MATHEMATICS: PAPER III
(LO 1, LO 3 AND LO 4)

EXAMINATION NUMBER

Time: 2 hours   100 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1.   This question paper consists of 16 pages, and a green insert (pages i – iv) containing a diagram sheet and a formula sheet. Please check that your paper is complete.

2.   Read the questions carefully.

3.   **Answer ALL the questions on the question 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.

8.   The last three pages can be used for additional working, if necessary. If this space is used, make sure that you indicate clearly which question is being answered.

9.   Hand in both the question paper and the green insert at the end of the examination.

SECTION A

QUESTION 1

The first term of an Arithmetic Sequence is 1 and the sixth term is 21.

Determine:

(a)   the first four terms of sequence.

_____

_____

_____

_____

_____   (3)

(b)   a formula for T_k, the kth term of the sequence.

_____

_____

_____

_____   (1)

(c)   a recursive formula for T_{k+1} of the sequence.

_____

_____

_____

_____

_____   (3)

7 marks

QUESTION 2

All answers involving factorials must be calculated, e.g. $5! = 120$.

(a)   Using the letters in the word 'MILLENIUM', determine:

(1)   the number of nine letter 'words' that can be formed.

(5)

(2)   the probability that the new word will start and end on the letter 'L'.

(5)

(b)   The weather forecast for the area for the coming weekend predicts a 30% chance of rain for Saturday and a 40% chance of rain for Sunday.
What is the probability that it will rain on Saturday or Sunday, but not both?

(4)

(c)   Four different glasses and five different bottles are to be arranged on a shelf. How many arrangements can be made if all the bottles are to be together and all the glasses are to be together?
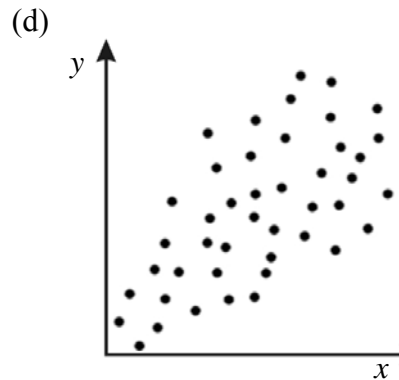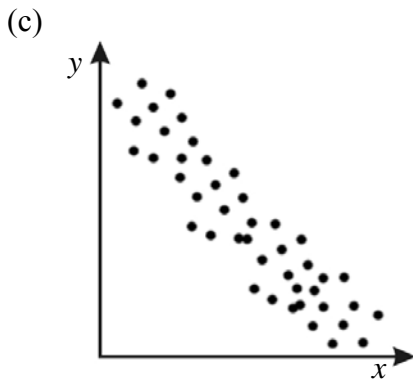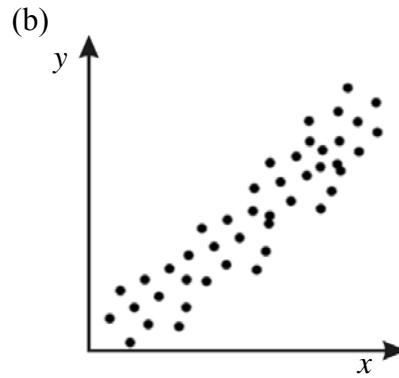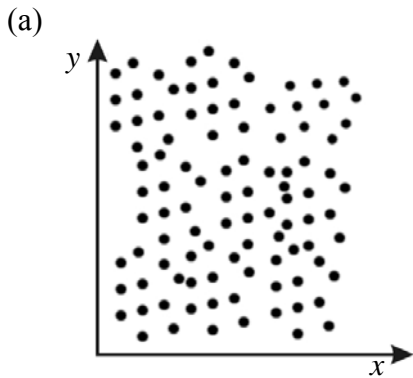
(4)

18 marks

QUESTION 3

Given below are four graphs. You are asked to estimate the value of r between -1 and 1 to predict the correlation between x and y.

(a)

(b)

(c)

(d)

Write down the letter of the graph and your estimate for the value of r (the correlation coefficient) next to it.

_____

_____

_____

_____   (4)

| **4 marks** |

QUESTION 4

Below is a table illustrating the relationship between the monthly rent (x) a person pays for an apartment and the person's monthly income (y). Both are given in thousands of Rands.

Year	2003	2004	2005	2006	2007	2008
Rent (x)	2	3	3,5	5,2	5,5	6
Income (y)	9	13,5	15	16,5	17	20

(a)   Calculate the equation of the regression line which best fits the data.

_____

_____

_____

_____   (4)

(b)   Predict the individual's monthly income if the rent per month is R9 000.

_____

_____

_____

_____   (2)

(c)   Calculate the correlation coefficient r.

_____

_____

_____   (2)

(d)   What does the correlation coefficient suggest about the relationship between monthly rent and monthly income?

_____

_____

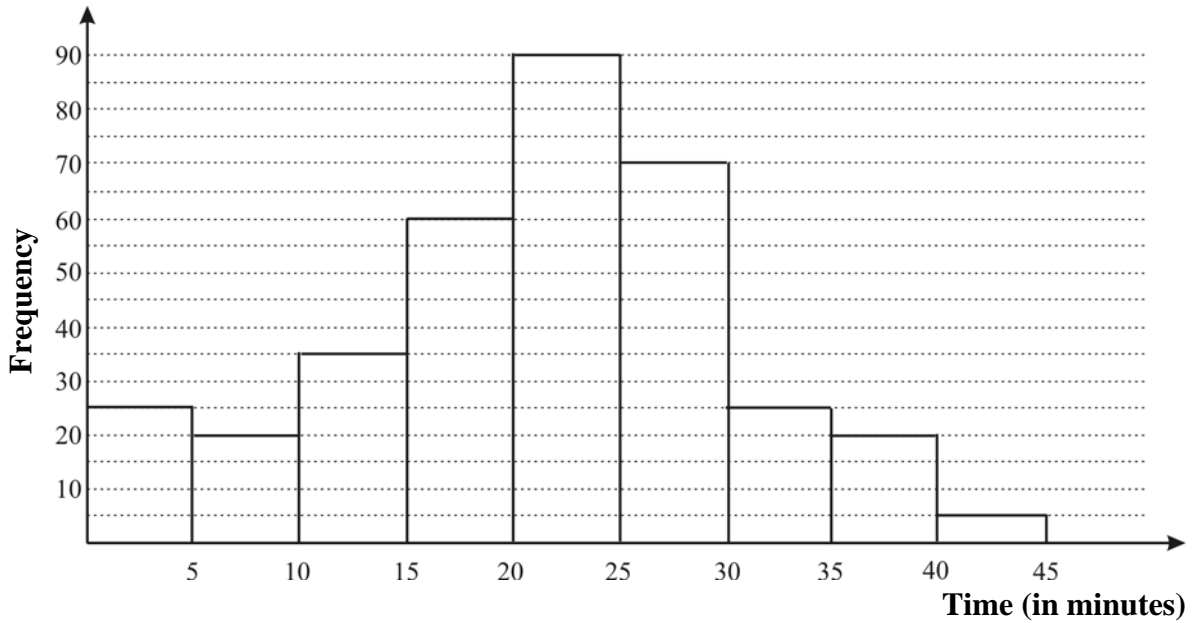_____   (2)

10 marks

QUESTION 5

Students were asked how long it took them to get to school in the morning.
A histogram for the data was drawn (refer to diagram).

(a)   Using the given histogram, complete the following frequency distribution table.

Class	Frequency	Midpoint
$0 \leq x < 5$	25	2,5

(4)

(b)   Estimate the mean for the data.

                                                                                          (4)

(c)   Estimate the standard deviation for the data.

                                                                                          (4)

(d)   Which is the median interval for this set of data?

                                                                                          (2)

(e)   Would you suggest this data to be normally distributed? Motivate your answer.

_____
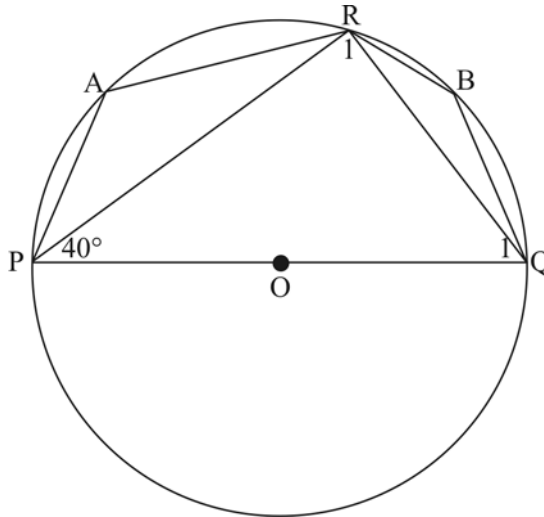
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_____   (2)

16 marks

SECTION B

QUESTION 6

REASONS MUST BE GIVEN UNLESS OTHERWISE STATED

Refer to the diagram.
O is the centre of the circle.
$R\hat{P}Q = 40°$

(a)   Write down the size of $\hat{R}_1$ $\hat{Q}_1$, $\hat{B}$ and $\hat{A}$ (you need not give reasons).

(4)

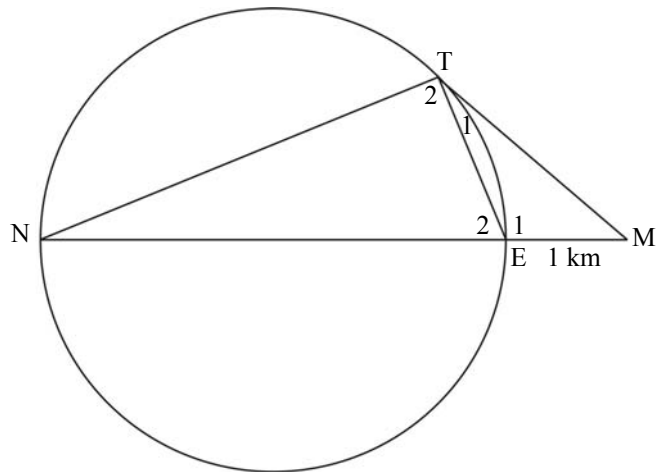(b)   Hence, write down the value of $\hat{A} + \hat{B}$.

(1)

5 marks

QUESTION 7

Refer to the diagram.
MT is a tangent to the circle at T.
NE is the diameter of the circle.

(a)   Prove $\Delta MTN \parallel\mid \Delta MET$

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_____

_____

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_____

_____

_____   (4)

(b)   If it is further given that circle NET represents the Earth and a man is in a helicopter at M, 1 km up in the air above Italy, determine how far the foot of the 'Tower of Pisa' (T) appears to be away from the man in the plane. Take the Earth's radius to be 6 400 km.

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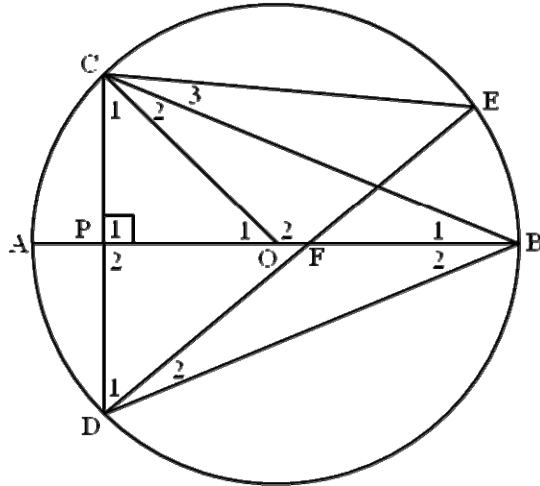_____   (4)

8 marks

QUESTION 8

Refer to the diagram.
O is the centre of the circle.
$CD \perp AB$ at P.

Prove:

(a) $CP = DP$

                                                                 (1)

(b) $\hat{B}_1 = \hat{B}_2$

                                                                 (4)

(c) $\hat{E} = 2\hat{B}_1$.

                                                                 (3)

(d)   CEFO a cyclic quadrilateral.
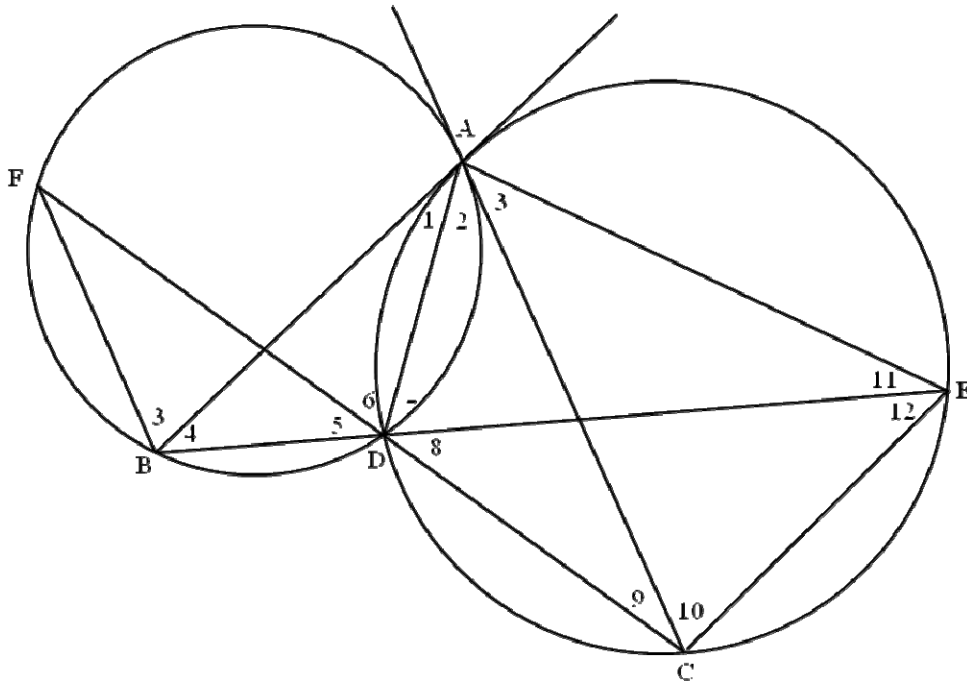
                                                                 (4)

12 marks

QUESTION 9

Refer to the figure.
AB and AC are tangents at A.
BDE is a straight line.

(a)   Prove AB∥EC .

_____

_____

_____

_____

_____   (4)

(b)   Why is AC∥FB ?

_____

_____   (2)

(c) Prove:

(1) $\hat{D}_6 = \hat{A}_1 + \hat{A}_2$.

_____

_____

_____

_____

_____

_____ (4)

(2) AD bisects $F\hat{D}E$.

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_____

_____

_____ (3)

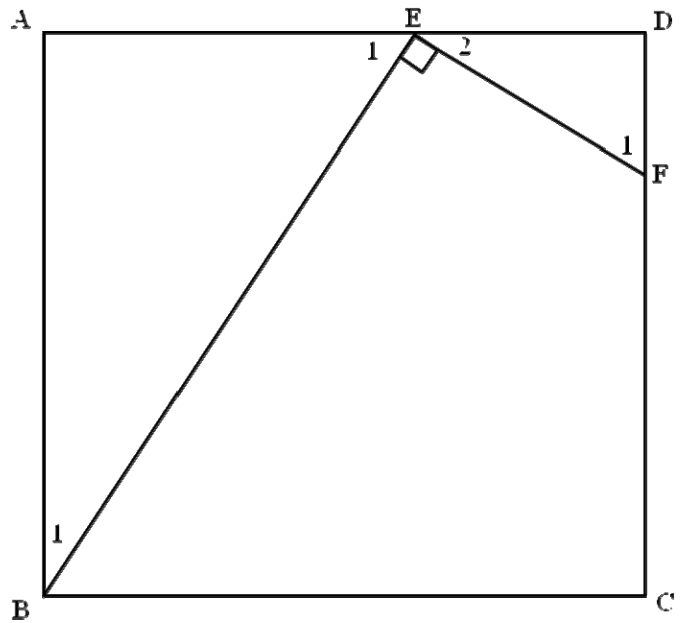**13 marks**

QUESTION 10

Refer to the figure.
ABCD is a square with sides 9 units.
$BE \perp EF$.

(a)   Prove $\Delta BAE \parallel\parallel \Delta EDF$.

_____

_____

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_____

_____

_____   (3)

(b)   If $AE = x$ units, show that the Area $\Delta EDF = \dfrac{x(9-x)^2}{18}$.

_____

_____

_____

_____

_____

_____   (4)

7 marks

Total: 100 marks

SPACE FOR ADDITIONAL WORKING: