



**MATHEMATICS: PAPER III
(LO 3 AND LO 4)**

Time: 3 hours

100 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 16 pages including a 2 page information sheet. Please check that your paper is complete.
 2. Read the questions carefully.
 3. Answer all the questions on the question paper. There is extra space on the last page for additional working. Do not hand in any other piece of paper.
 4. You may use an approved non-programmable and non-graphical calculator, unless otherwise stated.
 5. Round off your answers to two decimal digits where necessary.
 6. All the necessary working details must be clearly shown.
 7. It is in your own interest to write legibly and to present your work neatly.
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SECTION A

QUESTION 1

1.1 The general explicit form of the k^{th} term of a particular sequence is given by: $T_k = 5 - 4k$.

Determine the recursive formula for this sequence.

(4)

1.2 The recursive formula for T_{k+1} of a sequence is given by:

$$T_{k+1} = T_k + 2k + 3 \text{ where } T_1 = 5$$

Find the explicit form of the sequence in the form: $T_k = ak^2 + bk + c$

(5)

[9]

QUESTION 2

All answers using factorials ($n!$) must be evaluated, e.g. $4! = 24$

- 2.1 You have to choose a password for your new 'Facebook' profile.
 The password must be of the format: ###@@ where # is any digit (0's are NOT allowed) and @ is any of the vowels (a, e, i, o or u).
 You may repeat any digit but you may not repeat a vowel.
 How many different passwords can be formed?

(4)

- 2.2 The probability that a certain rugby team has all its players fit to play is 70%.
 The probability that they will win a game if all their players are fit is 90%.
 When they are not fit the probability of them winning becomes 45%.
 Calculate the probability of them winning their next game.

(6)

- 2.3 How many arrangements of all the letters in the word 'EXEMPLAR' start with 'X' and end in 'P'?

(4)

[14]

QUESTION 3

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

Interval	Frequency
$0 < x \leq 5$	12
$5 < x \leq 10$	29
$10 < x \leq 15$	13
$15 < x \leq 20$	63
$20 < x \leq 25$	12
$25 < x \leq 30$	3

3.1 Determine the median interval for this data.

(1)

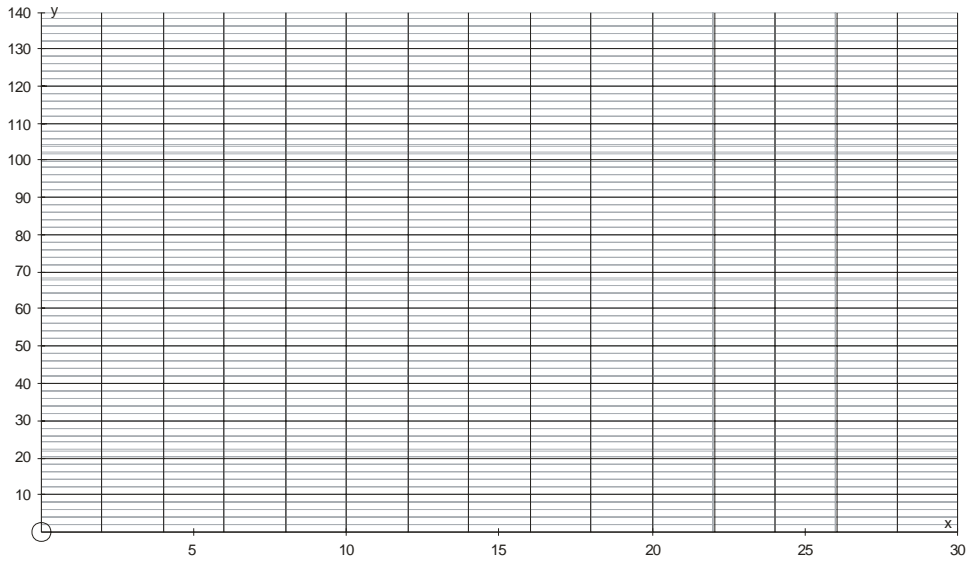
3.2 Determine the estimated mean distance covered.

(3)

3.3 Determine the standard deviation for the data.

(3)

3.4 Draw an ogive (cumulative frequency curve) for this data on the axes given below.



(3)

3.5 Estimate the median distance using your graph.

(1)

3.6 By referring to the relationship between the mean and the median, state whether the distribution of the data is normal, positively skewed or negatively skewed.

(3)

[14]

QUESTION 4

4.1 A newspaper makes the following statement:

'Over 65% of the houses were sold this month for more than the average selling price.'

Comment on whether the word 'average' in this statement could refer to:

- (a) the mean;
- (b) the mode; or
- (c) the median.

Motivate your answer.

(3)

4.2 A school announces in its media release:

'The Grade 12 pass rate has improved by a 100% from last year.'

Why is this statement misleading?

(2)

4.3 Data was collected to compare the length of time (x), in months couples have been dating to the amount of money (y), in rands, spent when going out on a date. The equation of regression was determined to be: $y = 165 - 6,3x$

4.3.1 What does the slope of the line tell us about the cost of an average date as the duration of the relationship increases?

(2)

4.3.2 Can we use this line to predict the cost of a date in a 3 year long relationship? Motivate your answer.

(2)

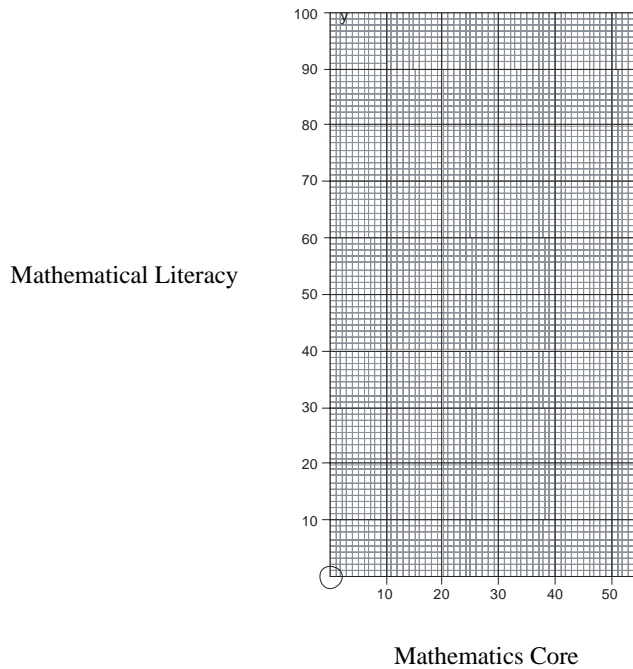
[9]

QUESTION 5

The percentages achieved by 10 learners studying Mathematics Core in Grade 11 were recorded. They then changed to Mathematical Literacy in Grade 12 and their results were recorded in the table below.

Candidate number	1	2	3	4	5	6	7	8	9	10
Mathematics Core	17	19	32	39	35	27	26	29	37	40
Mathematical Literacy	72	74	79	84	83	68	78	82	60	90

5.1 Draw a scatter plot of the data on the axes given.



(3)

5.2 Calculate the equation of the regression line of best fit.

(4)

5.3 Calculate the correlation coefficient for the data.

(2)

5.4 Describe the strength of the correlation.

_____ (2)

5.5 Which candidate appears to be an outlier?

_____ (1)

5.6 David wants to study a course at University that requires a Level 3 (40% - 50%) for Mathematics Core or a Level 7 (80% – 100%) for Mathematical Literacy. He is currently in Grade 11 and achieved a Level 2 (38%) on his latest report. Would you advise him to continue with Mathematics Core? Motivate your answer.

 _____ (2)

[14]

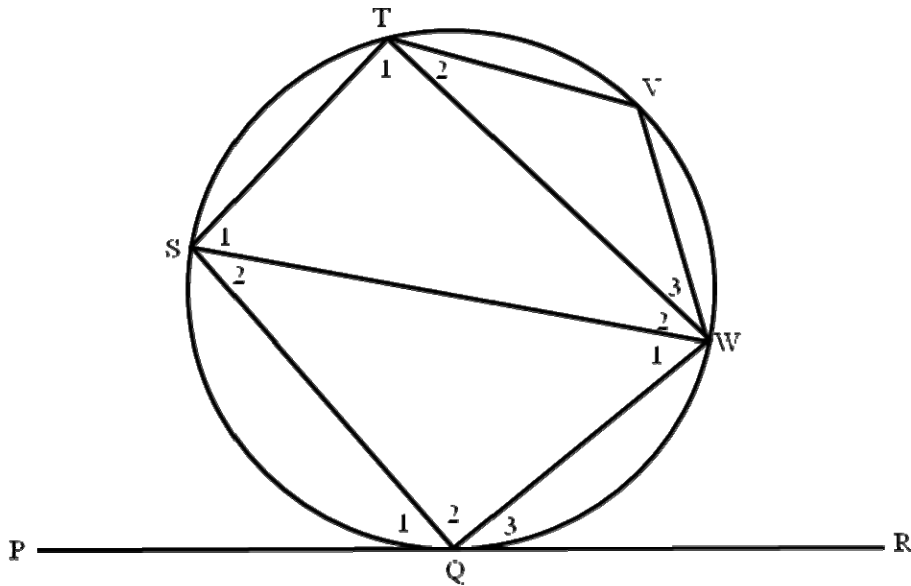
60 marks

SECTION B

REASONS TO BE GIVEN UNLESS OTHERWISE STATED

QUESTION 6

- 6.1 Refer to the given diagram.
 PQR is a tangent to the circle $STVWQ$. $ST \parallel QW$ and $VT = VW$.
 Given: $\hat{S}_2 = 30^\circ$ and $\hat{W}_1 = 70^\circ$.



Determine the size of the following:

6.1.1 \hat{V}

(3)

6.1.2 \hat{Q}_1

(1)

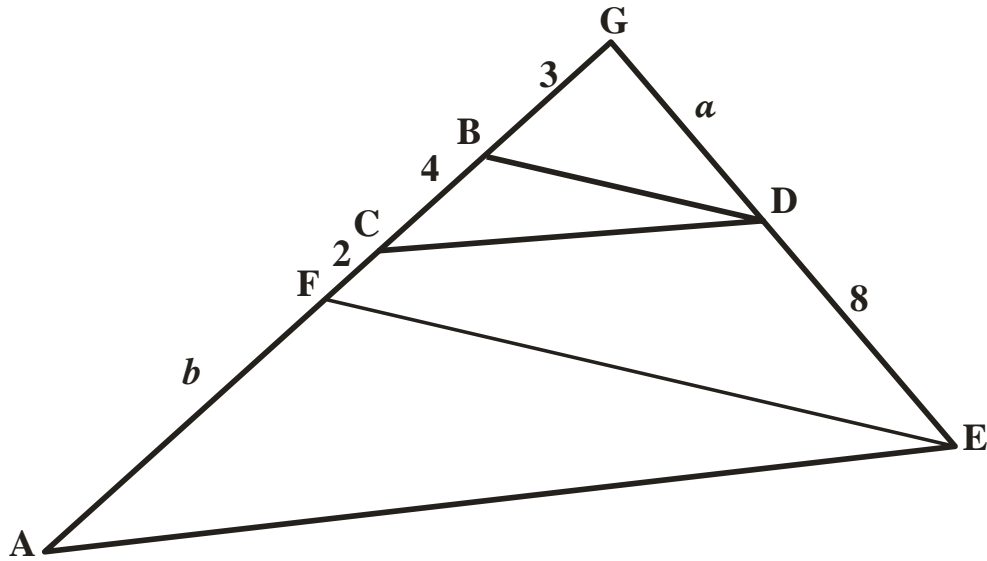
6.1.3 \hat{T}_1

6.2

Refer to the given diagram.

In $\triangle AEG$ $BD \parallel FE$ and $CD \parallel AE$

(3)



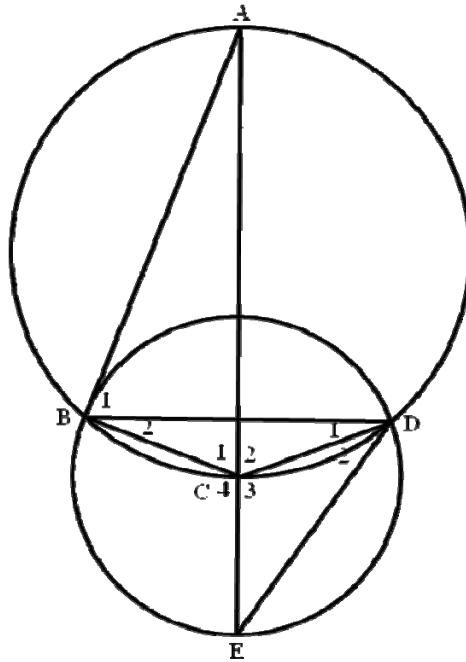
6.2.1 Determine the value of a .

(2)

6.2.2 Determine the value of b .

(3)

- 6.3 Refer to the given diagram. Two circles cut each other in B and D . C , the centre of the smaller circle, lies on the circumference of the larger circle. AC produced cuts the smaller circle in E .



Prove:

6.3.1 $\hat{B}_2 = \hat{A}$

(4)

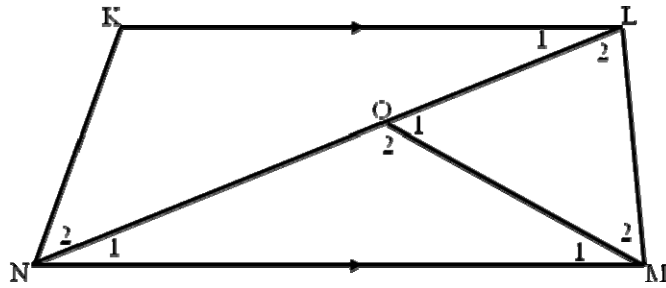
6.3.2 $\hat{B}_1 = 2\hat{D}_2$

(6)

6.3.3 $\hat{C}_4 = 2\hat{A} + \hat{B}_1$

(3)

- 6.4 Refer to the diagram. $KLMN$ is a trapezium with $KL \parallel MN$.
 NL is a diagonal of $KLMN$. OM is drawn such that $MO = ML$.
 $\hat{O}_2 = \hat{K}$ and $MN = 2ML$.



Prove:

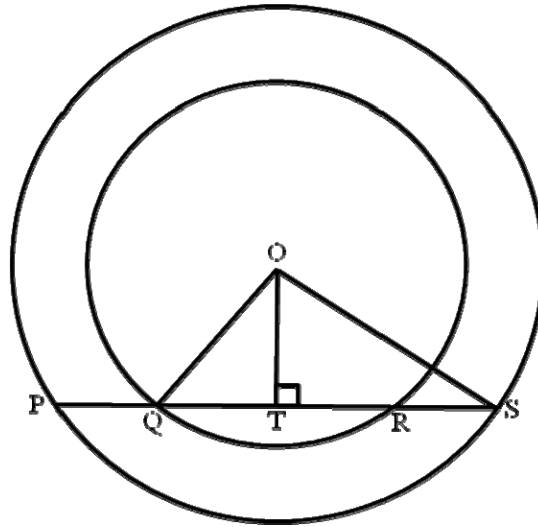
6.4.1 $\triangle KLN \parallel \triangle ONM$

(4)

6.4.2 $NL = 2NK$

(5)

- 6.5 Two concentric circles centred at O have radii of 5cm and $8,5\text{cm}$ respectively.
 $QR = 6\text{cm}$ and $OT \perp PS$.



Determine the length of PS .

(6)

40 marks

TOTAL FOR THIS PAPER = 100 MARKS

SPACE FOR ADDITIONAL WORKING OR DIAGRAMS

**MATHEMATICS
INFORMATION SHEET**

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

$$\sum_{i=1}^n 1 = n$$

$$\sum_{i=1}^n i = \frac{n(n+1)}{2}$$

$$\sum_{i=1}^n [a + (i-1)d] = \frac{n}{2} [2a + (n-1)d]$$

$$\sum_{i=1}^n ar^{i-1} = \frac{a(r^n - 1)}{r - 1}; \quad r \neq 1$$

$$\sum_{i=1}^{\infty} ar^{i-1} = \frac{a}{1-r}; \quad -1 < r < 1, r \neq 0$$

$$T_n = an^2 + bn + c$$

$$T_n = T_1 + (n-1)f + \frac{(n-1)(n-2)}{2}s$$

where f is the first term of the first difference
and s is the second difference

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

$$A = P(1 + ni)$$

$$A = P(1 - ni)$$

$$A = P(1 + i)^n$$

$$A = P(1 - i)^n$$

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

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

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$M \left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2} \right)$$

$$y = mx + c$$

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

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \tan \theta$$

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

$$\text{In } \triangle ABC: \quad \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

$$\text{area } \triangle ABC = \frac{1}{2} ab \cdot \sin C$$

$$\sin(\alpha + \beta) = \sin \alpha \cdot \cos \beta + \cos \alpha \cdot \sin \beta$$

$$\sin(\alpha - \beta) = \sin \alpha \cdot \cos \beta - \cos \alpha \cdot \sin \beta$$

$$\cos(\alpha + \beta) = \cos \alpha \cdot \cos \beta - \sin \alpha \cdot \sin \beta$$

$$\cos(\alpha - \beta) = \cos \alpha \cdot \cos \beta + \sin \alpha \cdot \sin \beta$$

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

$$\sin 2\alpha = 2\sin \alpha \cdot \cos \alpha$$

$$(x; y) = ((x_A \cos \alpha - y_A \sin \alpha); (y_A \cos \alpha + x_A \sin \alpha))$$

$$\bar{x} = \frac{\sum x}{n}$$

$$\bar{x} = \frac{\sum fx}{n}$$

$$\text{var} = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n - 1}$$

$$\text{var} = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}$$

$$s.d = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}}$$

$$P(A) = \frac{n(A)}{n(S)}$$

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$