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MATHEMATICS

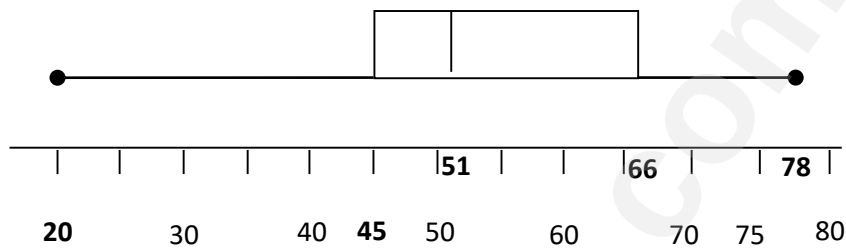
MATERIAL FOR GRADE 12

Statistics

QUESTIONS

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]

QUESTION 2

A group of learners from Mr Smith's class wrote a Mathematics test which was scored out of 75 marks. The results were represented in the table below.

MARKS	FREQUENCY	CUMULATIVE FREQUENCY
$5 < x \leq 15$	3	
$15 < x \leq 25$	6	
$25 < x \leq 35$	m	21
$35 < x \leq 45$	4	
$45 < x \leq 55$	7	
$55 < x \leq 65$	9	
$65 < x \leq 75$	n	
Total	51	

- 2.1 How many learners wrote the test? (1)
- 2.2 Determine the value of m and n . (2)
- 2.3 Complete the given table on the diagram sheet. (2)
- 2.4 Draw a cumulative frequency curve (Ogive) to represent above data on the Diagram provided for this sub-question. (3)

[8]

QUESTION 3

The relationship between age and spending money on buying clothes per month has been studied for years. Research has shown the following results:

AGE	SPENDING MONEY ON BUYING CLOTHES IN RANDS
21	1534
27	1260
35	986
42	810
55	450
63	250

- 3.1 Draw a scatter plot on DIAGRAM SHEET provided on this sub-question to represent the data. (3)
- 3.2 Determine the equation of the regression line and draw it on the scatter plot. (3)
- 3.3 Describe the trend of the data in reference to the correlation coefficient. (2)
- 3.4 Estimate the expenditure of a 50 year old person from the scatter plot. (1)

[9]

QUESTION 4

The Maths Literacy teachers usually complain about their learners' language and reading skills. The data below shows the percentages which 8 candidates obtained for English and Mathematical Literacy during the June Examination.

Maths Literacy	25	38	40	47	12	49	54	59
English	34	53	62	44	20	50	61	54

4.1 Calculate the:

4.1.1 mean percentage of the Maths Literacy. (2)

4.1.2 standard deviation of the Maths Literacy. (2)

4.2 Determine the number of learners whose percentages in Maths Literacy lie within ONE standard deviation of the mean. (3)

4.3 Use the grid provided to draw a scatter plot to represent the above data. (3)

4.4 Calculate an equation for the least squares regression line (line of best fit) for the data. (3)

4.5 Draw the regression line on the scatter plot. (2)

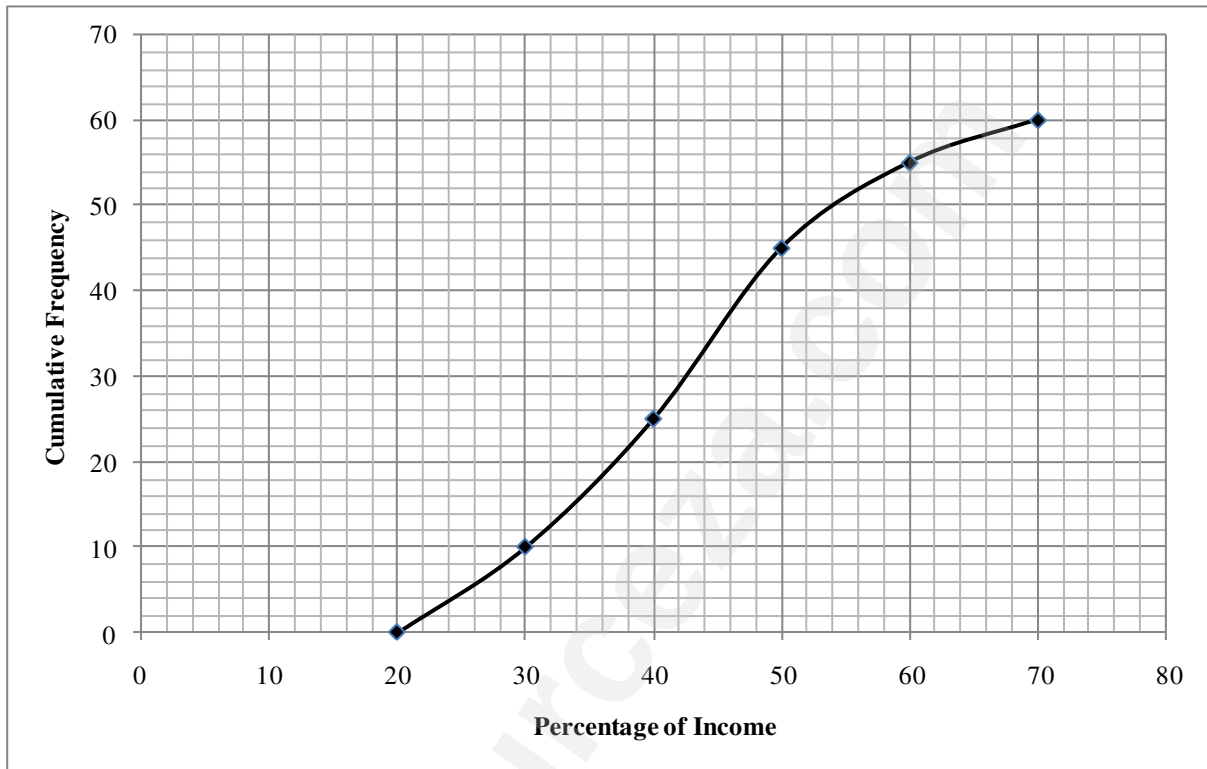
4.6 Describe the trend of the data by making use of the correlation coefficient. (3)

4.7 Estimate the Maths Literacy mark a learner would get, if his English mark is 58%. (2)

[20]

QUESTION 5

The following ogive (cumulative frequency graph) represents the percentage of income spent on food by people.



- 5.1 Complete the cumulative frequency table for the data. (3)
 - 5.2 Use the graph to estimate:
 - 5.2.1 The number of people who spent more than 50% of their income on food (2)
 - 5.2.2 The median of the data (2)
 - 5.3 Write down the modal class of the data. (1)
- [8]**

QUESTION 6

A factory manager recorded the number of items produced by the factory and the total cost of their production over 6 months. The following table summarises the manager's data.

No. of items (x) in thousands	18	36	45	22	69	72
Production cost (y) in thousands	37	54	63	42	84	91

- 6.1 Draw a scatter plot for the data. (2)
- 6.2 Write down an equation for the least squares regression line of the data. (2)
- 6.3 Draw a line of best fit for the data. (2)
- 6.4 Calculate the production cost if the number of items produced is 25 000. (2)
- 6.5 Calculate the correlation coefficient, correct to THREE decimal places. (2)
- 6.6 What conclusion can you reach about the strength of the relationship? (1)

[11]**QUESTION 7**

The ordered data below lists the fees (in thousands of Rands) paid by 30 students for their first year of study at university.

11 11,9 12 12,52 13,125 13,125 13,15 13,2 13,25 13,25
 13,25 13,25 13,4 13,5 13,7 13,7 14 14,2 14,2 14,5
 14,5 15 15,5 15,6 16,1 17,3 17,5 17,8 19 19,7

- 7.1 Calculate the mean and standard deviation of the given data. (4)

- 7.2 Complete the cumulative frequency column in the table provided. (3)
- 7.3 Draw an Ogive (cumulative frequency curve) of the given data on the grid provided. (5)
- 7.4 Draw the box and whisker diagram for the given data. (3)
- 7.5 Comment on the skewness of the data. (1)

[16]

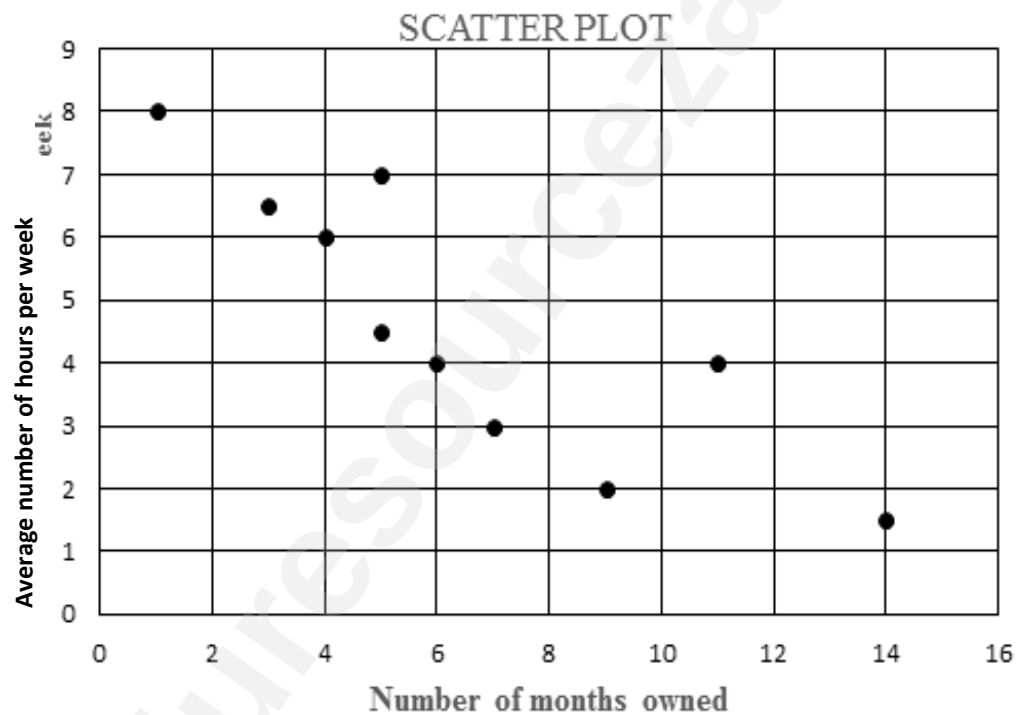
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QUESTION 8

A study was conducted to investigate the average number of hours per week an exercise bicycle is used in comparison to the number of months the bicycle has been owned. The data below was collected.

Number of months owned	1	5	7	4	9	14	5	11	3	6
Average number of hours per week used	8	4,5	3	6	2	1,5	7	4	6,5	4



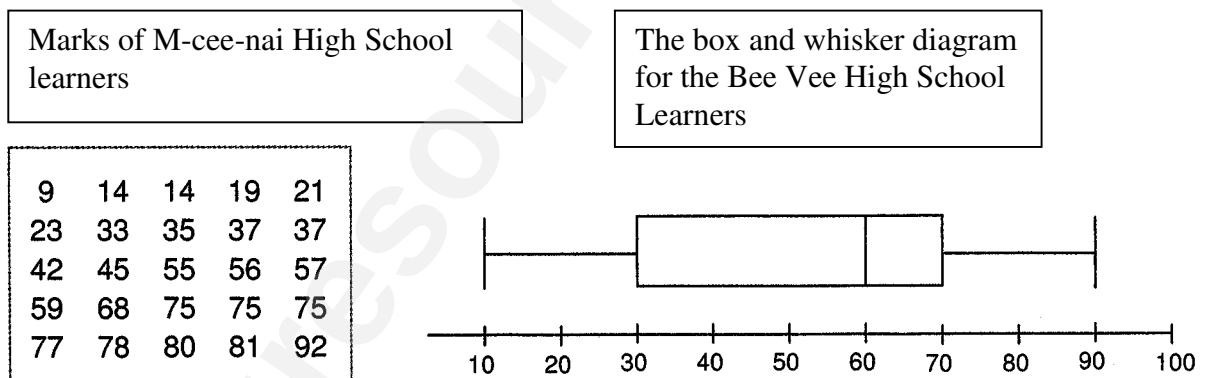
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- 8.1 Determine the equation of the least square regression line. (3)
- 8.2 Predict the number of hours the exercise bicycle will be used per week if it has been owned for 8 months. (2)
- 8.3 Comment on the trend of the data. (1)
- [6]

QUESTION 9

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 learners 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 %).



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

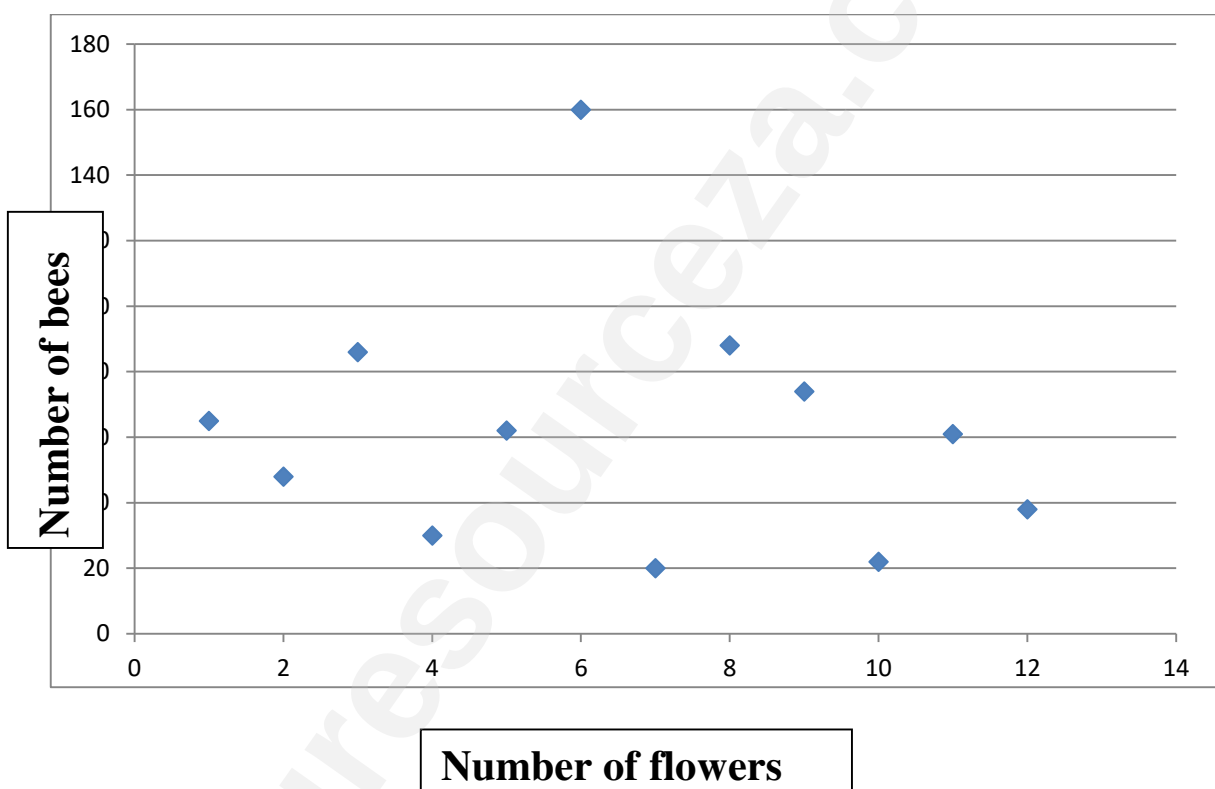
[13]

QUESTION 10

A survey was conducted indicating the number of bees that visited flowers over a period of 12 days.

The information is represented in the table and in the scatter plot below.

No. of Flowers	4	10	7	12	1	6	2	5	11	9	8	3
No. of bees	30	22	20	38	65	160	48	62	61	74	88	86

SCATTER PLOT

10.1 Write down the coordinates of the outlier. (2)

10.2 Determine the equation for the least squares regression line. (4)

10.3 Calculate the correlation co-efficient **if the outlier is excluded**. (2)
[8]

QUESTION 11

A company has 132 employees in their Polokwane branch. The distance (x) in kilometres which they travel to work each day, is summarised in the following frequency table:

Distance (in kms)	Frequency
$5 < x \leq 10$	12
$10 < x \leq 15$	29
$15 < x \leq 20$	48
$20 < x \leq 25$	27
$25 < x \leq 30$	13
$30 < x \leq 35$	3

- 11.1 Determine the estimated mean distance covered by the employees. (3)
- 11.2 Determine the standard deviation for the data, to two decimal places. (2)
- 11.3 Draw an ogive for this data on a set of axes provided in the answer book. (3)
- 11.4 Determine the median distance travelled, showing on the graph where your answer is read off. (2)
- 11.5 By referring to the relationship between the mean and median, discuss the distribution of the data. (2)
- [12]**

QUESTION 12

A training manager investigates the correlation between hours spent on the training of an employee (x) and consequent productivity (y units delivered per day). The data collected from the files of 10 employees was recorded in the following table:

Employee	1	2	3	4	5	6	7	8	9	10
Hours training (x)	16	36	20	38	40	30	35	22	40	24
Productivity (y units delivered per day)	45	70	44	56	60	48	75	60	63	38

- 12.1 Calculate the equation of the least squares regression line. (3)
- 12.2 Calculate the correlation coefficient for the data. (2)
- 12.3 Describe the strength of the correlation. (2)
- 12.4 Use your regression line to determine the units produced by an employee who received 28 hours of training. (2)
- [9]**

QUESTION 13

A Mathematics teacher wants to create a model by which she can predict a learner's final marks. She decided to use her 2015 results to create the model.

Preparatory exam (x)	55	35	67	85	91	48	78	72	15	75	69	37
Final exam (y)	57	50	74	80	92	50	80	81	23	80	75	42

- 13.1 Determine the equation of the least squares regression line in the form $y = a + bx$. (3)
- 13.2 Use the equation of the regression line to predict the final exam mark for a learner who attained 46% in the preparatory examination. (2)
- 13.3 Could you use this equation to estimate the preparatory exam mark for a learner who attained 73% in the final exam? Give a reason for your answer. (2)
- 13.4 Show that the point $(\bar{x} ; \bar{y})$ lies on the regression line. (4)
- 13.5 Determine the correlation coefficient of the data. (1)
- 13.6 Describe the correlation between preparatory and final exam results. (2)
- [14]**

QUESTION 14

The table below shows the results from a survey of cellphone expenditure for 100 learners from a secondary school in Rustenburg.

Expenditure (in rand)	Frequency	Cumulative frequency
$50 \leq x < 100$	24	
$100 \leq x < 150$	52	
$150 \leq x < 200$	14	
$200 \leq x < 250$	a	
$250 \leq x < 300$	4	

- 14.1 Determine the value of a . (1)
- 14.2 Complete the cumulative frequency table in the ANSWER BOOK. (2)
- 14.3 Draw an ogive (cumulative frequency graph) for the data. (3)
- 14.4 What is the modal class for the data? (1)
- [7]**

QUESTION 15

Learners were asked the time (to the nearest minute) that they usually take to get from home to school each morning. The results are shown in the table below:

Time in minutes	Number of learners
$5 < t \leq 10$	160
$10 < t \leq 15$	150
$15 < t \leq 20$	110
$20 < t \leq 25$	60
$25 < t \leq 30$	45
$30 < t \leq 35$	15

- 15.1 Complete the cumulative frequency column in the ANSWER BOOK provided. (2)
- 15.2 Draw the ogive of this data on the grid provided in the ANSWER BOOK. (4)
- 15.3 Calculate the mean time that these learners take to get to school in the morning. (2)
- 15.4 Calculate the standard deviation of this data. (2)
- 15.5 Use the ogive to determine approximately how many learners would take more than one standard deviation from the average time it takes learners to get to school. (3)

[13]

QUESTION 16

The table shows the number of athletes and total number of medals that some countries obtained during the 2012 Summer Olympics.

(Information according to: http://www.wow.com/wiki/2012_London_Olympics)

Country	Number of athletes	Number of medals
USA	530	103
China	396	88
Great Britain	541	65
Russia	436	79
South Korea	245	28
Germany	392	44
France	330	34
Australia	410	35
South Africa	133	6
Canada	277	18
The Netherlands	175	20
New Zealand	184	13

- 16.1 Use the table to determine the equation of the least squares regression line for the data. (3)
- 16.2 Calculate the correlation coefficient for the data. (1)

- 16.3 Predict how many medals (to the nearest integer) a country with 350 athletes should obtain? (2)
- 16.4 Comment on the correlation between the number of participating athletes and the number of medals obtained by a country. (1)
- [7]