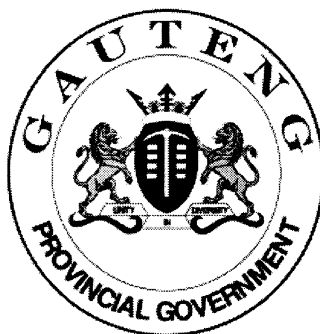


SENIOR CERTIFICATE EXAMINATION



FEBRUARY / MARCH
2007

**FUNCTIONAL
MATHEMATICS**

Second Paper : Geometry

SG

303-2/2 E

FUNCTIONAL MATHEMATICS SG: Paper 2



18 pages

X05



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GAUTENG DEPARTMENT OF EDUCATION
SENIOR CERTIFICATE EXAMINATION

FUNCTIONAL MATHEMATICS SG
(Second Paper: Geometry)

TIME: 3 hours

MARKS: 150

INSTRUCTIONS:

- Sections A and B are **COMPULSORY**.
 - Answer any **TWO** of the following Sections: C, D, E or F.
 - Non-programmable calculators may be used. If the question does not specify, then the final answer must be rounded off to **TWO** decimal digits.
 - All appropriate calculations must be shown.
 - No answers may be determined by construction and measurement.
 - A formula sheet **and** graph paper have been provided.
-
-

SECTION A
CO-ORDINATE GEOMETRY
COMPULSORY

QUESTION 1

1.1 A(1 ; 3), B(2 ; -1) and C(4 ; -2) are points on the Cartesian Plane.

Calculate

- 1.1.1 the midpoint of BC. (3)
- 1.1.2 the gradient of line BC. (3)
- 1.1.3 the equation of line BC. (4)
- 1.1.4 the length of AB. Leave your answer in surd form. (4)

1.2 Given: A straight line with equation $2y - 3x = 1$.

1.2.1 Calculate the x - and y - intercepts of $2y - 3x = 1$. (4)

1.2.2 Write $2y - 3x = 1$ in the form $y = mx + c$. (2)

1.2.3 Write down the gradient of the straight line. (1)

1.2.4 What will the gradient be of any other line **parallel** to $2y - 3x = 1$? (1)

1.2.5 Determine the equation of the straight line passing through the origin and perpendicular to $2y - 3x = 1$. (5)
[27]

QUESTION 2

2.1 Determine if points D (-2 ; 1), E (1 ; 4) and G (2 ; 5) are on the same straight line (collinear). (4)

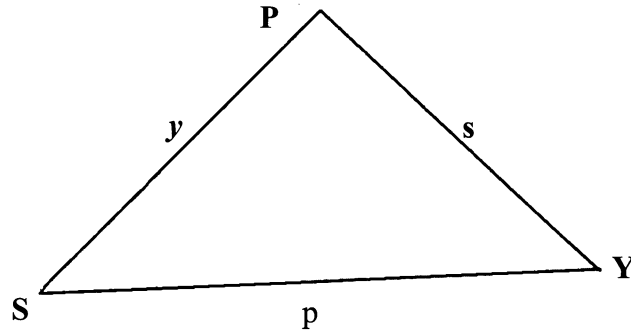
2.2 Determine the coordinates of the point(s) of intersection of the circle $x^2 + y^2 = 32$ and the straight line $y + x = 8$. (7)
[11]

TOTAL FOR SECTION A: [38]

SECTION B
TRIGONOMETRY
COMPULSORY

QUESTION 3

3.1



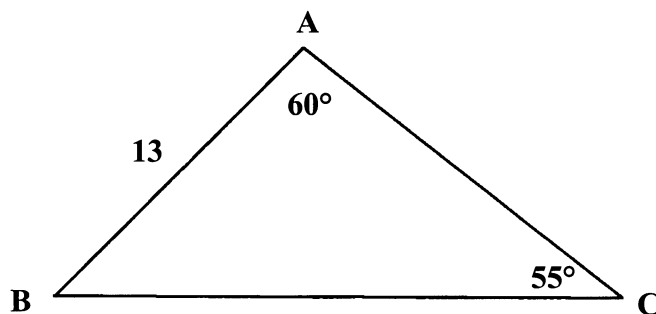
Use the figure and complete the following:

3.1.1 $\frac{s}{\sin P} = \frac{\dots\dots}{\sin P}$ (2)

3.1.2 $y^2 = \dots\dots + \dots\dots - 2 \dots\dots \cos \dots\dots$ (2)

3.1.3 Area of $\Delta PSY = \frac{1}{2} \dots\dots \sin S$ (2)

3.2 In the figure below, $AB = 13$ m, $\hat{C} = 55^\circ$ and $\hat{A} = 60^\circ$.



3.2.1 Calculate the length of BC, rounded off to one decimal digit. (4)

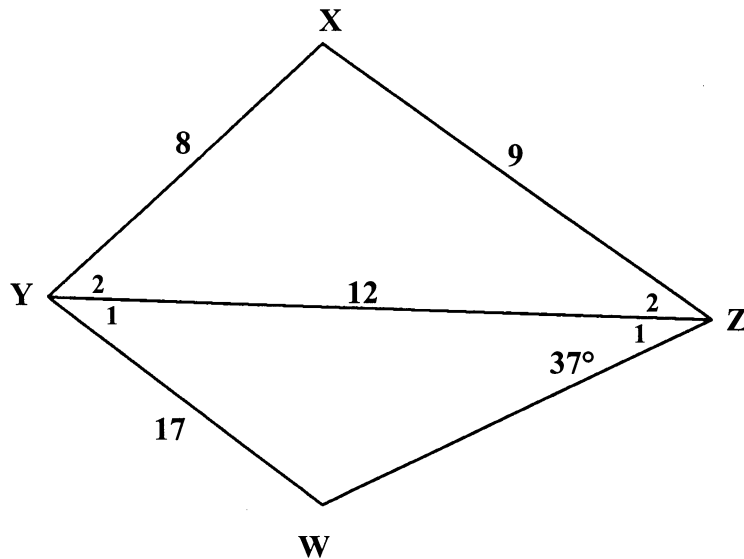
3.2.2 Calculate the size of \hat{B} . (1)

3.2.3 Calculate the area of ΔABC , rounded off to the nearest m^2 , if $BC = 13,7$ m. (3)

[14]

QUESTION 4

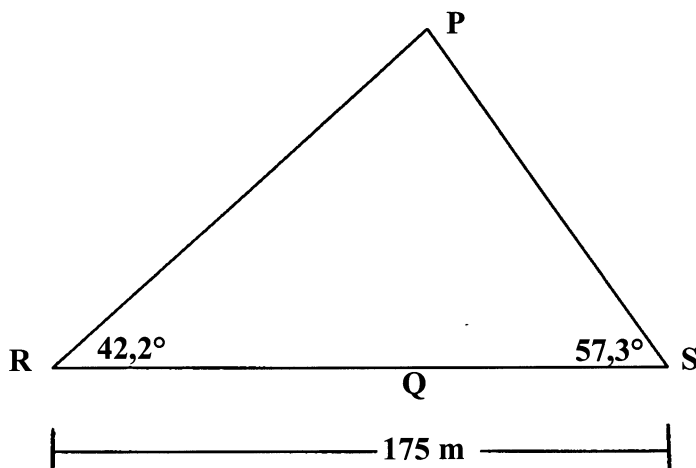
In the quadrilateral $XYWZ$, $XY = 8$ m, $XZ = 9$ m, $YZ = 12$ m, $YW = 17$ m and $\hat{Z}_1 = 37^\circ$.



- 4.1 Determine the size of \hat{X} , rounded off to one decimal digit. (5)
- 4.2 Determine the size of \hat{W} , rounded of to one decimal digit. (5)
- [10]

QUESTION 5

R and S are two points on opposite sides of a tower PQ and in a straight line with Q, the foot of the tower. $RS = 175$ m. From R and S the angles of elevation to P are $42,2^\circ$ and $57,3^\circ$ respectively.



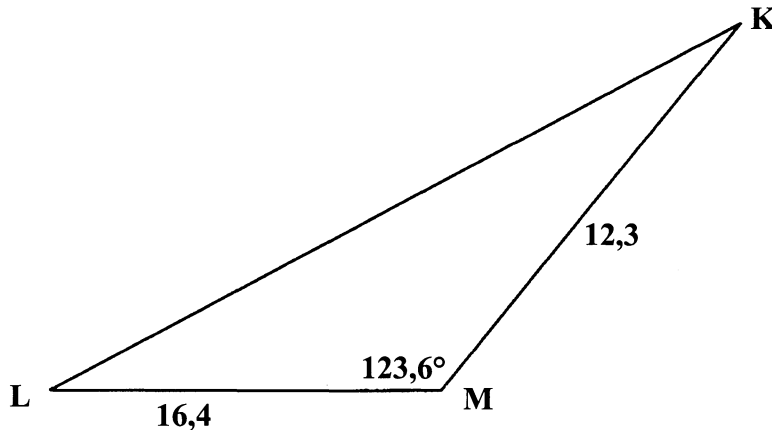
- 5.1 Calculate the size of \hat{SPR} . (1)
- 5.2 Calculate the length of PR, rounded off to two decimal digits. (4)

- 5.3 If $PR = 149,3$ m, calculate the height of tower PQ, rounded off to the nearest metre.

(4)
[9]

QUESTION 6

In the figure below $KM = 12,3$ m, $LM = 16,4$ m and $\hat{M} = 123,6^\circ$.



Determine the length of KL, rounded off to two decimal digits.

[5]

TOTAL FOR SECTION B:

[38]

SECTION C
CONSUMER MATHEMATICS
OPTIONAL

QUESTION 7

You receive an amount of R34 500 and decide to invest the amount at 12,3% interest. The bank uses simple interest.

- 7.1 Complete the table using the formula $I = \frac{krt}{100}$.

Time	1	2	3	4	5
Interest	4 244				

(4)

- 7.2 Represent the table graphically on the graph paper provided.

(4)

7.3 Use the graph to answer the following questions:

7.3.1 Determine the interest earned after 54 months. (2)

7.3.2 Determine the total value of your investment after five years. (2)
[12]

QUESTION 8

An amount of R124 000 is invested at 9% compound interest, compounded quarterly.

8.1 Show that the formula $P = 124\,000(1,0225)^{4n}$ can be used to determine the investment over n years. (4)

8.2 Use the formula in Question 8.1 to complete the following table:

n	1	2	3	4	5
P	135 542				

(4)

8.3 Represent the table graphically on the graph paper provided. (3)

8.4 Determine the interest earned after four years. (2)

8.5 Determine the time the investment would take to earn R211 515. (4)
[17]

QUESTION 9

Mr P earns a monthly salary of R6 200,00.

9.1 Determine his annual salary. (2)

9.2 Determine his annual tax he should pay. (4)

MARRIED PERSONS	
Taxable income	Rates of tax
R 0 - 5 000	17% of each R1
R 5 000 - 10 000	R 850 + 18% of the amount over R 5 000
R 10 000 - 15 000	R 1 750 + 19% of the amount over R 10 000
R 15 000 - 25 000	R 2 700 + 20% of the amount over R 15 000
R 25 000 - 30 000	R 3 700 + 21% of the amount over R 25 000
R 30 000 - 40 000	R 5 800 + 28% of the amount over R 30 000
R 40 000 - 50 000	R 8 600 + 36% of the amount over R 40 000
R 50 000 - 60 000	R 12 200 + 41% of the amount over R 50 000
R 60 000 - 80 000	R 16 300 + 42% of the amount over R 60 000
R 80 000 +	R 24 700 + 43% of the amount over R 80 000

9.3 Determine the monthly tax he should pay. (2)
[8]

TOTAL FOR SECTION C: [37]

SECTION D
CIRCULAR MEASUREMENT
OPTIONAL

QUESTION 10

Convert

10.1 $49,7^\circ$ to radians. (2)

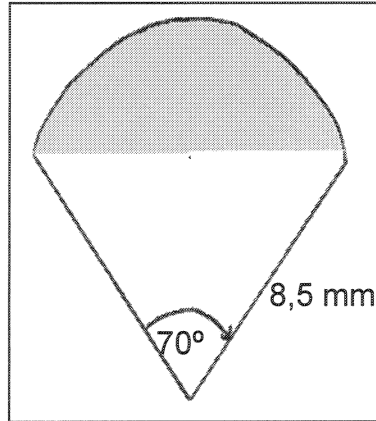
10.2 2,78 radians to degrees. (2)

10.3 $\frac{23}{60} \pi$ radians to degrees without a calculator. (2)

10.4 45° to π radians without a calculator. (2)
[8]

QUESTION 11

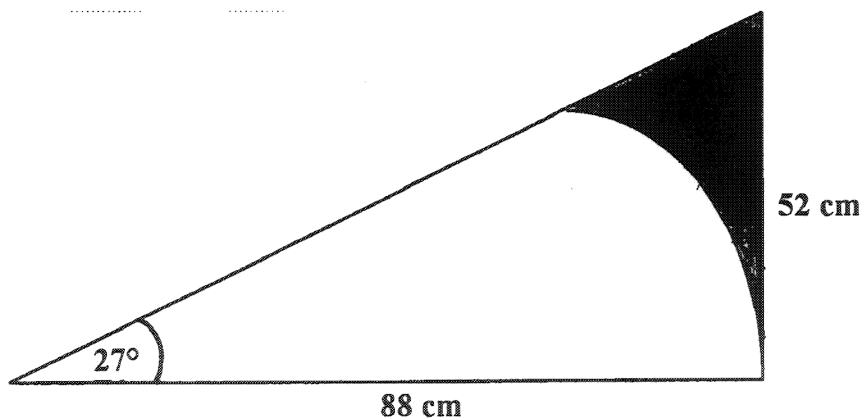
The figure shows sector of a circle with radius 8,5 mm and $\hat{Q} = 76^\circ$.



- 11.1 Use the formula $s = r\theta$ and determine the length of the arc. (4)
- 11.2 Use the formula $\text{Area} = \frac{1}{2} r^2 \theta$ and determine the area of the sector. (3)
- 11.3 Use the formula $\text{Area} = \frac{1}{2} r^2 (\theta - \sin\theta)$ and calculate the shaded area of the segment. (4)
- [11]

QUESTION 12

A piece of metal is cut out of the figure below.



- 12.1 Convert 27° to radians. (2)
- 12.2 Use the formula $\text{Area} = \frac{1}{2} r^2 \theta$ and calculate the area of the sector piece that is being cut out. (3)

- 12.3 Use the formula **Area** = $\frac{1}{2} \mathbf{b} \times \perp \mathbf{h}$ and calculate the area of the figure. (3)
- 12.4 Determine the area of the wasted piece of material. (2)
- [10]**

QUESTION 13

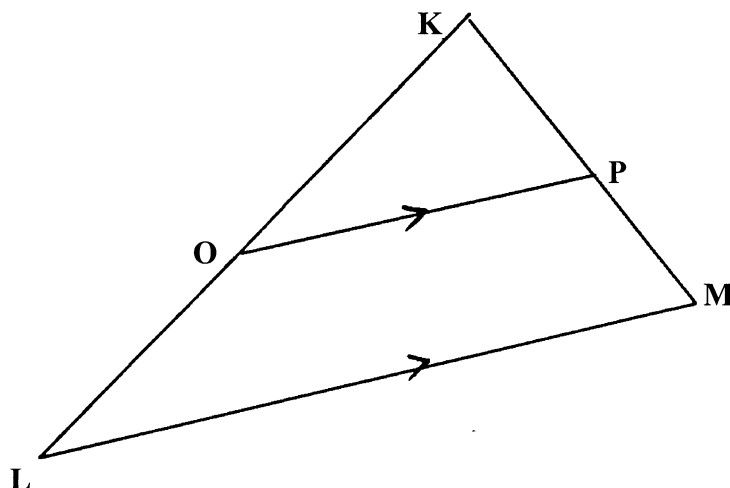
- 13.1 A wheel rotates at 40 revolutions per minute.
- 13.1.1 Determine the revolutions per second. (2)
- 13.1.2 Use the formula $\omega = 2\pi f$ and determine the angular velocity of the wheel in rad/sec. (2)
- 13.2 A wheel with diameter of 48 cm, rotates at 175,9 rad/sec.
- 13.2.1 Determine the radius in metres. (1)
- 13.2.2 Use the formula $V = \omega r$ and determine the circumference velocity in m/s. (3)
- [8]**

TOTAL FOR SECTION D: [37]

SECTION E
RATIO, PROPORTION AND SIMILARITY
OPTIONAL

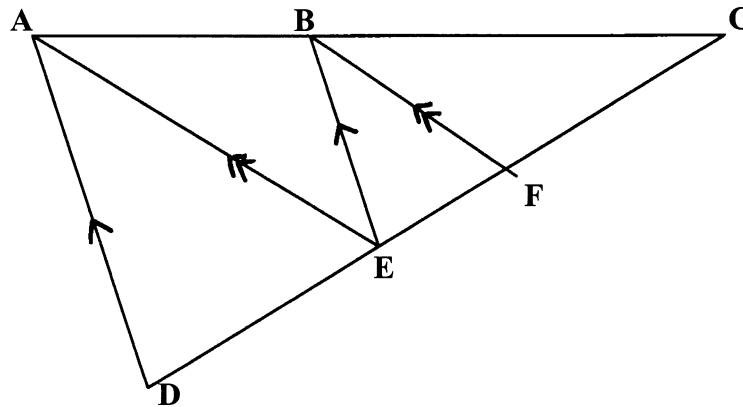
QUESTION 14

14.1



If $OP \parallel LM$, complete: $\frac{KO}{\dots\dots\dots} = \frac{\dots\dots\dots}{PM}$ (2)

14.2



In $\triangle ACD$, $BF \parallel AE$ and $BE \parallel AD$. If $BC = 6$, $CF = 4$ and $EF = 2$, calculate, with reasons,

14.2.1 the length of AB .

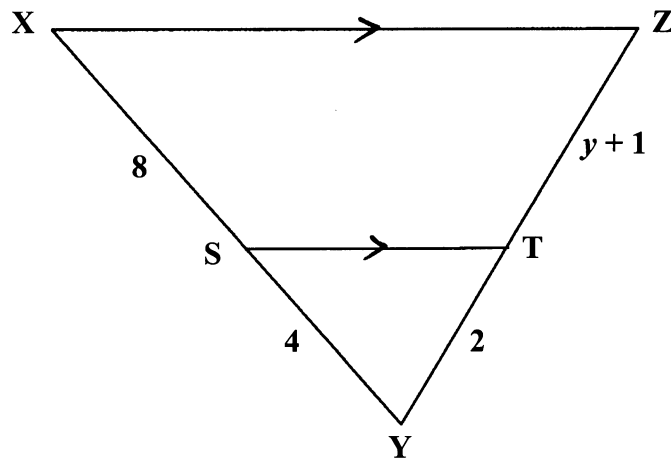
(4)

14.2.2 the length of DE .

(4)

[10]

QUESTION 15



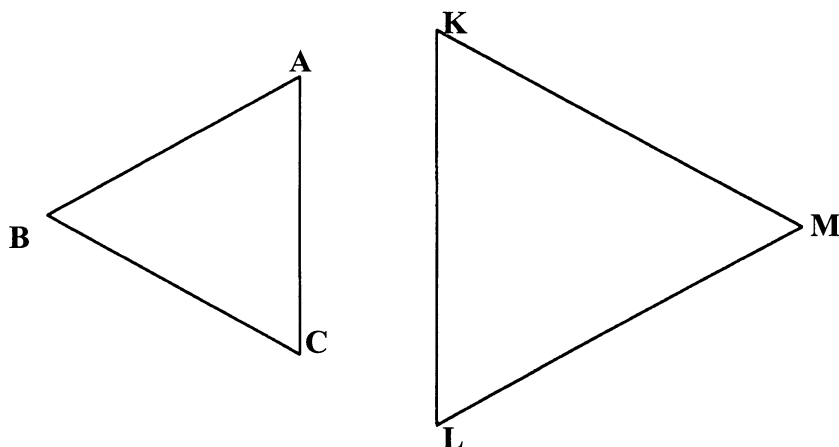
In $\triangle XYZ$, $XZ \parallel ST$, $XS = 8$, $SY = 4$, $ZT = y + 1$ and $TY = 2$.

Calculate the value of y .

[6]

QUESTION 16

16.1



In the figure, $\hat{B} = \hat{M}$ and $\hat{A} = \hat{K}$.

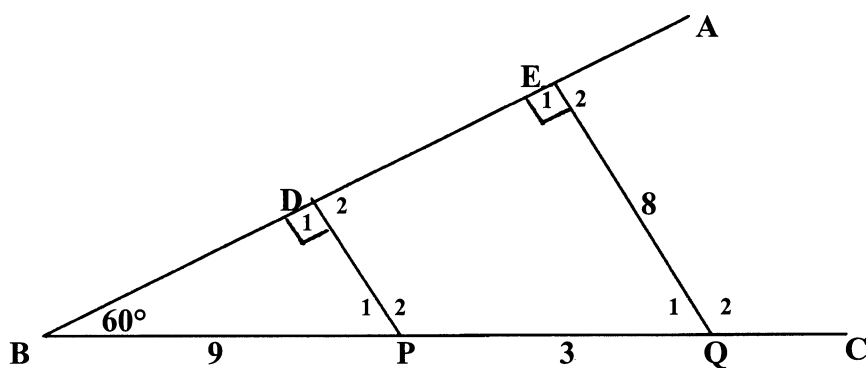
Complete:

16.1.1 $\hat{C} = \underline{\hspace{2cm}}$ (1)

16.1.2 $\triangle ABC \underline{\hspace{1cm}} \triangle KLM$ (1)

16.1.3 $\frac{AB}{\dots} = \frac{\dots}{ML} = \frac{AC}{\dots}$ (3)

16.2



In the figure above, $\hat{B} = 60^\circ$, $BP = 9$, $PQ = 3$ and $QE = 8$.

16.2.1 Show, with reasons, that $\triangle DBP \parallel \triangle EBQ$. (4)

16.2.2 Complete the following:

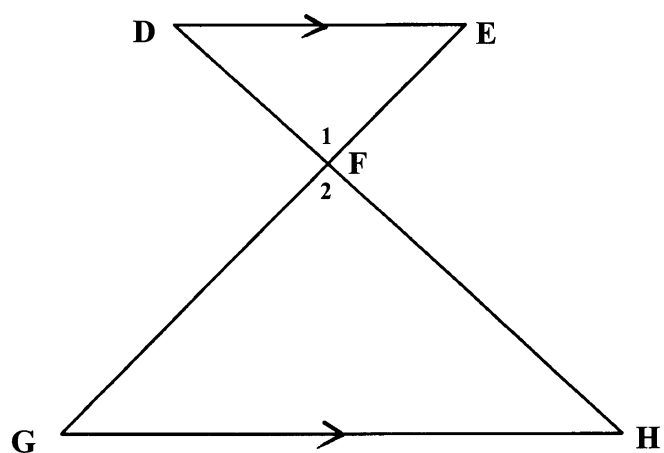
$\frac{EB}{\dots} = \frac{\dots}{BP} = \frac{EQ}{DP}$ (2)

16.2.3 Determine the length of DP. (4)

[15]

P.T.O.

QUESTION 17



In the figure above, $DE \parallel GH$.

Show with full reasons, that $\frac{DF}{HF} = \frac{EF}{GF}$.

[6]

TOTAL FOR SECTION E: [37]

SECTION F
STATISTICS
OPTIONAL

QUESTION 18

The population figures of the nine provinces of the Republic of South Africa are as follow:

Province	Population
Free State	2,8 million
Mpumulanga	3,3 million
Western Cape	4,7 million
North West	3,8 million
Gauteng	9,2 million
KwaZulu-Natal	9,8 million
Eastern Cape	6,7 million
Limpopo	5,5 million
Northern Cape	850 000

- 18.1 Which province has the least number of people? (1)
- 18.2 Which province has the largest population? (1)
- 18.3 How many more people are there in the largest province than in the province with the least people? (3)
- 18.4 Which TWO provinces differ the least in population numbers? (2)
- 18.5 Calculate the total population in the Republic of South Africa. (1)
- 18.6 Calculate the average population of the nine provinces, rounded off to the nearest integer. (3)
- 18.7 Rearrange the provinces from the smallest in population to the largest in population and determine which province represents the median. (3)
- 18.8 How many million people has KwaZulu-Natal more than the Free State and North West together? (2)

[16]

QUESTION 19

A lady selling sandwiches at the tuck shop of a certain school collected the following information from 25 learners, in order to determine a reasonable selling price for the sandwiches:

Allowance for the day				
R1	R5	R10	R7	R6
R5	R2	R5	R4	R8
R1	R5	R7	R3	R2
R7	R10	R9	R5	R6
R5	R2	R6	R12	R7

19.1 Rearrange the information in ascending order. (1)

19.2 Write down the mode of the information. (1)

19.3 Calculate the average amount of allowance a learner is taking to school per day. (3)

19.4 Determine the median, the first and third quartile of the information. (3)

19.5 Calculate the standard deviation of the data, rounded off to one decimal digit, making use of the following formula:

$$S = \sqrt{\frac{\sum x^2 - n\bar{x}^2}{n-1}}$$

(5)

19.6 Use the data given above and complete the following table in your answer book.

INTERVAL	SCORE	FREQUENCY	CUMULATIVE FREQUENCY
1 – 3			
4 – 6			
7 – 9			
10 – 12			

19.7 Draw a histogram of the frequencies. (3)
[21]

TOTAL FOR SECTION F: [37]

TOTAL: 150

INFORMATION SHEET / INLIGTINGSBLAD
**1. CO-ORDINATE GEOMETRY /
KOÖRDINAATMEETKUNDE**

$$M_{(x;y)} = \left(\frac{x_A + x_B}{2}, \frac{y_A + y_B}{2} \right)$$

$$d_{AB} = \sqrt{(x_B - x_A)^2 + (y_B - y_A)^2}$$

$$m_{AB} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$y = mx + c$$

$$y - y_1 = m(x - x_1)$$

$$\frac{y - y_1}{x - x_1} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$x^2 + y^2 = r^2$$

**4. CONSUMER MATHEMATICS /
VERBRUIKERSWISKUNDE**

$$I = \frac{krt}{100}$$

$$A = P \left(1 + \frac{r}{100} \right)^n$$

5. STATISTICS / STATISTIEK

$$S = \sqrt{\frac{\sum x^2 - n\bar{x}^2}{n-1}}$$

$$\sigma = \sqrt{\frac{\sum x^2 - N\mu^2}{N}}$$

**2. TRIGONOMETRY /
TRIGONOMETRIE**

For any ΔABC : / *Vir enige ΔABC :*

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cdot \cos A$$

$$\text{Area / Oppervlakte } \Delta ABC = \frac{1}{2} a \cdot b \cdot \sin C$$

**3. CIRCULAR MEASUREMENT /
BOOGMAAT**

$$S = r \theta$$

$$A = \frac{1}{2} r^2 \theta$$

$$A = \frac{1}{2} rs$$

$$V = r\omega$$

$$\omega = 2\pi f$$

$$A = \frac{1}{2} r^2 (\theta - \sin \theta)$$

