SUBJECT

MATHEMATICS

GRADE : 10

LESSON TOPIC: STATISTICS

DATE: 4 - 7 JULY 22

EVERYDAY, BE A TEACHER TO YOUR LEARNERS

"THE DAY YOU ARE WILLING TO VEER OFF THE LESSON PLAN, FOLLOW A LEARNER'S LEAD, AND LEARN WITH YOUR STUDENTS IS THE DAY YOU REALLY BECOME **A TEACHER."**

"SOMETIMES THE THING YOUR STUDENTS NEED **MOST**, RIGHT NOW, HAS **NOTHING** TO DO WITH WHAT'S ON YOUR **LESSON PLAN**."

Task at hand

Clarification:

Provide the **details and clarification** on the core content (knowledge and skills) to be taught per grade per topics, particularly in Grade 10.

Advice on the sequencing of concepts.

Apply **best teaching procedure** to avoid the misconceptions/common error that learners would normally have or commit.

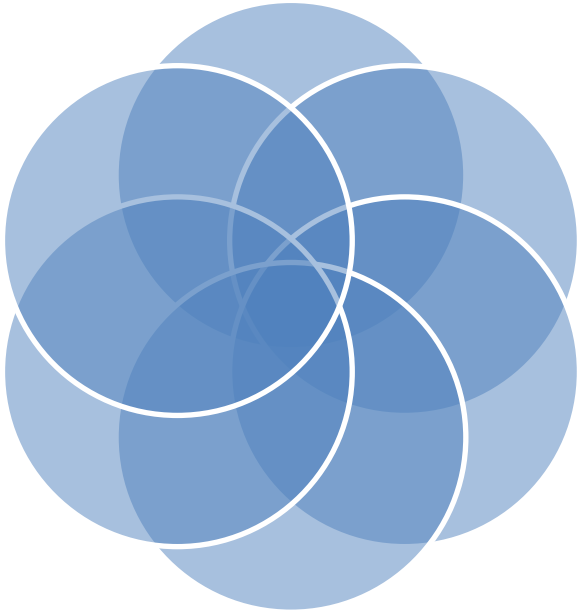
Provide supporting activity, showing spiral learning of concepts in various scenarios. At least a minimum of **three – four activity per scenario**, (Drill & Practices of concept) and **provide step-by-step solutions** for the suggested activities.

School Holiday Programme (Gr 10)

24-Jun	F	Online/FACE TO FACE		CONSOLIDATION: WAVES SOUND & L IGHT
25-Jun	S	Face-to-Face	TRIGONOMETRY	TEST 2
26-Jun	SU	Face-to-Face	Weekend Break	
27-Jun	M	Face-to-Face	TRIGONOMETRY	VECTORS AND SCALARS
28-Jun	T	Face-to-Face	TRIGONOMETRY	MOTION IN ONE DIMENSION
29-Jun	W	Face-to-Face	TRIG FUNCTIONS	MOTION IN ONE DIMENSION
30-Jun	Th	Face-to-Face	TRIG FUNCTIONS	INSTANTANEOUS SPEED, VELOCITY & EQUATIONS OF MOTIONS
01-Jul	F	Face-to-Face	TRIG FUNCTIONS	INSTANTANEOUS SPEED, VELOCITY & EQUATIONS OF MOTIONS
02-Jul	S	Face-to-Face	Weekend Break	
03-Jul	SU	Face-to-Face		
04-Jul	M	Face-to-Face	STATISTICS (UNGROUPED DATA)	INSTANTANEOUS SPEED, VELOCITY & EQUATIONS OF MOTIONS
05-Jul	T	Face-to-Face	STATISTICS (UNGROUPED DATA)	ENERGY
06-Jul	W	Face-to-Face	STATISTICS (GROUPED DATA)	ENERGY
07-Jul	Th	Face-to-Face	STATISTICS (GROUPED DATA)	REMEDIAL WORK TEST 2 & EXAM COACHING (MECHANICS)
08-Jul	F	Face-to-Face	CONSOLIDATION	EXAM PAPER 1
09-Jul	S	Face-to-Face	EXAM PAPER 2	
10-Jul	SU	School Holidays - BREAK		
11-Jul	M			
12-Jul	T			
13-Jul	W			
14-Jul	Th			
15-Jul	F			
16-Jul	S			
17-Jul	SU			

Putting Lessons Into Perspective

Focus : Statistics



Thursday : 07 July 2022

Lesson Topic : Grade 10 Statistics (Grouped data)

MONDAY : 4 July 2022

Lesson Topic : Grade 10 Statistics (Ungrouped data)

Wednesday : 6 July 2022

Lesson Topic : Grade 10 Statistics (Grouped data)

TUESDAY : 5 July 2022

Lesson Topic : Grade 10 Statistics (Ungrouped data)

MATHEMATICS GRADE 10

PAPER 2

LESSON 1 & 2

Statistics (Ungrouped data)

4 & 5 July 2022

What still need to be done!!!

Paper 2: Mathematics (Grade 10) Weighting of topics for end of year exam

Mark distribution for Mathematics NCS end-of-year paper Grade 10			
Topics	**Grade 10**	**Progress**	**Comments**
1. Trigonometry	40	Completed	• Learners to revise all Grade 8 & 9 Aspects as they are examinable in Grade 10 and collectively constitute about 15% of the paper
2. Euclidean Geometry and Measurement	30	Completed	
3. Analytical Geometry	15	Not yet started	
4. Statistics	15	In progress	
TOTAL	**100**		

Exam Guidelines

1. Candidates should be encouraged to use their calculators to calculate the mean for ungrouped and grouped data.
2. Candidates should be able to manually identify the quartiles from the set of data. Whilst formulae are available to identify the position of the quartiles in data sets, these should only be used in very large data sets.
3. Candidates are expected to identify outliers intuitively in the box and whisker diagram.

   In the case of the box and whisker diagram, observations that lie outside the interval (lower quartile – 1,5 IQR ; upper quartile + 1,5 IQR), are considered to be outliers. However, candidates will not be penalised if they do not use this formula in identifying outliers.

GRADE 10 CONTENT

INTRODUCTION

- **Data handling** refers to the process of gathering, recording and presenting information in a way that is helpful to others - for instance, in graphs or charts.

INTRODUCTION

➢ The **word data** is the plural of the word datum which means “a piece of unorganized information”.

- **Organizing Data**
  - ✓ In order to make sense of the data, we need to organise the data.
  - ✓ Different sets of data can be sorted in different ways:

You can write the data items in either alphabetical or numerical order.

For example:

- The words elephant ; lion; frog and crocodile can be ordered in alphabetical order as follows: crocodile; elephant; frog; lion

- The numbers 32,1; 32,001; 32,0001 and 32,01 can be ordered in ascending numerical order as follows: 32,0001; 32,001; 32,01 and 32,1

Discussion with the Learners

Zanele did a survey of 10 of her friends. She asked them how many siblings they had. The results of her survey were organized in a table as shown below called frequency table

Your sibling is your brother or sister.

Number of siblings	**0**	**1**	**2**	**3**
Frequency	2	3	4	1

***Frequency** : When collecting data, the number of times a particular item occurs is called its frequency.*

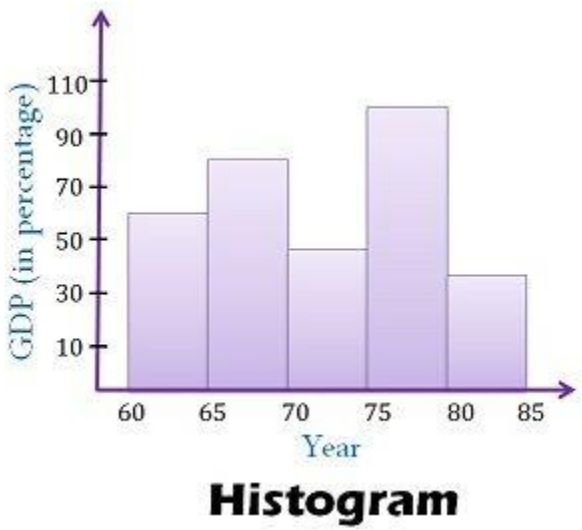
INTRODUCTION

We can use the following tools to **organize and display data** :

- Frequency table
- Bar chart
- Tally table
- Stem-and-leaf diagram
- Histogram
- Frequency polygon,
- Box-whisker diagram

Examples

Bar Graph



Histogram

People living in each house on a street:

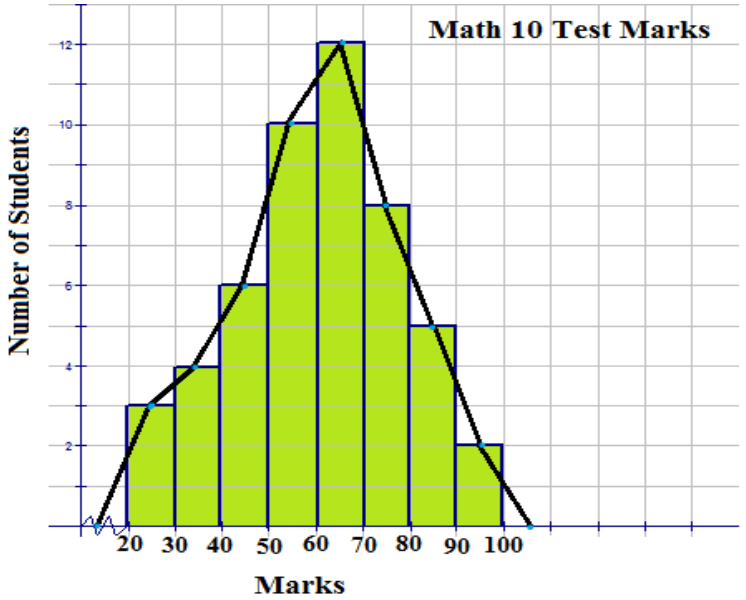
2, 5, 6, 3, 3, 4, 5, 5, 4, 3, 5, 7, 5, 2, 4, 1, 5, 4, 5, 5

Number of people in a house	Tally	Frequency
1		
2	1	
3	11	
4	11	
5	111	
6	1	

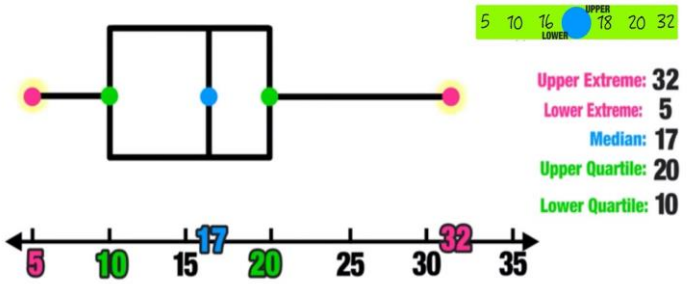
Ages of people in an office

stem	leaf
1	8 9 9
2	1 3 6 7 7 7 9
3	0 2 2 5 8
4	1 6 7
5	3 5

key: 2 | 3 means 23 years



BOX & WHISKER PLOTS



SORTING AND REPRESENTING DATA GRAPHICALLY

UNGROUPED DATA

- Representing ungrouped data using frequency tables and bar charts.

- Ungroup data :

Ungrouped Data

- Data that has not been organized into groups.
- Ungrouped data looks like a big list of numbers.

55	63	44	37	50	57	44	57	42	46	33	44
58	40	54	65	39	27	28	56	38	45	70	60
30	35	56	78	55	27	50	28	44	28	60	61
39	37	65	43								

SORTING AND REPRESENTING DATA GRAPHICALLY

SORTING AND REPRESENTING DATA GRAPHICALLY

Example 1. In a survey of 1m quadrats in a field the number of snails in each of 30 quadrats was recorded as follows:

1	2	4	0	2	3	1	4	2	3	5	2	2	3	2
2	3	1	2	3	2	0	1	1	2	0	3	2	3	3

1.1. Copy and complete the frequency table below:

Number of snails	0	1	2	3	4	5
Frequency						

1.2. Hence, draw a bar chart to show the number of snails.

WORKING AREA

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SOLUTION

1.1.

Number of snails	0	1	2	3	4	5
Frequency	3	5	11	8	2	1

[Check total frequency = 30]

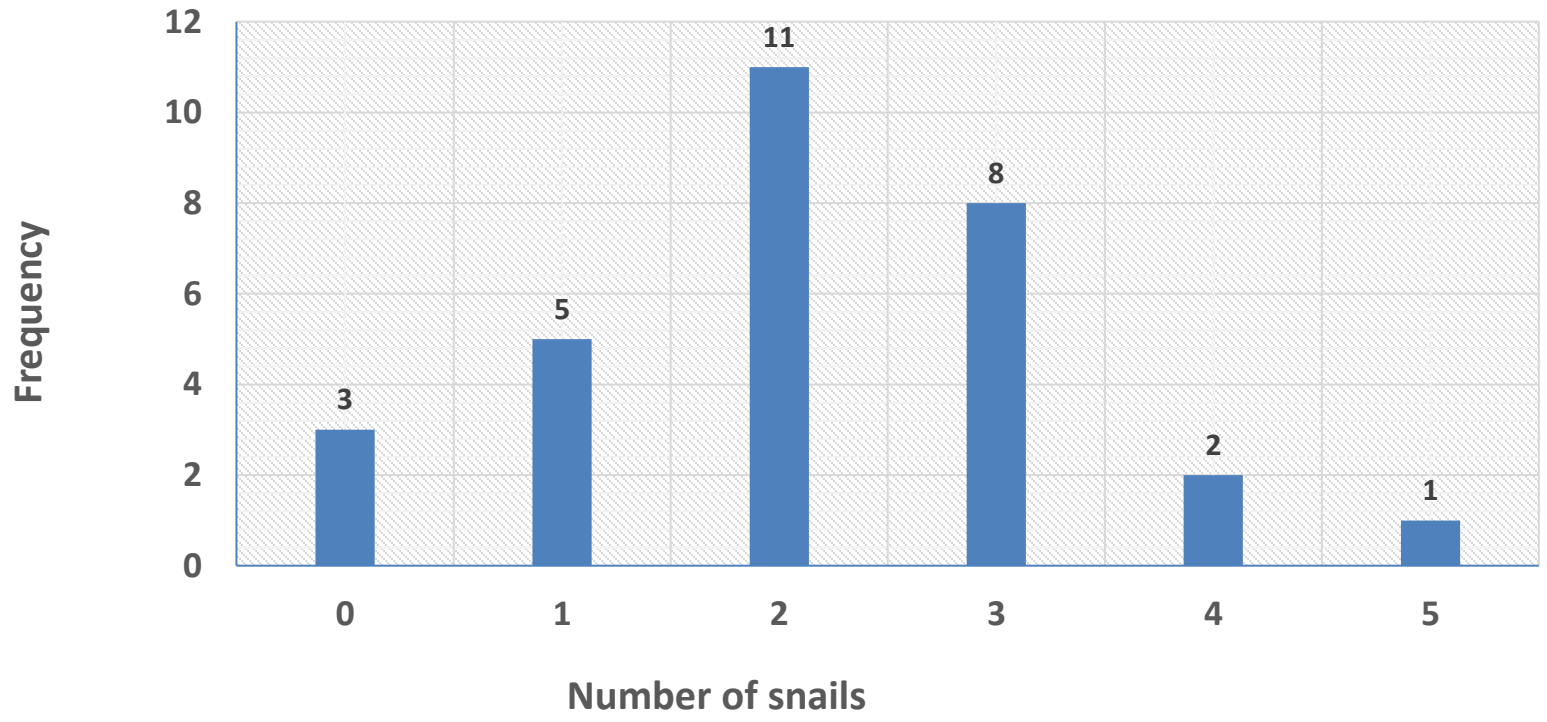
Note:

- In the bar chart, the bars are all the same width.
- Space between bars is uniform.
- Bars can be vertical (as shown above) or horizontal.
- Frequency represent the height of the bars.

SOLUTION

Number of snails	0	1	2	3	4	5
Frequency	3	5	11	8	2	1

[Check total frequency = 30]



ACTIVITY 1

1. In order to analyse the results of a grade 10 class test out of 10, a maths teacher recorded the test marks of forty grade 10 learners. The test was out of 10 marks.

10	6	9	2	7	5	7	4
6	1	5	8	5	3	4	6
6	6	8	5	10	10	3	8
6	5	3	9	6	2	4	6
2	4	7	6	1	4	3	4

1.1. Copy and complete the frequency table below:

Marks	1	2	3	4	5	6	7	8	9	10
Frequency										

1.2. Hence, draw a bar graph to represent the information.

WORKING AREA

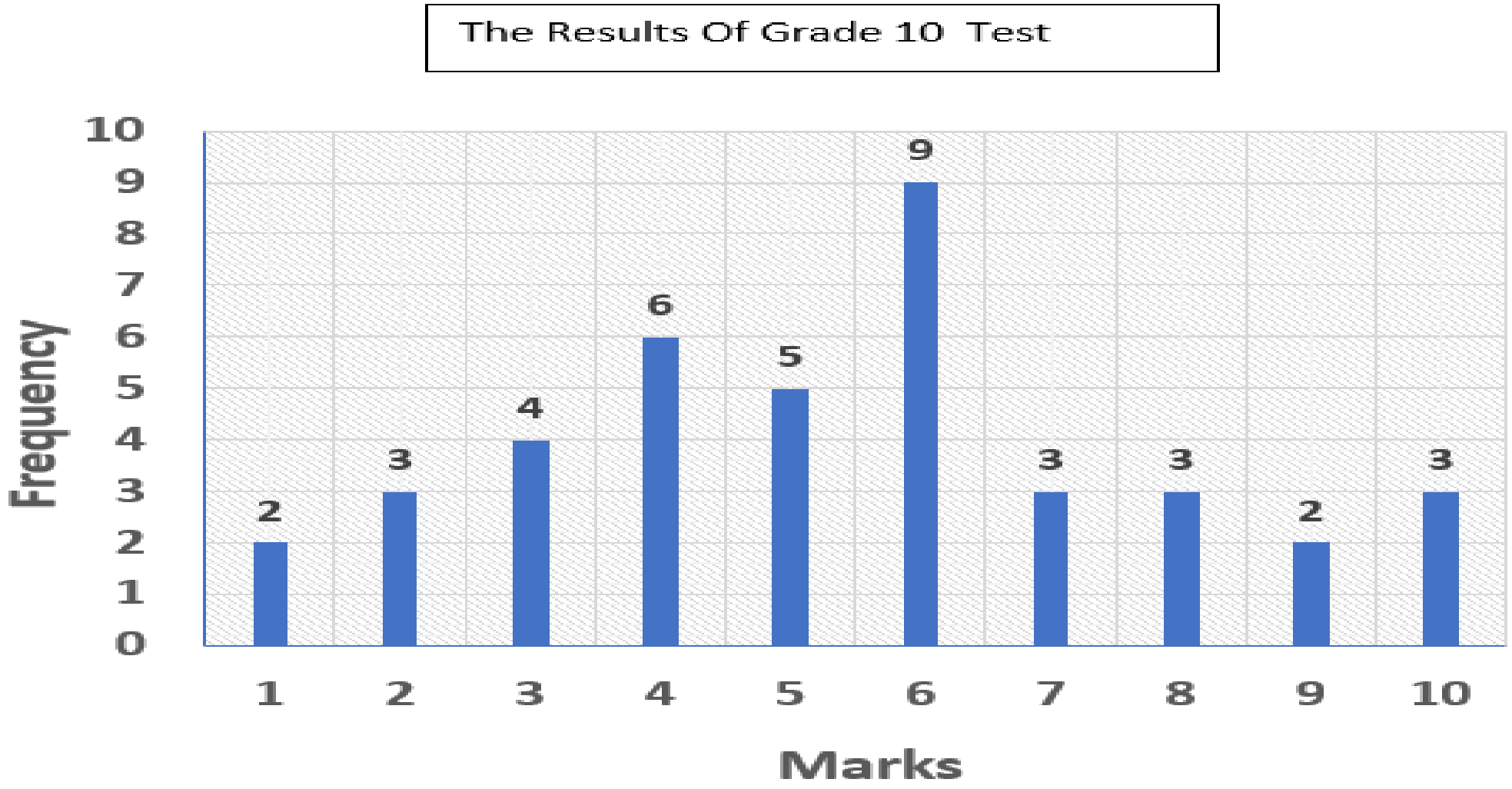
Promaths ONLINE

SOLUTION

1.1. Copy and complete the frequency table below:

Marks	1	2	3	4	5	6	7	8	9	10
Frequency	2	3	4	6	5	9	3	3	2	3

SOLUTION


The Results Of Grade 10 Test
Frequency
0
1
2
3
4
5
6
7
8
9
10
2
3
4
6
5
9
3
3
2
3
1
2
3
4
5
6
7
8
9
10
Marks

MEASURES OF CENTRAL TENDENCY (UNGROUPED DATA)

An average or measure of central tendency is a single number which is used to represent a collection of numerical data. The commonly used averages are the **mean**, **median** and **mode.**

Mode : The mode is the data item that occurs most frequently
Example : Find the mode of the following sets of data:
a) 3; 8; 9; 12; 17; 11; 9; 1; 10; 18

Solution :
✓ First arrange the data in ascending order: 1; 3; 8; 9; 9; 10; 11; 12; 17; 18
✓ Look for the value that occurs most frequently: 1; 3; 8; 9; 9; 10; 11; 12; 17; 18
Mode = 9

MEASURES OF CENTRAL TENDENCY (UNGROUPED DATA)

Median :

The median is the middle value when all values are placed in ascending or descending order.

Find the **median** of the following two sets of data:

a) 4; 7; 1; 9; 4; 9; 11; 10; 19; 2; 5; 8; 19

b) b) 4; 6; 1; 9; 4; 8; 11; 10; 19; 2; 5; 7; 19; 3

MEASURES OF CENTRAL TENDENCY (UNGROUPED DATA)

SOLUTION:

a) First **arrange the data in ascending** order: 1; 2; 4; 4; 5; 7; 8; 9; 9; 10; 11; 19; 19 There are 13 data items, and 13 is an odd number.

The middle item is the 7^{th} one: 1; 2; 4; 4; 5; 7; 8; 9; 9; 10; 11; 19; 19

The median = 8

Note that there are six data items to the left of 8 and six data items to the right of 8.

b) First arrange the data in ascending order: 1; 2; 3; 4; 4; 5; 6; 7; 8; 9; 10; 11;19; 19

There are 14 data items, and 14 is an even number.

The 7th and 8th terms are the **two middle data** items: 1; 2; 3; 4; 4; 5; 6; 7; 8; 9; 10; 11;19; 19

The median is halfway between 6 and 7, so the **median**

$$= \frac{6+7}{2}$$

$$= \frac{13}{2} = \mathbf{6,5}$$

MEASURES OF CENTRAL TENDENCY (UNGROUPED DATA)

- Mean = $\frac{sum\ of\ all\ scores}{Total\ number\ of\ scores}$
- Median is the middle score of a set of data that is arranged in order of size.
- Mode is the score (or value) that occurs most often. (The score with the highest frequency).

MEASURES OF CENTRAL TENDENCY (UNGROUPED DATA)

Fourteen of the learners in a Grade 10 class were asked to work out how many kilometers they lived from school. The following list of data shows the distances in km:

4; 7; 1; 9; 4; 8; 11; 10; 19; 2; 5; 7; 19; 3

a) Calculate the mean distance these fourteen learners live from school.

MEASURES OF CENTRAL TENDENCY (UNGROUPED DATA)

Solution :

a) $\Sigma x = 4 + 7 + 1 + 9 + 4 + 8 + 11 + 10 + 19 + 2 + 5 + 7 + 19 + 3 = 109$ km

There are 14 terms in the data set, so $n = 14$

$$\text{Mean} = \bar{x} = \frac{\Sigma x}{n}$$

$$\bar{x} = \frac{109}{14}$$

$$\bar{x} = 7{,}7857...$$

$$\bar{x} \approx 7{,}79$$

The mean distance that the 14 learners live from their school is 7,79 km.

MEASURES OF CENTRAL TENDENCY (UNGROUPED DATA)

	Advantages	Disadvantages
Mean	• Easy to work out with a calculator • Uses all the data • What most people think of as the average	• Can only be used for numbers and measurements • Not always one of the values • A few very large or small numbers can affect its size
Median	• Easy to find when the values are in order • Is one of the values if you have an odd number of values	• Can only be used for numbers and measurements • A lot of values can take a long time to put in order • May not be one of the values if you have an even number of values
Mode	• Can be found for any kind of data • Simple to find because you count, not calculate • Always one of the items in the data • Quick and easy to find from a frequency table, bar graph or pie chart.	• Not very useful for small amounts of data • May be more than one item • Does not exist if there is an equal number of each item

ACTIVITY 2

1. The following data is given:

10A	11	12	14	15	15	16	16	16	16	16	17	17	19
10B	14	21	14	14	12	14	2	5	7	14	-	-	-

1.1. Calculate the mean for each class.

1.2. Calculate the mode for each class.

1.3. Calculate the median for each class.

WORKING AREA

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SOLUTION

1.1. 10A: $Mean = \frac{\sum x}{n} = \frac{200}{13} = 15{,}8$

10B: $Mean = \frac{\sum x}{n} = \frac{117}{10} = 11{,}7$

1.2. 10A: Mode = 16
10B: Mode = 14

1.3. **10A: 11 12 14 15 15 16 16 16 16 16 17 17 19**

Median = 16

10B: 2 5 7 12 14 14 14 14 14 21

$Median = \frac{14+14}{2} = 14$

ACTIVITY 2 (continued)

2. [Refer to Activity 1 question1]

Marks	1	2	3	4	5	6	7	8	9	10
Frequency	2	3	4	6	5	9	3	3	2	3

Use the frequency table to calculate:

2.1. The mean

2.2. The median

2.3. The mode for this data.

WORKING AREA

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SOLUTION

2.1. $mean = \frac{\sum f.x}{\sum f}$

$$= \frac{1 \times 2 + 2 \times 3 + 3 \times 4 + 4 \times 6 + 5 \times 5 + 6 \times 9 + 7 \times 3 + 8 \times 3 + 9 \times 2 + 10 \times 3}{2 + 3 + 4 + 6 + 5 + 9 + 3 + 3 + 2 + 3}$$

$$= \frac{216}{40}$$

$$= 5,4$$

2.2. $median = \frac{5+6}{2} = 5,5$

2.3. $mode = 6$

MEASURES OF DISPERSION

- Measure how data is spread around the mean or median.
- Are: range, quartiles, deciles, percentiles, interquartile range, semi-interquartile range.

Definitions

- Range = largest score – smallest score
- Quartiles are measures of dispersion around the median.

MEASURES OF DISPERSION

There are three quartiles:

- Lower Quartile (Q_1)
  - The median of the lower half of the values.
- Median (Q_2)
  - The value that divides the data into halves.
- Upper Quartile (Q_3)
  - The median of the upper half of the values.

- Interquartile range (IQR) = $Q_3 - Q_1$
  - Measures the spread of the middle half around the median.
- Semi-interquartile range = $\frac{Q_3 - Q_1}{2}$.

MEASURES OF DISPERSION

The Five Number Summary :

✓ The five number summary consists of 5 items

1) The minimum value in the data set;
2) Q_1, the lower quartile;
3) Q_2, the median;
4) Q_3, the upper quartile;
5) The maximum value in the data set.

Work Area

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MEASURES OF DISPERSION

Example 1: For each set of data, determine

(a) Range (b) Lower quartile (Q_1) **(c)** Median (Q_2) (d) Upper quartile (Q_3)

(e) Interquartile range

1.1. 3; 3; 5; 6; 8; 9; 12; 14; 19; 20; 24.

1.2. 20; 23; 23; 26; 27; 28.

1.3. 147; 150; 154; 158; 159; 162; 164; 165.

1.4. 10; 12; 13; 15; 19; 19; 24; 26; 26.

SOLUTION

1.1. $Q_1 = 4; \quad Q_2 = 9; \quad Q_3 = 19.$

1.2. $Q_1 = 23; \quad Q_2 = \frac{1}{2}(23 + 26) = 24{,}5; \quad Q_3 = 27.$

1.3. $Q_1 = \frac{1}{2}(150 + 154) = 152; \quad Q_2 = \frac{1}{2}(158 + 159) = 158{,}5;$

$Q_3 = \frac{1}{2}(162 + 164) = 163.$

1.4. $Q_1 = \frac{1}{2}(12 + 13) = 12{,}5; \quad Q_2 = 19; \quad Q_3 = \frac{1}{2}(24 + 26) = 25.$

ACTIVITY 3

1 The heights of 20 children were measured (in cm) and the results were recorded.

The data collected is given in the table below:

127	128	129	130	131	133	134	134	135	136
137	138	139	140	141	142	142	143	144	145

1.1. Write down the median height measured. (1)

1.2. Determine:

1.2.1. The mean height (2)

1.2.2. The range (1)

1.2.3. The interquartile range (3)

WORKING AREA

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SOLUTION

1.1. $Median = \frac{136+137}{2} = 136{,}5$

1.2.1. $Mean = \frac{\sum x}{n} = \frac{2\,728}{20} = 136{,}4$

1.2.2. $Range = 145 - 127 = 18$

1.2.3. $Q_1 = \frac{131+133}{2} = 132$

$$Q_3 = \frac{141 + 142}{2} = 141{,}5$$

$$\therefore IQR = Q_3 - Q_1 = 141{,}5 - 132 = 9{,}5$$

ACTIVITY 3 (continued)

2. A baker keeps a record of the number of scones that he sells each day. The data for 19 days is shown below:

31	36	62	74	65	63	60	34	46	56
37	46	40	52	48	39	43	31	66	

2.1. Determine the mean of the given data. (2)

2.2. Rearrange the data in ascending order and then determine the median. (2)

2.3. Determine the lower and upper quartiles for the data. (2)

WORKING AREA

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SOLUTION

2.1. $\boldsymbol{mean = \frac{\sum x}{n} = \frac{929}{19} = 48,89 \approx 49}$

2.2.

31	31	34	36	37	39	40	43	46	46
48	52	56	60	62	63	65	66	74	

$Q_2 = 46$

2.3. $Q_1 = 37$

$Q_3 = 62$

ACTIVITY 3

3. A survey amongst 18 grade 10 learners showed that they receive the following amount of pocket money per month:

47	31	42	33	52
25	28	62	29	65
51	30	43	62	100
29	39	53		

3.1. What is the range of the data? (1)

3.2. Determine the following:

3.2.1. Q_1; Q_2; Q_3. (3)

3.2.2. the semi-interquartile range. (2)

WORKING AREA

Promaths ONLINE

SOLUTION

3.1. $\boldsymbol{Range = 100 - 25 = 75}$

25	28	29	29	30	31	33	39	42	43
47	51	52	53	62	62	65	100		

3.2.1. $Q_1 = 30$

$$Q_2 = \frac{42+43}{2} = 42{,}5$$

$$Q_3 = 53$$

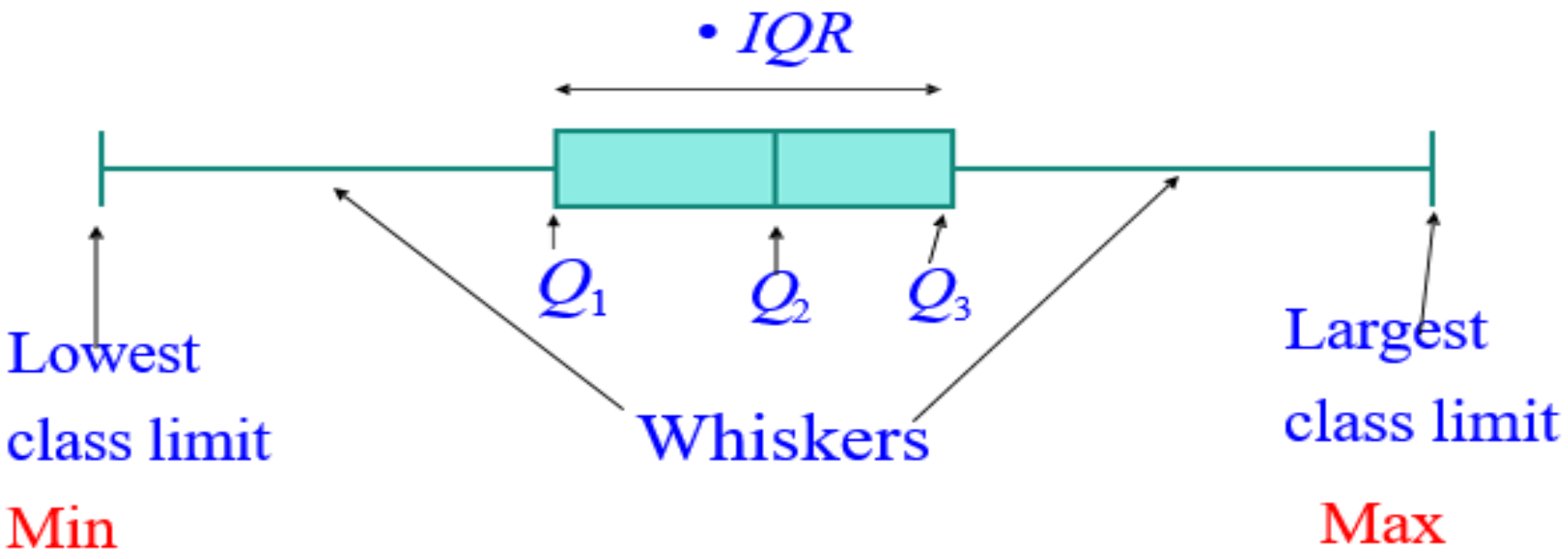
3.2.2. $\frac{Q_3 - Q_1}{2} = \frac{53-30}{2} = \frac{23}{2} = 11{,}5$

Five number summary

- Minimum, Q_1; Q_2; Q_3; Maximum.

Box- and- Whisker diagram

- Is a graphical representation of the five number summary.



Five number summary

Notes:

- 50% of the values lie between min. value and Q_2.
- 50% of the values lie between Q_2 and max. value.
- 25% of the values lie between min. value and Q_1.
- 25% of the values lie between $Q_1 \; and \; Q_2$.
- 25% of the values lie between $Q_2 \; and \; Q_3$.
- 25% of the values lie between $Q_3 \; and$ max. value.
- 50% of the values lie between $Q_1 \; and \; Q_3$.

ACTIVITY 4 [Extension of Act. 3]

1. [From Activity 5, Question 1]

$min = 127;\quad Q_1 = 132;\quad Q_2 = 136,5;\quad Q_3 = 141,5;\quad max = 145$

Draw a box and whisker plot for the information given. (2)

WORKING AREA

Promaths ONLINE

SOLUTION

From Activity 5, question 1:

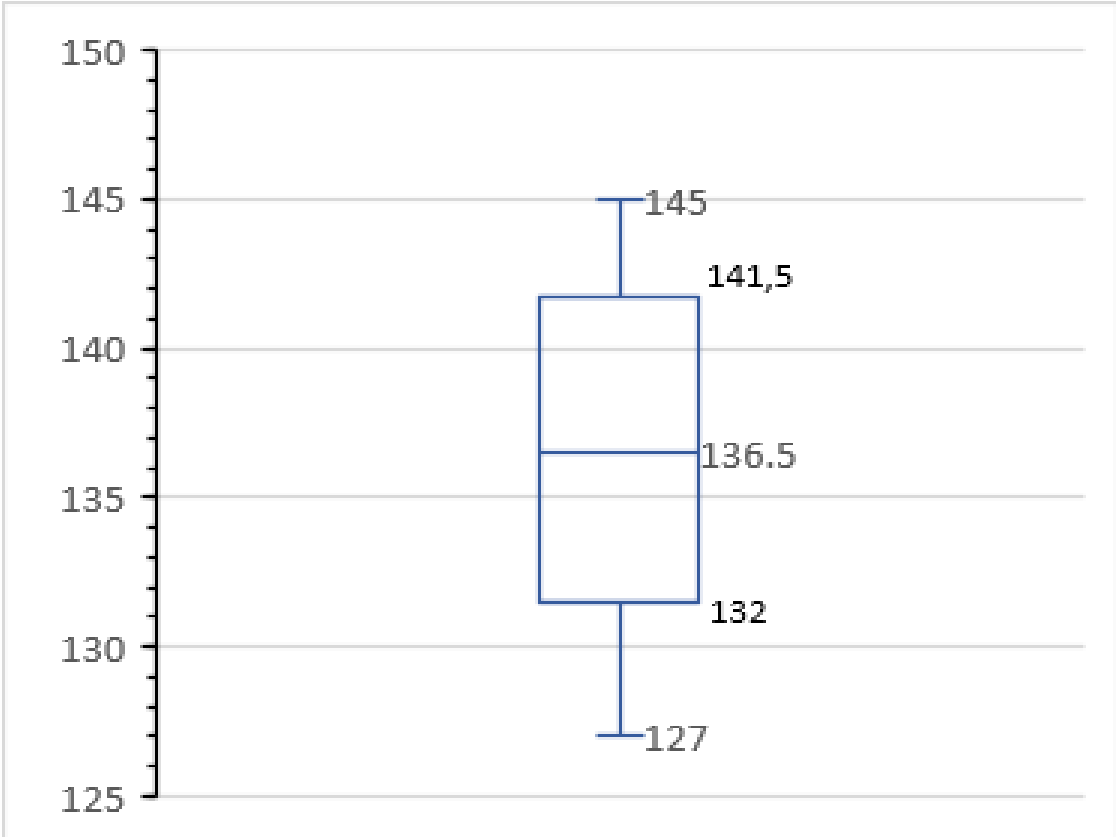
$\boldsymbol{min = 127;}$

$\boldsymbol{Q_1 = 132;}$

$\boldsymbol{Q_2 = 136,5;}$

$\boldsymbol{Q_3 = 141,5;}$

$\boldsymbol{max = 145}$



ACTIVITY 4 [Extension of Act. 3]

2. **[From Activity 5, Question 2]**

$min = 31;\ Q_1 = 37;\quad Q_2 = 46;\quad Q_3 = 62;\quad max = 74$

Draw a box and whisker plot for the information given. (2)

WORKING AREA

Promaths ONLINE

SOLUTION

From Activity 5, question 2:

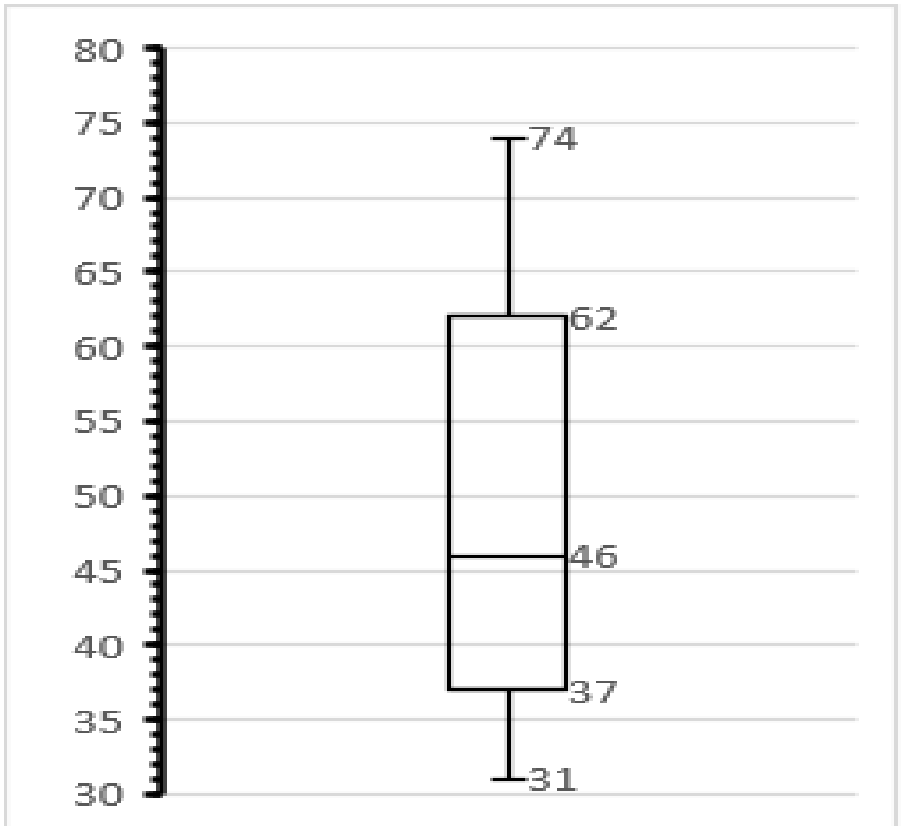
$min = 31;$

$Q_1 = 37;$

$Q_2 = 46;$

$Q_3 = 62;$

$max = 74$



ACTIVITY 4 (continued)

3. 20 learners at Bontle High School decided to raise funds to buy calculators for the winners of a Maths and Science week competition. Money collected in Rand was as follows:

20	32	53	5	23
15	9	27	29	44
17	47	18	35	13
50	10	7	11	37

3.1. Give the five-number summary of the information given above. (3)

3.2. Draw a box and whisker diagram for the information given. (3)

WORKING AREA

Promaths ONLINE

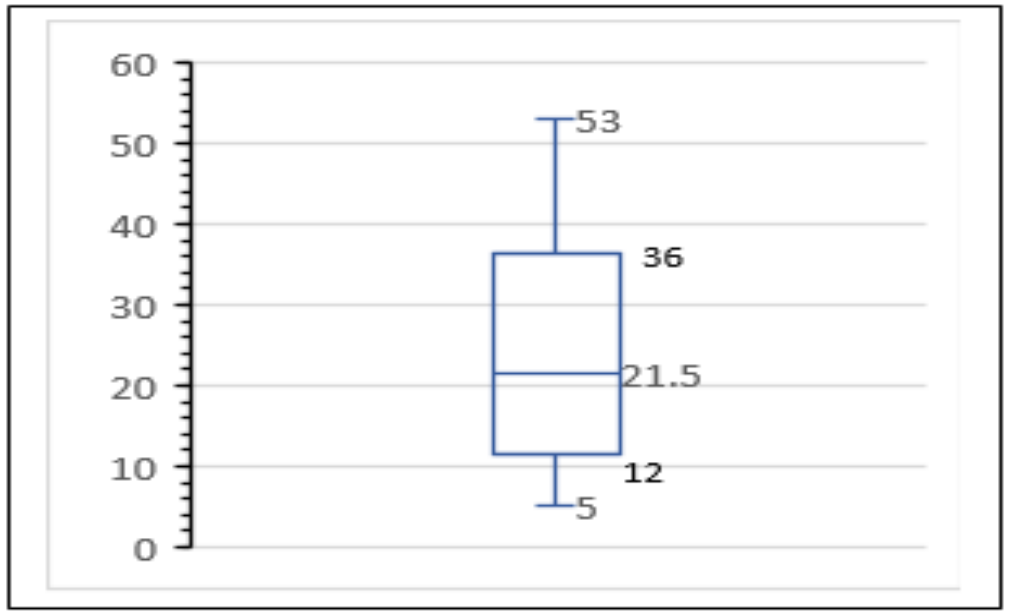
SOLUTION

3.1. Re-arranged data set:

5	**7**	**9**	**10**	**11**	**13**	**15**	**17**	**18**	**20**
23	**27**	**29**	**32**	**35**	**37**	**44**	**47**	**50**	**53**

$$min = 5; Q_1 = \frac{11+13}{2} = 12;\ Q_2 = \frac{20+23}{2} = 21,5;\ Q_3 = \frac{35+37}{2} = 36; max = 53$$

3.2.



Extra activities

QUESTION 1

Fifteen members of a basketball team took part in a tournament. Each player was allowed the same amount of time on the court. The points scored by each player at the end of the tournament are shown below.

27	28	30	32	34	38	41	42	43	43	44	46	53	56	62

1.1 Determine the median of the given data. (1)

1.2 Determine the interquartile range for the data. (3)

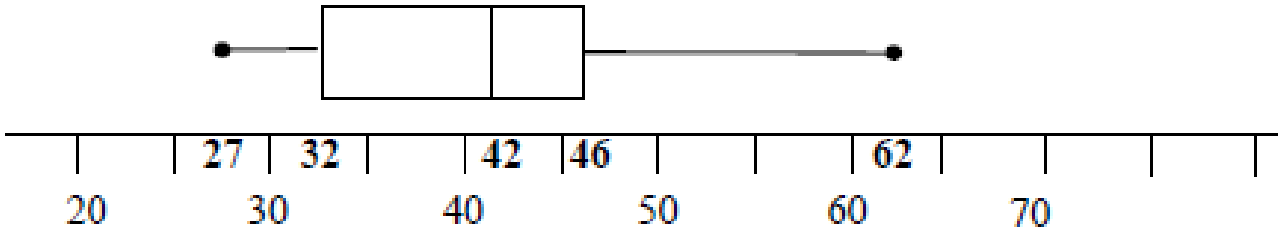
1.3 Draw a box and whisker diagram to represent the data. (3)

1.4 Use the box and whisker diagram to comment on the points scored by the players in this team. (2)

[9]

Solution

QUESTION 1

1.1	Median = 42	✓answer (1)
1.2	Lower quartile = 32 Upper quartile = 46 Inter quartile range = 46 – 32 = 14 Answer only: FULL MARKS	✓ lower quartile ✓ upper quartile ✓ answer (3)
1.3		✓ box-and-whisker with a median ✓ skewness ✓ indicating 5 number summary 27; 32; 42; 46; 62 or correct scale (3)

Solution

QUESTION/VRAAG 1

1.1

Marks/*Punte*	Frequency/*Frekwensie*
0	0
1	3
2	4
3	5
4	3
5	6
6	0
7	7
8	9
9	5
10	0

2 marks:
all 11 values correct

1 mark:
5 – 10 values correct

0 marks:
0 – 4 values correct

(2)

1.2 42 learners/*leerders*

✓answer/*antwoord*

(1)

1.3.1 Range/*Variasiewydte*
$= 9 - 1$
$= 8$

Answer only: 2/2 marks

✓max = 9 and min = 1
✓answer/*antwoord*

(2)

1.3.2

$$\bar{x} = \frac{(1\times3)+(2\times4)+(3\times5)+(4\times3)+(5\times6)+(7\times7)+(8\times9)+(9\times5)}{42}$$

$$= \frac{234}{42}$$
$$= 5{,}57$$

Answer only: 3/3 marks

✓ sum of (frequencies × values)
✓÷ *n*
✓answer/*antwoord*

(3)

1.4 Position of the median/*Posisie van die mediaan* $= \frac{n+1}{2}$

$= 21{,}5^{\text{ste}}$ position/*posisie*

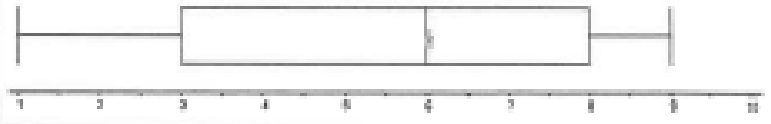
$Q_2 = \frac{5+7}{2}$
$= 6$

Answer only: 3/3 marks

✓ identification of 5 and 7
✓$\frac{5+7}{2}$
✓answer/*antwoord*

(3)

1.5



✓ Q_1
✓ Q_3
✓ rest of the box

(3)

Extra activities

QUESTION 1

1.1 An ice cream vendor recorded his daily sales for a period of time. The number of ice creams that he sold each day is given in the table below.

5	7	8	10	13	15	15	15	21	24
29	30	32	36	38	44	45	51	55	

1.1.1 Write down the mode of the data set. (1)

1.1.2 Determine the median of the data set. (1)

1.1.3 Calculate the interquartile range. (3)

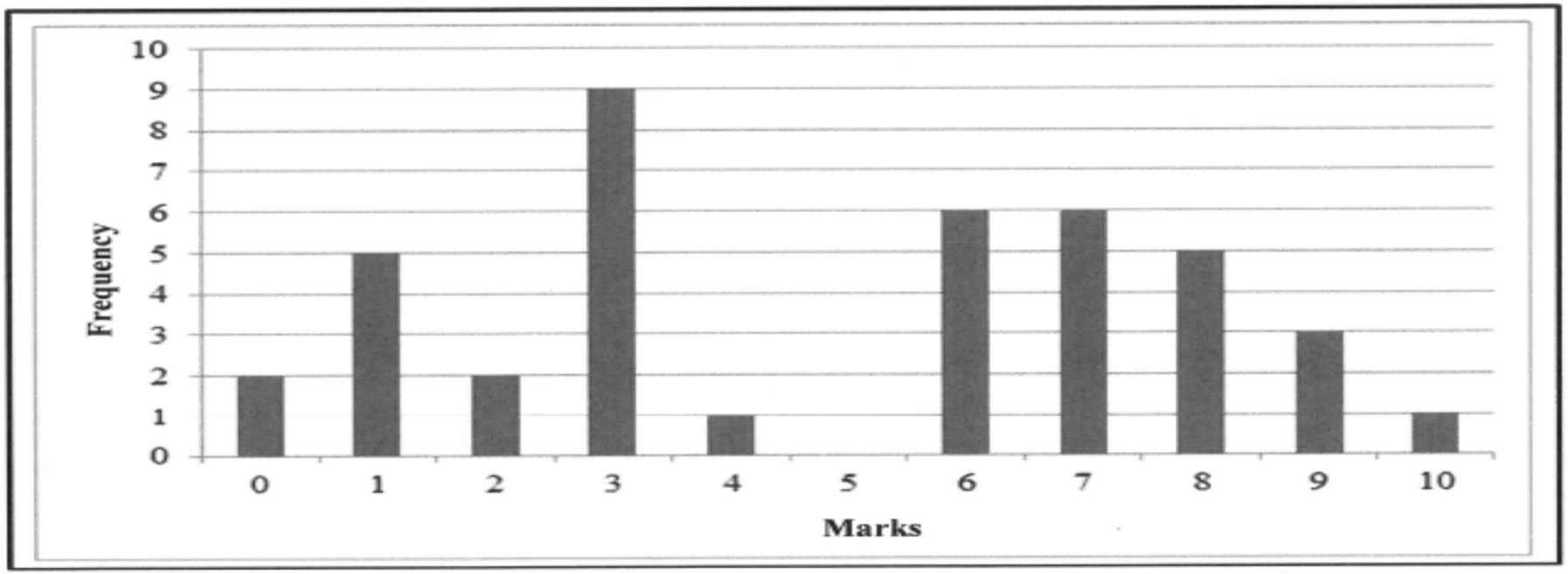
1.1.4 On the scaled line provided in the ANSWER BOOK, draw a box and whisker diagram for the data set. (2)

1.1.5. comment on the skewness on the box and whisker (1)

1.2 Learners in a certain class wrote a Mathematics test that had a maximum mark of 10. The teacher represented the marks obtained by the learners of this class in the bar graph below.

Extra activities

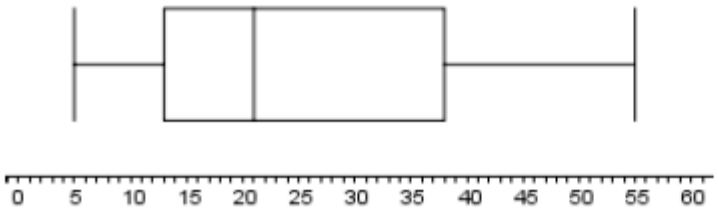
Bar graph showing distribution of marks scored in Mathematics test



1.2.1	How many learners scored 8 marks out of 10 for the test?	(1)
1.2.2	How many learners are in this class?	(1)
1.2.3	Calculate the range of the marks scored in the test.	(2)
1.2.4	If the pass mark for the test was 50%, what percentage of the learners failed the test?	(2)
1.2.5	Calculate the mean mark scored in the test.	(3)
		[16]

Solution

QUESTION/*VRAAG* 1

1.1.1	15 is the mode/*is die modus*	✓answer/*antwoord* (1)
1.1.2	$\text{Position of the median} = \frac{n+1}{2}$ $= 10\text{th position}$ $\text{median} = 24$ $\textit{Posisie van die mediaan} = \frac{n+1}{2}$ $= 10\textit{de posisie}$ $\textit{mediaan} = 24$	✓answer/*antwoord* (1)
1.1.3	$\text{Interquartile range} = Q_3 - Q_1$ $= 38 - 13$ $= 25$ $\textit{Variasiewydte} = Q_3 - Q_1$ $= 38 - 13$ $= 25$	✓ Q_3 ✓ Q_1 ✓answer/*antwoord* (3)
1.1.4		✓box/*mond* ✓whiskers/*snor* (2)

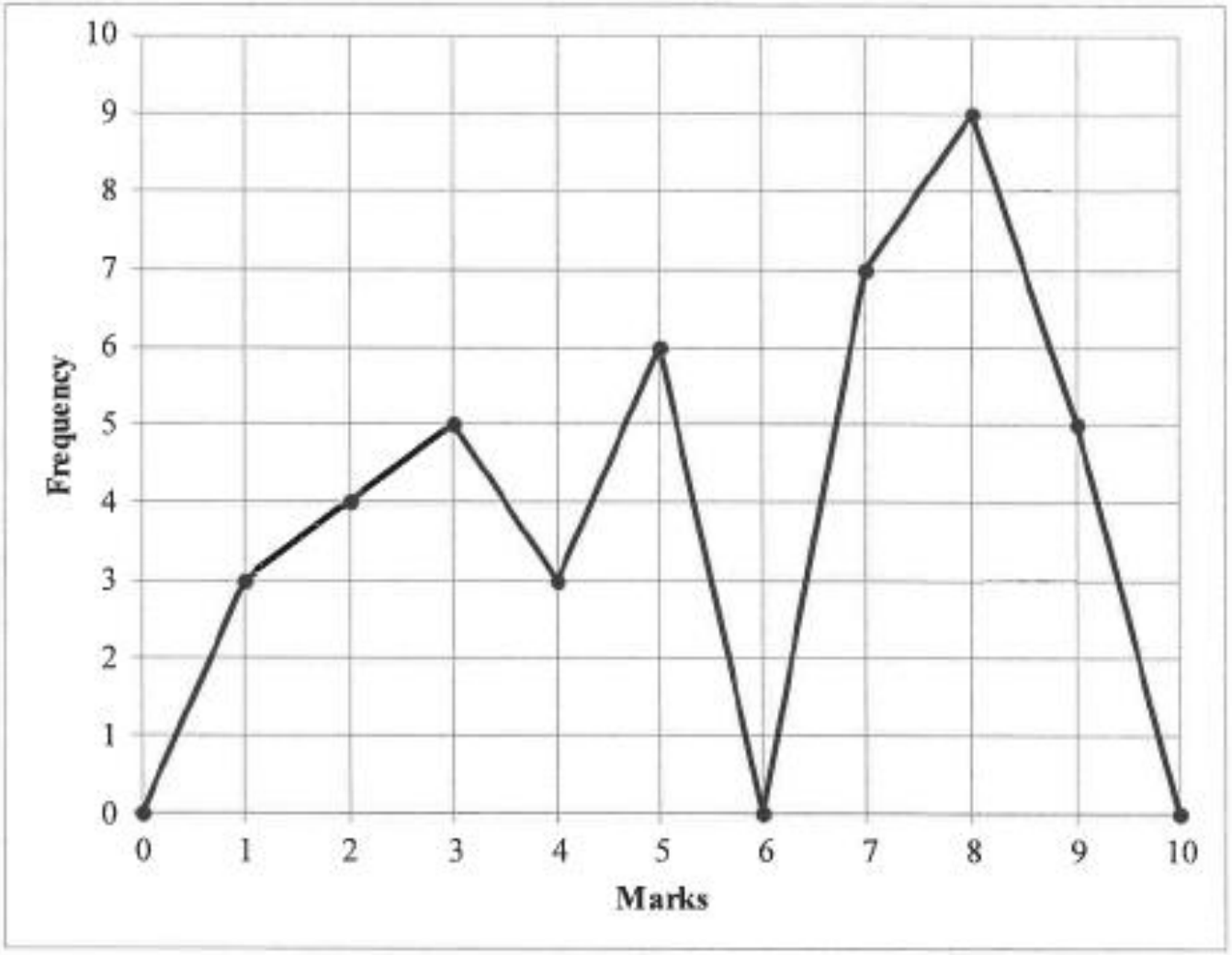
Solution

1.2.1	5 learners/*leerders*	✓answer/*antwoord* (1)
1.2.2	40 learners/*leerders*	✓answer/*antwoord* (1)
1.2.3	Range = max value − min value $=10-0$ $=10$ *Varisasiewydte = maks waarde − min waarde* $=10-0$ $=10$	✓min and max/*min en maks* ✓answer/*antwoord* (2)
1.2.4	Number of learners/*Getal leerders* = 1 + 9 + 2 + 5 + 2 = 19 Percentage/*Persentasie* $=\frac{19}{40}\times 100$ $=47{,}5\%$	✓no. of learners/*getal leerders* ✓answer/*antwoord* (2)
1.2.5	$\bar{x}=\frac{(0\times 2)+(1\times 5)+(2\times 2)+(3\times 9)+\ldots+(10\times 1)}{40}$ $=\frac{195}{40}$ $=\frac{39}{8}$ $=4{,}88$	✓195 ✓40 ✓answer/*antwoord* (3)
		[16]

Extra activities

QUESTION 1

The line graph below shows test marks out of 10 obtained by a Grade 10 class.



Extra activities

1.1	Complete the frequency column in the table provided in the ANSWER BOOK.	(2)
1.2	How many learners wrote the test?	(1)
1.3	Calculate the:	
	1.3.1 Range for the data	(2)
	1.3.2 Mean for the test	(3)
1.4	Determine the median for the data.	(3)
1.5	Draw a box and whisker diagram for the data.	(3)
1.6.	comment on the skewness on the box and whisker	(1)

Extra activities

QUESTION 1

The heights of 20 children were measured (in centimetres) and the results were recorded. The data collected is given in the table below.

127	128	129	130	131	133	134	134	135	136
137	138	139	140	141	142	142	143	144	145

1.1 Write down the median height measured. (1)

1.2 Determine:

1.2.1 The mean height (2)

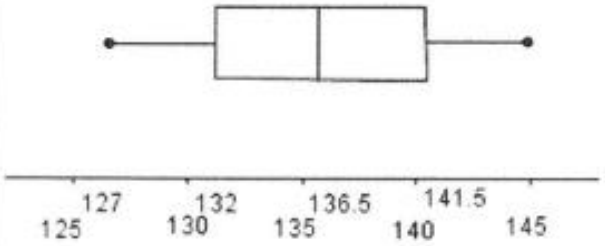
1.2.2 The range (1)

1.2.3 The interquartile range (3)

1.3 Draw a box and whisker diagram to represent the data. (2)

1.4. comment on the skewness on the box and whisker and support your answer (1)

Solution

1.1	Median/*Mediaan* $= \frac{136+137}{2}$ $= 136,5$	✓ answer/*antwoord* (1)
1.2.1	Mean/*Gemiddelde* $= \frac{2728}{20}$ $= 136,4$ cm	✓ 2728 ✓ answer/*antwoord* Answer only/ *slegs antw* 2/2 (2)
1.2.2	Range/*Variasiewydte* $= 145 - 127$ $= 18$ cm	✓ answer/*antwoord* (1)
1.2.3	Lower quartile/*Onderste kwartiel* = 132 Upper quartile/*Boonste kwartiel* $= 141\frac{1}{2}$ Interquartile range/*IKO* $= 141\frac{1}{2} - 132$ $= 9,5$ cm	✓ Lower quartile/*Onderste kwartiel* ✓ Upper quartile/*Boonste kwartiel* ✓ answer/*antwoord* Answer only full marks *Slegs antw volpunte* (3)
1.3		✓ median/min/max/ *mediaan/min/maks* ✓Q_1 and/ *en* Q_3 CA from 1.1 & 1.2.3 *VA vanaf 1.1 & 1.2.3* (2) **[9]**

Extra activities

Nineteen girls were required to complete a puzzle as quickly as possible. Their times (in seconds) were recorded and are shown in the table below.

14	15	16	16	17	17	18	18	19	19
19	20	21	21	22	23	24	24	29	

1.1 Identify the median time taken by the girls to complete the puzzle. (1)

1.2 Determine the lower and upper quartiles for the data. (2)

1.3 Draw a box and whisker diagram to represent the data. (2)

comment on the skewness on the box and whisker and support your answer

Extra activities

1.4 The five-number summary of the time (in seconds) taken by 19 boys to complete the same puzzle is (15 ; 19 ; 23 ; 26 ; 30).

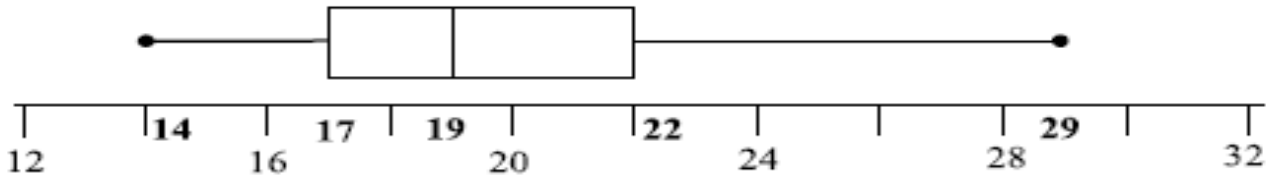
1.4.1 Calculate the interquartile range for the time taken by the boys. (2)

1.4.2 If only one boy took 19 seconds to complete the puzzle, what percentage of the boys took at least 19 seconds to complete the puzzle? (1)

1.5 In which group, the girls or the boys, did a larger number of learners complete the puzzle in less than 23 seconds? Justify your answer. (2)

[10]

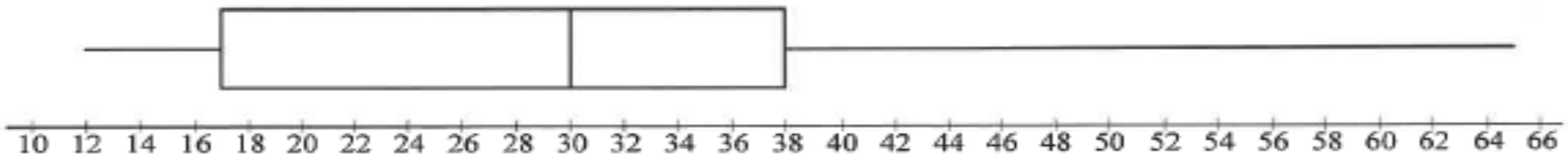
Solution

1.1	Median/*Mediaan* = 19 seconds/*sekondes*	✓ answer/*antw* (1)
1.2	Lower quartile/*Onderste kwartiel* ($Q_{1)}$) = 17 Upper quartile/*Boonste kwartiel* ($Q_{3)}$) = 22	✓ Q_1 ✓ Q_3 (2)
1.3		✓ box/*mond* ✓ whiskers/*snor* (2)
1.4.1	IQR/*IKO* = 26 – 19 = 7	✓ $Q_3 - Q_1$ ✓ answer/*antw* (2)
1.4.2	75% of the boys took at least 19 seconds to complete the puzzle./*75% van die seuns het ten minste 19 sekondes geneem om die legkaart te voltooi.*	✓ 75% (1)
1.5	About 50% but not more than 75% of the boys completed the puzzle in less than 23 seconds./*Ongeveer 50% maar nie meer as 75% van die seuns het die legkaart in minder as 23 sekondes voltooi.* More than 75% of the girls completed the puzzle in less than 23 seconds./*Meer as 75% van die dogters het die legkaart in minder as 23 sekondes voltooi.* Therefore more girls completed the puzzle in less than 23 seconds./*Meer dogters het dus die legkaart in minder as 23 sekondes voltooi.*	✓relevant/*relevante* explanation/*ver-duideliking* ✓ girls/*dogters* (2) **[10]**

Extra activities

QUESTION 1

1.1 Mr Brown conducted a survey on the amount of airtime (in rands) EACH student had on his or her cellphone. He summarised the data in the box and whisker diagram below.



1.1.1 Write down the five-number summary of the data. (2)

1.1.2 Determine the interquartile range. (1)

1.1.3 Comment on the skewness of the data. (1)

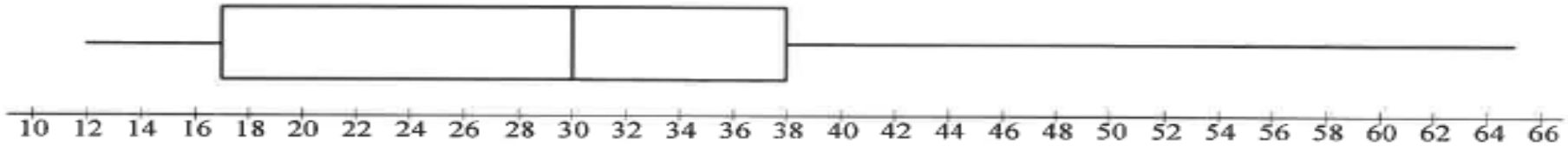
1.2 A group of 13 students indicated how long it took (in hours) before their cellphone batteries required recharging. The information is given in the table below.

5	8	10	17	20	29	32	48	50	50	63	y	107

1.2.1 Calculate the value of y if the mean for this data set is 41. (2)

Solution

QUESTION/*VRAAG* 1



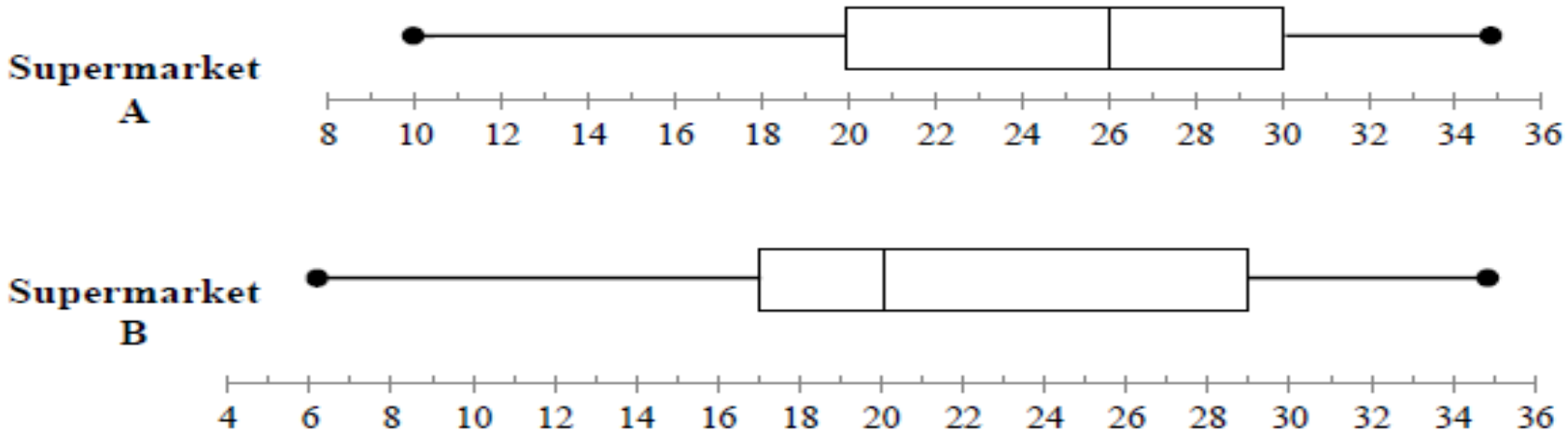
1.1.1	min = 12 Q_1 = 17 Q_2 = median / *mediaan* = 30 Q_3 = 38 max = 65	✓ min + max ✓ median, Q_1 and/en Q_3 (2)
1.1.2	$IQR = Q_3 - Q_1$ $= 38 - 17$ $= 21$	✓ answer/*antw* (1)
1.1.3	Skewed to the right OR positively skewed *Skeef na regs* *OF positief skeef*	✓ answer/*antw* (1)

5	8	10	17	20	29	32	48	50	50	63	y	107

1.2.1	Mean/*Gemiddeld* $= \frac{439+y}{13}$ $41 = \frac{439+y}{13}$ $439 + y = 533$ $y = 94$	✓ $41 = \frac{439+y}{13}$ ✓ answer/*antw* (2)

Extra activities

1.1 The number of delivery trucks making daily deliveries to neighbouring supermarkets, Supermarket A and Supermarket B, in a two-week period are represented in the box-and-whisker diagrams below.



1.1.1 Calculate the interquartile range of the data for Supermarket A. (2)

1.1.2 Describe the skewness in the data of Supermarket A. (1)

1.1.3 Calculate the range of the data for Supermarket B. (2)

1.1.4 During the two-week period, which supermarket receives 25 or more deliveries per day on more days? Explain your answer. (2)

Extra activities

1.2 The number of delivery trucks that made deliveries to Supermarket A each day during the two-week period was recorded. The data is shown below.

10	15	20	x	30	35	15	31	32	21	x	27	28	29

If the mean of the number of delivery trucks that made deliveries to supermarket A is 24,5 during these two weeks, calculate the value of x. (3)

[10]

Solution

	Solution	Marks
1.1.1	A : $IQR = Q_3 - Q_1$ $= 30 - 20$ ✓ $= 10$ ✓	2 (2)
1.1.2	A : $M - Q_1 = 26 - 20 = 6$ ... 1 $Q_3 - M = 30 - 26 = 4$ ... 2 (1) > (2) ∴ Skewed to the left ✓	1 (1)
1.1.3	B : $R = max - min$ $= 35 - 6$ ✓ $= 29$ ✓	2 (2)
1.1.4	A : $25 < M$ ∴ on more than 50% of the days > 25 del.pd ✓ B : $25 > M$ ∴ on less than 50% of the days < 25 del.pd ✓ ∴ Supermarket A ✓	2 (2)

Solution

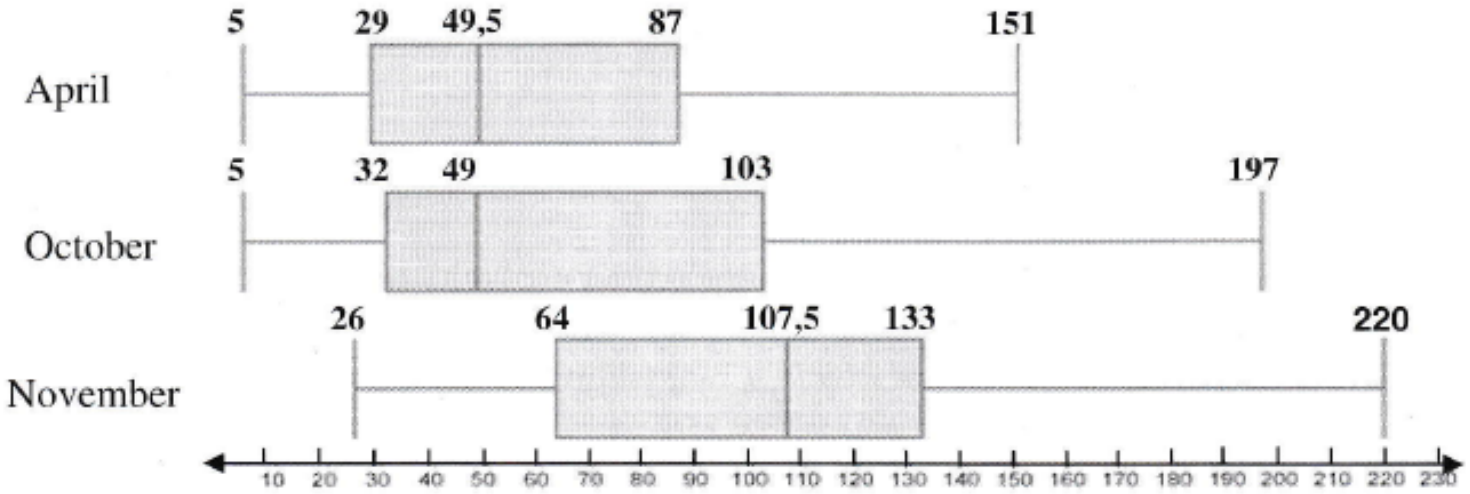
1.2

10	15	20	x	30	35	15	31	32	21	x	27	28	29

	Solution	Marks
1.2	$\bar{x} = \frac{\Sigma x}{n}$	3
	$24,5 = \frac{10 + 15 + \ldots + 29}{14}$	
	$24,5 = \frac{2x + 293}{14}$ ✓ ✓	
	$24,5 \cdot 14 = 2x + 293$ LCD = 14 x thru	
	$343 = 2x + 293$	
	$25 = x$ ✓	
		(3)
		[10]

Extra activities

The diagram below shows a comparison of the recorded monthly rainfall statistics for the months of April, October and November, for the years 2004 to 2015.



1.2.1 Determine the range of the rainfall for the November months. (1)

1.2.2 Comment on the skewness of the data for the October months. (1)

1.2.3 If the maximum rainfall for October was incorrectly recorded and is now increased, what effect will this have on

(a) the mean and

(b) the median. (2)

1.2.4 For how many years was November's rainfall less than 64 mm? (2)

Extra activities

1.2.1	$220 - 26$ $= 194$	✓194 (1)
1.2.2	skewed to the right */skeef na regs* **OR / *OF*** positively skewed / *positief skeef*	✓positively/skewed to the right *positief skeef/ skeef na regs* (1)
1.2.3	(a) the mean will increase / *die gemiddeld sal verhoog* (b) the median will stay the same / *die mediaan sal dieselfde bly*	✓mean increases ✓median the same (2)
1.2.4	$Q_1 = 64$ which means 25% of the data lies to the left of Q_1 / *25% van die data lê links van* Q_1 $25\% \times 12$ years $= 3$ for 3 years */vir 3 jaar*	✓25% ✓3 years (2)

Extra activities

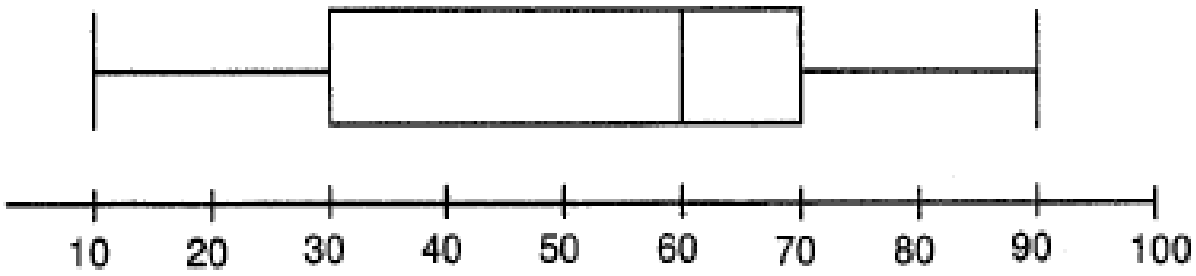
Two schools, M-cee-nai High and Bee Vee high are in competition to see which school performed better in mathematics in the June Examination.

The marks of the leaners at M-cee-nai High school are recorded below. The box whisker diagram below illustrates the results of Bee Vee High School. Both schools have 25 learners. (Marks are given in %).

Marks of M-cee-nai High School learners

9	14	14	19	21
23	33	35	37	37
42	45	55	56	57
59	68	75	75	75
77	78	80	81	92

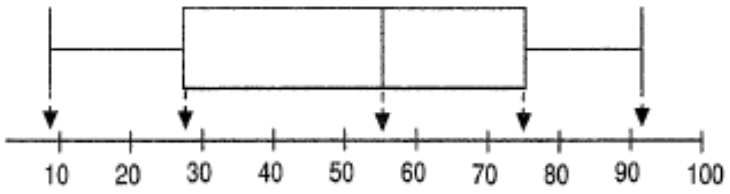
The box and whisker diagram for the Bee Vee High School Learners



Extra activities

1.1	Write down the five-number summary for M-cee-nai High School.	(4)
1.2	Draw the box and whisker diagram that represents M-cee-nai High School marks. Clearly indicate ALL relevant values.	(3)
1.3	Comment on the skewness of the data of M-cee-nai High School.	(1)
1.4	Calculate the mean mark of M-cee-nai High School.	(2)
1.5	Determine which school performed better in the June Examination and give reasons for your conclusion.	(3)
		[13]

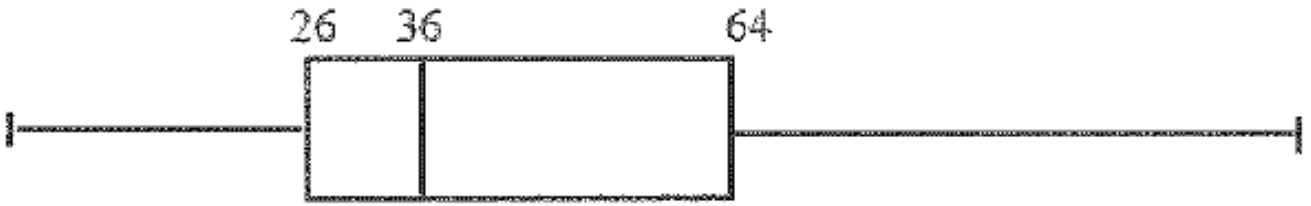
Solution

1.1	min = 9 ; maximum = 92 ; upper quartile = 75 Lower quartile = 28 and medium = 55 Therefore five number summary is (9; 28; 55; 75; 92)	A✓9 and 92 A✓28 A✓55 A✓75 (4)
1.2		CA✓ correct Q1 & Q3 CA✓ median correctly shown CA✓ both correct whiskers (3)
1.3	Data is skewed to the left /Data is negatively skewed	CA CA✓✓Answer (2)
1.4	mean mark for M–cee-nai High $= \frac{9+14+14+19+21+23+33+35+37+37+42+45+55+56+57+59+68+75+75+75+77+78+80+81+92}{25}$ $\frac{1257}{25} = 50{,}28$ OR $\bar{x} = \frac{1257}{25} = 50{,}28$	A✓sum CA✓answer (2) [Answer only full marks]
1.5	Bee Vee High School. Bee Vee High School performed better because half of the learners got above 60% whilst half of M–cee-nai learners got more than 55%. The median of Bee Vee High was higher than that of M–cee-nai High.	CA✓Bee Vee High CA✓✓Reasoning (3)

Extra activities

QUESTION 1

Some of the test results of 21 learners are given below. There was only one result of 26 marks and only one result of 64 marks.



1.1 What information is omitted on the diagram above? (1)

1.2 The results were read to the learners in ascending order. If the 5th learner's result was 26, which learner obtained a result of 64? (2)

1.3 One of the learners was arguing that the distribution of the data wasn't symmetrical. Is the learner correct? Give a reason for the learner's remark. (3)

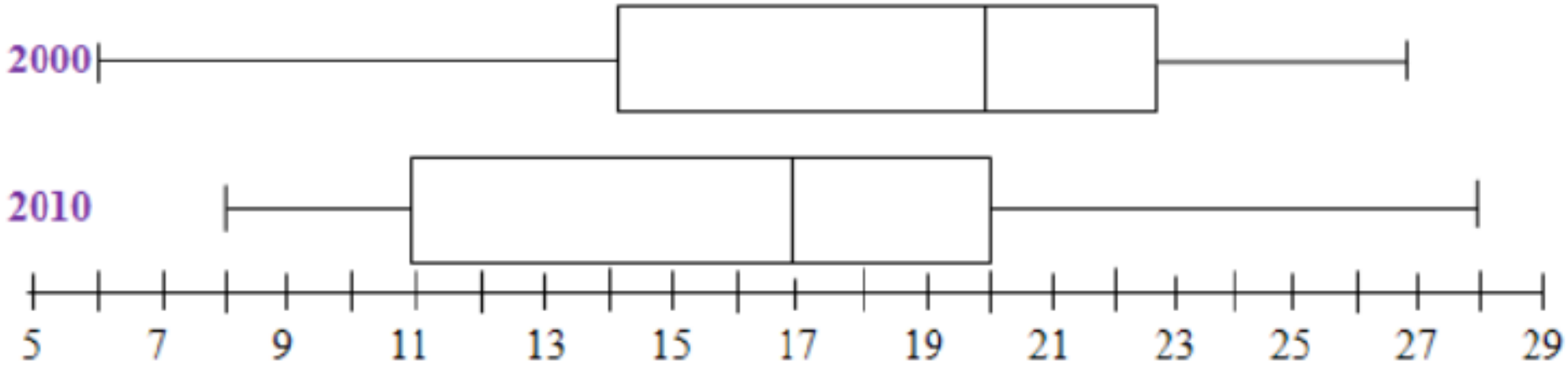
Solution

QUESTION/*VRAAG* 1

1.1	Minimum and maximum values/ *Minimum en maksimum waardes*	✓values both /albei waardes (1)
1.2	$0,75 \times 21 = 15,75$	✓ method/metode ✓answer (2)
1.3	Yes./*Ja* The difference between the median and lower quartile is much smaller than the difference between the median and upper quartile. / *Die verskil tussen die mediaan en onderst kwartiel is baie kleiner as die verkil tussen die mediaan en die boonste kwartiel.*	✓yes./*Ja* ✓✓reason/ *rede* (3)

Extra activities

The results from a test for students for the year 2000 and the year 2010 are illustrated in the box and whisker plot. The total mark for the test was 30.



1.2.1 Determine the interquartile range for 2010. (2)

1.2.2 In which year did students perform better in the test?
Motivate your answer. (2)

Solution

1.2.1	$IQR = 20 - 11$ $= 9$	✓ 20-11 ✓ *answer* OR ✓✓Answer only	(2) K
1.2.2	2000 • the median score of 20 in 2000 is greater in value than the median score of 17 in 2010. • the upper half (50%)of the students in 2000 scored in the same score range as the upper one-fourth (25%) of the students in 2010. By considering the upper quarter, upper half, and upper three-quarters instead of just the lowest and highest scores, we would conclude that the students as a whole did much better in 2000 than in 2010.	✓ 2000 ✓ *reason*	(2) P

Extra activities

In the grid below a, b, c, d, e, f and g represent values in a data set written in an increasing order. No value in the data set is repeated.

a	b	c	d	e	f	g

Determine the value of a, b, c, d, e, f and g if:

- The maximum value is 42
- The range is 35
- The median is 23
- The difference between the median and the upper quartile is 14
- The interquartile range is 22
- $e = 2c$
- The mean is 25

[7]

Solution

$a = 7$	$b = 15$	$c = 17$	$d = 23$	$e = 34$	$f = 37$	$g = 42$

✓ each correct answer (7)

OR

$g = 42$; $a = 7$; $d = 23$; $f = 37$; $b = 15$

$$\frac{42 + 7 + 23 + 37 + 15 + 3c}{7} = 25$$

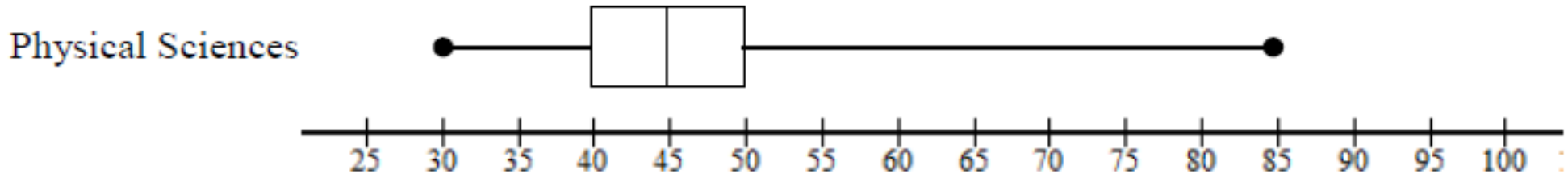
$$3c = 51$$
$$c = 17$$
$$e = 34$$

✓ g
✓ a
✓ d
✓ f
✓ b
✓ c
✓ e (7)

[7]

Extra activities

In a certain school 60 learners wrote examinations in Mathematics and Physical Sciences. The box-and-whisker diagram below shows the marks (out of 100) that these learners scored in the Physical Sciences examination.



3.1 Write down the range of the marks scored in the Physical Sciences examination. (1)

3.2 Use the information below to draw the box-and-whisker diagram for the Mathematics results on DIAGRAM SHEET 1.

Minimum mark = 30
Range = 55
Upper quartile = 70
Interquartile range = 30
Median = 55

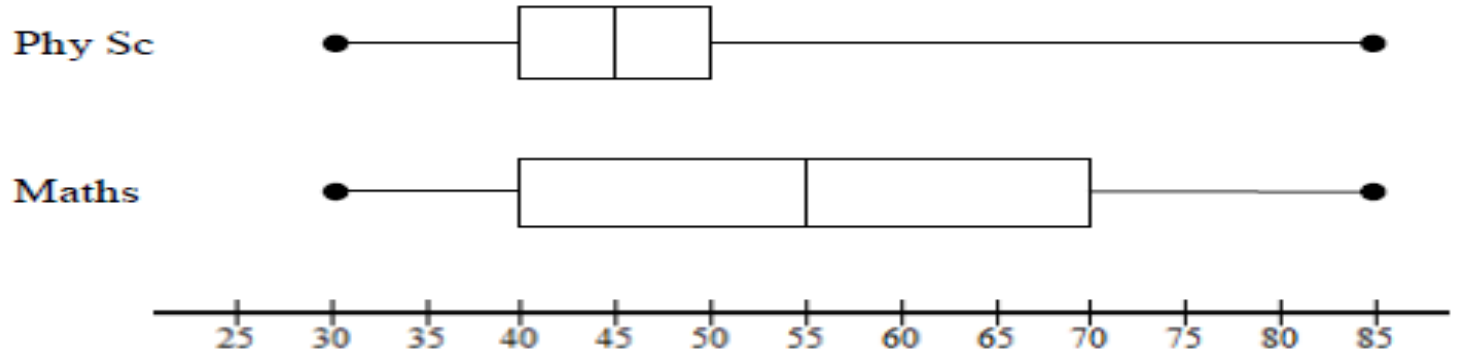
(4)

Extra activities

3.3 How many learners scored less than 70% in the Mathematics examination? (2)

3.4 Joe claims that the number of learners who scored between 30 and 45 in Physical Sciences is smaller than the number of learners who scored between 30 and 55 in Mathematics. Is Joe's claim valid? Justify your answer. (2)

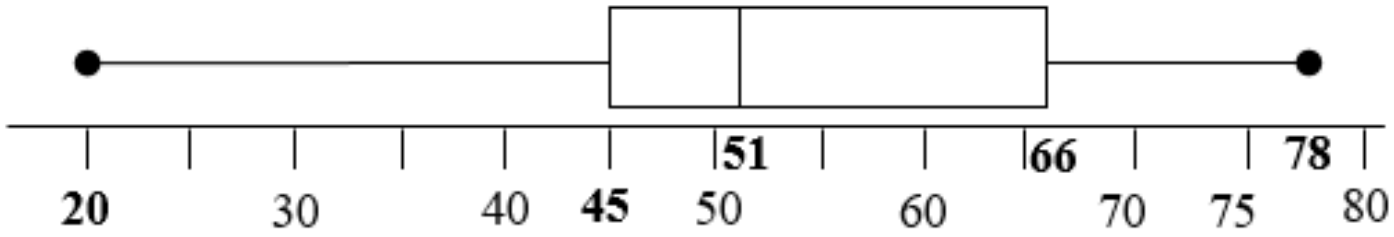
Solution

3.1	Range $= 85 - 30 = 55$	✓ 55 (1)
3.2		✓ max 85 ✓ $Q_3 = 70$ ✓ $Q_1 = 40$ ✓ Median = 55 (4)
3.3	From the information given for Mathematics, the value of the third quartile is 70%. Therefore 75% of learners got below 70%. Number of learners below 70% is expected to be $\frac{75}{100} \times 60 = \frac{3}{4} \times 60 = 45$ learners	✓ 75% of learners ✓ 45 learners (2)
3.4	No, Joe's claim is invalid. 50% of the learners scored between 30% and 45% in Physical Sciences. 50% of the learners scored between 30% and 55% in Mathematics. Therefore the numbers will be equal. **OR** No, Joe's claim is invalid. Same number of learners (between min and median)	✓ invalid/no ✓ median represents 50% of learners (2) [9]

Extra activities

QUESTION 1

The five-number summary of the spread of marks (out of 100) of a Mathematics test is (20; 45; 51; 66; 78). This information is shown in the box and whisker diagram below.



1.1 Determine the interquartile range. (2)

1.2 What percentage of marks is in excess of 66? (2)

1.3 Between which quartiles do the marks have the least variation? Explain. (2)

[6]

Solution

QUESTION 1

1.1	Inter-quartile range = 66 – 45 = 21	✓66 – 45 ✓21 (2)
1.2	25%	✓✓ 25% (2)
1.3	Between Q_1 and Q_2 Spread in this quarter only over 6 units	✓quartile ✓reason (2)
		[6]

Extra activities

QUESTION 2

The stem-and-leaf plot shows how many pages of a textbook learners in a Mathematics class revised before writing their examination.

5	7
4	3 4 4
3	1 1 1 4 6 8
2	2 4 8 9 9
1	5 5 6 7
0	3 5

2.1 How many learners were in the class? (1)

2.2 What was the least number of pages of revision completed? (1)

2.3 Calculate the mean of the given data. (2)

Solution

QUESTION 2 / *VRAAG 2*

5 | 7 4 | 3 4 4 3 | 1 1 1 4 6 8 2 | 2 4 8 9 9 1 | 5 5 6 7 0 | 3 5			
2.1	21 learners / *leerders*	✓ answer / *antwoord*	(1)
2.2	3 pages / *bladsye*	✓ answer / *antwoord*	(1)
2.3	$\bar{x} = 28{,}19$	✓✓ answer / *antwoord*	(2)

Concluding Remarks

The NEXT lesson will still focus on Statistics , which links with the work we completed today

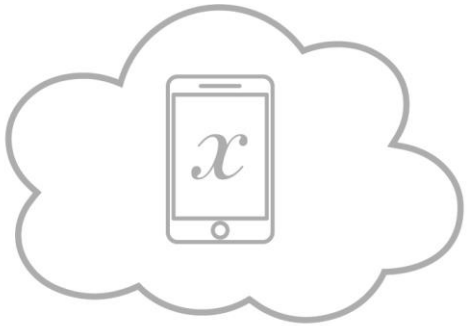
Concluding Remarks

Following our today lesson, I want you to do the to:

- Read through what the learner **need to understand and master** in your learner material.
- **Complete** the activities
- Attempt as many as possible other similar examples on your own from the **Text-Book and the past exam papers**.

Repeat this procedure until you are **confident**.

- Do not forget: **Practice makes perfect!**



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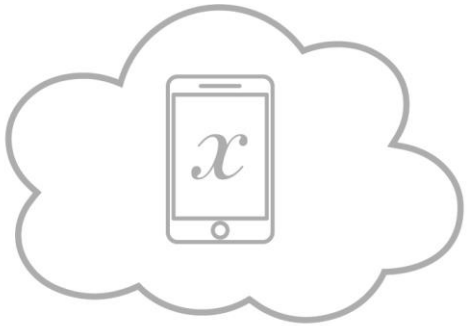
Thank you



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MATHEMATICS GRADE 10

PAPER 2

Statistics (Grouped data)

LESSON 3 & 4

6 – 7 JULY 2022

GRADE 10 CONTENT

INTRODUCTION

- **Data handling** refers to the process of gathering, recording and presenting information in a way that is helpful to others - for instance, in graphs or charts.

INTRODUCTION

➢ The **word data** is the plural of the word datum which means “a piece of unorganized information”.

- **Organizing Data**
  - ✓ In order to make sense of the data, we need to organise the data.
  - ✓ Different sets of data can be sorted in different ways:

You can write the data items in either alphabetical or numerical order.

For example:

- The words elephant ; lion; frog and crocodile can be ordered in alphabetical order as follows: crocodile; elephant; frog; lion

- The numbers 32,1; 32,001; 32,0001 and 32,01 can be ordered in ascending numerical order as follows: 32,0001; 32,001; 32,01 and 32,1

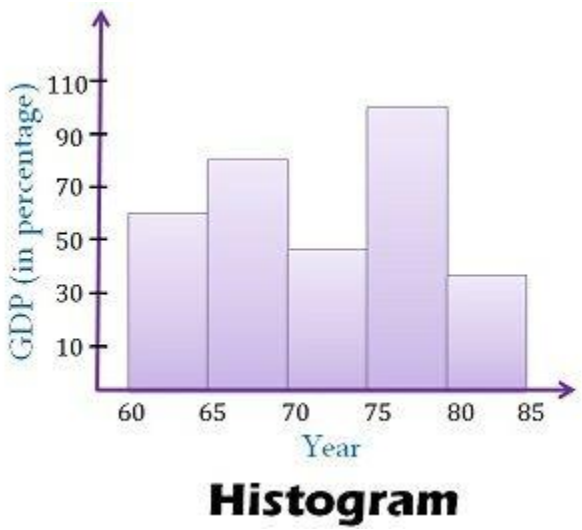
INTRODUCTION

We can use the following tools to **organize and display data** :

- Frequency table
- Bar chart
- Tally table
- Stem-and-leaf diagram
- Histogram
- Frequency polygon,
- Box-whisker diagram

Examples

Bar Graph



Histogram

People living in each house on a street:

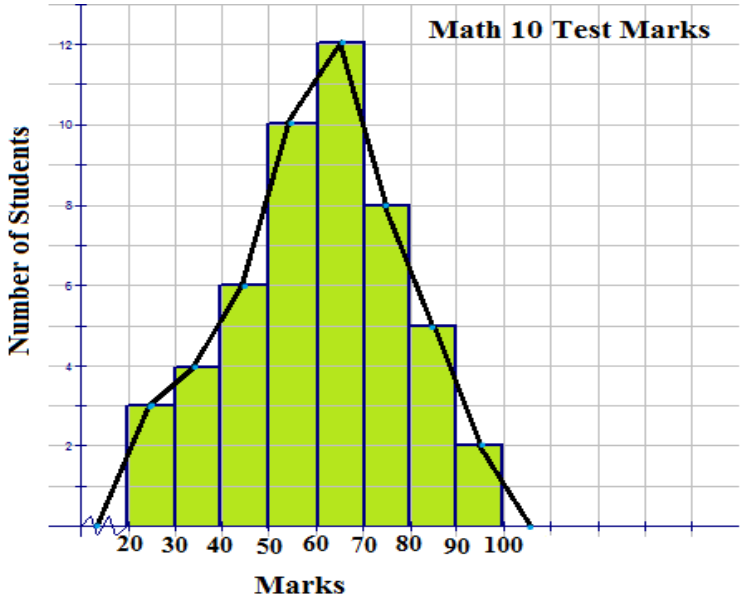
2, 5, 6, 3, 3, 4, 5, 5, 4, 3, 5, 7, 5, 2, 4, 1, 5, 4, 5, 5

Number of people in a house	Tally	Frequency
1		
2	1	
3	11	
4	11	
5	111	
6	1	

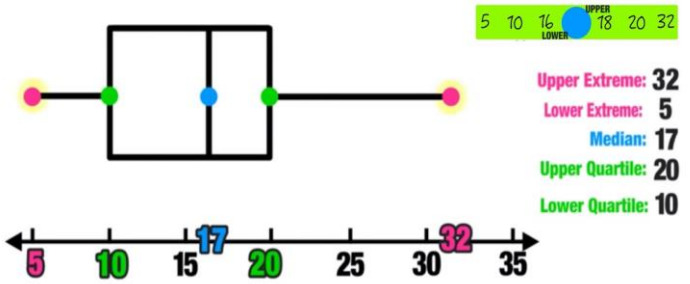
Ages of people in an office

stem	leaf
1	8 9 9
2	1 3 6 7 7 7 9
3	0 2 2 5 8
4	1 6 7
5	3 5

key: 2 | 3 means 23 years



BOX & WHISKER PLOTS



SORTING AND REPRESENTING DATA GRAPHICALLY

GROUPED DATA

GROUP	X	TALLY	f		
20.5 - 20.9	20.7	𝍸 |	3		
21.0 - 21.4	21.2	𝍸 𝍸	10		
21.5 - 21.9	21.7	𝍸 𝍸 |	11		
22.0 - 22.4	22.2	𝍸 𝍸 | | |	13		
22.5 - 22.9	22.7	𝍸 | | | |	9		
23.0 - 23.5	23.2	| |	2		

SORTING AND REPRESENTING DATA GRAPHICALLY

SORTING AND REPRESENTING DATA GRAPHICALLY

GROUPED DATA

➢ Representing grouped data using stem and leaf diagrams, frequency tables (using class intervals) and histograms.

STEM AND LEAF DIAGRAMS (STEMPLOTS)

- A way of grouping data into classes while still retaining the original data.
- In a stem and leaf diagram, all the intervals must be of equal width.

Remember !!!

Ages of people in an office

stem	leaf
1	8 9 9
2	1 3 6 7 7 7 9
3	0 2 2 5 8
4	1 6 7
5	3 5

key: 2 | 3 means 23 years

Example of Group Data

GROUP	X	TALLY	f		
20.5 - 20.9	20.7	III	3		
21.0 - 21.4	21.2	𝍸 𝍸	10		
21.5 - 21.9	21.7	𝍸 𝍸 I	11		
22.0 - 22.4	22.2	𝍸 𝍸 III	13		
22.5 - 22.9	22.7	𝍸 IIII	9		
23.0 - 23.5	23.2	II	2		

SORTING AND REPRESENTING DATA GRAPHICALLY

Example 1. The table below shows marks of 20 learners in an assignment:

84	17	38	45	47	53	76	54	75	22
66	65	55	54	51	44	39	19	54	72

1.1. Draw a stem and leaf diagram to sort the data; using class intervals 10 – 19; 20 – 29; 30 – 39; 40 – 49; - - - ; 80 – 89.

SORTING AND REPRESENTING DATA GRAPHICALLY

1.2. Hence, copy and complete the frequency table below:

Mark (x)	Tally	Frequency (f)
$0 \leq x < 10$		0
$10 \leq x < 20$	II	2
$20 \leq x < 30$	I	1
$30 \leq x < 40$		
$40 \leq x < 50$		
$50 \leq x < 60$	$\cancel{IIII}$	5
$60 \leq x < 70$		
$70 \leq x < 80$		
$80 \leq x < 90$	I	1
$90 \leq x < 100$		

1.3. Hence, draw a histogram to represent this data.

WORKING AREA

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SOLUTION

1.1. Stem and leaf diagram

Stem	leaf				
1	7	9			
2	2				
3	8	9			
4	4	4	5	7	
5	1	3	4	4	5
6	5	6			
7	2	5	7		
8	4				

Key: 5/3 means 53

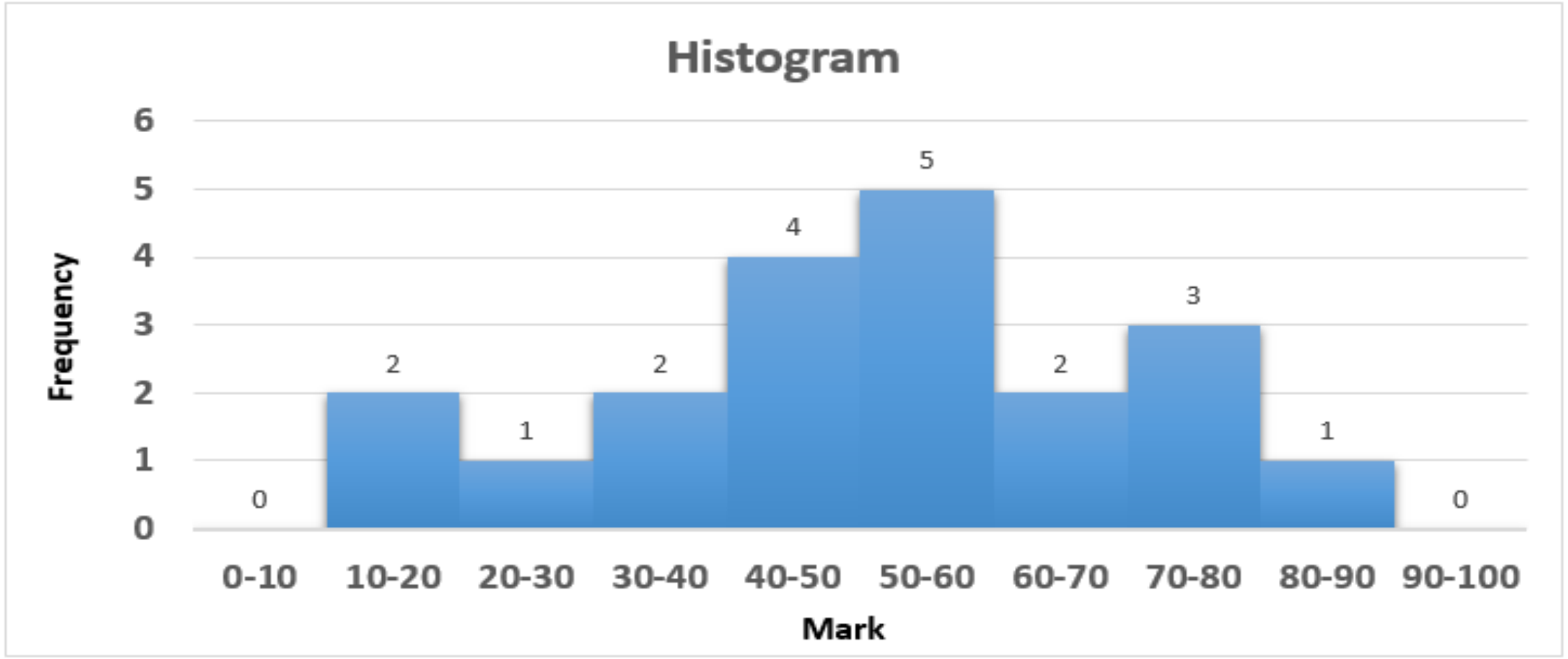
SOLUTION (continued)

1.2. Frequency table

Mark (x)	Tally	Frequency (f)
$0 \leq x < 10$		0
$10 \leq x < 20$	II	2
$20 \leq x < 30$	I	1
$30 \leq x < 40$	II	2
$40 \leq x < 50$	$IIII$	4
$50 \leq x < 60$	$\cancel{IIII}$	5
$60 \leq x < 70$	II	2
$70 \leq x < 80$	III	3
$80 \leq x < 90$	I	1
$90 \leq x < 100$		0

SOLUTION (continued)

1.3. Histogram showing learners' marks.



ACTIVITY 1

1. The number of houses built in 35 suburbs are as follows:

23	7	27	35	8	5	36
27	17	22	20	33	17	29
35	30	19	36	12	30	42
10	37	32	45	41	24	32
43	40	19	24	23	32	15

1.1. Draw a stem and leaf diagram to sort the data using class intervals 0 -9; 10 – 19; 20 – 29; - - - ; 40 – 49.

ACTIVITY 1 (continued)

1.2. Hence, copy and complete the following frequency table:

Interval	Tally	Frequency
$0 \leq x < 10$		
$10 \leq x < 20$		
$20 \leq x < 30$		
$30 \leq x < 40$		
$40 \leq x < 50$		
Total		

1.3. Draw a histogram to represent this data.

WORKING AREA

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ACTIVITY 1; SOLUTION

1.1. Stem and leaf diagram

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

Key: 2 | 7 means 27

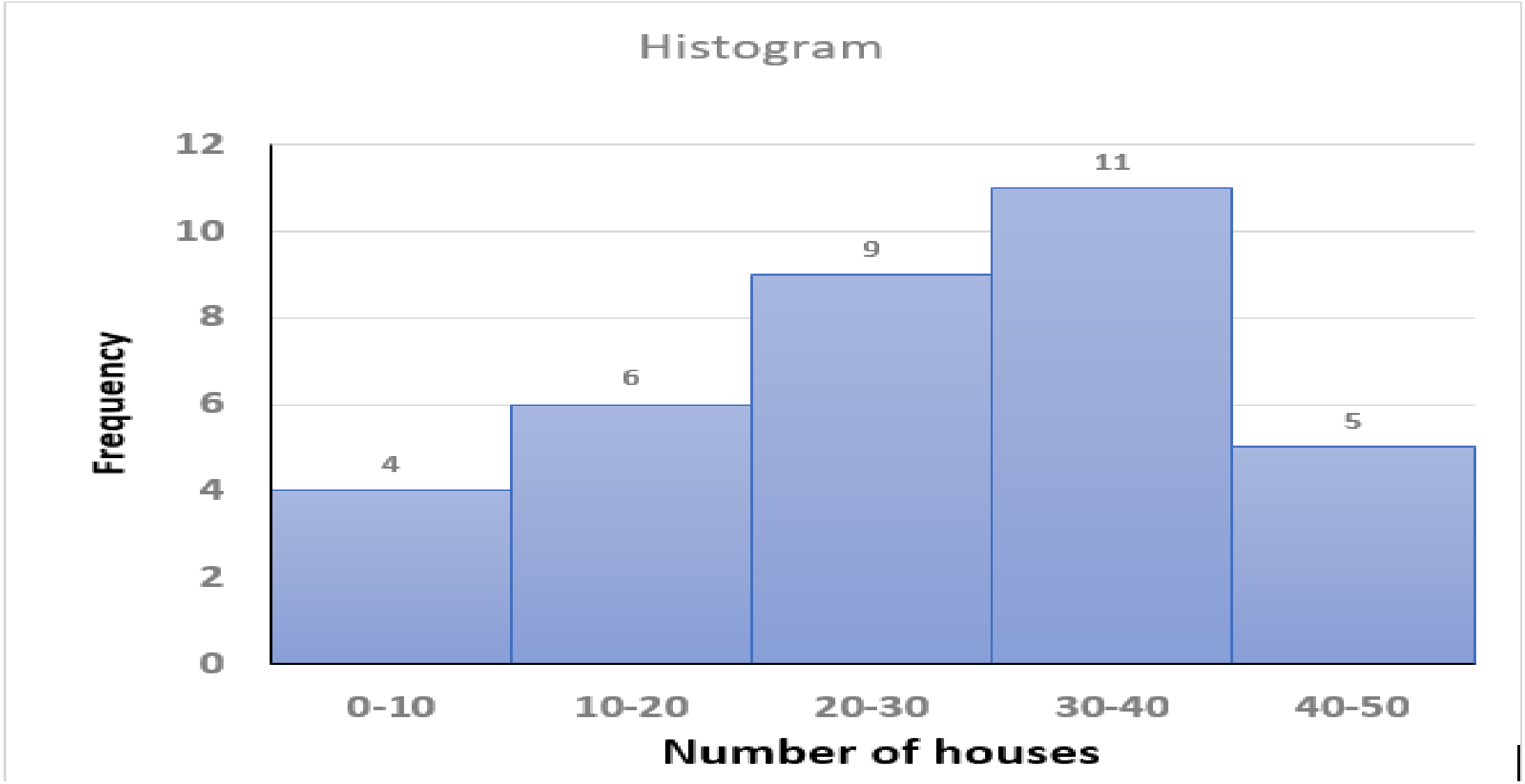
SOLUTION (continued)

1.2. Frequency table:

Interval	Tally	Frequency
$0 \leq x < 10$	$IIII$	4
$10 \leq x < 20$	$\cancel{IIII}\ I$	6
$20 \leq x < 30$	$\cancel{IIII}\ IIII$	9
$30 \leq x < 40$	$\cancel{IIII}\ \cancel{IIII}\ I$	11
$40 \leq x < 50$	$\cancel{IIII}$	5
Total		35

SOLUTION (continued)

1.3. Histogram showing number of houses in 35 surbubs



MEASURES OF CENTRAL TENDENCY (GROUPED DATA)

- After grouping data, we lose the original data.
- Using grouped data, we can calculate the ‘estimated mean’, ‘estimated mode’ (or modal class), and ‘estimated median’ (or the interval in which the median lies).
- Estimated mode = midpoint of the modal class interval.
- Estimated median = midpoint of the class the median lies.

MEASURES OF CENTRAL TENDENCY (GROUPED DATA)

Mode

- The **modal interval** is the interval in the table that occurs most often. It is the group of values with the greatest frequency.
- Note: **Mode** refers to a single value that occurs most often; modal interval refers to the group of values that occurs most often.
- *Remember*: The mode is the **value**, not the frequency.

MEASURES OF CENTRAL TENDENCY (GROUPED DATA)

The choir teacher kept a record of the number of learners who attended the 40 choir practices during the year. This frequency table gives a summary of the attendance.

Number of learners at choir practice (x)	Frequency (f)
$0 < x \leq 10$	1
$10 < x \leq 20$	2
$20 < x \leq 30$	11
$30 < x \leq 40$	9
$40 < x \leq 50$	14
$50 < x \leq 60$	3
	n = 40

Find the modal interval.

MEASURES OF CENTRAL TENDENCY (GROUPED DATA)

SOLUTION:

The interval with the greatest frequency is $40 < x \leq 50$.
This means that there were more times when there were from 40 up to and including 50 learners at the choir practices than any other interval.
So, the modal interval is $40 \leq x \leq 50$.

MEASURES OF CENTRAL TENDENCY

Example 1.

The intelligence quotient score (IQ) of a Grade 10 is summarised in the table below:

IQ Interval	Frequency
$90 \leq x < 100$	4
$100 \leq x < 110$	8
$110 \leq x < 120$	7
$120 \leq x < 130$	5
$130 \leq x < 140$	4
$140 \leq x < 150$	2

1.1. Write down the modal class of the data. (1)

1.2. Determine the interval in which the median lies. (2)

1.3. Estimate the mean IQ score of this class of learners. (3)

WORKING AREA

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SOLUTION

1.1. $100 \leq x < 110$

1.2. $110 \leq x < 120$

SOLUTION (continued)

1.3.

IQ Interval	Frequency (f)	Class Midpoint (x_1)	$f \times x_1$
$90 \leq x < 100$	4	95	380
$100 \leq x < 110$	8	105	840
$110 \leq x < 120$	7	115	805
$120 \leq x < 130$	5	125	625
$130 \leq x < 140$	4	135	540
$140 \leq x < 150$	2	145	290
Totals	30		3 480

$$\text{Estimate mean} = \frac{3\,480}{30} = 116.$$

ACTIVITY 2

1. [Refer to Activity 2, Question 1]
   The number of houses built in 35 suburbs are as follows:

23	7	27	35	8	5	36
27	17	22	20	33	17	29
35	30	19	36	12	30	42
10	37	32	45	41	24	32
43	40	19	24	23	32	15

ACTIVITY 2

1.1. Complete the following table:

Interval	Tally	Frequency (f)	Class Midpoint (x_1)	$f \times x_1$
$0 \leq x < 10$		4	5	20
$10 \leq x < 20$				
$20 \leq x < 30$		9	25	225
$30 \leq x < 40$		11	35	385
$40 \leq x < 50$				
Totals		35		

(4)

ACTIVITY 2

1.2. Calculate the approximate mean number of houses. (2)

1.3. Write down the modal class. (1)

1.4. In which interval does the median lie? (2)

WORKING AREA

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SOLUTION

Interval	Tally	Frequency (f)	Class Midpoint (x_1)	$f \times x_1$
$0 \leq x < 10$	III	3	5	$3 \times 5 = 15$
$10 \leq x < 20$	𝍸 II	7	15	$7 \times 15 = 105$
$20 \leq x < 30$	𝍸 IIII	9	25	$9 \times 25 = 225$
$30 \leq x < 40$	𝍸 𝍸 I	11	35	$11 \times 35 = 385$
$40 \leq x < 50$	𝍸	5	45	$5 \times 45 = 225$
Totals				$\sum f \times x_1 = 955$

SOLUTION

1.2. Calculate the approximate mean number of houses.

$$mean = \frac{\sum f \times x_1}{n} = \frac{955}{35} = 27.28$$

1.3. Write down the modal class.

$$30 \leq x < 40$$

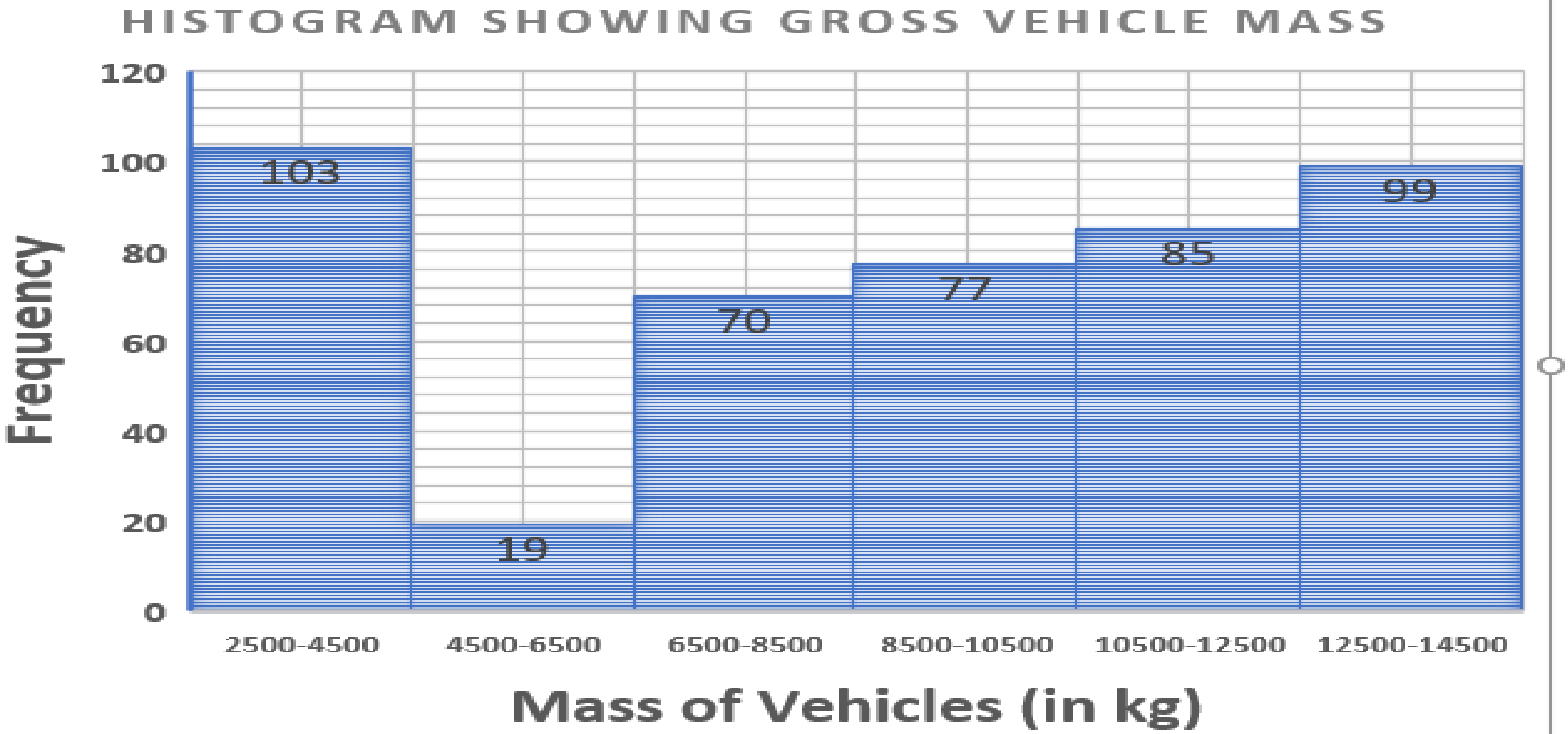
1.4. In which interval does the median lie?

$$20 \leq x < 30$$

ACTIVITY 2 (Continued)

2. Traffic authorities are concerned that heavy vehicles (trucks) are often overloaded. In order to deal with this problem, a number of weighbridges have been set up along the major routes in South Africa. The gross (total) vehicle mass is measured at these weigh bridges. The histogram below shows the data collected at a weighbridge over a month.

ACTIVITY 2 (continued)



ACTIVITY 2

2.1. Write down the modal class of the data. (1)

2.2. Estimate the mean gross vehicle mass for the month. (5)

2.3. Which of the measures of central tendency, the modal class or the Estimated mean, will be the most appropriate to describe the data set?

Explain your choice. (1)

[7]

WORKING AREA

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SOLUTION

2.1 The modal class is $2500 \leq x < 4500$

✓ $2500 \leq x < 4500$ (1)

2.2

Gross Vehicle Mass (GVM) (in kg)	Frequency	Midpoint	Frequency × midpoint
$2500 \leq x < 4500$	103	3500	360 500
$4500 \leq x < 6500$	19	5500	104 500
$6500 \leq x < 8500$	70	7500	525 000
$8500 \leq x < 10500$	77	9500	731 500
$10500 \leq x < 12500$	85	11500	977 500
$12500 \leq x < 14500$	99	13500	1 336 500
Sum	453		4 035 500

✓ midpoints

✓✓ frequencies × midpoint

✓4 035 500

Estimated mean $(\overline{X}) = \frac{4035500}{453} = 8908{,}39\,\text{kg}.$

✓ answer (5)

SOLUTION

	Estimated mean $(\overline{X}) = \frac{4035500}{453} = 8908{,}39\,\text{kg}.$	✓ 4 035 500 ✓ answer (5)
2.3	The estimated mean. It is more at the centre of the data set. The modal class is found at the extreme left-hand side of the data set.	✓ estimated mean with reason (1) [7]

ACTIVITY 2 (Continued)

3. The following data is given:

Interval	Frequency
$100 \leq x < 200$	3
$200 \leq x < 300$	7
$300 \leq x < 400$	12
$400 \leq x < 500$	18
$500 \leq x < 600$	12
$600 \leq x < 700$	6

3.1. Write down the modal class of the data and the estimated mode.

3.2. Determine the interval in which the median lies and the estimated median.

3.3. Estimate the mean of the data.

WORKING AREA

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SOLUTION

Interval	Frequency	Mid point	$f \times x_1$
$100 \leq x < 200$	3	150	450
$200 \leq x < 300$	7	250	1750
$300 \leq x < 400$	12	350	4200
$400 \leq x < 500$	18	450	8100
$500 \leq x < 600$	12	550	6600
$600 \leq x < 700$	6	650	3900
Total	58	$\sum f \times x_1 = 25000$	

SOLUTION

3.1. Write down the modal class of the data and the estimated mode.

$$400 \leq x < 500$$

3.2. Determine the interval in which the median lies and the estimated median.

$$400 \leq x < 500$$

3.3. Estimate the mean of the data.

$$mean = \frac{\sum f \times x_1}{n} = \frac{25000}{58} = 431.03$$

Concluding Remarks

The NEXT lesson will still focus on Statistics , which links with the work we completed today

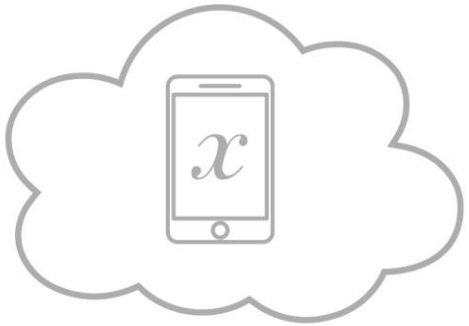
Concluding Remarks

Following our today lesson, I want you to do the to:

- Read through what the learner **need to understand and master** in your learner material.
- **Complete** the activities
- Attempt as many as possible other similar examples on your own from the **Text-Book and the past exam papers**.

Repeat this procedure until you are **confident**.

- Do not forget: **Practice makes perfect!**



Promaths

ONLINE

Thank you