JENN

Training and Consultancy

The path to enlightened education

SUBJECT: MATHEMATICS

ACTIVITY MANUAL

GRADE 12

STATISTICS

JENN MArEMatloU

A Division of Marematlou Group Holdings

CONTENTS

JENN TRAINING: STATISTICS

STATISTICS

1. Candidates should be encouraged to use the calculator to calculate standard deviation, variance and the equation of the least squares regression line.
2. The interpretation of standard deviation in terms of normal distribution is not examinable.
3. Candidates are expected to identify outliers intuitively in both the scatter plot as well as 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 did not make use of this formula in identifying outliers.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$A = P(1 + ni) \qquad A = P(1 - ni) \qquad A = P(1 - i)^n \qquad A = P(1 + i)^n$$

$$T_n = a + (n-1)d \qquad S_n = \frac{n}{2}\left[2a + (n-1)d\right]$$

$$T_n = ar^{n-1} \qquad S_n = \frac{a(r^n - 1)}{r - 1} \; ; \qquad r \neq 1 \qquad S_\infty = \frac{a}{1 - r} \; ; \; -1 < r < 1$$

$$F = \frac{x\left[(1 + i)^n - 1\right]}{i} \qquad P = \frac{\left[1 - (1 + i)^{-n}\right]}{i}$$

$$f'(x) = \lim_{h \to 0} \frac{f(x + h) - f(x)}{h}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \qquad M\left(\frac{x_1 + x_2}{2} ; \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c \qquad y - y_1 = m(x - x_1) \qquad m = \frac{y_2 - y_1}{x_2 - x_1} \qquad m = \tan\theta$$

$$(x - a)^2 + (y - b)^2 = r^2$$

$$\textit{In } \triangle ABC: \; \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \qquad a^2 = b^2 + c^2 - 2bc.\cos A \qquad \textit{area } \triangle ABC = \frac{1}{2}ab.\sin C$$

$$\sin(\alpha + \beta) = \sin\alpha.\cos\beta + \cos\alpha.\sin\beta \qquad \sin(\alpha - \beta) = \sin\alpha.\cos\beta - \cos\alpha.\sin\beta$$

$$\cos(\alpha + \beta) = \cos\alpha.\cos\beta - \sin\alpha.\sin\beta \qquad \cos(\alpha - \beta) = \cos\alpha.\cos\beta + \sin\alpha.\sin\beta$$

$$\cos 2\alpha = \begin{cases} \cos^2\alpha - \sin^2\alpha \\ 1 - 2\sin^2\alpha \\ 2\cos^2\alpha - 1 \end{cases} \qquad\qquad \sin 2\alpha = 2\sin\alpha.\cos\alpha$$

$$\bar{x} = \frac{\sum fx}{n} \qquad\qquad \sigma^2 = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n}$$

$$P(A) = \frac{n(A)}{n(S)} \qquad\qquad P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$\hat{y} = a + bx \qquad\qquad b = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sum(x - \bar{x})^2}$$

Outcomes :

Grade 10

1. Revise measures of central tendency in ungrouped data.
2. Measures of central tendency in grouped data:
   calculation of mean estimate of grouped and ungrouped data and identification of modal interval and interval in which the median lies.
3. Revision of range as a measure of dispersion and extension to include percentiles, quartiles, interquartile and semi interquartile range.
4. Five number summary (maximum, minimum and quartiles) and box and whisker diagram.
5. Use the statistical summaries (measures of central tendency and dispersion), and graphs to analyse and make meaningful comments on the context associated with the given data.

Grade 11

1. Histograms
2. Frequency polygons
3. Ogives (cumulative frequency curves)
4. Variance and standard deviation of ungrouped data
5. Symmetric and skewed data
6. Identification of outliers

Grade 12

1. Revise symmetric and skewed data.
2. Use statistical summaries, scatterplots, regression (in particular the least squares regression line) and correlation to analyse and make meaningful comments on the context associated with given bivariate data, including interpolation, extrapolation and discussions on skewness.

Parts

Part 1 : Grade 10 and 11

Part 2 : Grade 12

Part 3 : More Exercises
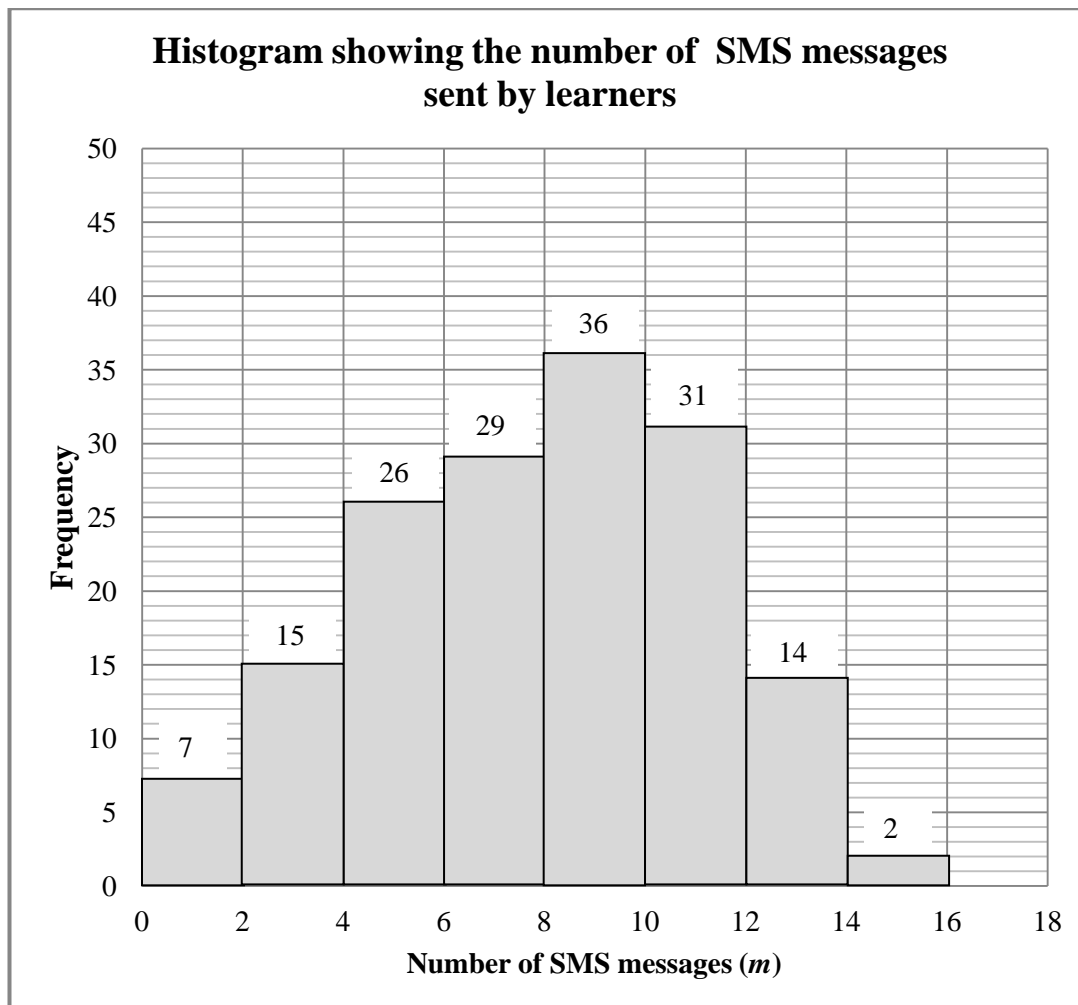
Part 1: Grade 10 and 11

QUESTION 1

The data below shows the number of people visiting a local clinic per day to be vaccinated against measles.

5	12	19	29
35	23	15	33
37	21	26	18
23	18	13	21
18	22	20	

1.1   Determine the mean of the given data.

1.2   Calculate the standard deviation of the data.

1.3   Determine the number of people vaccinated against measles that lies within ONE standard deviation of the mean.

1.4   Determine the interquartile range for the data.

1.5   Draw a box and whisker diagram to represent the data.

1.6   Identify any outliers in the data set. Substantiate your answer.

QUESTION 2

A group of Grade 11 learners were interviewed about using a certain application to send SMS messages. The number of SMS messages, m, sent by each learner was summarised in the histogram below.

Histogram showing the number of SMS messages sent by learners

2.1   Complete the cumulative frequency table provided in DIAGRAM SHEET 1.   (2)

2.2   Use the grid provided in DIAGRAM SHEET 2 to draw an ogive (cumulative frequency curve) to represent the data.   (3)

2.3   Use the ogive to identify the median for the data.   (1)

2.4   Estimate the percentage of the learners who sent more than 11 messages using this application.   (2)

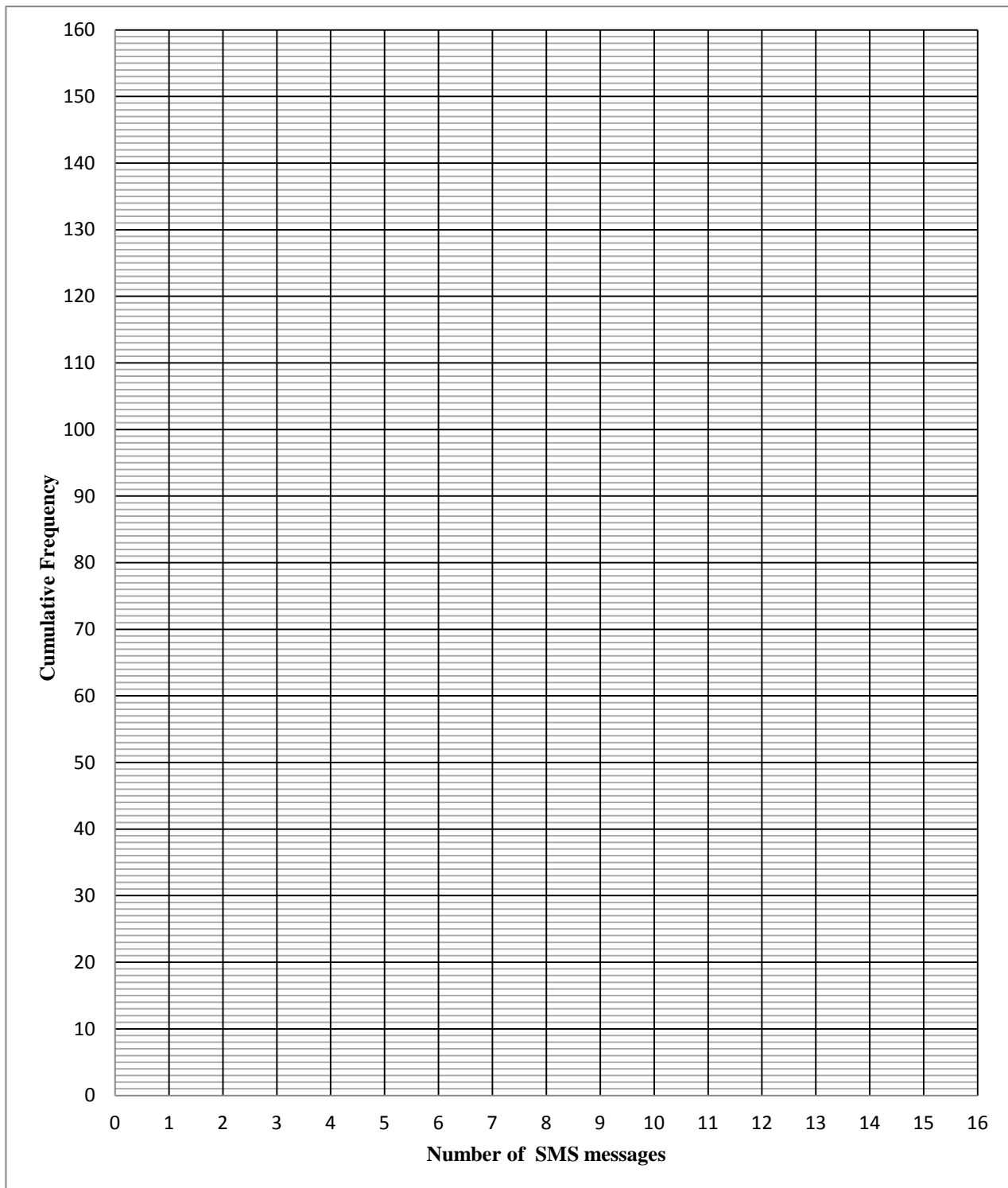2.5   In which direction is the data skewed?   (1)

[9]

JENN TRAINING: STATISTICS

QUESTION 2.1

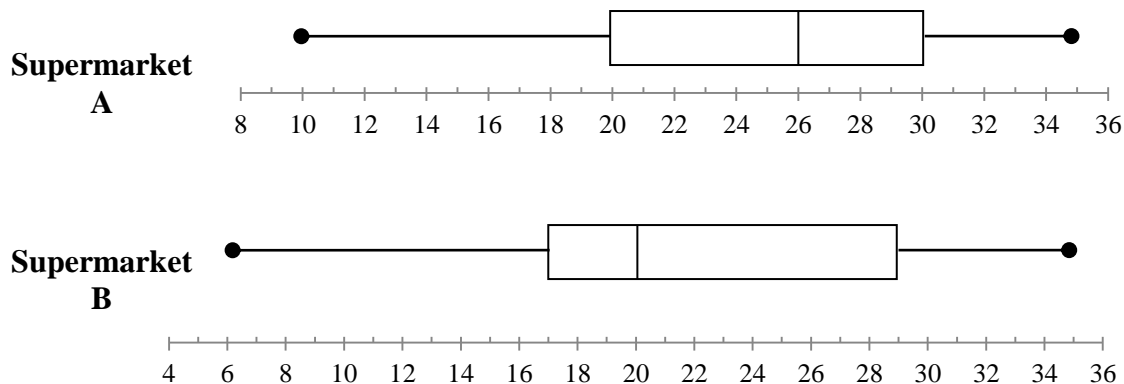| CLASS	FREQUENCY	CUMULATIVE FREQUENCY
$0 \le m < 2$		
$2 \le m < 4$		
$4 \le m < 6$		
$6 \le m < 8$		
$8 \le m < 10$		
$10 \le m < 12$		
$12 \le m < 14$		
$14 \le m < 16$		

DIAGRAM SHEET 2

QUESTION 2.2

QUESTION 3

3.1 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.
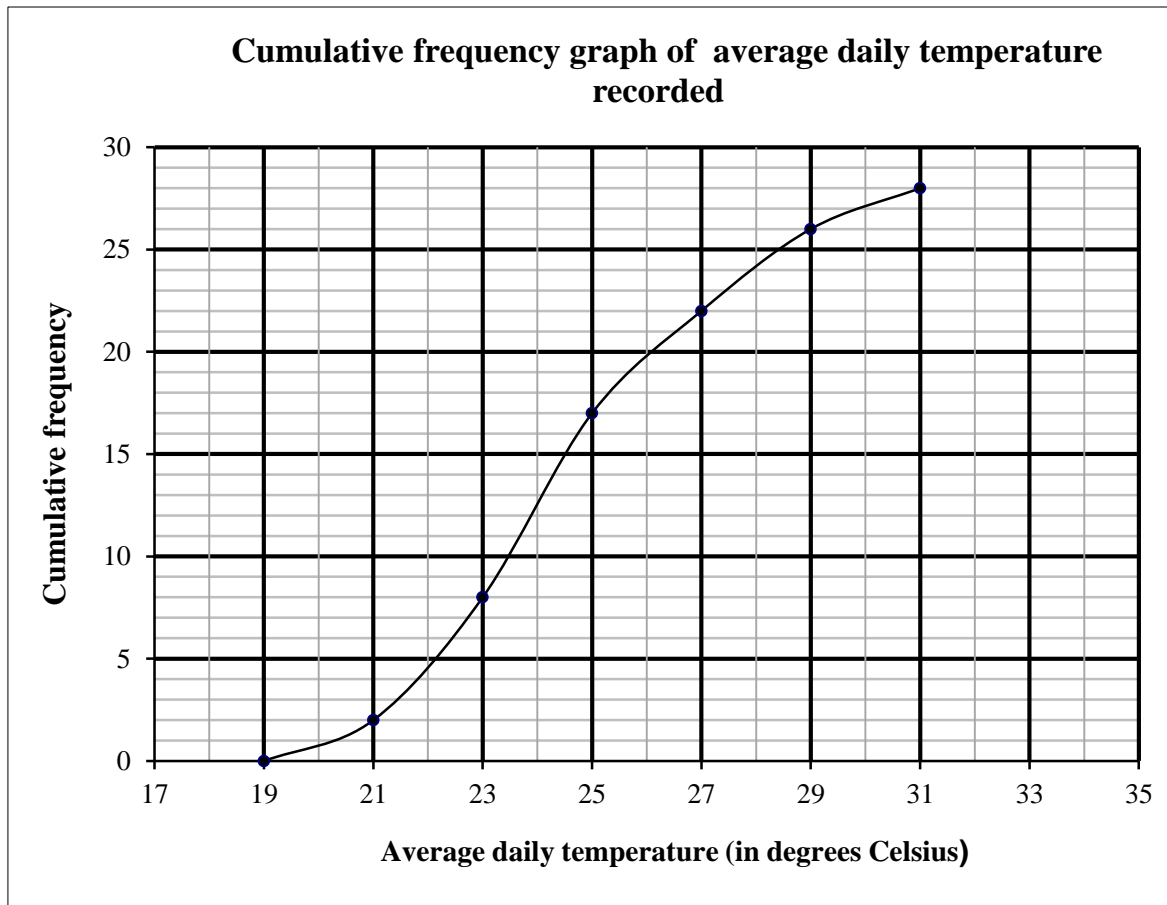
Supermarket A

| | | | | | | | | | | | | | | |
|8|10|12|14|16|18|20|22|24|26|28|30|32|34|36|

Supermarket B

| | | | | | | | | | | | | | | | |
|4|6|8|10|12|14|16|18|20|22|24|26|28|30|32|34|36|

3.1.1 Calculate the interquartile range of the data for Supermarket A.

3.1.2 Describe the skewness in the data of Supermarket A.

3.1.3 Calculate the range of the data for Supermarket B.

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

3.2 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.

QUESTION 4

The 2012 Summer Olympic Games was held in London. The average daily temperature, in degrees Celsius, was recorded for the duration of the Games. A cumulative frequency graph (ogive) of this data is shown below.
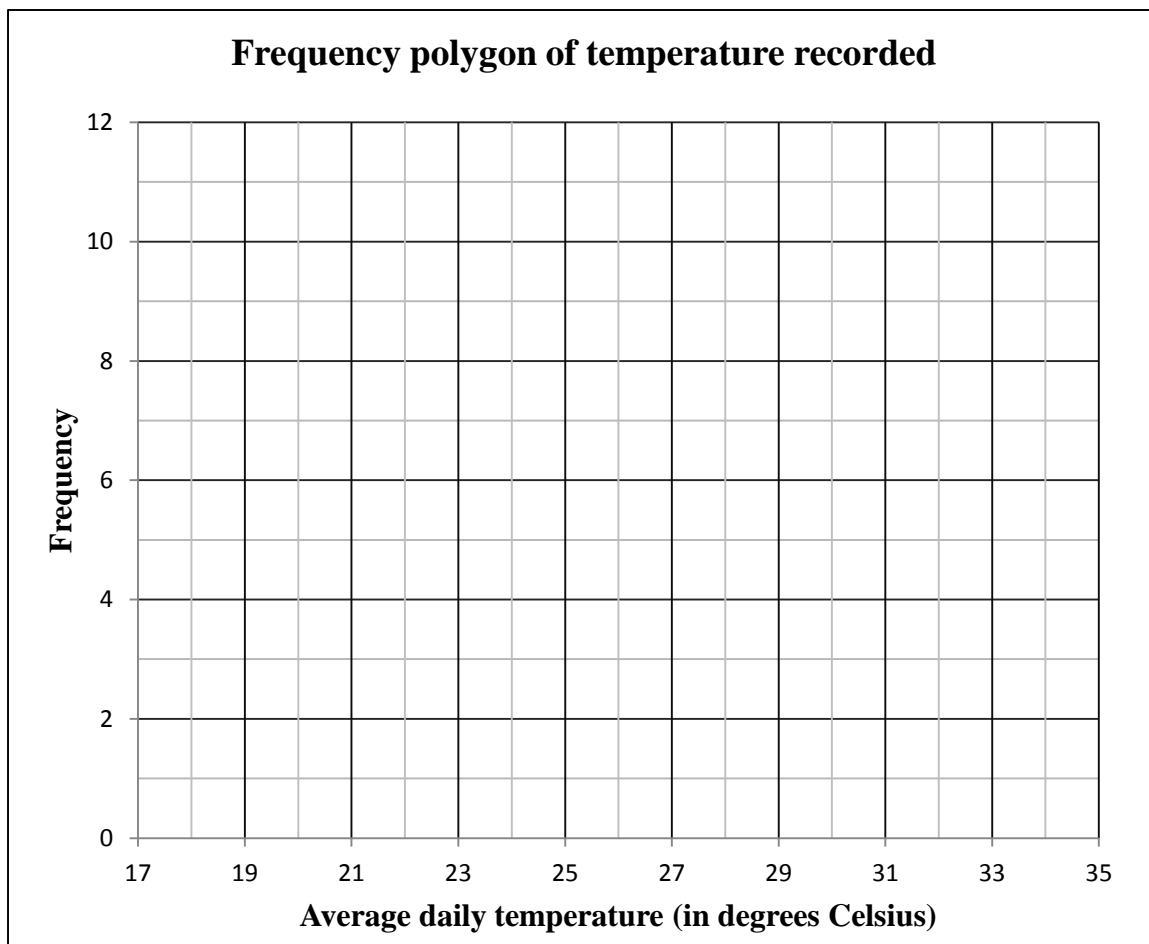

Cumulative frequency graph of average daily temperature recorded

4.1   Over how many days was the 2012 Summer Olympic Games held?

4.2   Estimate the percentage of days that the average daily temperature was less than 24 °C.

4.3   Complete the frequency table for the data in the DIAGRAM SHEET 3   .

4.4   Hence, use the grid provided in the DIAGRAM SHEET 3 to draw a frequency polygon of the data.

DIAGRAM SHEET 3

4.3

Temperature, T, in degrees Celsius	Frequency
$19 \leq T < 21$	
$21 \leq T < 23$	
$23 \leq T < 25$	
$25 \leq T < 27$	
$27 \leq T < 29$	
$29 \leq T < 31$	

4.4

Frequency polygon of temperature recorded

Frequency (y-axis, values: 0, 2, 4, 6, 8, 10, 12)

Average daily temperature (in degrees Celsius) (x-axis, values: 17, 19, 21, 23, 25, 27, 29, 31, 33, 35)

QUESTION 5

The table below shows the weight (to the nearest kilogram) of each of the 27 participants in a weight-loss programme.

56	68	69	71	71	72	82	84	85
88	89	90	92	93	94	96	97	99
102	103	127	128	134	135	137	144	156

5.1   Calculate the range of the data.

5.2   Write down the mode of the data.

5.3   Determine the median of the data.

5.4   Determine the interquartile range of the data.

5.5   Use the number line provided in the DIAGRAM SHEET 4 to draw a box and whisker diagram for the data above.

5.6   Determine the standard deviation of the data.

5.7   The person weighing 127 kg states that she weighs more than one standard deviation above the mean. Do you agree with this person? Motivate your answer with calculations.
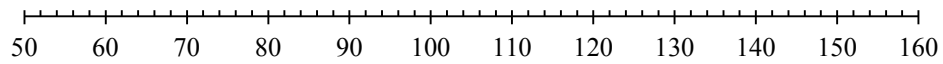
QUESTION 6

The table below shows the weight (in grams) that each of the 27 participants in the weight-loss programme lost in total over the first 4 weeks.

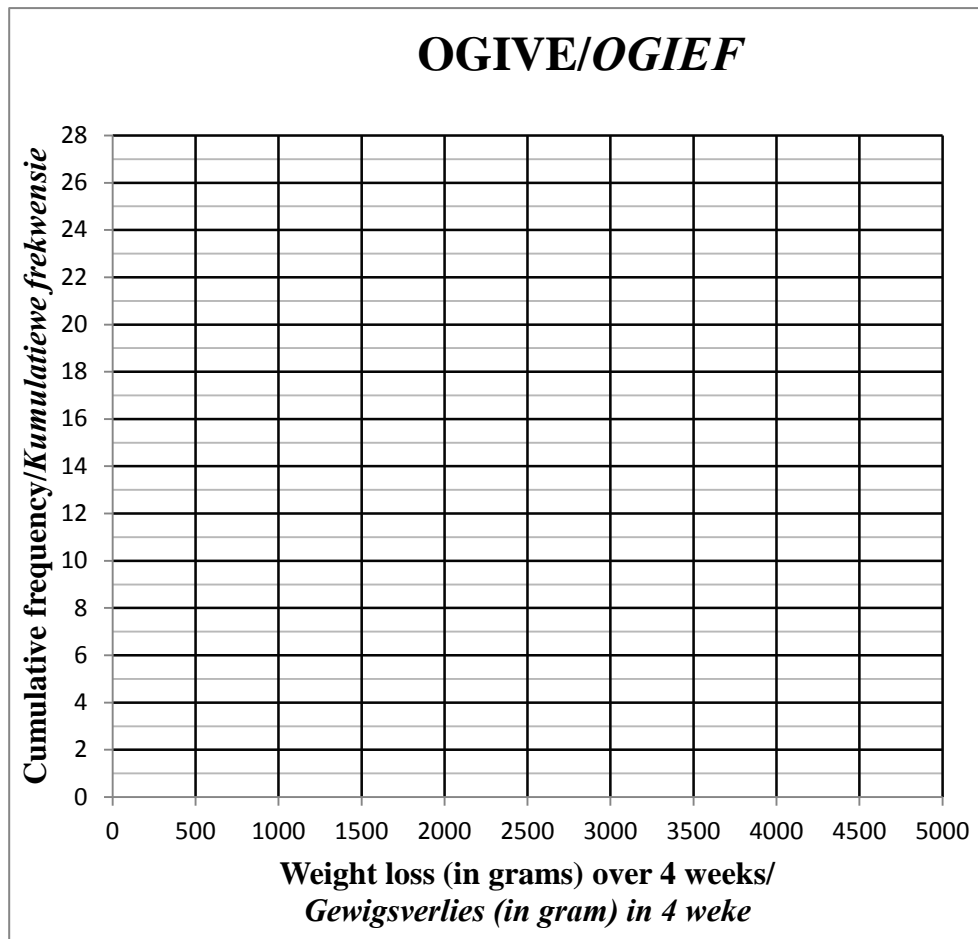| WEIGHT LOSS OVER 4 WEEKS (IN GRAMS)	FREQUENCY
$1\ 000 < x \le 1\ 500$	2
$1\ 500 < x \le 2\ 000$	3
$2\ 000 < x \le 2\ 500$	3
$2\ 500 < x \le 3\ 000$	4
$3\ 000 < x \le 3\ 500$	5
$3\ 500 < x \le 4\ 000$	7
$4\ 000 < x \le 4\ 500$	2
$4\ 500 < x \le 5\ 000$	1

6.1   Estimate the average weight loss, in grams, of the participants over the first 4 weeks.

6.2   Draw an ogive (cumulative frequency graph) of the data on the grid provided. in the DIAGRAM SHEET 4

6.3   The weight-loss programme guarantees a loss of 800 g per week if a person follows the programme without cheating. Hence, determine how many of the participants had an average weight loss of 800 g or more per week over the first 4 weeks.

DIAGRAM SHEET 4

5.5

```
├──┬──┬──┬──┬──┬──┬──┬──┬──┬──┬──┤
50   60   70   80   90  100  110  120  130  140  150  160
```

6.2

OGIVE/*OGIEF*

Cumulative frequency/*Kumulatiewe frekwensie*

28
26
24
22
20
18
16
14
12
10
8
6
4
2
0

0   500 1000 1500 2000 2500 3000 3500 4000 4500 5000

Weight loss (in grams) over 4 weeks/
Gewigsverlies (in gram) in 4 weke
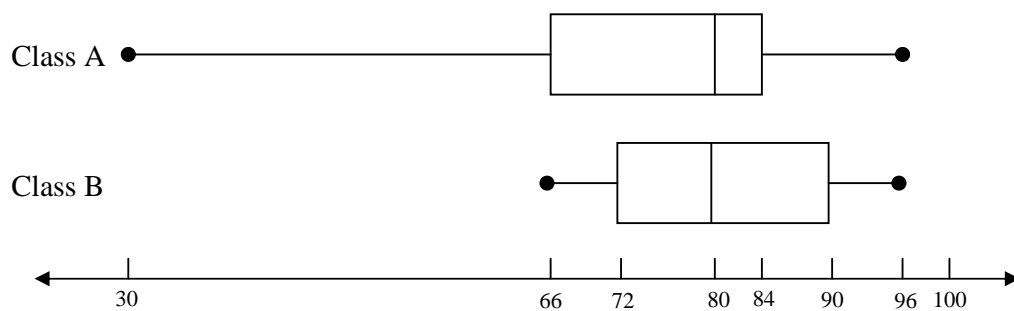
QUESTION 7

The time taken, in minutes, to complete a 5 kilometre race by a group of 10 runners is given below:

        18   21   16   24   28   20   22   29   19   23

7.1   Calculate the mean time taken to complete the race.

7.2   Calculate the standard deviation of the time taken to complete the race. (Use the formula on the information sheet.)

7.3   How many runners completed the race within one standard deviation of the mean?

QUESTION 8

The box and whisker plots below summarise the final test scores for two of Mr Jack's Mathematics classes from the same grade.

8.1   Describe the features in the scores that are the same for both classes.

8.2   Calculate the interquartile range for Class B.

8.3   Mr Jack considers the median of each class and reports that there is no significant difference in the performance between them. Is Mr Jack's conclusion valid? Support your answer with reasons.

QUESTION 9

The following set of data shows the individual travelling times, in minutes, that 20 learners took to get to school one morning.

       40   21   23   27   20   29   35   19   20   45
       18   36   17   19   39   25   27   22   21   17

9.1   Calculate the mean time it took for a learner to get to school on this particular morning.

9.2   Calculate the standard deviation of the above set of data.

9.3   The educator says that all learners took about the same time to get to school. Do you agree with the educator? Give a reason for your answer.
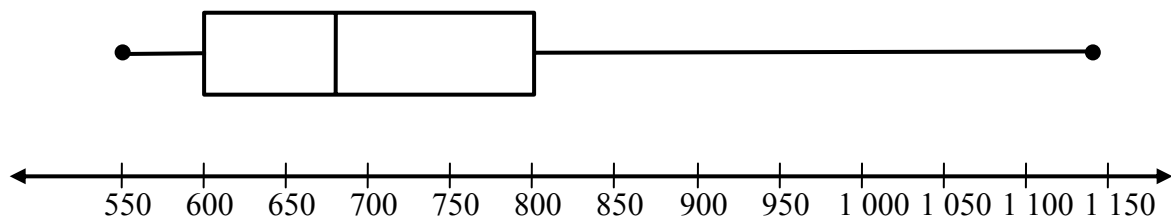
QUESTION 10

The price of 95-octane unleaded petrol in Gauteng for the period January 2007 to July 2008 is shown below. The price is in South African cents per litre.

January 2007	598	February 2007	575	March 2007	599
April 2007	667	May 2007	701	June 2007	724
July 2007	716	August 2007	701	September 2007	691
October 2007	701	November 2007	704	December 2007	747
January 2008	747	February 2008	764	March 2008	825
April 2008	891	May 2008	946	June 2008	996
July 2008	1 070				

[Source: www.sasol.com]
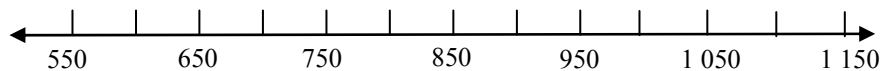
10.1   Determine the median, lower quartile and upper quartile for the data.

10.2   Draw a box and whisker diagram on THIS PAGE(BELOW).

10.3   The box and whisker diagram for the price of diesel for the same period as above is shown below. The lower quartile is 600 and the upper quartile is 800.

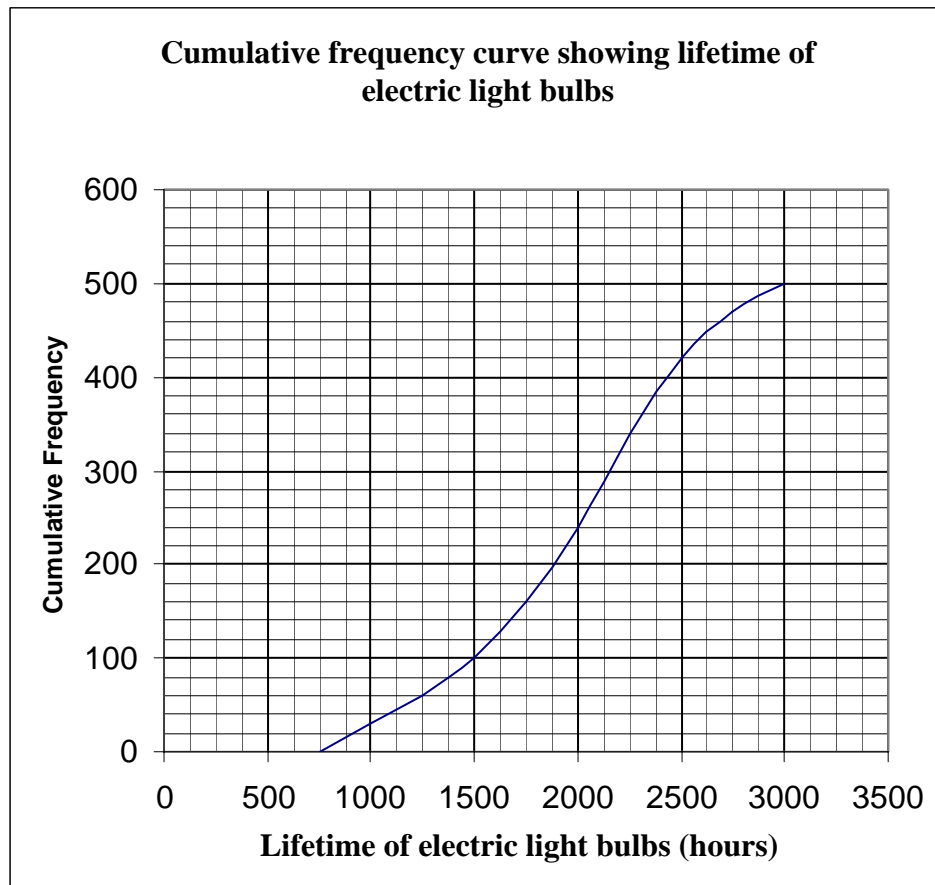How many data points are there, strictly between 600 and 800?

QUESTION 10.2

Price of Petrol

QUESTION 11

The lifetime of electric light bulbs was measured in a laboratory. The results are shown in the cumulative frequency diagram below.

Cumulative frequency curve showing lifetime of electric light bulbs

11.1   Use the above cumulative frequency curve to determine the following:

   11.1.1   How many light bulbs were tested

   11.1.2   The median lifetime of the electric light bulbs tested

   11.1.3   The interquartile range

   11.1.4   The number of electric light bulbs with a lifetime of between 1 750 and 2 000 hours

11.2   If the cost of one light bulb is R5,00, determine the amount spent on purchasing the light bulbs that lasted longer than 2 500 hours.

QUESTION 12

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

12.1   Determine the median of the given data.

12.2   Determine the interquartile range for the data.

12.3   Draw a box and whisker diagram to represent the data.

12.4   Use the box and whisker diagram to comment on the points scored by the players in this team.

QUESTION 13

The scores for 8 golfers who played a single round of golf on the same golf course are shown below.

69	71	75	74	78	70	72	71

13.1   Calculate the mean score.

13.2   Calculate the standard deviation for the data.

13.3   How many golfers' scores lie outside one standard deviation of the mean?

QUESTION 14

Abe plays for his school's cricket team. The number of runs scored by Abe in the eight games that he batted in, is shown below. (Abe was given out in all of the games.)
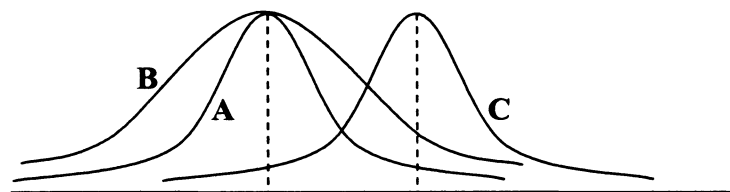
21   8   19   7   15   32   14   12

14.1   Determine the average runs scored by Abe in the eight games.

14.2   Determine the standard deviation of the data set.

14.3   Abe's scores for the first three of the next eight games were 22, 35 and 2 respectively. Describe the effect of his performance on the standard deviation of this larger set having 11 data points.

14.4   Abe hopes to score an average of 20 runs in the first 16 games. What should his average in the last five games be so that he may reach his goal?

QUESTION 15

The Grade 10 classes of three schools wrote a term test. All three schools have the same number of learners in Grade 10. The results of the tests have been summarised in the table below.

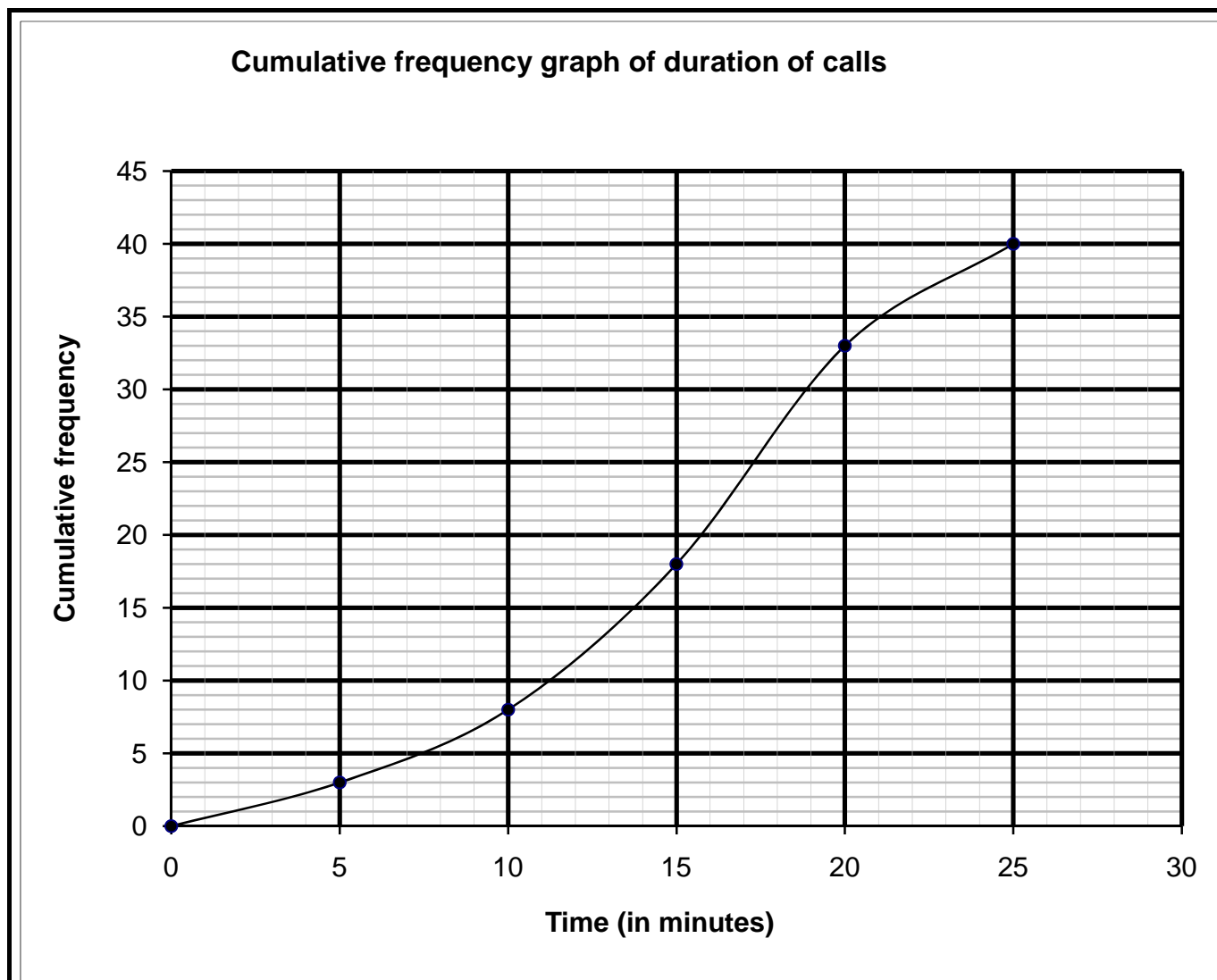|	SCHOOL A	SCHOOL B	SCHOOL C
Mean	9,8	9,8	14,8
Standard deviation	2,3	3,1	2,3

The distribution of the results is shown in the diagram below.

1. In which school (A, B or C) is the majority of the results more widely spread around the mean? Give a reason for your answer.

2. What is the difference in the spread around the respective means of the marks in School A and School C?

3. Explain how the marks of School A must be adjusted to match the marks of School C.

4. If each mark in School C is lowered by 10%, explain the effect it will have on the mean and standard deviation of this school.

QUESTION 16

The length of time, in minutes, of a certain number of telephone calls was recorded. No call lasted 25 minutes or longer. A cumulative frequency diagram of this data is shown below.

Cumulative frequency graph of duration of calls

16.1   Determine the total number of calls recorded.

16.2   Complete the frequency table for the data on DIAGRAM SHEET 5.

16.3   Hence, draw a histogram on the grid on DIAGRAM SHEET 5.

QUESTION 17

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

DIAGRAM SHEET 5

QUESTION 16.2

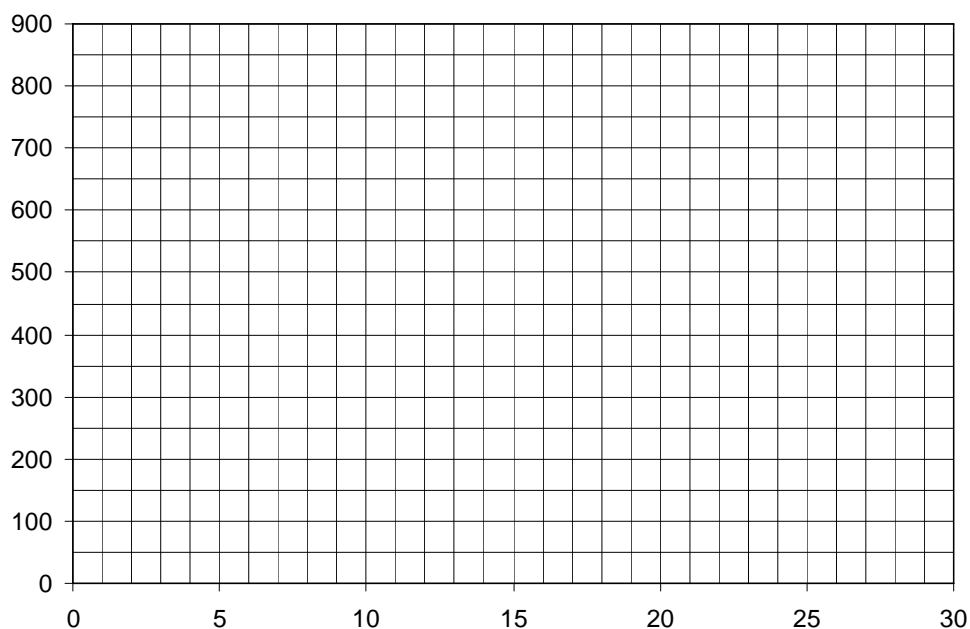| Time, t, in minutes	Frequency
$0 \le t < 5$	
$5 \le t < 10$	
$10 \le t < 15$	
$15 \le t < 20$	
$20 \le t < 25$	

QUESTION 16.3

Part 2: Grade 12

QUESTION 1

During the month of July a number of patients visited a local clinic suffering from influenza. The table below shows the cumulative number of patients treated as per the dates given.

Dates in the month of July	3	5	8	12	15	19	22	26
Number of patients treated	270	275	376	420	602	684	800	820

1.1   Draw a scatter plot of the above data.

1.2   Determine the equation of the least squares line for the data.

1.3   Draw the least squares line for the data.

1.4   Estimate how many patients were treated as at 30 June.

1.5   Estimate how many patients were treated as at 24 July.

1.6   Determine the correlation coefficient for the data. Interpret this result.

QUESTION 2

The term *latitude* refers to how far a place is from the equator. Latitude in the Northern Hemisphere range from 0° at the equator to 90° N at the north pole.
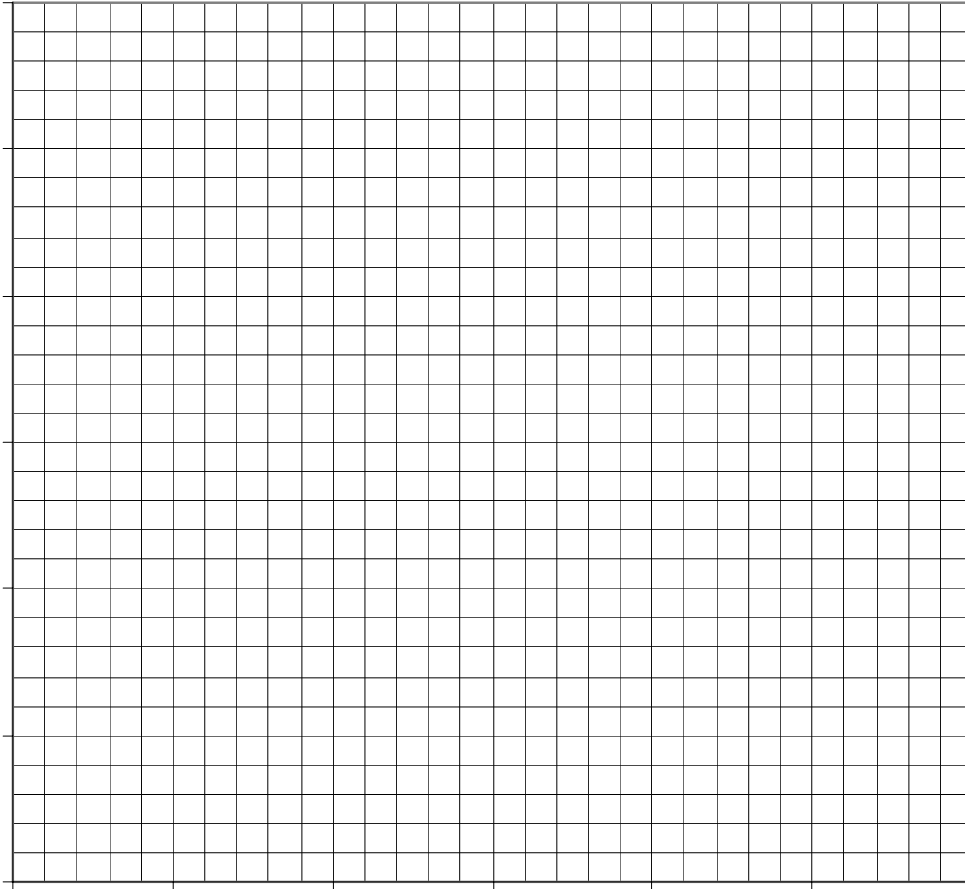
Below are the latitudes of several cities in the Northern Hemisphere together with the mean maximum temperature for April in degrees Celsius.

City	Northern Latitude	Mean maximum temperature for April
Lagos, Nigeria	6	32
London, England	52	13
Calcutta, India	23	36
Rome, Italy	42	20
Moscow, Russia	56	8
Cairo, Egypt	30	28
San Juan, Puerto Rico	18	29
Copenhagen, Denmark	56	10
Tokyo, Japan	35	17

2.1   Draw a scatter plot for the above information on DIAGRAM SHEET 6.

2.2   Determine the equation of the least squares regression line.

2.3   Draw the least squares regression line on your scatter plot, on DIAGRAM SHEET 6.

2.4   What information does the *y*-intercept of this line represent?

2.5   The city of Madrid has a latitude of 40°N. Determine the mean maximum temperature for April for this city.

2.6   Calculate the correlation coefficient of the data.

2.7   Explain the correlation between latitude and the mean maximum temperature for April.

QUESTION 2.1 AND 2.3

QUESTION 3

The outdoor temperature, in °C, at noon on ten days and the number of units of electricity used to heat a house on each of those days, are shown in the table below.

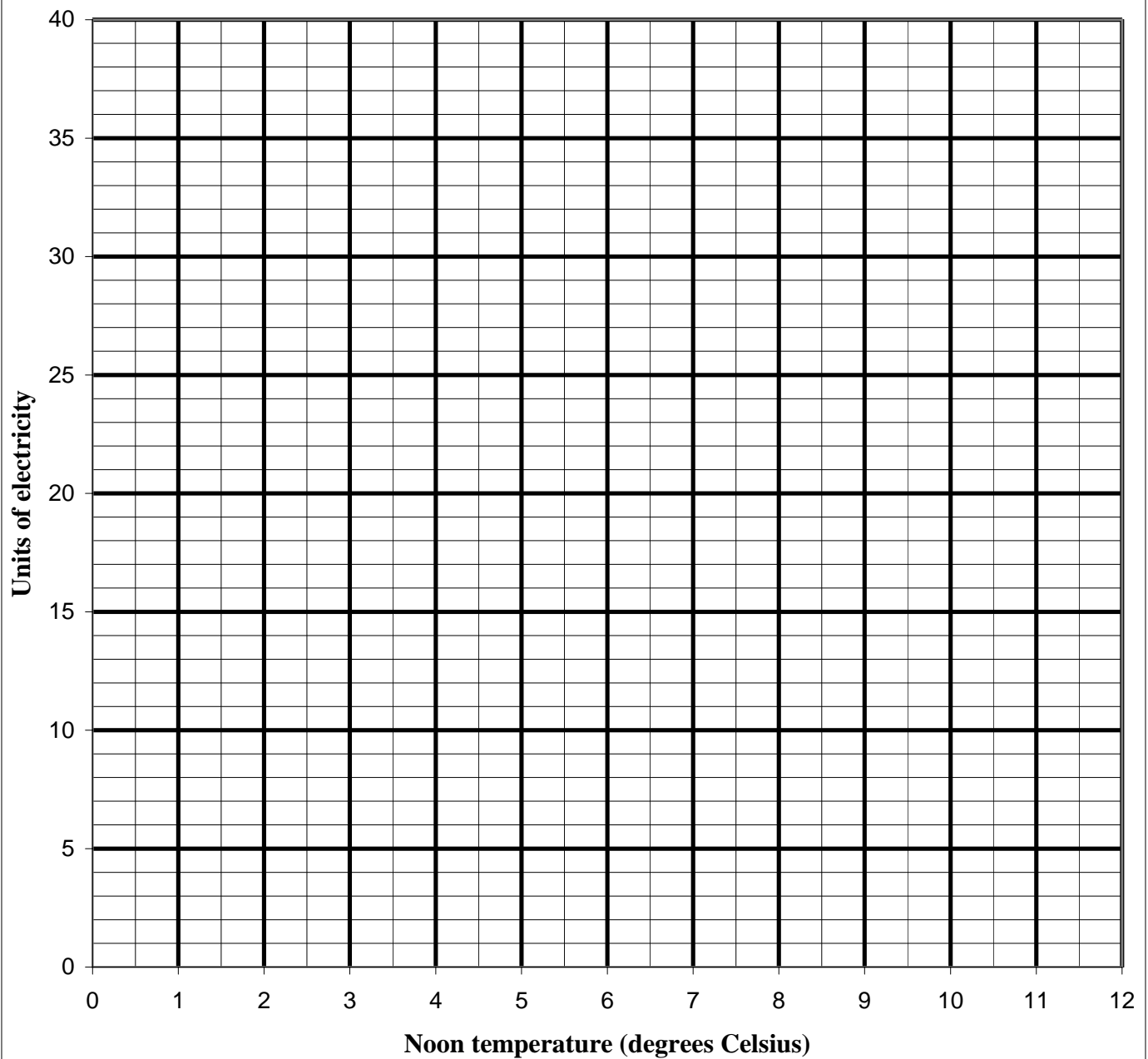| Noon temperature (in °C)	7	11	9	2	4	7	0	10	5	3
Units of electricity used	32	20	27	37	32	28	41	23	33	36

3.1   Draw a scatter graph that shows this information on the grid provided on DIAGRAM SHEET 6a.

3.2   Determine the equation of the least squares regression line.

3.3   Determine the correlation coefficient.

3.4   What can we conclude about the relationship between the noon temperature and the number of units of electricity used for heating?

3.5   Estimate the number of units of electricity that was used to heat a house on a day when the outdoor temperature at noon was 8 °C.

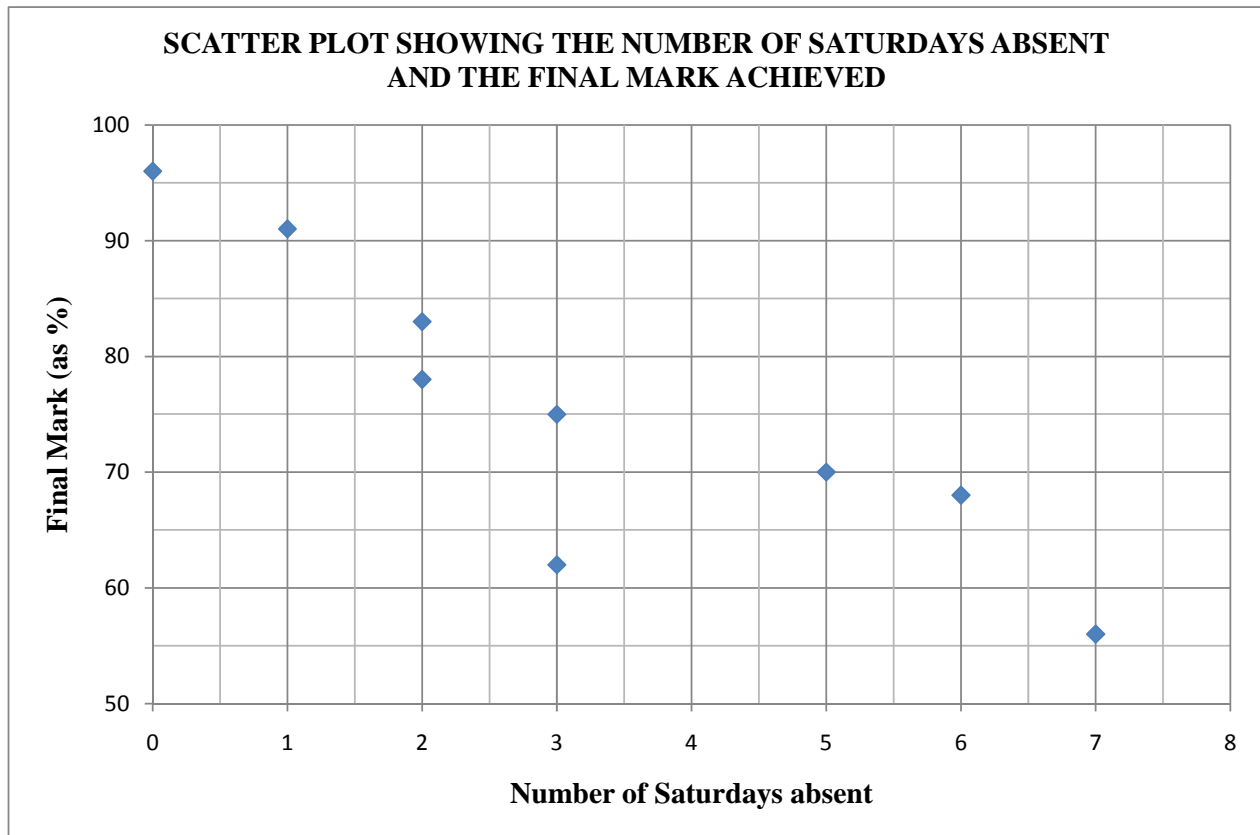# DIAGRAM SHEET 6a

QUESTION 3.1

Scatter plot showing noon temperature vs electricity consumption

QUESTION 4

A group of students attended a course in Statistics on Saturdays over a period of 10 months. The number of Saturdays on which a student was absent was recorded against the final mark the student obtained. The information is shown in the table below and the scatter plot is drawn for the data.
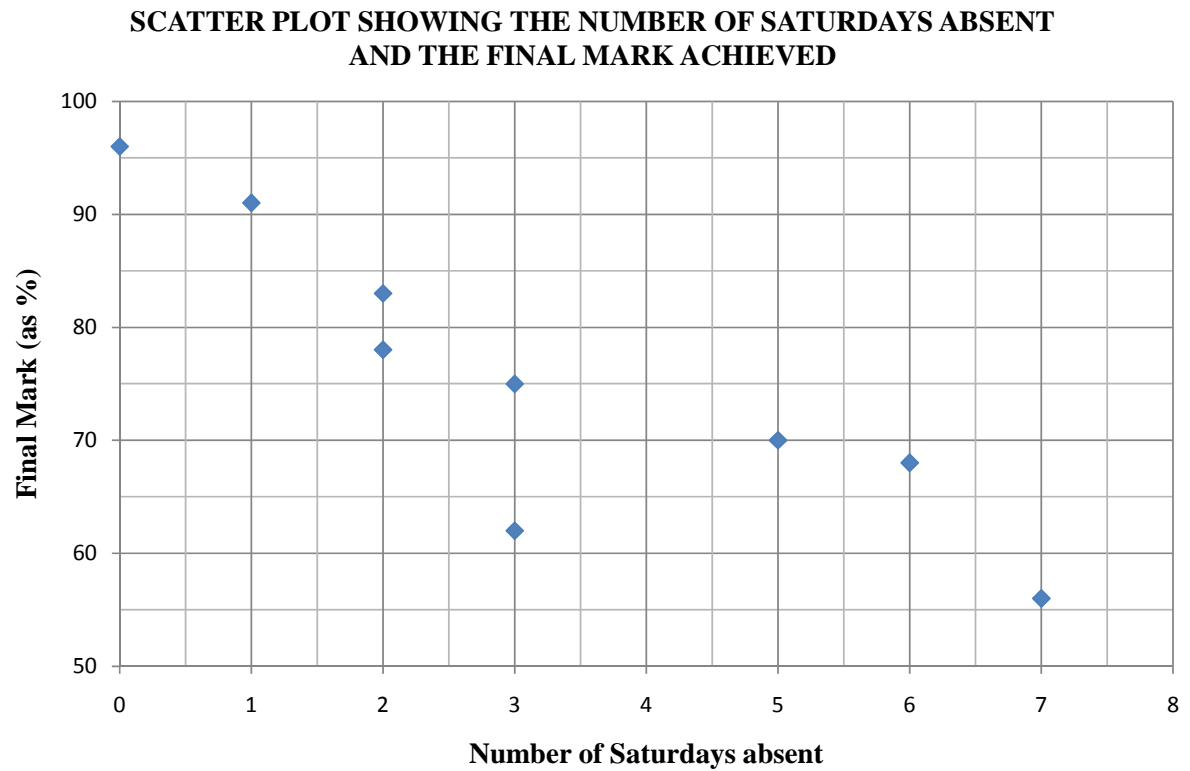
Number of Saturdays absent	0	1	2	2	3	3	5	6	7
Final mark (as %)	96	91	78	83	75	62	70	68	56

SCATTER PLOT SHOWING THE NUMBER OF SATURDAYS ABSENT AND THE FINAL MARK ACHIEVED

4.1   Calculate the equation of the least squares regression line.

4.2   Draw the least squares regression line on the grid provided on DIAGRAM SHEET 7.

4.3   Calculate the correlation coefficient.

4.4   Comment on the trend of the data.

4.5   Predict the final mark of a student who was absent for four Saturdays.

DIAGRAM SHEET 7

QUESTION 4.2

**SCATTER PLOT SHOWING THE NUMBER OF SATURDAYS ABSENT
AND THE FINAL MARK ACHIEVED**

Part 3: More Exercise

QUESTION 1

The table below shows the total fat (in grams, rounded off to the nearest whole number) and energy (in kilojoules, rounded off to the nearest 100) of 10 items that are sold at a fast-food restaurant.

Fat (in grams)	9	14	25	8	12	31	28	14	29	20
Energy (in kilojoules)	1 100	1 300	2 100	300	1 200	2 400	2 200	1 400	2 600	1 600

1.1 Represent the information above in a scatter plot on the grid provided in the ANSWER BOOK. (3)

1.2 The equation of the least squares regression line is $\hat{y} = 154{,}60 + 77{,}13x$.

    1.2.1 An item at the restaurant contains 18 grams of fat. Calculate the number of kilojoules of energy that this item will provide. Give your answer rounded off to the nearest 100 kJ. (2)

    1.2.2 Draw the least squares regression line on the scatter plot drawn for QUESTION 1.1. (2)

1.3 Identify an outlier in the data set. (1)

1.4 Calculate the value of the correlation coefficient. (2)

1.5 Comment on the strength of the relationship between the fat content and the number of kilojoules of energy. (1)
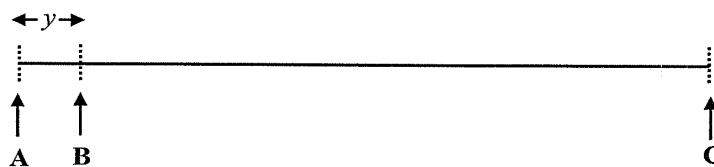
[11]

QUESTION 1

The distances (in cm) of the best attempts of 11 long jump athletes during an athletics event are given below:

$$287 \qquad 328 \qquad 374 \qquad 486 \qquad 492 \qquad 501$$

$$522 \qquad 583 \qquad 601 \qquad 619 \qquad 685$$

1.1	Calculate the mean distance of the athletes' best attempts.	(2)
1.2	Calculate the standard deviation of the above data.	(2)
1.3	Determine how many distances lie outside ONE standard deviation from the mean attempt. Show ALL your calculations.	(3)
1.4	The official that measured the distances of the long jump athletes, mistakenly measured y cm short from the correct measuring mark. Hence all distances measured were y cm shorter than what it was supposed to be.	

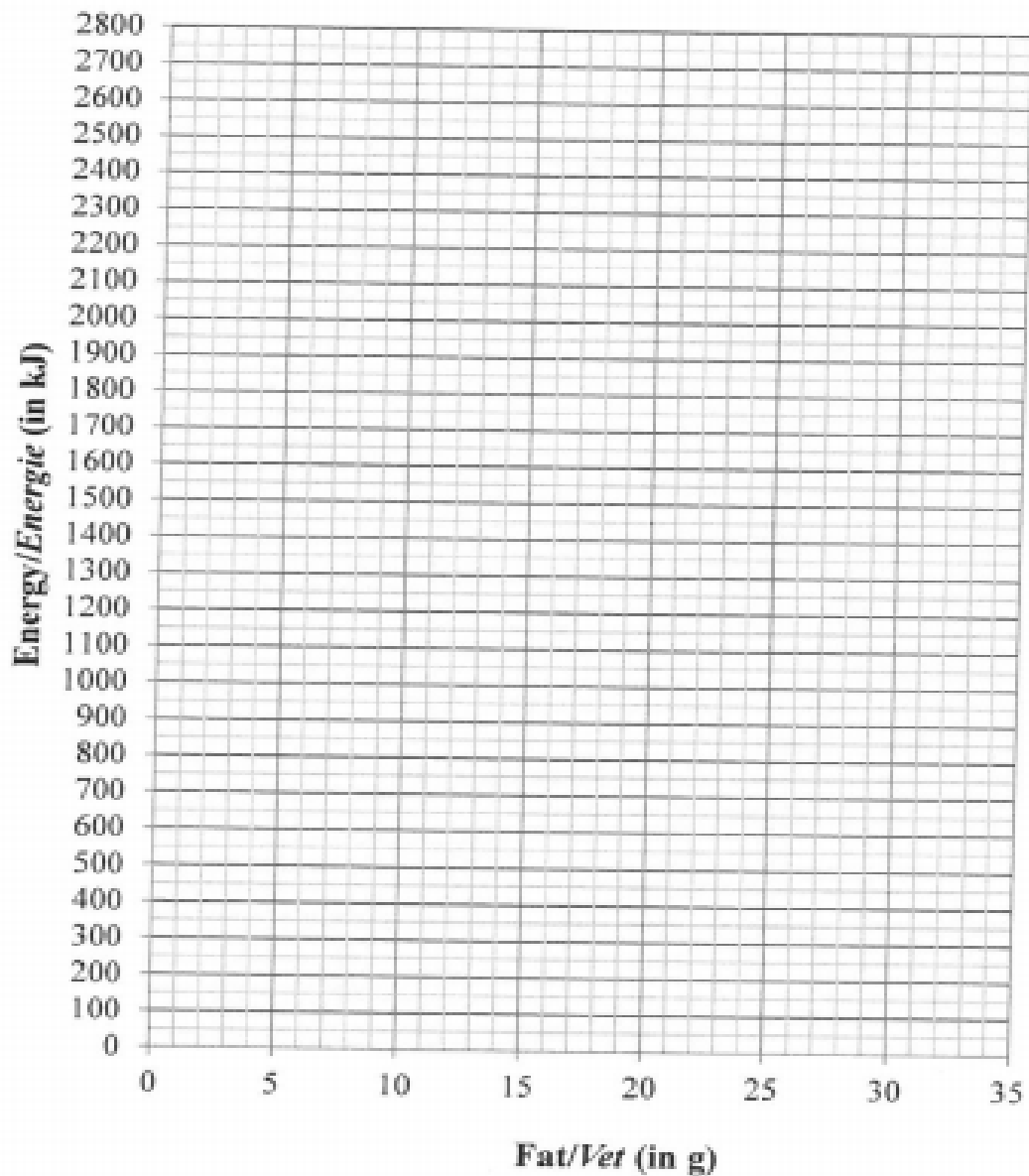This scenario is shown in the diagram below.

- A = The correct mark from where the distance should have been measured.

- B = The incorrect mark from where the distances were measured.

- C = The mark up to where the distance was measured.

When the correction is made to the distances, the sum of the athletes' best jumps is now 5555 cm, i.e. $\displaystyle\sum_{n=1}^{11} k_n = 5555$.

1.4.1	Calculate the value of y.	(2)
1.4.2	Write down the standard deviation of the new correct distances.	(2)
		[11]

Scatter plot/*Spreidiagram*

QUESTION 2

The goal-scorers in a netball game practice scoring at training during the week. In the tournament during the weekend, the number of goals they score from the total number of attempts they made, is recorded as a percentage. This statistic is referred to as the successful goal-shoot average.

The table below shows the number of goal shots practiced during the week and the successful goal-shoot average during the tournament for 8 goal-scorers.

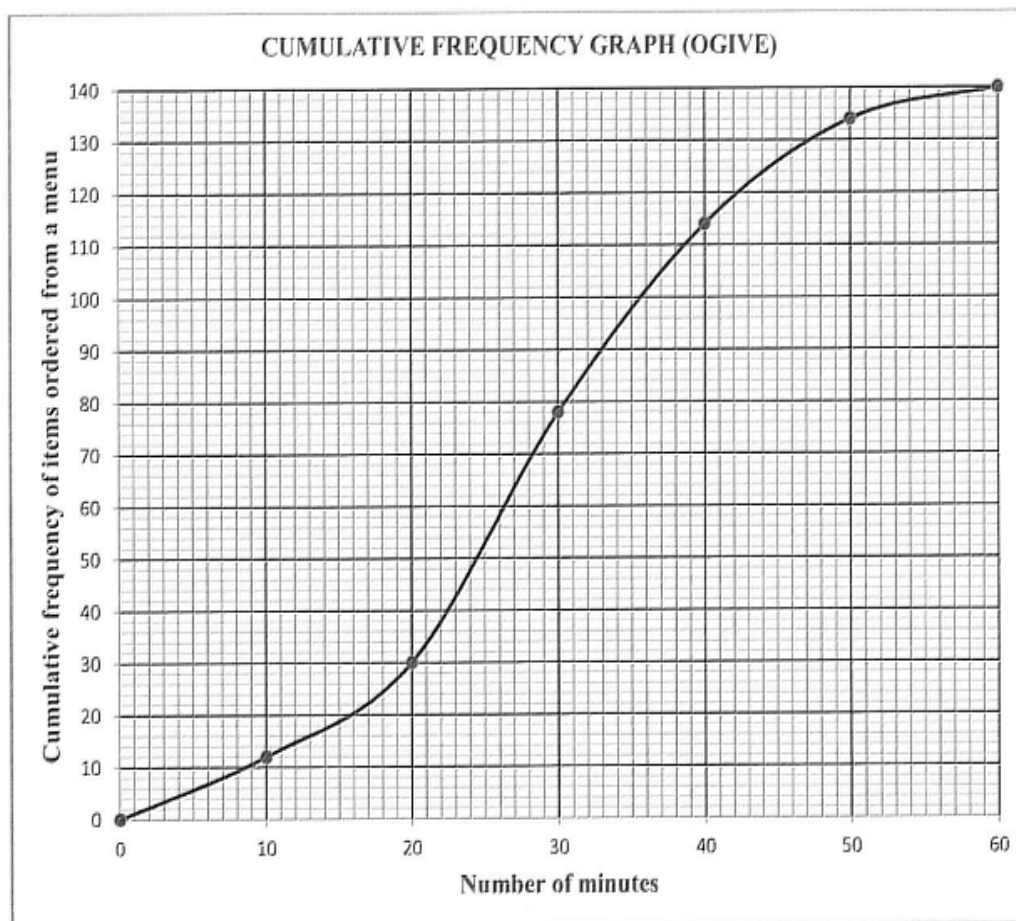| Number of goal shots practiced	280	400	540	595	375	430	500	650
Successful goal shoot average (%)	73	75	83	89	80	76	82	91

2.1   Determine the equation of the least squares regression line.   (3)

2.2   Calculate the correlation coefficient for the data.   (2)

2.3   Comment on the correlation between the number of goal shots practiced and the successful goal-shoot average.   (2)

2.4   A player practiced 465 goal shots. What is her expected successful goal-shoot average for the next tournament?   (2)
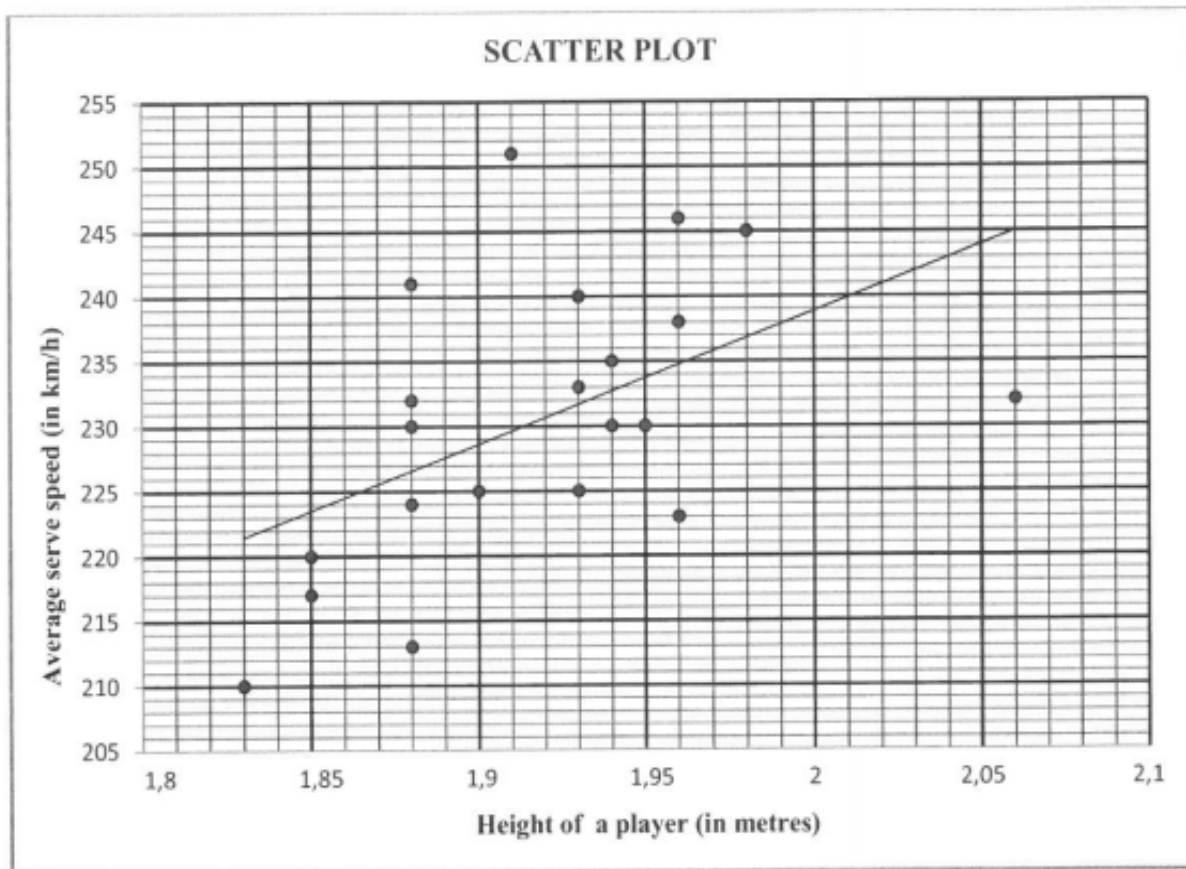
[9]

QUESTION 1

1.1   The cumulative frequency graph (ogive) drawn below shows the total number of
        food items ordered from a menu over a period of 1 hour.

CUMULATIVE FREQUENCY GRAPH (OGIVE)

1.1.1	Write down the total number of food items ordered from the menu during this hour.	(1)
1.1.2	Write down the modal class of the data.	(1)
1.1.3	How long did it take to order the first 30 food items?	(1)
1.1.4	How many food items were ordered in the last 15 minutes?	(2)
1.1.5	Determine the 75th percentile for the data.	(2)
1.1.6	Calculate the interquartile range of the data.	(2)

QUESTION 2

A familiar question among professional tennis players is whether the speed of a tennis serve (in km/h) depends on the height of a player (in metres). The heights of 21 tennis players and the average speed of their serves were recorded during a tournament. The data is represented in the scatter plot below. The least squares regression line is also drawn.

SCATTER PLOT

2.1   Write down the fastest average serve speed (in km/h) achieved in this tournament.   (1)

2.2   Consider the following correlation coefficients:

         A. $r = 0,93$ B. $r = -0,42$ C. $r = 0,52$

         2.2.1   Which ONE of the given correlation coefficients best fits the plotted data?   (1)

         2.2.2   Use the scatter plot and least squares regression line to motivate your answer to QUESTION 2.2.1.   (1)

2.3   What does the data suggest about the speed of a tennis serve (in km/h) and the height of a player (in metres)?   (1)

2.4   The equation of the regression line is given as $\hat{y} = 27,07 + bx$.
          Explain why, in this context, the least squares regression line CANNOT intersect the y-axis at $(0 ; 27,07)$.   (1)
                                                                    [5]

QUESTION 1

The table below shows the monthly income (in rands) of 6 different people and the amount (in rands) that each person spends on the monthly repayment of a motor vehicle.

MONTHLY INCOME (IN RANDS)	9 000	13 500	15 000	16 500	17 000	20 000
MONTHLY REPAYMENT (IN RANDS)	2 000	3 000	3 500	5 200	5 500	6 000

1.1   Determine the equation of the least squares regression line for the data.   (3)

1.2   If a person earns R14 000 per month, predict the monthly repayment that the person could make towards a motor vehicle.   (2)

1.3   Determine the correlation coefficient between the monthly income and the monthly repayment of a motor vehicle.   (1)

1.4   A person who earns R18 000 per month has to decide whether to spend R9 000 as a monthly repayment of a motor vehicle, or not. If the above information is a true representation of the population data, which of the following would the person most likely decide on:

    A   Spend R9 000 per month because there is a very strong positive correlation between the amount earned and the monthly repayment.

    B   NOT to spend R9 000 per month because there is a very weak positive correlation between the amount earned and the monthly repayment.

    C   Spend R9 000 per month because the point (18 000 ; 9 000) lies very near to the least squares regression line.

    D   NOT to spend R9 000 per month because the point (18 000 ; 9 000) lies very far from the least squares regression line.   (2)
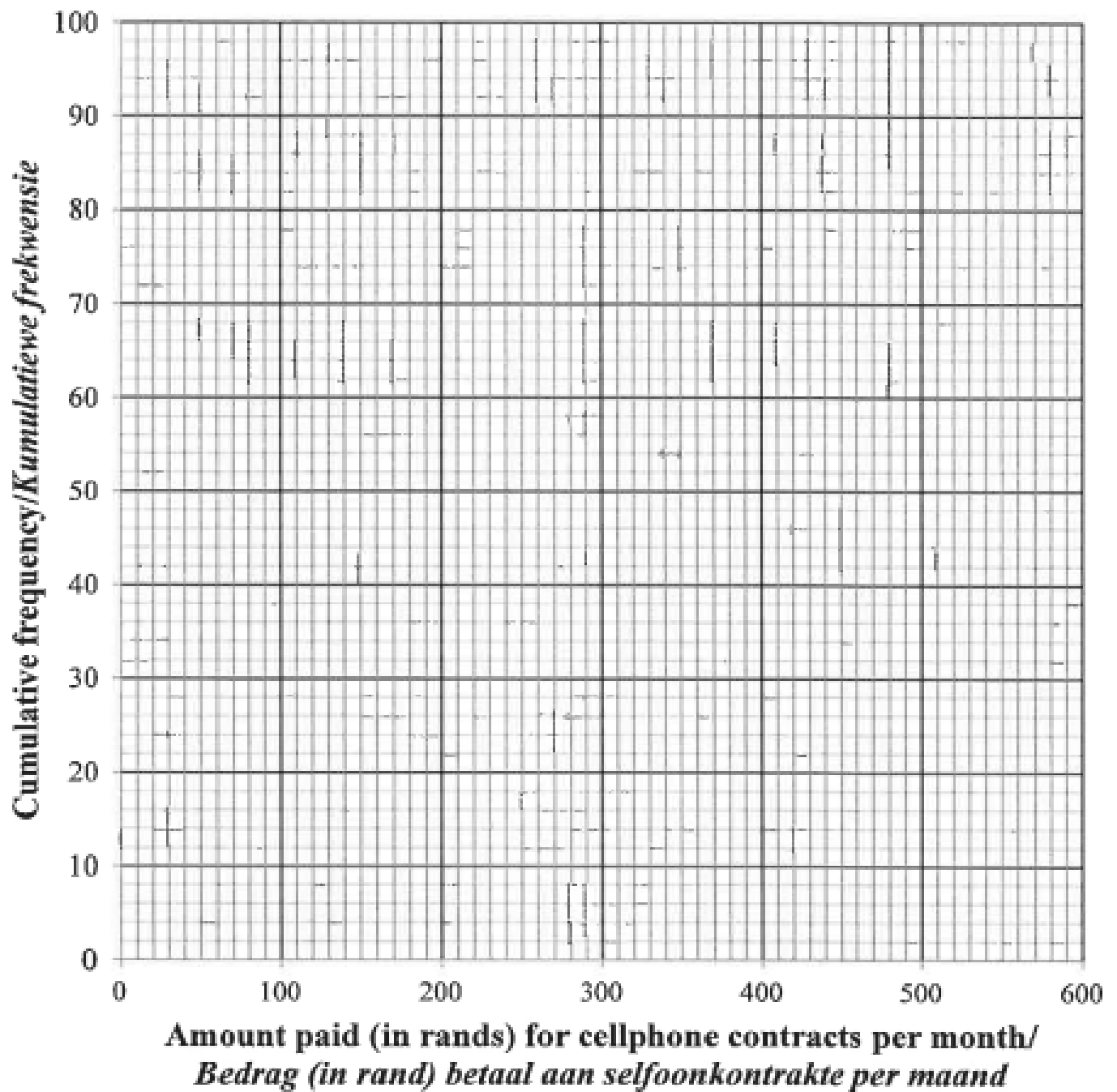
                        [8]

QUESTION 2

A survey was conducted among 100 people about the amount that they paid on a monthly basis for their cellphone contracts. The person carrying out the survey calculated the estimated mean to be R309 per month. Unfortunately, he lost some of the data thereafter. The partial results of the survey are shown in the frequency table below:

AMOUNT PAID (IN RANDS)	FREQUENCY
$0 < x \leq 100$	7
$100 < x \leq 200$	12
$200 < x \leq 300$	a
$300 < x \leq 400$	35
$400 < x \leq 500$	b
$500 < x \leq 600$	6

2.1	How many people paid R200 or less on their monthly cellphone contracts?	(1)
2.2	Use the information above to show that $a = 24$ and $b = 16$.	(5)
2.3	Write down the modal class for the data.	(1)
2.4	On the grid provided in the ANSWER BOOK, draw an ogive (cumulative frequency graph) to represent the data.	(4)
2.5	Determine how many people paid more than R420 per month for their cellphone contracts.	(2)
		[13]

OGIVE/*OGIEF*

Amount paid (in rands) for cellphone contracts per month/
Bedrag (in rand) betaal aan selfoonkontrakte per maand

QUESTION 1

The table below shows the mass (in kg) of the school bags of 80 learners.

MASS (in kg)	FREQUENCY
$5 < m \leq 7$	6
$7 < m \leq 9$	18
$9 < m \leq 11$	21
$11 < m \leq 13$	19
$13 < m \leq 15$	11
$15 < m \leq 17$	4
$17 < m \leq 19$	1

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

1.2 Complete the cumulative frequency column in the table in the ANSWER BOOK. (2)

1.3 Draw a cumulative frequency graph (ogive) for the given data on the grid provided in the ANSWER BOOK. (3)

1.4 Use the graph to determine the median mass for this data. (2)

1.5 The international guideline for the mass of a school bag is that it should not exceed 10% of a learner's body mass.

    1.5.1 Calculate the estimated mean mass of the school bags. (2)

    1.5.2 The mean mass of this group of learners was found to be 80 kg. On average, are these school bags satisfying the international guideline with regard to mass? Motivate your answer. (2)
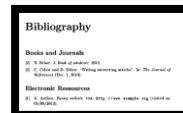
[12]

QUESTION 1

The monthly profit (in thousands of rands) made by a company in a year is given in the table below

110	112	156	164	167	169
171	176	192	228	278	360

1 1   Calculate the:

    1.1.1   Mean profit for the year   (3)

    1.1.2   Median profit for the year   (1)

1.2   On the number line provided in the ANSWER BOOK, draw a box and whisker diagram to represent the data.   (2)

1.3   Hence, determine the interquartile range of the data.   (1)

1.4   Comment on the skewness in the distribution of the data.   (1)

1.5   For the given data:

    1.5.1   Calculate the standard deviation   (1)

    1.5.2   Determine the number of months in which the profit was less than one standard deviation below the mean   (2)

[11]

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