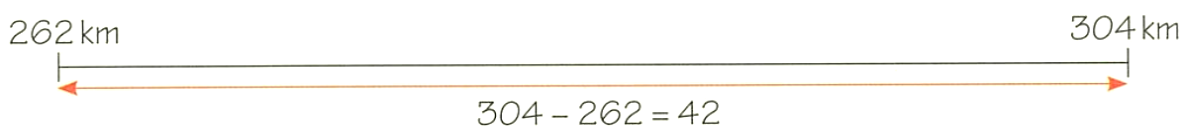
b $\frac{50+96}{10}$

c $\frac{3+7+12}{4}$

- 7 Here are some number lines.
Work out the number that is exactly halfway between the two numbers marked.



- 8 Emily is calculating the midpoint of 262 km and 304 km. Her method is shown below.
Step 1:



Step 2:



Describe her method.

.....

.....

.....

- 9 Calculate the midpoint of these two numbers.

a 21 and 35

b 104 and 110

c 80 and 124

d 18 and 18

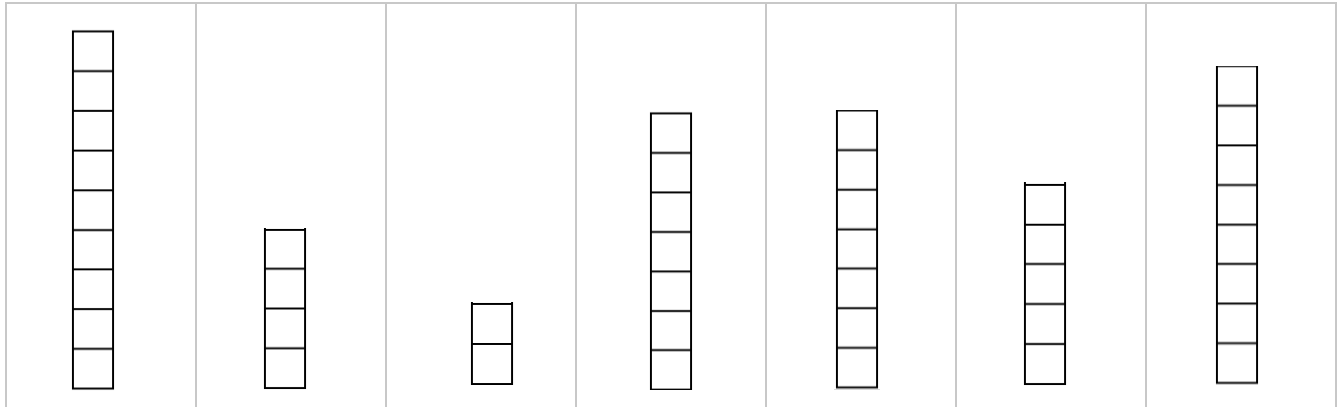
e 455 m and 1.23 km

f 110 mm and 11 cm

SUMMARY STATISTICS

Investigation: Summary Statistics

Seven students gather a handful of blocks and make a tower.



Sort the towers from shortest to tallest.

--	--	--	--	--	--	--

The difference between the shortest tower and the tallest tower is

This is called the **range**.

The height that occurs the most often is

This is called the **mode**.

The tower that has the middle height is

This is called the **median**.

Share the blocks evenly so each person has the same height tower.

Each person gets

This is called the **mean**.

SUMMARY STATISTICS

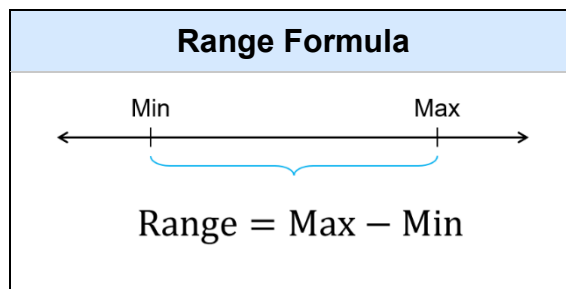
- Summary statistics are used to summarise a numerical dataset.

Summary Statistic	Definition
Range	The difference between the greatest and smallest data value.
Mode	The most frequent data value.
Mean	The result of sharing the total of a set of data equally.
Median	The middle data value after sorting the data in ascending order. 50% of data is below the median, 50% of data is above.

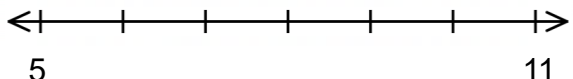
- Mean, median, mode are measures of centre.**
- Range is a measure of spread.**
- In daily life, people use "average" for a typical value in a dataset.
- In statistics, we avoid "average" as it could refer to mean, median, or mode.
- Summary statistics help compare datasets and track changes over time.

RANGE

- The **maximum** is the largest data value.
- The **minimum** is the smallest data value
- The **range** is the difference between the maximum and minimum.
- The range shows how spread out the data values are.



Example Calculate the range of a dataset.

Calculate the range for: 6 10 10 5 11 7 min max Range = Max – Min = 11 – 5 = 6	Draw what the range represents on the number line. 
--	--

Calculate the range for these datasets.

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

b 25, 30, 28, 23, 27, 26, 29

c 12, 1, 8, 6, 10, 9

d -3, 2, -5, 1, 0, -1

Key ideas

1. The range is calculated using the formula Range = –
2. On a number line, the range is the distance between the and data value,
3. The range represents how a dataset is.

1 Determine the range of each dataset.

a 3, 7, 4, 7, 5

$$\text{Range} = \square - \square = \square$$

b 1, 2, 3, 4

$$\text{Range} = \square - \square = \square$$

c 2, 7, 2, 7, 5

$$\text{Range} = \square - \square = \square$$

d 12, 9, 6, 3, 12, 4, 7

$$\text{Range} = \square - \square = \square$$

2 Calculate the range of each dataset.

a 2, 5, 12, 1, 2

b 1, 1, 3, 5, 10

c 2, 2, 4, 6, 11

d 4, 4, 8, 12, 22

e 4, 4, 8, 12, 20

f 4, 4, 8, 10, 20

g 1, 4, 8, 10, 17

h 0.1, 0.4, 0.8, 1, 1.7

i -1, -4, -8, -10, -17

3 Here are the number of kilometres Beth drives each day in a week.

31, 84, 120, 43, 17, 35, 102

a Beth says "The range of the kilometres I drive is 17 to 120" Describe Beth's mistake.

In data, range is a single number.

b Find the range of the number of kilometres she drives in a week.

4 Describe the mistake made in each of these examples.

a

64 cm	111 cm	93 cm	48 cm	180 cm
-------	--------	-------	-------	--------

The range = $180 - 64 = 116 \text{ cm}$

64 is not the lowest number.

b

2 kg	180 g	3 kg	520 g	80 g
------	-------	------	-------	------

The range = $520 - 2 = 518 \text{ g}$

The units are different

5 Solve these problems.

a The range of a set of numbers is 10.
The smallest number is 4.
What is the largest number?

b The range of a set of numbers is 12.
The largest number is 63.
What is the smallest number?

14

51

c The range of the times taken to complete a puzzle is 81 seconds.
The fastest time was 2 minutes 11 seconds.
What was the slowest time?

d The range of the times taken to complete a puzzle is 26 seconds.
The fastest time was 1 minute 40 seconds.
What was the slowest time?

3 min 32 sec

2 min 6 sec

6 The table shows the number of loaves of bread sold each day in a bakery.

Day	Mon	Tues	Wed	Thurs	Fri
Number of loaves sold	28	39	45	48	37

a What is the range of number of loaves of bread sold?

20

b The bakery makes 50 loaves of bread each day.
Find the range of the number of loaves not sold.

17

7 Consider this dataset: 10, 20, 30, 40, 50, 60, 70, 80

a What is the range?

70

b Change one score to make the range 60. List your new scores.

Many answers possible

c Which scores affect the range?

Smallest and largest only

8 Below are the heights of eight children in a line:

143 cm	138 cm	151 cm	139 cm
145 cm	155 cm	152 cm	140 cm

a Another child joins the line. The range of the heights stays the same.
What can you say about the height of the extra child?

They were neither the shortest nor tallest

b Another child joins the line. The range increases by 2 cm.
What could the height of the child be?

157 cm or 136 cm

MODE

- The **mode** is the value that appears **most often** in a dataset.
- A dataset can have more than one mode or no mode.
- Sorting the data helps spot the mode more easily.

Example Identify the mode of a dataset.

Identify the mode of the dataset: 9, 2, 3, 9, 7, 4, 2, 9 2 2 3 4 7 9 9 9 Mode = 9	What does the mode represent? <i>The mode is the data value that occurs the most</i> Is it necessary to sort the data to find the mode? <i>....., but it can make it easier.</i>
3, 6, 5, 8, 5, 9, 8 3 5 5 6 8 8 9 Mode = 5 and 8	Why are there two modes in this example? <i>5 and 8 both occur the most</i> When will a dataset have no mode? <i>If every data value occurs</i>

Identify the mode of these datasets.

a 3, 6, 2, 8, 3

b 6, 6, 2, 1, 7, 5, 9, 7

c 5, 2, 8, 3, 5, 7, 8, 1, 5

d 3, 6, 8, 4, 7, 5, 0, 11, 1, 2

Key ideas

1. The mode is the data value(s) that occur the
2. There can be no mode if each data value only occurs

1

Identify the mode of each dataset.

a

3, 7, 4, 7, 5

7

b

1, 2, 3, 4

No mode

c

2, 7, 2, 7, 5

2, 7

d

12, 9, 12, 3, 12, 4, 7

12

2

Identify the mode of these datasets.

a

5, 7, 12, 5, 9

5

b

5, 6, 7, 9, 12

No mode

c

5, 5, 7, 9, 12

5

d

5, 5, 7, 7, 12

7

e

5, 5, 7, 9, 12, 16

5

f

5, 5, 7, 7, 12, 12

5, 7, 12

g

5, 7, 7, 9, 12, 12, 12, 14

12

3

A car dealer records the number of sales she makes each day of the week.

1, 0, 1, 1, 2, 4, 2

The dealer says, “the mode for this dataset is 3” Explain why she is incorrect.

There is no 3 in this dataset.

1 is the mode (it has a frequency of 3)

4

Find the mode of this dataset:

ride, walk, walk, ride, ride, walk, drive, walk, drive, drive

drive

5

Consider this dataset: 0, 2, 2, 3, 4, 5, 6, 8

a

What is the mode?

2

b

Change one score to make the mode 3. List the new scores.

0, 2, 3, 3, 4, 5, 6, 8

c

Change the scores to make the mode 5. List the new scores.

0, 2, 2, 3, 5, 5, 6, 8

d

Change the scores to make the modes 5 and 6. List the new scores.

0, 2, 5, 3, 4, 5, 6, 6

e

Change the scores to have no mode. List your new scores.

0, 1, 2, 3, 4, 5, 6, 8

MEAN

- The **mean** is the total shared equally among all values in a dataset.
- In statistics the mean has its own special symbol $\bar{x}$.

Mean Formula
$\bar{x} = \frac{\text{Sum of data values}}{\text{Number of data values}}$

Example Calculate the mean of a dataset.

Calculate the mean of the dataset: 5, 7, 2, 5, 1 $\bar{x} = \frac{5 + 7 + 2 + 5 + 1}{5}$ $= \frac{20}{5}$ $= 4$	Describe how we calculate the mean. <i>To calculate the mean, we all the data values, then by how many data values there are.</i> What does the mean represent? <i>The mean represents the data values evenly.</i>
---	--

Calculate the mean for these datasets.

a 7, 14, 3, 18

$$\bar{x} = \frac{(\quad) + (\quad) + (\quad) + (\quad)}{(\quad)}$$

$$=$$

10.5

b 6, 12, 7, 3, 5, 12

7.5

c 1, 11, -3, 41, 0

10

d 5, 5, 5, 5, 3, 7

5

Key ideas

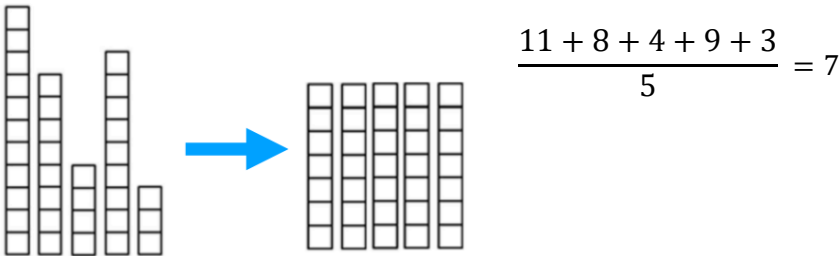
1. The mean is the result of the total of a set of data equally.
2. The mean has the formula: Mean =
3. The mean has a special symbol:

1 Consider the example, then complete the sentence.

To find the mean, we the blocks equally between all the towers.

Here we have towers. We add up all the blocks, then by 5 because we are sharing between 5 towers.

divide | 5 | divide



Find the mean of these towers using the formula and by drawing the sharing.

a <u>1</u> <u>2</u> <u>2</u> <u>3</u> Mean = $\frac{1+2+2+3}{4} =$ 2	b - - - - 2	c - - - - 2
d - - - - 2	e - - - - 1.75	f - - - - 2

2 Calculate the mean of these two numbers.

a 3 and 5 4	b 4 and 6 5	c 4 and 7 5.5	d 3 and 7 5
e 3 and 9 6	f 3.5 and 9 6.25	g 7 and 18 12.5	h 7 and 17 12
i 7 and 16.5 11.75	j 7 and 15 11	k 0.7 and 1.5 1.1	l -7 and -15 -11
m -7 and -16 -11.5	n -6 and -16 -22	o -6 and 16 5	p 6 and -16 -5

3 Calculate the mean of the dataset.

a 16, 24, 40

$$\bar{x} = \frac{\text{Add the scores}}{\text{Three scores} = 3} = \frac{\boxed{}}{\boxed{3}} = \frac{\text{Divide total}}{\text{by 3}} \boxed{}$$

26.6

b 12, 14, 35, 10

$$\bar{x} = \frac{\boxed{}}{\boxed{}} = \boxed{}$$

17.75

c 8, 13, 17, 23, 15, 18

$$\bar{x} = \frac{\boxed{}}{\boxed{}} = \boxed{}$$

15.6

d -6, -2, 3, 0, 5

$$\bar{x} = \frac{\boxed{}}{\boxed{}} = \boxed{}$$

0

4 Calculate the mean

a 4 4 4 4 4

4

b 6 6 6 6 6

6

c 6 6 6 6

6

d 6 6 6 6 0

4.8

e 6 6 6 5

5.75

f 5 6 6 6

5.75

g 12 12 12 10

11.5

h 1 2 3 4 5

3

i 1 2 3 4 50

12

j 1 2 3 4 4

2.8

k 1 2 3 4 2

2.4

l 1 2 3 4 -2

1.6

5 Calculate the mean of each dataset.

a 1, 1, 3, 5, 10

4

b 2, 2, 6, 10, 20

8

c 3, 3, 7, 11, 21

9

d 3, 3, 7, 11, 16

8

e 8, 3, 7, 11, 16

9

f 8, 13, 7, 11, 16

11

g 8, 13, 7, 11, 16, 11

11

h 8, 13, 7, 11, 16, 11, 18

12

i 8, 13, 7, 11, 16, 11, 14.5

11.5

j 0.8, 1.3, 0.7, 1.1, 1.6, 1.1, 1.45

1.15

k -0.8, -1.3, -0.7, -1.1, -1.6, -1.1, -1.45

1.15

6

a Find the mean of the data set 12, 15, 20, 32, 40.

$$\frac{119}{5} = 23.8$$

b An extra number is added to the data set, and its value is 19.
How does the mean change?

$$\text{New mean} = \frac{138}{6} = 23$$

c Instead of 19, the value of the extra number is 91. How does the mean change now?

$$\text{New mean} = \frac{210}{6} = 35$$

7 Calculate the mean of this dataset: 8 cm, 12 cm, 9.5 cm, 47 mm, 82 mm.

$$\text{Mean} = \frac{424}{5} = 84.8$$

8 Find the total of the values in a data set if

a there are 10 values and their mean is 6

60

b there are 6 values and their mean is 10

60

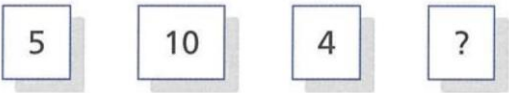
c there are 15 values and their mean is 4

60

d there are 15 values and their mean 40

600

9 The mean of the numbers on these cards is 8.
Find the missing number.



$$\text{Mean: } \frac{19 + x}{4} = 8, x = 13$$

10 Find the missing number in the dataset such that the mean is the given number.

a 7 7 7 $\bar{x} = 7$

7

b 5 5 5 5 $\bar{x} = 5$

5

c 5 5 5 5 $\bar{x} = 6$

10

d 5 5 5 5 $\bar{x} = 7$

15

e 5 5 5 5 $\bar{x} = 0$

-20

f 5 5 5 $\bar{x} = 5$

5

g 5 5 5 $\bar{x} = 6$

9

h 5 5 5 $\bar{x} = 7$

13

i 5 5 5 $\bar{x} = 0$

-15

j 5 5 $\bar{x} = 5$

5

11 The mean of a group of numbers is 20.
The total of the numbers is 180.
How many numbers are in the set?

$$n = \frac{180}{20} = 9$$

12 The dataset 5, 3, 9, x has a mean of 6. Find the value of x .

Worked Solution	Explanation
$\bar{x} = \frac{\text{Sum of data values}}{\text{Number of data values}}$ $6 = \frac{5 + 3 + 9 + x}{4}$ $6 = \frac{17 + x}{4}$ $24 = 17 + x$ $7 = x$	Fill in the steps for working with formulas: Step 1: Write the Step 2: given values. Step 3: Solve for the unknown by applying operations to sides of the equation. Show what is happening between each line

a 9 x 6 8 6 6 has a mean of 7.
Find the value of x

b 30, 30, 30, 30, x has a mean of 40.
Find the value of x .

7

80

13 Find the missing number in the dataset such that the mean is the given number.

a 4, 2, 8, x Mean = 5

$$\bar{x} = \frac{\text{sum of data values}}{\text{number of data values}}$$
$$5 = \frac{4 + 2 + 8 + x}{4}$$
$$5 = \frac{14 + x}{4}$$
$$\dots = 14 + x$$
$$\dots = x$$

6

b 4, 2, 8, x Mean = 4

$$\bar{x} = \frac{\text{sum of data values}}{\text{number of data values}}$$
$$= \frac{(\quad) + (\quad) + (\quad) + x}{(\quad)}$$

2

c 5, 3, 9, x Mean = 5

3

d 10, 6, 18, x $\bar{x} = 20$

46

e 10, 6, 18, x , 20 $\bar{x} = 20$

46

f 10, 6, 18, x , 0 $\bar{x} = 20$

66

- 14** Ten adults were surveyed on the number of hours they slept last night.

Their answers were 8, 10, 9, 5, 5, 6, 9, 8, 4 and 12.

- a** Find the mean number of hours slept.

$$\frac{76}{10} = 7.6$$

- b** Another adult was then surveyed and the mean changed to 8.
How many hours did this adult sleep?

$$\text{New total} = 8 \times 11 = 88,$$

$$\text{Extra hours} = 88 - 76 = 12$$

- 15** The set 3, 7, 9, 10 has one number added to it, which causes the mean to double.
What is the number?

$$\text{Original mean} = \frac{29}{4} = 7.25$$

$$\text{New mean} = 14.5$$

$$14.5 = \frac{29 + x}{5}$$

$$x = 43.5$$

- 16** A netball player scored the following number of goals in her 10 most recent games:

15 14 16 14 15 12 16 17 16 15

- a** What is her mean number of goals per game?

$$15$$

- b** What number of goals does she need to score in the next game for the mean of her scores to be 16?

$$16 = \frac{150 + x}{11}$$

$$x = 26$$

- 17** Stevie obtained the following scores on her first five Maths tests:

92, 89, 94, 82, 93

- a** What is her mean test score?

$$90$$

- b** If there is one more test left to complete, and she wants to achieve an average of at least 85, what is the lowest score Stevie can obtain for her final test?

$$85 = \frac{450 + x}{6}$$

$$x = 60$$

- 18** Find the mean of each set of expressions.

- a** $3a, 4a, 5a, 6a, 12a$

- b** $a + 3, a + 5, a + 13$

$$\frac{30a}{5} = 6a$$

$$\frac{3a + 21}{3} = a + 7$$

19

- a** The mean of 8 numbers is 17.
What is the sum of the data values?

$$\bar{x} = \frac{\text{Sum of data values}}{\text{Number of data values}}$$

$$17 = \frac{\text{Sum}}{8}$$

136

- b** The mean of 12 numbers is 7.
What is the sum of the data values?

84

- c** The mean of 14 numbers is 13.5.
What is the sum of the data values?

189

- d** Mr Ding is sharing Jellysnakes evenly between 20 students.
Each student receives 3 jellysnakes.
How many jellysnakes are there total?

60

Worked Solution	Explanation
The mean of seven numbers is 11. A number is added and the mean increases to 12. What is that number? $\bar{x} = \frac{\text{sum of data values}}{\text{number of data values}}$ $12 = \frac{7 \times 11 + x}{8}$ $96 = 7 \times 11 + x$ $96 = 77 + x$ $19 = x$	What does 7×11 represent? <i>7×11 is the previous before adding the new number.</i> sum What does $7 \times 11 + x$ represent? <i>$7 \times 11 + x$ is the new</i> sum Why is the number of data values 8? <i>There used to be numbers, after adding a number, the total data values is 8.</i> 7

- 20** The mean of three integers is 8. A fourth number is added to the list and the mean is now 7.
What is the fourth number?

$$7 = \frac{24 + x}{4}$$

$$x = 4$$

- 21** The mean number of goals scored per soccer match is 5.125 over 16 matches in a season.
After the 17th match, the mean changed to 5. How many goals were scored in the 17th match?

$$5 = \frac{5.125(16) + x}{17}$$

$$x = 3$$

- 22** Peter has completed a series of 5 quizzes. He currently has a mean score of 12. Each quiz has a maximum mark of 30.

a For the last remaining quizzes, Peter decides to study hard. His goal is to have a mean of 15 for all 6 quizzes. What mark does he need to get in the final quiz?

$$15 = \frac{12(5) + x}{6}$$

$$x = 30$$

b Brian is in the same class and has a mean score of 15 across 5 quizzes. His goal is to have a mean of 18 across all 6 quizzes. Explain why this is impossible, using calculations.

$$18 = \frac{5(15) + x}{6}$$

$$x = 33$$

Brian cannot score 33/30 for the last test.

- 23** Six friends play a game. Their mean score in the game is 19. The mean score of four of the friends is 24. Find the mean score of the remaining two friends.

$$19 = \frac{24(4) + 2x}{6}$$

$$x = 9$$

- 24** The mean mark for a class of 32 students in a Maths test is 68%. If the results of two students are excluded, the mean rises to 72%. Find the mean mark of the two students whose results were excluded.

$$72 = \frac{32(68) - 2x}{30}$$

$$x = 8$$

- 25** Chloe says the mean of a set of three consecutive numbers is the middle number. Explain using algebra why Chloe is correct.

$$\frac{n + (n + 1) + (n + 2)}{3} = \frac{3n + 3}{3} = n + 1$$

- 26** There are 20 students in a class. Their mean mark in a Science test is given as 62%. However, one paper has been marked incorrectly and awarded 58% instead of 85%. What should the correct mean mark in the test be?

Old total: 1240, new total: $1240 + 85 - 58 = 1267$

$$\bar{x} = \frac{1267}{20} = 63.35\%$$

MEDIAN

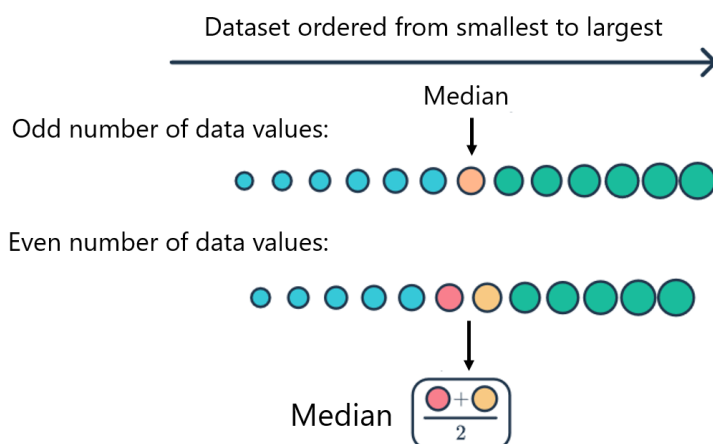
- The **median** is the **middle** value in an ordered dataset.
- To find the median:
 - Sort data in ascending order.
 - Find the middle number.

Odd number of data values:

The median is the middle number.

Even number of data values:

Calculate the mean of the two middle numbers.



Example Calculate the median of a dataset.

Calculate the median of the dataset: 2, 3, 9, 6, 4, 2, 9 1. Sort data 2 2 3 <u>4</u> 6 9 9 2. Middle number Median = 4	What does the median represent? The median is the data value when sorted in order. % of the data is below this number, and% of the data is above this number.
9, 2, 3, 9, 7, 4, 2, 9 1. Sort data 2 2 3 <u>4</u> 7 9 9 9 2. Middle number Median = $\frac{4 + 7}{2} = 5.5$	Why are there two middle values in this example? When there are an number of data values, there will be two middle values. The median is the of the two middle values.

Find the median of these datasets.

a 2, 4, 5, 7, 9

b 1, 2, 3, 5, 7, 9

5

4

c 5, 12, 7, 11, 4, 1, 7

d 12, 14, 14, 11, 10, 12, 13, 9

7

12

Key ideas

- The median is the data value in the of a dataset, after sorting.
- If there are an number of data values, there will be middle numbers.
The median is the of these two middle numbers.
-% of data is below the median, and% of data is above the median.

1 Calculate the median of each dataset. Remember to sort the data first.

a 3, 5, 10, 12, 19, 23, 34.

, , , , , , .

Median =

12

b 6, 14, 14, 22, 37.

, , , , .

Median =

14

c 7, 7, 12, 16, 18, 21, 26.

, , , , , , .

Median =

16

d 12, 8, 19, 36, 17.

, , , , .

Median =

17

e 84, 36, 55, 58, 65.

, , , , .

Median =

58

f 66, 86, 99, 92, 49, 62, 57.

, , , , , , .

Median =

66

g 11, 14, 24, 16, 19

16

h 8, 2, 7, 3, 4, 7, 8, 2, 9

7

2 Calculate the median of each dataset. You will need to find the mean of the two middle scores.

a 11, 24, 28, 36.

, , , .

Add then $\div 2$

Median =

26

b 46, 21, 11, 35.

, , , .

Median =

28

c 22, 19, 34, 15, 18, 24.

, , , , , .

Median =

20.5

d 8, 19, 14, 6, 11, 15.

, , , , , .

Median =

12.5

e 82, 71, 48, 55

63

f 23, 11, 14, 40, 28, 32

25.5

g 104, 111, 86, 123, 92, 88

98

h 8, 13, 12, 6, 13, 18, 7, 12

12

3 Calculate the median of each dataset.

a 1, 1, 3, 5, 10

3

b 10, 5, 3, 1, 1

3

c 2, 2, 6, 10, 20

6

d 3, 3, 7, 11, 210

7

e -3, 3, 7, 11, 210

7

f 3, 3, -7, 11, 210

3

g 3, 4, 5, 6, 7

5

h 3, 4, 5, 6, 7, 8

5.5

i 2, 3, 4, 5, 6, 7, 8

5

j 1, 2, 3, 4, 5, 6, 7, 8

4.5

k 2, 4, 5, 6, 7, 8

5.5

4 These five cards have a median of 12. What could the value of the missing card be?

7	20	30	12	
---	----	----	----	--

x can be any value less than or equal to 12

5 These six cards have a median of 12. What is the value of the missing card?

7	20	30	14	9	
---	----	----	----	---	--

For the median to be 12, the mean of the middle two numbers must be 12. $x = 10$.

6 The masses of five parcels are shown. What is the median mass?



1.8 kg

7 Find the median and range of:

a 12.5%, $\frac{12}{5}$, $\frac{7}{5}$, 1.25, 1.4, 140%

Median: 1.4, Range: 13.875

b $\frac{17}{4}$, $2\frac{1}{4}$, $5\frac{3}{4}$, $7\frac{1}{4}$, $\frac{31}{4}$

Median: $5\frac{3}{4}$, Range: 5.5

8 Consider this dataset: 15, 16, 16, 16, 18, 18, 19, 20

a What is the median?

17

b Change one score to make the median 16. List your new scores.

15, 16, 16, 17, 18, 18, 19, 20

c Change one score to make the median 16.5. List your new scores.

15, 16, 16, 16, 17, 18, 19, 20

d Change 20 to 55. Would this change the median? Why?

No, the middle two numbers stay the same

SUMMARY STATISTICS FROM A LIST

- Summary statistics are used to summarise a numerical dataset.
- Average:** a number that represents a set of data.
Mean, median, mode can all be considered the “average.”

Summary Statistic	Definition	How to calculate
Mean	The result of sharing the total of a set of data equally.	$\bar{x} = \frac{\text{sum of data values}}{\text{number of data values}}$
Median	The middle data value after sorting the data in ascending order.	1. Sort data values in ascending order. 2. Identify the middle number. If there are two middle numbers, the median is the mean of the two.
Mode	The most frequent data value.	Identify the data value(s) that appears the most frequently. If each data value appears once, there is no mode.
Range	The difference between the highest and lowest data value.	$\text{Range} = \text{Max} - \text{Min}$

- Mean, median, mode are measures of centre.
- Range is a measure of spread.

Example Calculate summary statistics for a list of data.

Worked Example	Your Turn
0, 14, 12, 8, -3, 5.5, 8	7, 8, 9, -1, 13, 23, -2, 9
Mean: $\bar{x} = \frac{0+14+12+8+(-3)+5.5+8}{7} \approx 6.36$	Mean: 8.25
Median: -3, 0, 5.5, 8, 8, 12, 14 The median is 8.	Median: 8.5
Mode: 8	Mode: 9
Range: $14 - (-3) = 17$	Range: 25

1 Calculate the mode, range, median, and mean. Round to 1 d.p. if required.

a 19, 34, 22, 16, 27, 35, 19, 12, 16

Mode =

Mode = Most

Median =

Middle score (when in order)

Range = -

Largest - Smallest

=

Add scores →
Mean = =
No. of scores → 1 d.p.

Mode: 16, 19 | Median: 19 | Range: 23 | Mean: 22.2

b 68, 54, 23, 42, 38, 52, 65, 42

Mode =

Range = -

=

Median = +
2

=

Mean = =

Mode: 42 | Median: 47 | Range: 45 | Mean: 48

c 240, 310, 205, 296, 240, 256, 205

Mode =

Median =

Range = -

=

Mean =

=

Mode: 205, 240 | Median: 240 | Range: 105 | Mean: 250.3

d 80, 23, 56, 21, 87, 66, 23

Mode: 23 | Median: 56 | Range: 66 | Mean: 50.9

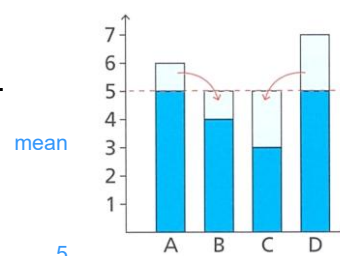
2 Complete the table.

Data Values	Mean	Median	Mode	Range
2, 2, 4, 5, 7	4	4	2	5
2, 2, 4, 5, 12	5	4	2	10
3, 3, 5, 6, 13	6	5	3	10
6, 6, 10, 12, 26	12	10	6	20
6, 6, 10, 18, 20	12	10	6	14
6, 6, 13, 15, 20	12	13	6	14
6, 6, 13, 15, 20, 24	14	14	6	18
0, 6, 6, 13, 15, 20, 24	12	13	6	24

3

a Identify the summary statistic being worked out from this diagram.

b What is the value of the summary statistic?



- 4 Complete the table then decide whether the statements are always true or false.

Scores	Scores in order	Mode	Median	Range
2, 1, 1, 6, 1, 7, 1, 1, 7, 1, 2, 1, 1		1	1	6
30, 70, 70, 70, 10, 30, 30		30, 70	30	60
40, 42, 35, 35, 40, 35, 18, 41		35	37.5	24
0.8, 0.7, 0.9, 0.8, 1.2, 0.95, 0.8		0.8	0.8	0.5
-4, 2, -1, 0, 2, -1, -5, -1, 1		-1	-1	7

- a There is always a mode. F
- b There is always a median. T
- c There is always a range. T
- d The mode is always towards the middle of the scores. F
- e If the mode were 5, then at least 2 scores must be 5. T
- f The median is always part of the dataset. F
- g The range is always positive. T
- 5 In a class test, the range in marks was 17 and the lowest score was 9. What was the highest score in the group? 26
- 6 Krystal collected this data on her class' favourite colours:
blue, blue, red, green, pink, red, blue, yellow. blue
- a Is it possible to calculate the mean, median, or range of the data? Explain. No, this is categorical data
- b What would be the most appropriate summary statistic to use? mode
- 7 Write down four whole numbers such that the median is 14 and range is 3. 13, 13, 15, 16. Many possibilities
- 8 Here are five cards. 26 28 30 36 40
- a Another two cards are added. The median is now 33 and the range is now 20. What are the values of the two cards? 33 and 46
- b Another card is added. The range and median both increase. What is the new median, and explain why the new median does not depend on this new card.

9 Fill in the blank cells of the table.

	Ordered data set					Mode	Median	Range
a	2	2	5			2	2	3
b	3	3	5			3	3	2
c	1	2	2	4	5	2	2	4
d	2	4	4	8	10	4	4	8
e	3	5	5	9	9	5 and 9	5	6
f	20	20	20	40	60	20	20	40
g	1.3	2.6	3.5	9.1	9.2	none	3.5	7.9
h	4	4	7	10		4	5.5	6
i	6.8	6.8	23.9	81.75		6.8	15.35	74.95
j	-5	-5	0			-5	-5	-5
k	-3	0	5			None	0	8
l	-12	-12	-10	-8	-9	-12	-10	3
m	-10	-10	-10	-10	0	-10	-10	10
n	-1.4	-1.4	-1	0	1.4	-1.4	-1	2.8
o	n	$n + 2$	$n + 7$	$2n$		14	11.5	7

10 Edward says:



The mean doesn't have to part of the dataset, but the mode always is.

a Explain why he is correct.

The mode is the most frequently occurring value in the dataset, so by definition it must be present in the data.

The mean doesn't always appear in the dataset, example for a dataset of {0, 10} the mean is 5, which is not part of the dataset.

b Does the median always have to be a part of the dataset? Justify your answer.

For datasets with an even number of values, the median is the mean of the middle two numbers, and the mean does not have to be part of the dataset

11 What does a range of zero tell you about a dataset?

All data values are the same.

12 Six numbers are listed in ascending order and some are removed.
The mean and median are both 6, the mode is 2 and the range is 10.
Fill in the missing numbers.

.....,, 5,,,

2, 2, 5, 7, 8, 12

13 Consider the dataset: 10, 8, 3, 2, 5, p

a What value of p would make the mean of this dataset 6?

8

b What value of p would make the median of this dataset 6?

7

c What value of p would make the mode of this dataset 8?

8

d What value of p would make the range of this dataset 11?

13

14 Come up with a list of numbers to satisfy the requirements.

a mean = 3
mode = 2

2, 2, 5

b mean = 7
mode = 10

1, 10, 10

c mean = 8
median = 10
range = 8

3, 10, 11

d mean = 6
median = 7
range = 11

0, 7, 11

e mode = 7
median = 7
mean = 6

4, 7, 7

f mean = 4
mode = 1
median = 2

1, 1, 2, 10

g mean = 9
mode = 6
median = 7

6, 6, 8, 16

h mean = 6
median = $6\frac{1}{2}$
range = 11

0, 6, 7, 11

i mean = $7\frac{1}{2}$
mode = 6
median = 7

6, 6, 8, 9

j mean = 10
range = 12
mode = 13

1, 13, 13, 13

k range = 5
mean = 6
median = 7
mode = 8

3, 4, 7, 8, 8

l range = 6
mean = 4
mode = 2

2, 2, 3, 5, 8

Other answers possible

- 15 Shown below are five numbered cards which are arranged in order from smallest to largest.

The range is 6.

The median is 7.

The mean is 8.

5				
---	--	--	--	--

Work out the four missing numbers. Compare your answer with the person next to you.

7, 7, 10, 11

- 16 The masses, in kilograms, of the players in an ice hockey team are

95.2, 89.2 98.8 93.4 89.7 94.2

- a Explain why the data has no mode.

Every data value is different

- b Find the mean mass of the ice hockey players.

93.42 kg

- c Find the median mass. Hint: Remember to put the masses in order first.

93.8 kg

- d Which, if any, of the averages will change if the heaviest player is replaced by a player of mass 94 kg?

Mean, median, range will all change, but the mode will not.

- 17 The mean of a set of 10 numbers is 5. A new number is added and the mean stays the same. What was the number?

For the mean to stay the same, the new number must be the current mean.

So, 5.

- 18 The mean of a set of 20 numbers is 20. After the 21st number is added, the mean is now 21. What was the 21st number?

$$21 = \frac{20(20) + x}{21}$$

$$x = 41$$

- 19 **2011 HSC Standard 2 Band 4**

A data set of nine scores has a median of 7.

The scores 6, 6, 12 and 17 are added to this data set.

What is the median of the data set now?

Since 2 scores are less than 7 and 2 scores are greater than 7, the middle score doesn't change.

Median is still 7.

20 2011 HSC Standard 2 Band 4

The heights of the players in a basketball team are 1.8 m, 1.83 m, 1.84 m, 1.86 m and 1.92 m. When a sixth player joined the team, the average height of the players increased by 1 cm. What was the height of the sixth player?

Original mean: 1.85 m

$$1.86 = \frac{9.25 + x}{6}$$

$$x = 1.91$$

New player is 1.91 m tall

21 2013 HSC Standard 2 Band 4

The July sales prices for properties in a suburb were:

\$552 000, \$595 000, \$607 000, \$607 000, \$682 000, and \$685 000.

On 1 August, another property in the same suburb was sold for over one million dollars.

If the property had been sold in July, what effect would it have had on the mean and median sale prices for July?

- (A) Both the mean and median would have changed.
- (B) Neither the mean nor the median would have changed.
- (C) The mean would have changed and the median would have stayed the same.
- (D) The mean would have stayed the same and the median would have changed.

The mean will change; the mean only stays the same if the new data value is the existing mean.

The old median was 607 000, the new median is the mean of 607 000 and 607 000, which is still 607 000.

C

22 2008 HSC Standard 2 Band 4

The height of each student in a class was measured and the mean height was 160 cm.

Two students were absent.

When their heights were included in the data for the class, the mean height did not change.

Which of the following heights are possible for the two absent students?

- (A) 155 cm and 162 cm
- (B) 152 cm and 167 cm
- (C) 149 cm and 171 cm
- (D) 143 cm and 178 cm

The two heights must also have a mean of 160

C

23 2006 HSC Standard 2 Band 4

The mean of a set of 5 scores is 62.

What is the new mean of the set of scores after a score of 14 is added?

$$x = \frac{5(62) + 14}{6} = 54$$

24 2022 HSC Standard 2 Band 4

Consider the following dataset. 13 16 17 17 21 24

Which row of the table shows how the median and mean are affected when a score of 5 is added to the dataset?

	<i>Median</i>	<i>Mean</i>
A.	Changes	Changes
B.	Stays the same	Stays the same
C.	Changes	Stays the same
D.	Stays the same	Changes

D

25 2023 HSC Standard 2 Band 5

Ashan's mathematics class needs to complete six tests, each worth 100 marks.

After completing the first five tests, Ashan calculated that he would need a mark of 90 in the final test in order to have a mean mark of 80 for the six tests.

What was Ashan's mean mark after completing the first five tests?

$$80 = \frac{5x + 90}{6}$$

$$x = 78$$

26 2009 HSC Standard 2 Band 6

The mean of a set of ten scores is 14. Another two scores are included and the new mean is 16.

What is the mean of the two additional scores?

$$16 = \frac{10(14) + 2x}{12}$$

$$x = 26$$

27 2008 HSC Standard 2 Band 5

Christina has completed three Mathematics tests. Her mean mark is 72%.

What mark (out of 100) does she have to get in her next test to increase her mean mark to 73%?

$$73 = \frac{3(72) + x}{4}$$

$$x = 76$$

28 2020 HSC Standard 2 Band 5

Consider the following dataset. 1 5 9 10 15

Suppose a new value, x , is added to this dataset, giving the following.

1 5 9 10 15 x

It is known that x is greater than 15. It is also known that the difference between the means of the two datasets is equal to ten times the difference between the medians of the two datasets.

Calculate the value of x .

difference in median: 0.5, so difference in mean is 5

Old mean: 8, new mean: 13

$$13 = \frac{40 + x}{6}$$

$$x = 38$$

MEDIAN POSITION

- To find the median, you can cross off pairs of values from each end of an ordered dataset.
- This method is slow for large datasets.
- Instead, we can find the median's position using a formula:

Median Position
Number of data values ↓ $\text{Position} = \frac{n + 1}{2}$

Example Determine the median position of a dataset.

1 1 3 7 8 10 15 18 24 43 44 49 129 $\text{Position} = \frac{13 + 1}{2}$ $= 7$ the median is the 7th score. ∴ the median is 15.	What does a median position of 7 mean? <i>The median is theth data value when sorted in ascending order.</i>
0 2 2 4 11 17 60 100 200 4000 $\text{Position} = \frac{10 + 1}{2}$ $= 5.5$ the median is the mean of the 5th and 6th score ∴ the median is 14.	What does a median position of 5.5 mean? <i>The median is the mean of theth andth data value when sorted in ascending order.</i>

Determine the median position of these datasets, then find the median.

a 4 12 23 34 42 53 61 71 81

Position =

5

Median =

42

b 3 8 11 17 22 27 31 38 43 47 52 57
61 66 71 75 81 86 90 93 95 96 98

Position =

12

Median =

57

c 4 11 19 25 33 41 53 62 68 74 81
90 99 110

Position =

7.5

Median =

57.5

d 2 7 13 21 28 35 42 47 53 61 67
71 76 81 85 88 92 97

Position =

7.5

Median =

57

1

a There are 5 data values in a dataset.
What is the median position?

3rd value

b There are 119 data values in a dataset.
What is the median position?

60th value

c There are 4 data values in a dataset.
What is the median position?

2.5 (between 2nd and 3rd value)

d There are 472 data values in a dataset.
What is the median position?

236.5 (between 236th and 337th value)

2 Find the position of the median and the median. The data is already in ascending order.

a 3, 4, 7, 12, 12, 15, 18, 25, 26, 30, 38, 38, 45, 48, 55, 63, 70

Position = $\frac{\boxed{} + 1}{2}$ Count the scores
= $\boxed{}$ th score.
The median is $\boxed{}$

9th score
26

b 63, 82, 83, 87, 88, 94, 96, 98, 99, 100, 104, 110, 115, 122, 122, 127, 129, 135, 142, 154, 179.

Position = $\frac{\boxed{} + 1}{2}$ Count the scores
= $\boxed{}$ th score.
The median is $\boxed{}$

11th score
104

c -19, -12, -5, -2, -2, 0, 0, 3, 4, 12, 13, 13, 18, 23, 24, 29, 29, 30, 31, 37, 39, 42, 46, 55, 57, 59, 94, 123, 128, 152.

Between 15th and 16th score
26.5

d 105, 127, 185, 209, 234, 276, 362, 368, 391, 412, 419, 438, 446, 502, 535, 572, 590, 590, 612, 616, 623, 655, 662, 720, 739, 750, 750, 773, 781, 782, 810, 834, 880, 881.

Between 17th and 18th score
590

ANALYSING STEM-AND-LEAF PLOTS

Example Analyse a stem-and-leaf plot.

Worked Solution	Your Turn																										
<table><tr><th>Stem</th><th>Leaf</th></tr><tr><td>1</td><td>7</td></tr><tr><td>2</td><td>0 6</td></tr><tr><td>3</td><td>8 8</td></tr><tr><td>4</td><td></td></tr><tr><td>5</td><td>0</td></tr></table> Key: 1 7 means 17	Stem	Leaf	1	7	2	0 6	3	8 8	4		5	0	<table><tr><th>Stem</th><th>Leaf</th></tr><tr><td>0</td><td>3</td></tr><tr><td>1</td><td>0 7</td></tr><tr><td>2</td><td>2 2 8</td></tr><tr><td>3</td><td>4 9</td></tr><tr><td>4</td><td>5</td></tr><tr><td>5</td><td>0</td></tr></table> Key: 3 4 means \$34	Stem	Leaf	0	3	1	0 7	2	2 2 8	3	4 9	4	5	5	0
Stem	Leaf																										
1	7																										
2	0 6																										
3	8 8																										
4																											
5	0																										
Stem	Leaf																										
0	3																										
1	0 7																										
2	2 2 8																										
3	4 9																										
4	5																										
5	0																										
Identify the mode 38	Identify the mode																										
Calculate the range Range = 50 – 17 = 33	Calculate the range																										
Calculate the mean	Calculate the mean																										
$\text{Mean} = \frac{\text{sum of data values}}{\text{number of data values}}$ $= \frac{17 + 20 + 26 + 38 + 38 + 50}{6}$ $= 31.5$																											
Calculate the median	Calculate the median																										
$\text{Position} = \frac{6 + 1}{2} = 3.5$ The median is between the 3rd and 4th scores. $\text{Median} = \frac{26 + 38}{2} = 32$																											

1 Calculate the range from these stem-and-leaf plots.

a

Tens	Units
0	0 7 7
1	8 9
2	3 3

Remember the 10's
0,7,7
18,19
23,23

Range = - =

23

b

Tens	Units
7	0 1 3
8	2
9	5 5 6
10	0 4

34

c

Tens	Units
95	2 4 4 7 7
96	0 1 3 6
97	9 9

27

2 Identify the mode from these stem-and-leaf plots.

a

Tens	Units
9	0 3 3 4
10	5 7 8
11	1 6 6 6

116

b

Tens	Units
0	3 5 5 7 8
1	2 2 2 6
2	0 1 1
3	3 5 5 5

12, 35

c

Tens	Units
551	5 6 7
552	9 9
553	1 5

5529

3 Find the median of these stem-and-leaf plots. 1 | 5 means 15.

a

Tens	Units
0	5 7 7 8 9
1	4 4
2	1 1 1 4 4
3	0 0 3

Position:

8th score

Median:

21

b

Stem	Leaf
0	3 3 7
1	0
2	5 6 6 6 7
3	2 4

Position:

6th score

Median:

26

c

Tens	Units
8	3 5
9	2 4 9
10	0 3 3 4 7
11	2 6

Position:

Between 6th and 7th score

Median: $\frac{\text{ } + \text{ }}{\text{ }} = \text{ }$

101.5

d

Tens	Units
8	3 5 8
9	4 6 7 9
10	0 5 5
11	1 2

Position:

Between 6th and 7th score

Median: $\frac{\text{ } + \text{ }}{\text{ }} = \text{ }$

98

4 Calculate the mean from these stem-and-leaf plots. 1 | 5 means 15.

a

Stem	Leaf
0	7 8
1	0 4 6
2	8 8 9

Remember the 10's

7,8
10,14,16
28,28,29

Add the scores

$\bar{x} = \frac{\boxed{}}{\boxed{8}}$

Divide total

$\bar{x} = \frac{\boxed{}}{\text{by } 8}$

17.5

b

Tens	Units
8	4 4 5
9	3
10	0 0 7

$\bar{x} = \frac{\boxed{}}{\boxed{}}$

$\bar{x} = \frac{\boxed{}}{\boxed{}}$

93.3

5 **a** Find the median.

Stem	Leaf
-4	0 0 2 5 8
-3	2 2 2
-2	4 6 7 8
-1	1 1
-0	6 7 7 7 9
0	0 0 3 9 9
1	2 6 6 6 8

-6

b Find the mean.

Tens	Units
18	1 7 7
19	2 6
20	0 3 6
21	1

195.8

6 Calculate the summary statistics for each of these stem-and-leaf plots.

a

Tens	Units
0	0 7 7
1	2 5 9 9
2	2 3 7
3	1
4	2 6

Range	Mode
46	7, 19
Mean	Median
20.77	19

b

Stem	Leaf
7	5 5 9 9
8	0 0 2
9	6 6 6 7
10	
11	3 4 8
12	1 3 5 5

Range: 50,
Mode: 96,
Mean: 98.5,
Median: 96

c

Stem	Leaf
29	5 8
30	9
31	6 6 8 8
32	0 1 1 4
33	3 3 8

Range: 43,
Mode: 316, 318
Mean: 318.57,
Median: 319

d

Tens	Units
-2	0 6
-1	3 9 9
-0	4
0	7
1	0 5 5
2	0 2
3	6 8

Range: 58,
Mode: -19, 15,
Mean: 4.43,
Median: 8.5

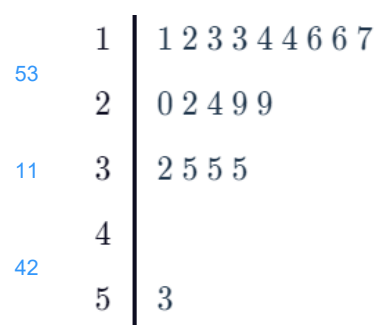
- 7 The age of people who enter a theme park are displayed in the stem-and-leaf plot.

a What is the age of the oldest person?

b What is the age of the youngest person?

c What is the range in ages of visitors?

d What is the median age of visitors?



Key: 1|2 = 12 years old

- 8 Entry and exit have the same mode. Fill in the boxes to make this statement true.

a

Entry	Tens	Exit
5 3	1	0 3
5 0	2	5 5 5
7 4	3	8 8

5, 9

b

Entry	Tens	Exit
7 6	0	3 3
8	1	1 4 7
5 5	2	5

9, 5, 5

- 9 **2012 HSC Standard 2 Band 4**

A set of 15 scores is displayed in a stem-and-leaf plot.

What is the median of these scores?

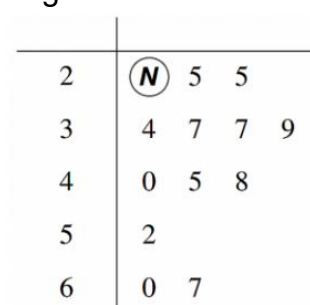


78

- 10 **2008 HSC Standard 2 Band 4**

The stem-and-leaf plot represents the daily sales of soft drink from a vending machine.

If the range of sales is 43, what is the value of N ?

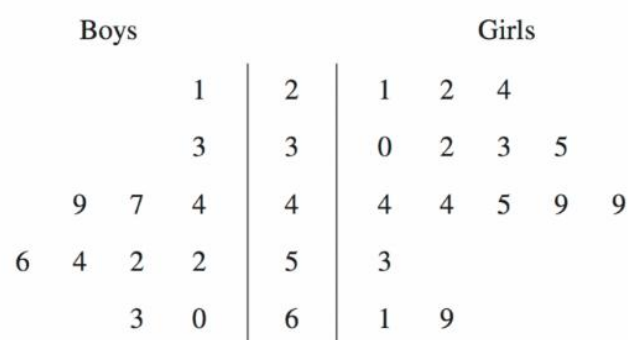


Missing value is 24, so $N = 4$

- 11 **2010 HSC Standard 2 Band 5**

This back-to-back stem-and-leaf plot displays the test results for a class of 26 students.

What is the median test result for the class?



46

ANALYSING DOT PLOTS

Example Analyse a dot plot.

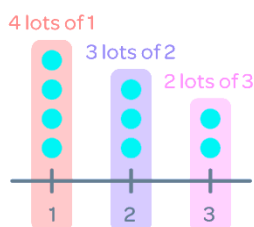
Worked Solution



Identify the mode 1

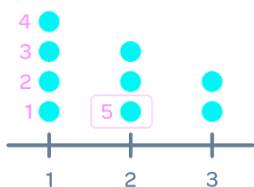
Calculate the range $\text{Range} = 3 - 1 = 2$

Calculate the mean



$$\begin{aligned} \text{Mean} &= \frac{\text{sum of data values}}{\text{number of data values}} \\ &= \frac{(4 \times 1) + (3 \times 2) + (2 \times 3)}{9} \\ &= 1.8 \end{aligned}$$

Calculate the median

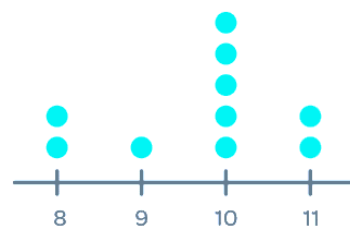


$$\text{Position} = \frac{9 + 1}{2} = 5$$

The median is the 5th score.

Median = 2

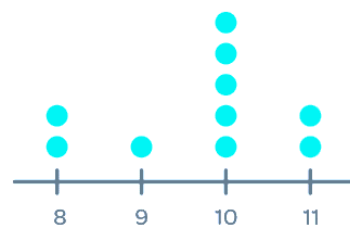
Your Turn



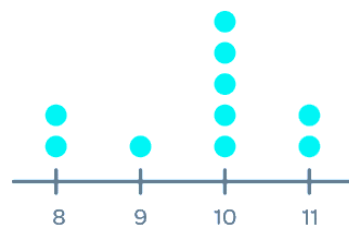
Identify the mode

Calculate the range

Calculate the mean



Calculate the median



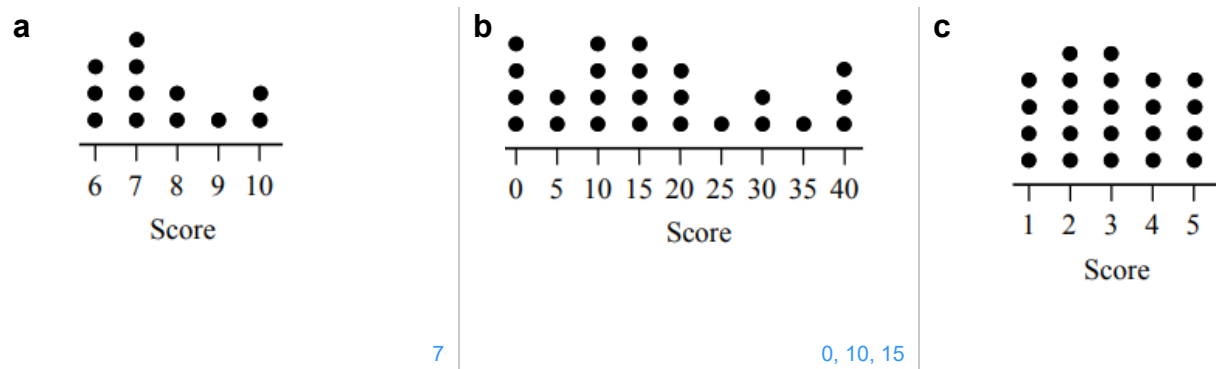
10

3

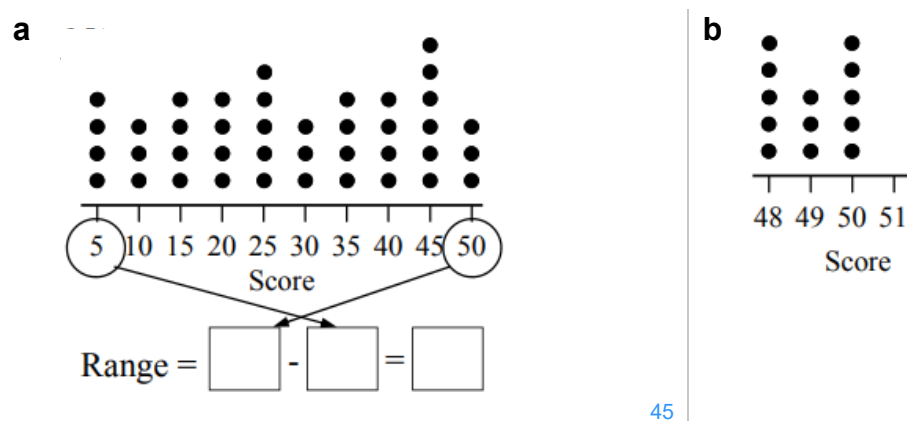
9.7

10

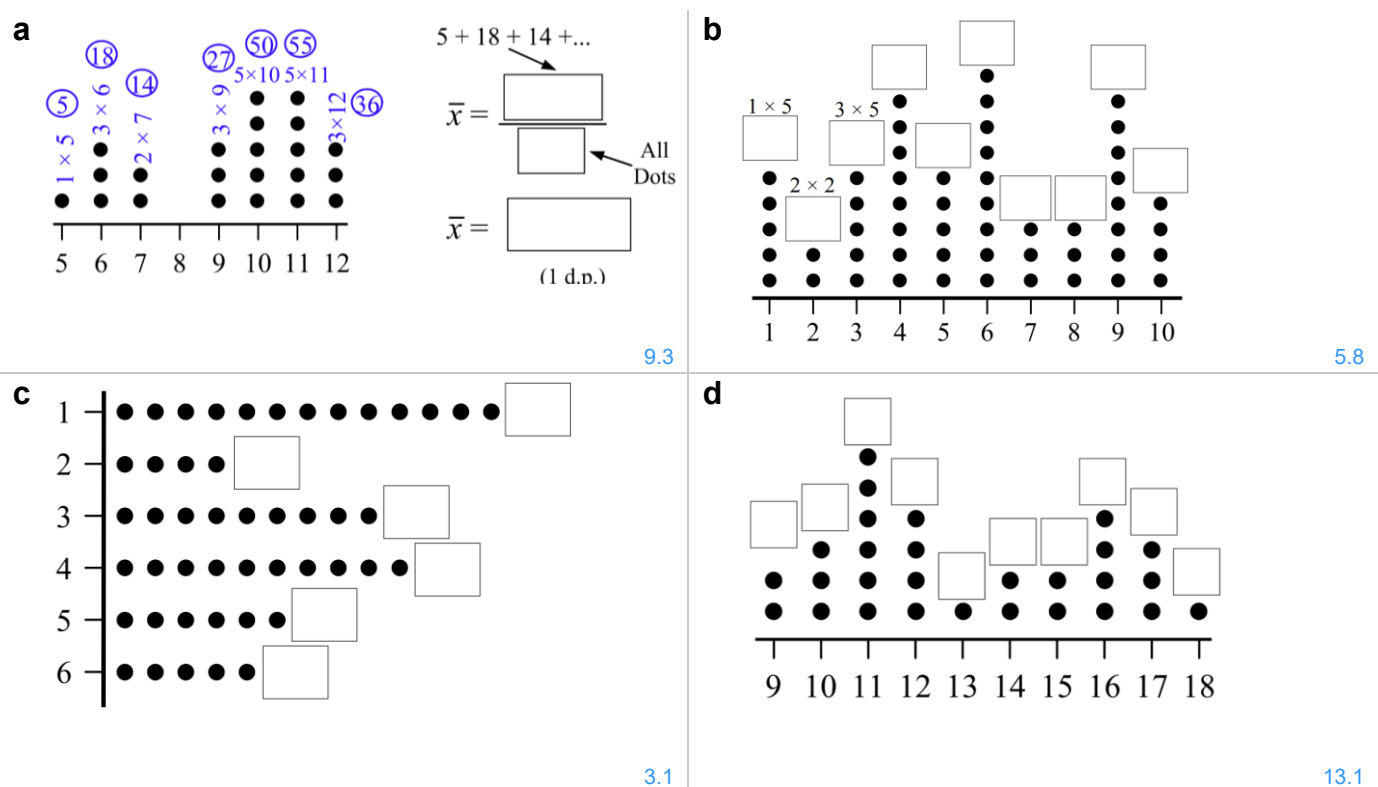
1 Identify the mode from these dot plots.



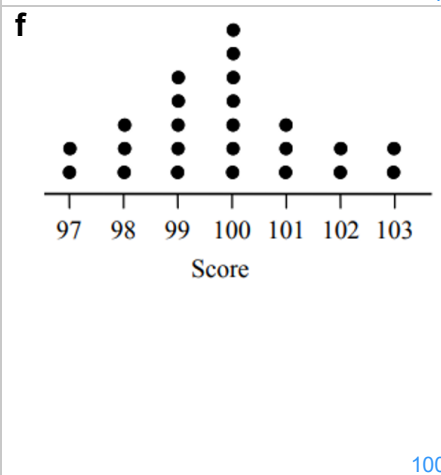
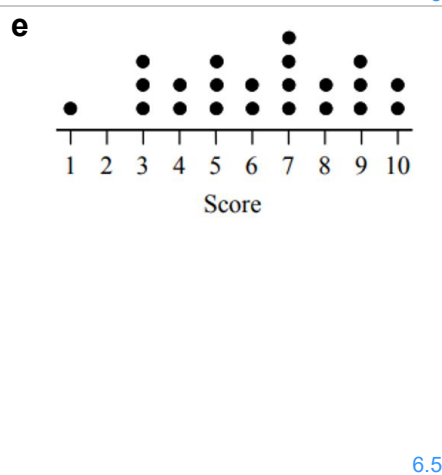
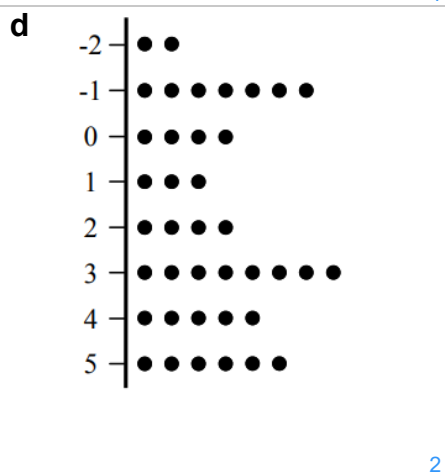
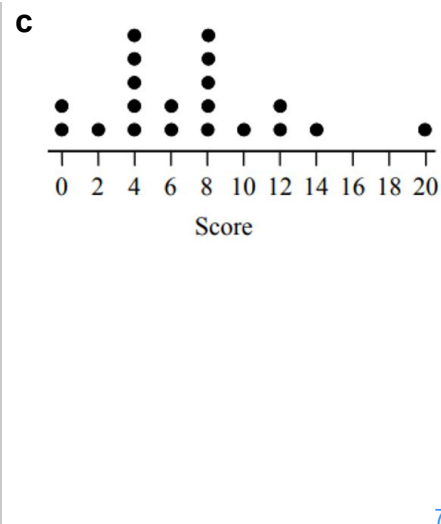
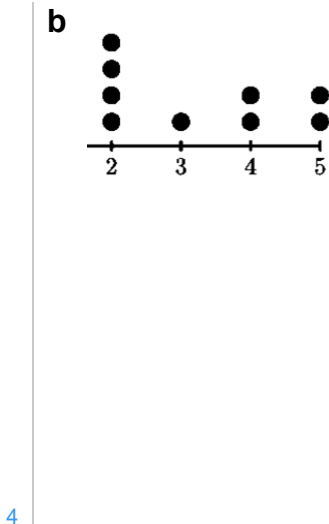
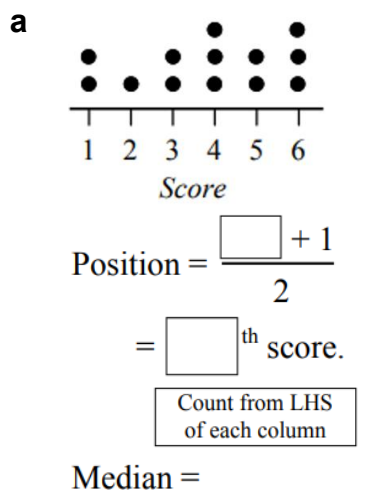
2 Determine the range from these dot plots.



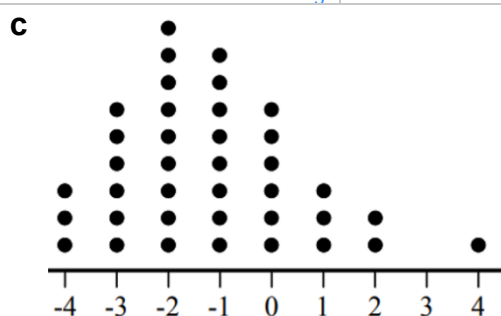
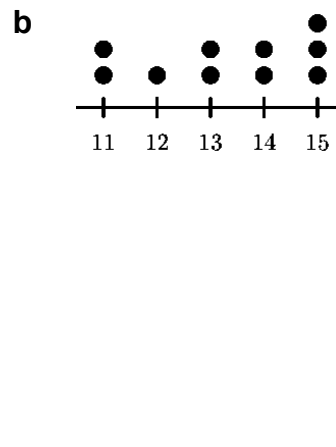
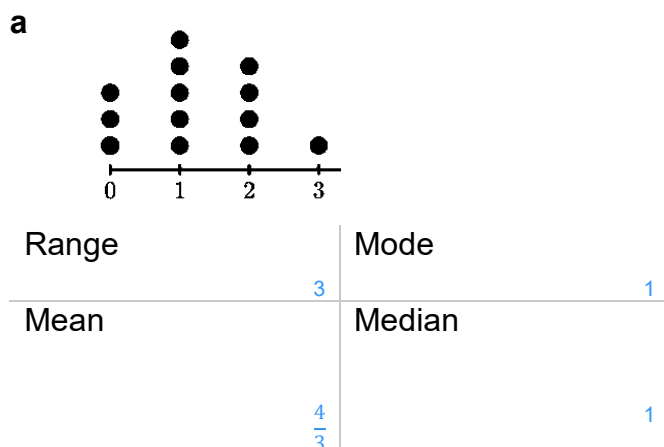
3 Write $f \times x$ at the top of each column, find the sum, then calculate the mean.



- 4 Find the median from these dot plots by identifying the median position.
Count from the LHS of each column.



- 5 Calculate the summary statistics for each of these dot plots.



Range: 8, Mode: -2, Mean: -1.18, Median: -1

6 This dot plot shows the frequency of households with 0, 1, 2 or 3 pets.

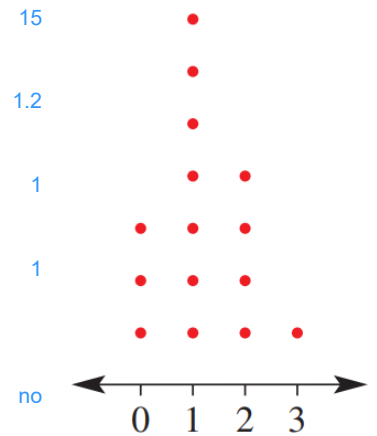
a How many households were surveyed?

b Find the mean number of pets correct to 1 decimal place.

c Calculate the median number of pets.

d Identify the mode.

e Another household with 7 pets is added to the list.
Does this change the median?



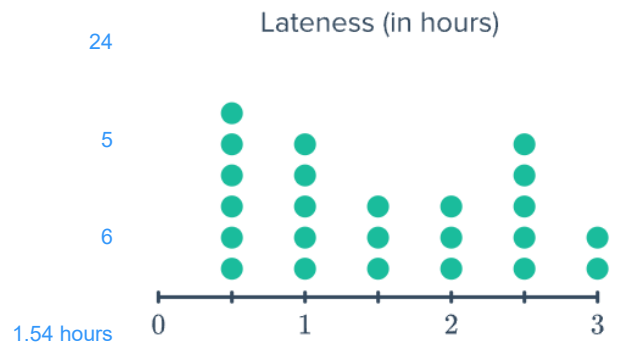
7 The lateness of people to a party is displayed in the dot plot.

a How many people were late overall?

b How many people were 1 hour late?

c How many people were 30 minutes late?

d What is the mean lateness in hours?

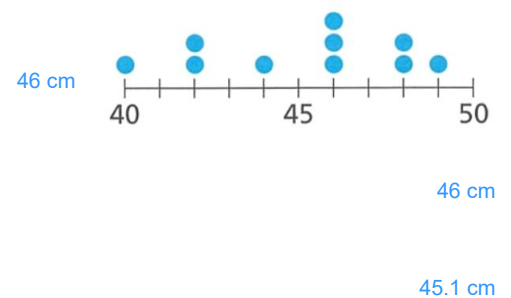


8 The heights of 10 plants (in cm) are shown on the number line.

a What is the modal height?

b What is the median height?

c Work out the mean height of the plants.



MEAN FROM A FREQUENCY TABLE

Investigation Analysing a frequency table.

1 Identify the range from these frequency tables.

a

Score	<i>f</i>
0	4
5	2
10	7
15	11
20	6
25	4

b

Score	<i>f</i>
10	1
20	6
30	2
40	7

c

Score	<i>f</i>
0	7
2	7
4	3
6	4
8	7
10	5

2 Identify the mode from these frequency tables.

a

Score	<i>f</i>
0	2
1	8
2	3
3	5
4	6
5	0

b

Score	<i>f</i>
98	5
99	2
100	4
101	5

c

Score	<i>f</i>
2	2
3	8
4	2
5	7
6	7

3 The table shows the number of passengers in each car entering a car park.
Ed says, "There are 44 passengers in total."

a Explain why Ed is wrong.

.....

b Work out the total number of passengers in the cars.
Explain your method.

.....

.....

Number of passengers	Frequency
1	7
2	21
3	11
4	5

4 A class records how many pens each student has.
How many pens do the class have in total?

.....

.....

Number of pens	Frequency
0	1
1	4
2	7
3	12
4	0
5	3

CALCULATING MEAN FROM A FREQUENCY TABLE

- The **mean** is the sum of all values divided by the number of values.
- We can use **multiplication** to quickly add many identical values.
- To calculate the mean from a frequency table:
 - Create the **Data Value** × **Frequency** (xf) column.
 - Find Σxf and Σf
 - $\bar{x} = \frac{\Sigma xf}{\Sigma f}$

Example Calculate mean from frequency table.

Calculate the mean.

Data value	Frequency	xf
0	4	0
1	3	3
2	5	10
3	1	3
	$\Sigma f = 13$	$\Sigma xf = 16$

$$\begin{aligned}\bar{x} &= \frac{\Sigma xf}{\Sigma f} \\ &= \frac{16}{13} \\ &= 1.23\end{aligned}$$

How does xf help us calculate the mean?

The of xf is the sum of the data values.

What does Σxf mean?

Σ (Greek letter uppercase Sigma) in mathematics means

Calculate the mean.

a

Data value	Frequency	xf
1	2	
2	4	
3	6	
4	2	
5	1	
	Σf	Σxf

$$\bar{x} = \frac{\Sigma xf}{\Sigma f} =$$

b

Data value	Frequency	xf
4	3	
5	2	
6	7	
7	0	
8	3	
	Σf	Σxf

1 Calculate the mean from this frequency table.

a

Data Value (x)	Frequency (f)	xf
1	3	3
2	4	
3	2	
4	7	
	$\Sigma f =$	$\Sigma fx =$

$$\bar{x} = \frac{\Sigma xf}{\Sigma f} = \frac{\boxed{}}{\boxed{}} = \dots\dots\dots$$

2.8125

b

Data Value (x)	Frequency (f)	xf
8	6	48
9	8	
10	15	
11	11	121
12	3	
	$\Sigma f =$	$\Sigma fx =$

$$\bar{x} = \frac{\Sigma xf}{\Sigma f} = \frac{\boxed{}}{\boxed{}} = \dots\dots\dots$$

9.93

c

Data Value (x)	Frequency (f)	xf
5	7	
6	13	
7	18	
8	15	
9	12	
	$\Sigma f =$	$\Sigma fx =$

$$\bar{x} = \dots\dots\dots$$

7.18

2 Calculate the mean from these frequency tables.

a

Score	f	
0	2	
1	3	
2	7	
3	12	
4	9	
5	14	
6	13	
$\Sigma f =$		$\Sigma fx =$

3.95

b

Score	f	
0	4	
5	2	
10	7	
15	11	
20	6	
25	4	

13.68

3 The table shows the numbers of goals scored by a football team in 24 matches. Complete the table and find the mean number of goals scored.

Number of goals	Frequency	Subtotals
0	5	
1	8	
2	6	
3	4	
4	1	
Total	24	

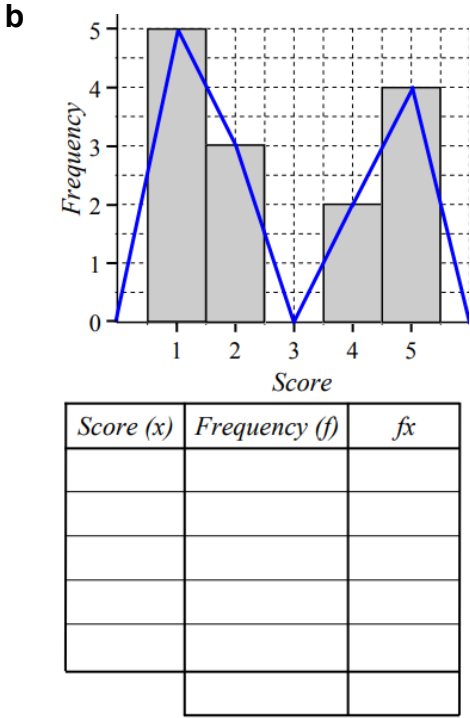
1.5

4 Convert these to frequency tables, then calculate the mean.

a

Score (x)	Frequency (f)	fx

19.41



2.64

5 Calculate the mean for each frequency table.

a

x	f
0	2
1	2
2	2
3	2

b

x	f
0	5
1	5
2	5
3	5

c

x	f
0	20
1	0
2	0
3	0

1.5

1.5

0

d

x	f
0	0
1	20
2	0
3	0

e

x	f
0	0
1	10
2	10
3	0

f

x	f
0	0
1	0
2	10
3	10

1

1.5

2.5

g

x	f
0	0
1	5
2	5
3	10

h

x	f
0	10
1	5
2	5
3	0

i

x	f
0	10
1	5
2	3
3	2

2.25

0.75

0.85

MEDIAN FROM A FREQUENCY TABLE

Investigation Median from a frequency table.

- 1 Extract the data from the table and write the data in ascending order. Find the median.

a

Score	Frequency
0	2
1	3
2	5
3	1

, , , , , , , , , .

b

x	f
2	4
4	2
6	1
8	3
10	2

, , , , , , , , , .

- 2 Write out all the scores from the frequency distribution table, then find the median.

a

Score	f	
1	3	1, 1, 1
2	1	2
3	2	3, 3
4	3	
5	5	
6	3	
$\Sigma f =$		

Position = $\frac{\text{ } + 1}{2} = \text{ }^{\text{th}}$ score.

The median is

b

Score	f	
1	2	
2	5	
3	3	
4	4	
5	2	
$\Sigma f =$		

c

Score	f	
0	1	
10	2	
20	4	
30	3	
40	4	
50	3	
60	3	
$\Sigma f =$		

- 3 Find the mean and median from this frequency distribution table.

Score	f	fx
10	3	
20	5	
30	2	
40	3	
50	1	
$\Sigma f =$		$\Sigma fx =$

Write the scores out to find the median

- 4 What's the issue with finding median this way? (Hint: what if the frequency was 50?)

.....

CALCULATING MEDIAN FROM A FREQUENCY TABLE

- **Cumulative frequency** is the total count of data values up to and including a value.
- To find the median from a frequency table:
 1. Create and fill in the **Cumulative Frequency (cf)** column.
 - a. For the first data value, cumulative frequency equals its frequency.
 - b. For other values, add their frequency to the previous cumulative frequency.
 2. Find the median position using $\text{Pos} = \frac{n+1}{2}$
 3. The median is the value where cumulative frequency first equals or exceeds the median position.

Example Calculate median from a frequency table.

Data value	Frequency	Cumulative Frequency	
2	3	3	
3	5	8	
4	3	11	
5	4	15	
6	8	23	
7	2	25	
Σf	25		

What is cumulative frequency?

Cumulative frequency is the of the of all the scores up to and a particular score.

What are two ways to find the total number of data values?

We can either the frequency column or look at the final frequency.

How can we use the median position and the cumulative frequency to find the median?

The median position is 13, so we need to find the 13th score.

Using the cumulative frequency, the 11th score is and the 15th score is Therefore, the 13th score is

How many data values are there in total?

25

How many data values are 4 or less?

Using the cumulative frequency column, 11.

What is the median?

$$\text{Position} = \frac{25 + 1}{2} = 13$$

The 11th score is 4, the 15th score is 5, so the 13th score is 5.

The median is 5.

Consider the frequency table to the right.

How many data values are there in total?

How many data values are 5 or less?

What is the median?

Data value	Frequency	Cumulative Frequency
2	7	
3	2	
4	8	
5	5	
6	4	
7	7	

1 Find the median from these frequency tables.

a

Score	f	$c.f.$
0	2	2
2	3	5
4	1	
6	6	
8	5	
10	2	
$\Sigma f =$		

$$\text{Position} = \frac{\boxed{} + 1}{2}$$

$$= \boxed{}^{\text{th}} \text{ score.}$$

Median = _____

b

x	f	$c.f.$
1	1	
2	4	
3	12	
4	9	
5	12	
6	9	
$\Sigma f =$		

$$\text{Position} = \frac{\boxed{} + 1}{2}$$

$$= \boxed{}^{\text{th}} \text{ score.}$$

Median = _____

6

4

c

Score	Frequency	$c.f.$
-3	9	
-2	15	
-1	32	
0	38	
1	22	
2	13	
3	7	

d

Score	Frequency	$c.f.$
10	14	
20	8	
30	5	
40	8	
50	6	
60	3	
70	10	

0

35

2 Consider the table below. Marta says:

Number of goals	Frequency
0	5
1	8
2	6
3	4
4	1



The median number of goals scored is 2 because it's in the middle of 0, 1, 2, 3 and 4

a Explain why Marta is wrong.

The median is the middle of the data values. The middle of the *variables* may not be the median.

b By writing out the full list of the numbers of goals scored, find the correct median.

The median is 1.

c How can you find the median from a frequency table without writing out the data in a list?

Using the cumulative frequency to identify the median position.

3 Calculate the median for each frequency table.

a

x	f
0	2
1	2
2	2
3	2
4	5

b

x	f
0	5
1	5
2	5
3	5
4	5

c

x	f
0	20
1	0
2	0
3	0
4	0

3

2

0

d

x	f
0	0
1	20
2	0
3	0
4	0

e

x	f
0	0
1	11
2	10
3	0
4	0

f

x	f
0	0
1	0
2	10
3	11
4	0

1

1

3

g

x	f
0	0
1	5
2	5
3	10
4	10

h

x	f
1	10
2	6
3	6
4	0

i

x	f
1	10
2	5
3	3
4	3

3

2

2

SUMMARY STATISTICS FROM A FREQUENCY TABLE

SUMMARY STATISTICS ON CALCULATOR

CASIO FX-82 AU

1. Set calculator to *Statistics Mode 1-var*: **MODE** **2** **1**
2. A table should show up. If it does not have a frequency column: **SHIFT** **MODE** **▼** **3** **1**
Repeat step 1.
3. Enter your data into the table using numbers, arrows and equals button.
4. Press **AC** to save the data.
5. Calculate summary statistics. Mean is under *Var* and median is under *MinMax*.

$\bar{x}$ mean. **SHIFT** **1** **4** **2**

med median. **SHIFT** **1** **5** **4**

Then press **=**

CASIO FX-8200 AU

1. Set the calculator to Statistics Mode: Home → Statistics → 1 – Variable
2. A table should show up. If it does not have a frequency column:
 - a. Tools → Frequency → On
3. Enter your data into the frequency distribution table.
4. Press EXE → 1 – var results
 - a. $\bar{x}$ is mean.
 - b. med is median.

Example Calculate summary statistics from a table.

Find the mean and median using a calculator.

The correct values are given; check you get the same values.

Data value	Frequency
2	3
3	5
4	3
5	4
6	8
7	2

$$\bar{x} = 4.6$$

$$\text{med} = 5$$

- 1 From the table, calculate the mode, range, mean, and median.
Check your answer using a calculator.

Data Value (x)	Frequency (f)	xf	C.F.
1	7		
2	4		
3	7		
4	8		
5	9		
6	8		
Total			

Mode: Range:

5

5

Mean: Median:

3.88

22

- 2 From the table, calculate the mode, range, mean, and median.

Data Value (x)	Frequency (f)
24	9
25	11
26	18
27	0
28	12

Mode: Range:

26

4

Mean: Median:

25.9

26

- 3 From the table, calculate the mode, range, mean, and median.

Mass (kg)	Frequency
23	2
24	5
25	7
26	4
27	2

Mode: Range:

25

4

Mean: Median:

24.85

25

- 4 From the table, calculate the mode, range, mean, and median.

Score	Frequency
10	3
11	0
12	10
13	8
14	7
15	2

Mode: Range:

12

5

Mean: Median:

12.73

13

- 5 The table on the right shows the ages of students at an acting academy.

- a Fill in the cumulative frequency column to calculate the median age.

- b The two oldest students leave the academy. What is the new median?

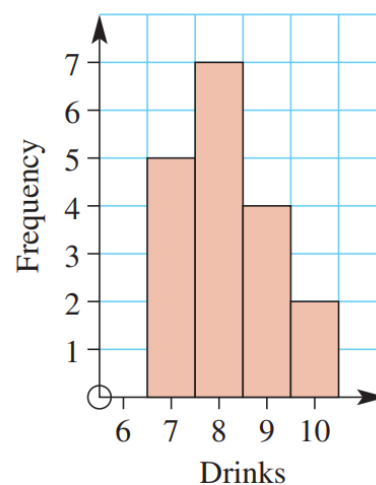
Age	Frequency	Cumulative frequency.
18	2	
19	5	
20	6	
21	2	

20

19

- 6 The frequency histogram shows the number of drinks sold each day. Construct a frequency table to calculate the mean and median.

Drinks	Frequency	fx	Cumulative Frequency
6	0	0	0
7	5	35	5
8	7	56	12
9	4	36	16
10	2	20	18



Mode: Range:

8

3

Mean: Median:

8.1 $\bar{6}$

8

- 7 Explain why you cannot find the range, mean, or median from this table.

This is not numerical data.

Identify the mode.

Burgers

Order	Frequency
Pizza	81
Burger	87
Pie	72
Sandwich	63

- 8 Consider the table to the right.

Do you think the mean will be positive or negative?
Explain your reasoning without using calculations.

Negative. There are more negative values than positive values.

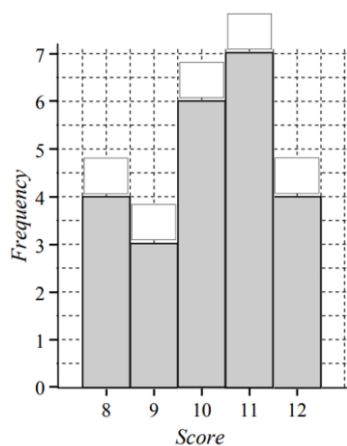
Calculate the mean to check your prediction.

-5.3

Data Value (x)	Frequency (f)
-2	12
-1	18
0	30
1	13
2	7

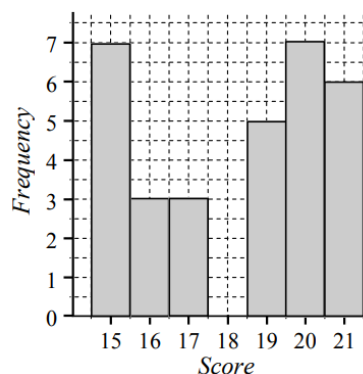
9 Calculate the mean from these frequency histograms.

a



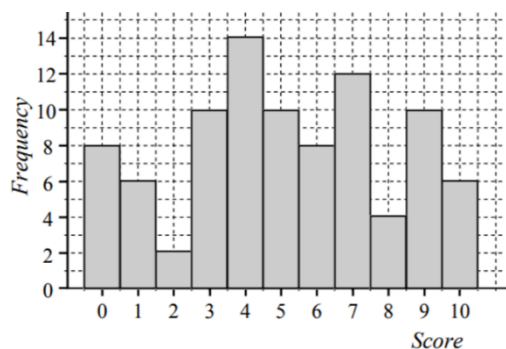
10.16

b



18.23

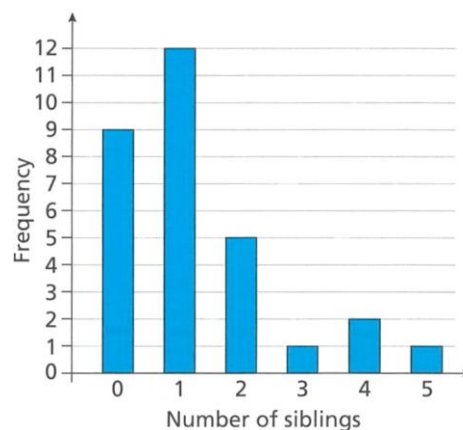
c



5.1

d

The bar chart shows the numbers of siblings of the members of a class. Find the mean number of siblings per student.



1.26

10 What mistakes have been made in working out the mean from these frequency tables?

a

Number	Frequency	Subtotals
46	8	368
47	5	235
48	11	528
49	3	147
	27	1278

$$\text{Mean} = \frac{1278}{4} = 319.5$$

Should have divided by the number of data values, 27

b

Number	Frequency	Subtotals
0	10	10
1	8	8
2	7	14
3	6	18
4	8	32
	39	82

$$\text{Mean} = \frac{82}{39} = 2.1$$

0 × 10 = 0

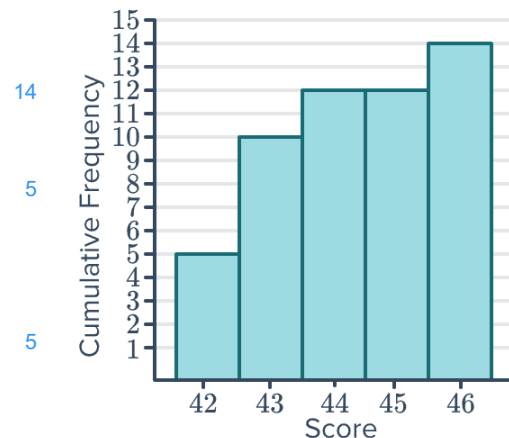
11 This is a **cumulative** frequency histogram.

a Identify the total number of scores.

b Identify the frequency of 42.

c Explain why the frequency of 43 is 5.

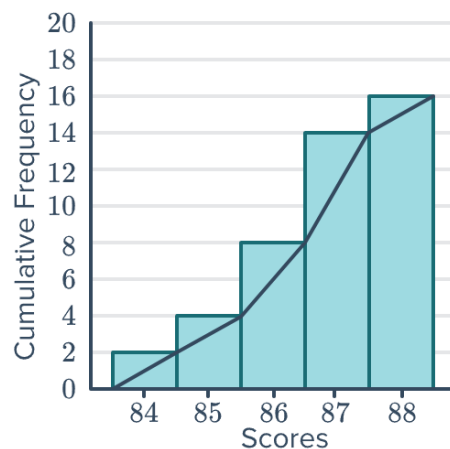
d Complete the frequency table from the histogram.



Score	Frequency	Cumulative Frequency
42	5	5
43	5	10
44	2	12
45	0	12
46	2	14

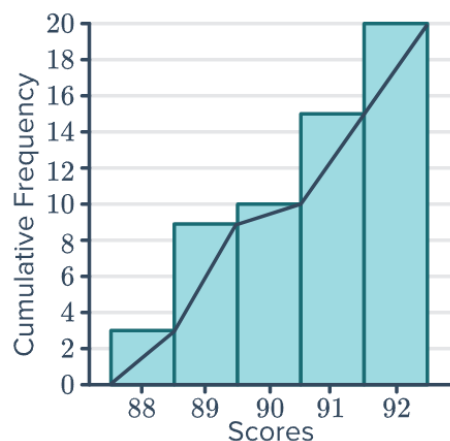
12 Use the cumulative frequency histogram to complete the frequency table.

Score	Frequency	Cumulative Frequency
84	2	2
85	2	4
86	4	8
87	6	14
88	2	16

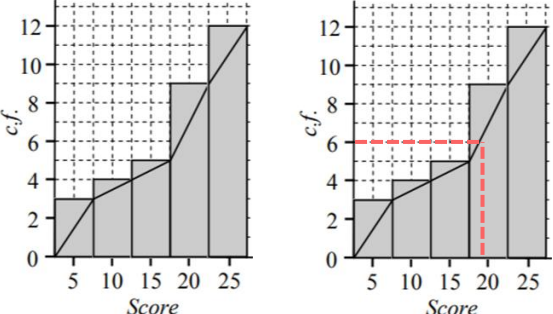


13 Use the cumulative frequency histogram to complete the frequency table.

Score	Frequency	Cumulative Frequency
88	3	3
89	6	9
90	1	10
91	5	15
92	5	20

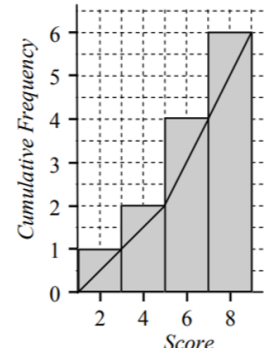
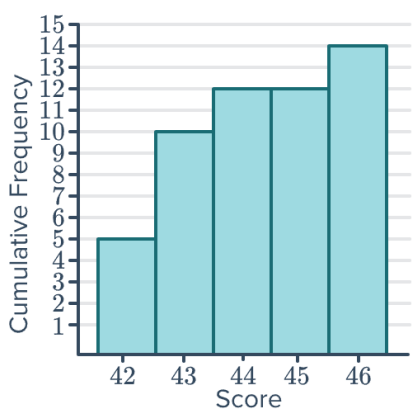
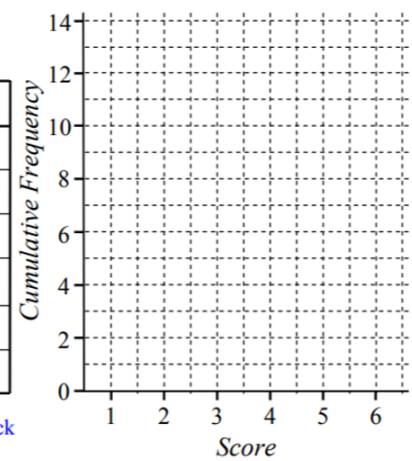
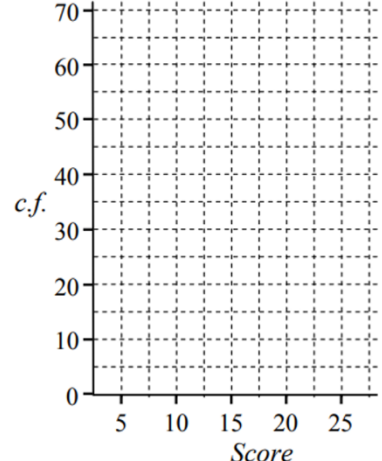


29 A cumulative frequency polygon (line), or ogive, can be used to find median.
At 50% of the total cumulative frequency, rule a horizontal line to the ogive, then read off the score to find the median.

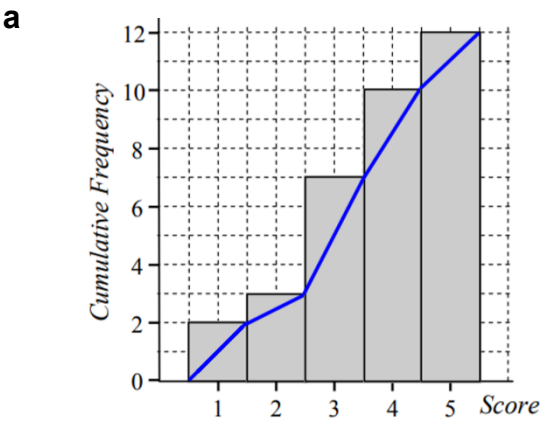
Worked Example	Explanation
 The total number of scores is 12. The median position is 6. The median is 20.	How do we know the total number of scores is 12? <i>The final of the cumulative histogram is 12.</i> Why is the median position 6? $12 \div \dots = 6$ How did we determine that the median is 20? <i>We draw a horizontal line from the median position to the, then draw a vertical line down to the score.</i>

NOTE: you may be confused about why we use $\frac{n}{2}$ to find the median position instead of $\frac{n+1}{2}$.
When we learn grouped cumulative frequency graphs, this inaccuracy won't matter as we'll always be finding an estimate.

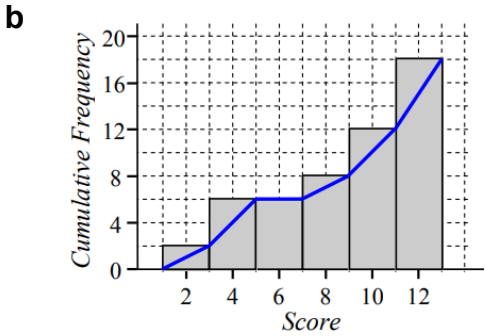
30 Find the median from these cumulative frequency graphs.

a 	b You will need to draw the ogive first. 																																										
c <table><thead><tr><th>Score</th><th><i>f</i></th><th><i>c.f.</i></th></tr></thead><tbody><tr><td>1</td><td>2</td><td>2</td></tr><tr><td>2</td><td>1</td><td></td></tr><tr><td>3</td><td>3</td><td></td></tr><tr><td>4</td><td>3</td><td></td></tr><tr><td>5</td><td>1</td><td></td></tr><tr><td>6</td><td>4</td><td></td></tr><tr><td>$\Sigma f =$</td><td></td><td></td></tr></tbody></table> 	Score	<i>f</i>	<i>c.f.</i>	1	2	2	2	1		3	3		4	3		5	1		6	4		$\Sigma f =$			d <table><thead><tr><th>Score</th><th><i>f</i></th><th><i>c.f.</i></th></tr></thead><tbody><tr><td>5</td><td>15</td><td></td></tr><tr><td>10</td><td>10</td><td></td></tr><tr><td>15</td><td>7</td><td></td></tr><tr><td>20</td><td>11</td><td></td></tr><tr><td>25</td><td>21</td><td></td></tr></tbody></table> 	Score	<i>f</i>	<i>c.f.</i>	5	15		10	10		15	7		20	11		25	21	
Score	<i>f</i>	<i>c.f.</i>																																									
1	2	2																																									
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5	15																																										
10	10																																										
15	7																																										
20	11																																										
25	21																																										

31 Calculate the mean from these *cumulative* frequency histograms.



Score	Frequency	cf	fx
1			
2			
3			
4			
5			



3.16

2.05

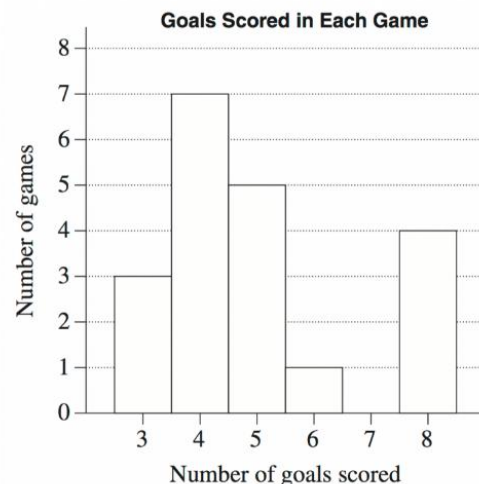
32 In a class of 20 students, a poll was taken of the number of cars owned by each family. The median number of cars owned is 1.5 and the mean number is 1.4 cars. Fill in the table in such a way to reflect this information.

Number of cars	0	1	2	3
Number of students	4			

33 2013 HSC Standard 2 Band 4

The frequency histogram shows the number of goals scored by a football team in each game in a season.

What is the mean number of goals scored per game by this team?



5

34 2008 HSC Standard 2 Band 4

What is the median of the following set of scores?

Score	Frequency
12	13
14	6
16	2
18	12
Total	33

14

35 2018 HSC Standard 2 Band 4

A set of data is summarised in this frequency distribution table. Which of the following is true about the data?

- A. Mode = 7, median = 5.5
- B. Mode = 7, median = 6
- C. Mode = 9, median = 5.5
- D. Mode = 9, median = 6

Score	Frequency
3	1
4	2
5	6
6	7
7	9
8	5
Total = 30	

B

COMPARING DATASETS USING SUMMARY STATISTICS

Example Comparing datasets using summary statistics.

Worked Example	Your Turn
Two friends do an experiment to see who runs 100 m faster. They time their results (in seconds): Izhaak: 17, 15, 22, 19, 20 Justin: 14, 18, 23, 15, 22, 18	Two students compare their test results for maths: Adam: 58, 72, 71, 40, 44 Sampson: 90, 55, 30, 85, 30
Calculate the mean of each friend to determine who is the faster runner. $\bar{x}$ of Izhaak: $\frac{17+15+22+19+20}{5} = 18.6$ $\bar{x}$ of Justin: $\frac{14+18+23+15+22+18}{6} = 18.\dot{3}$ Justin is the faster runner.	Calculate the mean of the two students to determine who was the more serious learner. Sampson is the more serious learner
Calculate the range of each friend to see who is more consistent. Range of Izhaak: $22 - 15 = 7$ Range of Justin: $23 - 14 = 9$ Izhaak is more consistent.	Calculate the range to see who was more consistent with their efforts. Adam is more consistent

- 1 Class 8C sit tests in English, Maths and Science. The table shows some summary information about their results.

Subject	Median mark	Range of marks
English	56	35
Maths	61	47
Science	59	22

- a In which subject did students do best?
- b In which subject were the students' marks most similar?

Maths

Science

- 2 Rhys and Ali both play cricket. The table shows the mean and the range of the numbers of runs they scored last season. Compare their performances last season, explaining your reasoning.

	Mean	Range
Rhys	56	32
Ali	61	57

Ali performed better overall because he has a higher mean.

Rhys was more consistent because he has a lower range.

- 3 A Year 4 teacher runs a two-week programme with her class on learning their times tables. Information about the class's performance in a times-tables test before and after the two-week programme is shown in the table.

	Lowest mark	Mean mark	Highest mark
Before	3	12.5	19
After	9	14.5	20

Based on this information, you think that the programme was effective?

Yes, the mean increased.

Teachers are always sceptical about new programmes. What other information might be useful to help convince someone that this program is causing the change (Hint: think about fair tests in science)

We need to do a fair test involving a control group.

- 4 Here are the heights of five basketball players.

200 cm 195 cm 201 cm 197 cm 194cm

Here are the heights of six gymnasts.

154 cm 152 cm 160 cm 158 cm 146 cm 158 cm

Discuss what you notice about the median height of the basketball players compared to the median height of the gymnasts. Explain why this might be the case.

Basketball median: 197, Gymnast median: 156

Basketballers have an advantage if they're taller, so taller people play basketball

- 5 Here are the times taken, in seconds, by two sprinters in their practice runs for a race.

Sprinter A 12.6 12.8 13.5 12.7 13.9 12.6 13.1 14.2 12.4

Sprinter B 12.7 11.9 15.1 11.8 15.2 14.4 11.8

- a Which sprinter is quicker on average? Support your answer using a summary statistic.

A mean = 13.09, B mean: 13.27

Sprinter A as they have a lower mean

- b Which sprinter is more consistent?

A range: 1.8, B range: 3.4

Sprinter A as well

- 6 Here are Chloe's marks in her end of term tests.

- a Find Chloe's mean mark.

74

- b Find the range of Chloe's marks.

English	73%
Maths	85%
Science	71%

French	88%
History	71%
Geography	56%

32

- c Which average of Chloe's marks is greater, the mean or the median?

Median is 72, so the mean is greater.

- 7 A hot dog stall compares its sale figures for two locations.
The dot plots show the number of hot dogs sold per hour, over a time period.
Calculate the range, mode, median, and mean for both locations.

Location 1:

Range:

5

Mode:

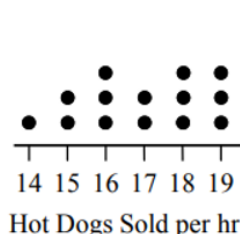
16, 18, 19

Median:

17

Mean:

16.93



Location 2:

Range:

3

Mode:

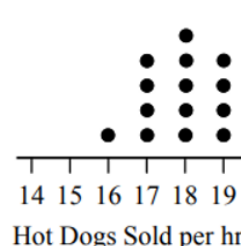
18

Median:

18

Mean:

17.86



- a Which stand was more profitable? Use a summary statistic to support your answer.

Location 2. More hot dogs per hour.

- b Location 2 had more consistent sales. Use a summary statistic to support this statement.

Range of location 2 is 3, compared to 5.

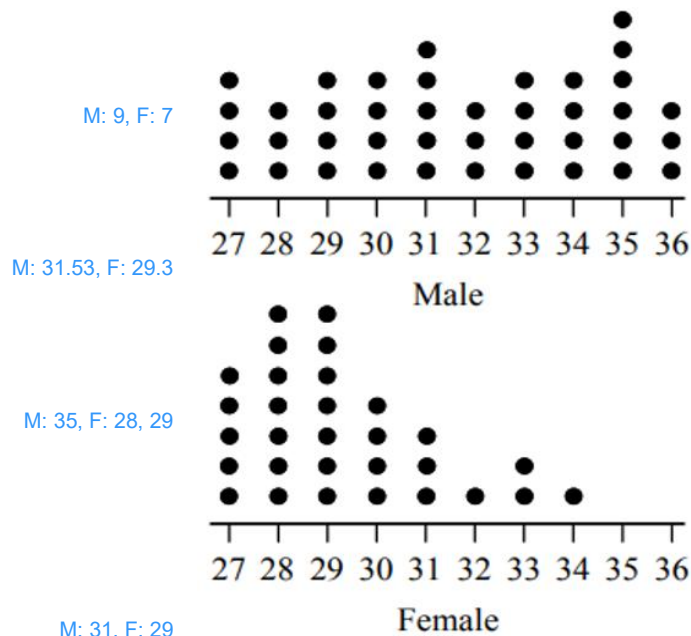
- 8 Compare the range, mean, mode, and median of these two datasets.

Range:

Mean:

Mode:

Median:



The dataset is the time taken (in minutes) to complete a test.

Make a comment comparing the two datasets.

Refer to the summary statistics you've just calculated.

Females took less time as they have a lower mean and median and were also more consistent as they have a lower range.

- 9 Compare the range, mean, mode, and median of these two datasets.

Range:

Mean:

Mode:

Median:

	TRAIN		Stem	BUS		
T: 42, B: 29	3	2	29	2	3	7
T: 311.5, B: 306.92	7	6	30	1	1	5 8
T: 320, 332, B: 301	5	2	31	2	4	9
	6	3	32	0	1	
T: 311, B: 306.5	4	2	33			

The dataset is time taken (where 30|1 means 30.1) to board a train or bus at a busy station.

Make a comment comparing the two datasets.

Refer to the summary statistics you've just calculated.

It is much faster to board a bus and the timing is more consistent. The mean, median, and range are all lower for a bus

- 10** The table shows information about the times taken, in seconds, to complete a shape puzzle by some people in different age groups.

Age (years)	Mean (seconds)	Range (seconds)
12–16	25	18
16–30	23	16
30–60	31	22
Over 60	44	11

- a** Samira thinks that the over 60s did best because they have the greatest mean.
Explain why Samira is not correct.

In this context, taking longer means they did worse.

- b** Put the age groups in order, from most consistent to least consistent.

Over 60, 16 – 30, 12 – 16, 30 – 60

- 11** The heights of Year 8 boys and girls are shown.
Comment on the differences between boys and girls with reference to summary statistics.

Girls	Stem	Boys
	10	
	11	
6 3 1	12	
8 4 3 2	13	8
7 6 5 4 0	14	3 4 7 9
6 4 1	15	0 1 2 4 6 8
2 0	16	2 3 6 8
3	17	

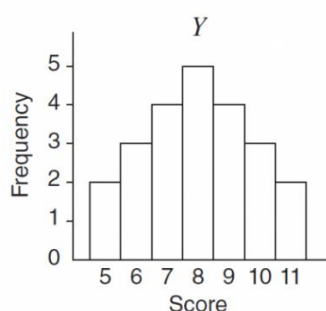
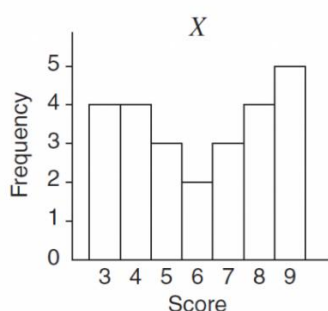
14 | 7 means 147 cm

Boys are taller on average, with a higher mean and median

Girls' heights are more spread out with higher range.

12 2011 HSC Standard 2 Band 4

The sets of data, X and Y, are displayed in the histograms.



Which statement is true?

- (A) X has a larger mode and Y has a larger range.
 (B) X has a larger mode and the ranges are the same.
 (C) The modes are the same and Y has a larger range.
 (D) The modes are the same and the ranges are the same.

Ranges are the same

Mode of X is 9 and mode of Y

B

SUMMARY STATISTICS USING SPREADSHEETS

- Summary statistics for large datasets are always calculated using functions on spreadsheets.

- Transcribe this table to Excel. In spreadsheets, it is best practice to have vertical tables to make them easier to scroll.

2	5	6	3	1	4	5	6	6	8	8
---	---	---	---	---	---	---	---	---	---	---

- Calculate the **mean** using this formula:

=AVERAGE(A:A)

- Calculate the **median** using this formula

=MEDIAN(A:A)

- Calculate the **mode** using this formula

=MODE(A:A)

Note: if there is more than one mode, this function will only show one.

- Calculate the range using this formula

=MAX(A:A)– MIN(A:A)

	A	B	C	D	E
1	2		Mean	=AVERAGE(A:A)	
2	5		Median	=MEDIAN(A:A)	
3	6		Mode	=MODE(A:A)	
4	3		Range	=MAX(A:A)-MIN(A:A)	
5	1				
6	4				
7	5				
8	6				
9	6				
10	8				
11	8				

	A	B	C	D	E
1	2		Mean	4.90909	
2	5		Median	5	
3	6		Mode	6	
4	3		Range	7	
5	1				
6	4				
7	5				
8	6				
9	6				
10	8				
11	8				

- You can change the data values in column A and Excel will automatically recalculate the mean, median, mode, and range.

- 1 The marks scored by Tiffany and Con in eight topic tests in mathematics are shown below.

Test	1	2	3	4	5	6	7	8
Tiffany	82	81	91	84	82	75	88	54
Con	81	80	86	83	88	72	86	79

- a Find the total marks scored by each student.
- b Find the mean, mode and median for each student.
- c In how many tests did Con score more marks than Tiffany?
- d Find the range of each student's scores and comment.
- e Which student scored the highest mark?
- f Which student scored the lowest mark?
- g The mathematics prize is to be given to the better student. Who should get it? Give two reasons.

- 2 Brent and Ali organise their maths test marks in a table.

	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6	Test 7	Test 8	Test 9	Test 10
Brent	58	91	91	75	96	60	94	100	96	89
Ali	90	84	82	50	76	67	68	71	85	57

- a Which boy has the higher mean?
- b Which boy has the higher median?
- c Which boy has the smaller range?
- d Which boy do you think is better at tests? Explain why.
- 3 Compare the differences between the two sets of data using summary statistics.
- Set A: 46 32 40 43 45 47 53 54 40 54 33 48 39 43
- Set B: 48 49 31 40 43 47 48 41 49 51 44 46 53 44

CHECK YOUR UNDERSTANDING

Range

1	Calculate the range of this dataset. 5 2 5 11	a 5	b 9	c 13	d 6
2	Calculate the range of this dataset. 2 3 3 15 12 11	a 9	b 13	c 3	d 17
3	Calculate the range of this dataset. 112 cm 2.25 m 1.8 m 110 cm 125 cm	a 115 cm	b 123.2 cm	c 13 cm	d 15 cm
4	Calculate the range of this dataset. 2 2 4 17 -10	a 15	b 12	c 7	d 27
5	Calculate the range of this dataset. 6 10 -3 8 -1 15	a 12	b 18	c 16	d 9
6	Calculate the range of this dataset. 5 2 -4 8 11	a 12	b 18	c 16	d 9

Mode

1	Identify the mode. 0 2 3 5	a 5	b 2.5	c 0, 2, 3, and 5	d No mode
2	Identify the mode. 2 2 4 7 10	a 5	b 4	c 2	d No mode
3	Identify the mode. 2 2 4 4 7 10	a 2	b 2 and 4	c 3	d No mode
4	Identify the mode. 0.4 $\frac{1}{4}$ 2.5 $\frac{2}{5}$	a $\frac{1}{4}$	b $\frac{2}{5}$	c 0.4 and 2.5	d No mode

Mean

1	Calculate the mean 2 2 3 5 8	a 20	b 4	c 3	d 2
2	Calculate the mean 0 2 3 5 20	a 20	b 7.5	c 6	d 3
3	Determine the mean, without a calculator: 2 2 3 3 2	a 2	b A little more than 2	c 3	d A little less than 2
4	The mean of 7 numbers is 4. What is the total of the numbers?	a 28	b 11	c 4	d Can't tell.
5	The mean of this dataset is 4. What is the missing number? 2 ... 3 8 6	a 1	b 3	c 4	d Need more information

Median

1	What is the median of these numbers? 2 2 4 7 10	a 5	b 4	c 2	d 5.5
2	What is the median of these numbers? 2 2 4 7 10 15	a 7	b 4	c 4.5	d 5.5
3	What is the median of these numbers? 2 2 4 7 10 -15	a 7	b 4	c 3	d 5.5
4	What is the median of these numbers? 1 0.1 0.01 0.001	a 0.055	b 0.22	c 0.55	d 0.11
5	What is the median of these numbers? $\frac{3}{7}$ $\frac{5}{9}$ $\frac{1}{2}$	a $\frac{1}{2}$	b $\frac{3}{7}$	c $\frac{5}{9}$	d Not enough information