HILTON COLLEGE

TRIAL EXAMINATION

AUGUST 2010

MATHEMATICS: PAPER 3

LAUNDRY NUMDER: | | | | |

Time: 2 hours 100 marks

GENERAL INSTRUCTIONS

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. **Write your laundry number in the space provided.**
2. This question paper consists of 14 pages. **Answer all the questions in the paces provided on the question paper.**
3. Read the questions carefully.
4. This question paper consists of 9 questions.
5. You may use an approved non-programmable and non-graphical calculator, unless a specific question prohibits the use of a calculator.
6. Round off your answers to one decimal digit where necessary, unless otherwise stated.
7. All necessary working details must be shown.
8. It is in your own interest to write legibly and to present your work neatly.
9. Please note that the diagrams are **NOT** necessarily drawn to scale.

Please do not turn over this page until you are asked to do so.

SECTION A

QUESTION 1

The recursive formula for a sequence of numbers is given by the formula:

$$T_{k+1} = T_k + 4k - 2 \text{ where } T_1 = 2$$

a) Write down the first 3 terms of the sequence. (3)

b) Write down an explicit formula for the above sequence. (4)

[7]

QUESTION 2

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

a) A school bus must pass through 2 sets of traffic lights on route to school. The probability that the bus has to stop at a set of lights is 0.6.

1) Draw a tree diagram showing the different probability outcomes. (2)

2) What is the probability that the bus stop at both sets of traffic lights? (1)

_____

3) What is the probability that the bus stops at exactly one set of traffic lights? (2)

_____

_____

b) Consider the word **DIFFERENT**:

In how many ways can the letters of this word be arranged in

1) a row (2)

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_____

_____

2) a row with the first and last letters being the same (3)

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3) a row that starts with the letter **T** and ends with a double **E**. (3)

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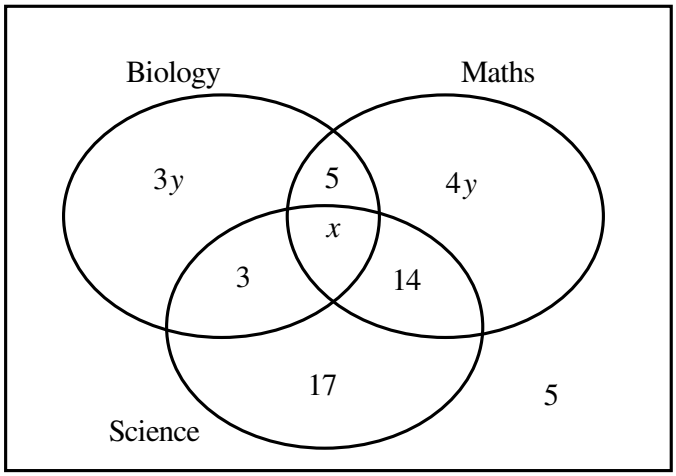
c) At a school there are 120 grade 12 learners. A survey is conducted to see how many of them take Biology, Mathematics and Science.

The following Venn diagram summarizes the results:



1) If it is known that a total of 44 learners take Biology and a total of 65 take Maths then solve for x and y. (3)

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d) Hence, calculate the probability that a student selected at random takes Biology but not Maths or Science. (3)

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e) A coin is biased so that when tossed it fall heads uppermost 60% of the time. The coin is tossed 6 times. What is the probability that there will be at most 4 heads? (Give your answer correct to 3 decimal places.) (4)

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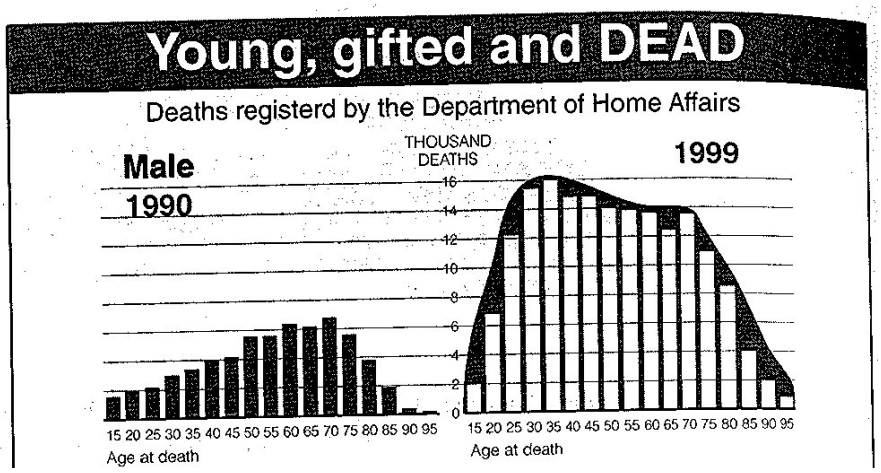
[23]

QUESTION 3

Study the following growths showing the number of South African males who die at a certain age.



a) Describe the difference in distribution of the age at death for males in 1990 and 1999. (3)

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b) Would you say that the graph for 1999 is symmetrical or skewed? Give a social or political or economic reason for your answer. (2)

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c) How does it affect a country if there is a high death rate amongst the young, economically active people between 15 and 49 years of age? (2)

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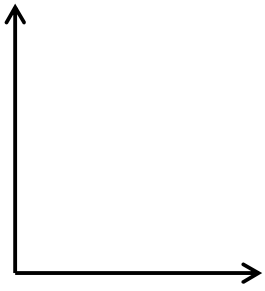
[7]

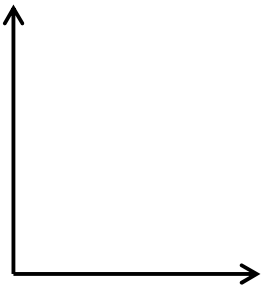
QUESTION 4

a) On the axes provided draw a scatter plot (around 10 dots in each case) for bivariate data with the given correlation coefficient: (3)

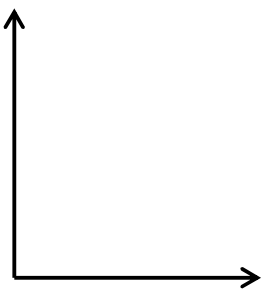
1) $r = 0.95$



2) $r = 0.1$



3) $r = -0.8$



b) Consider the following table of heights and foot lengths of seven learners:

Height (cm)	Foot length (cm)
171	27
135	20
162	23
167	24
130	20
145	22
180	28

1) A scatter plot of the data is shown below. Draw in where you feel the line of best fit will go. Do not use a calculation – merely draw in "by eye". (1)

2) Describe the trend shown by the scatter plot. (2)

3) Use your calculator to find the equation of the line of best fit when doing a regression analysis of foot length (y) on height (x). (3)

4) Use your equation to predict the foot length of someone who is 175 cm tall (2)

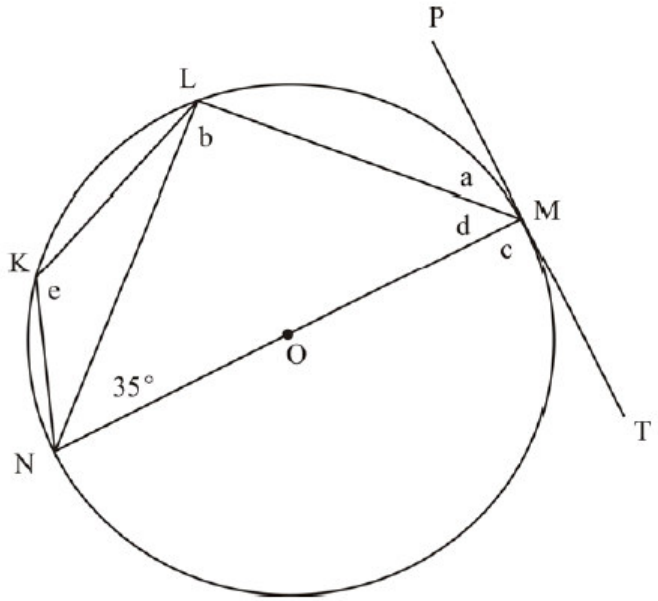
5) Calculate the correlation coefficient (2)

[13]

SECTION B

QUESTION 5

In the diagram below, PMT is a tangent and O is the centre of the circle. MON is a straight line. $L\hat{N}M = 35°$



Determine, **with reasons,** the sizes of the angles marked a − e:

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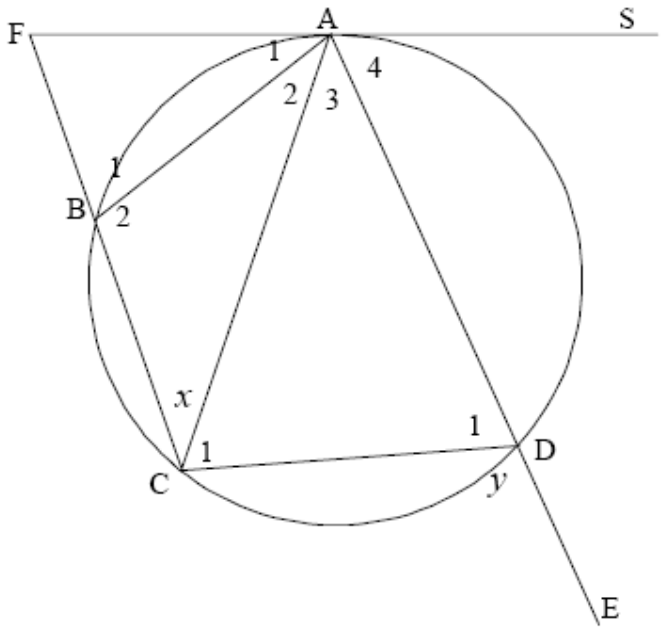
[10]

QUESTION 6

In the figure below, ABCD is a cyclic quadrilateral and FAS is a tangent meeting CB produced to F. AD is produced to E. $E\hat{D}C = y$ *and* $A\hat{C}B = x$.



a) Give, stating reasons, one other angle equal to *x*. (2)

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b) Give, stating reasons, two other angles each equal to *y*. (4)

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c) Write down $\hat{F}$ in terms of *x* and *y*. (2)

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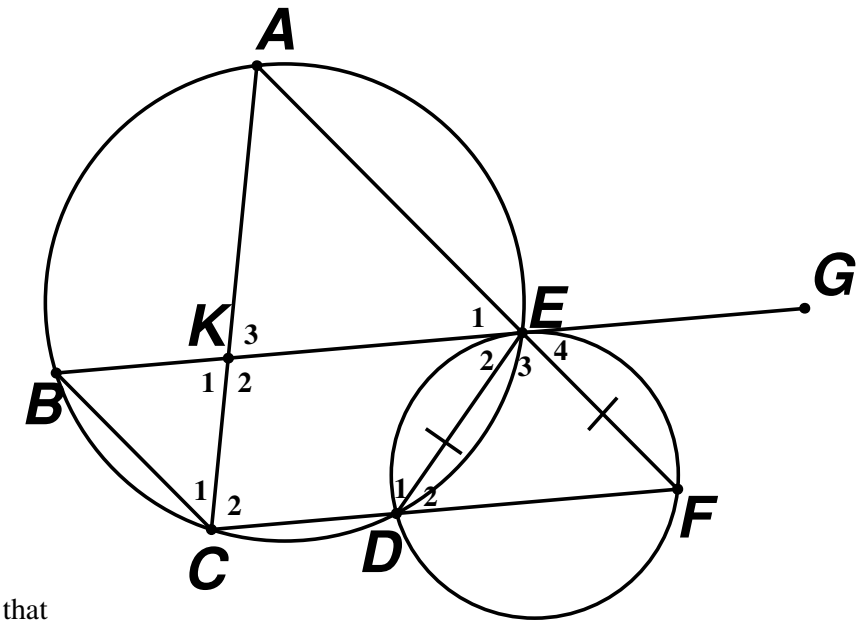
[8]

QUESTION 7

Two circles cut in D and E. BEG is tangent to the smaller circle at E. AEF, BEG and CDF are all straight lines. AC and BE intersect in K and DE = EF.



Prove that

a) BE ∥ CF (3)

b) BEFC is a parallelogram (5)

c) AC = BE (4)

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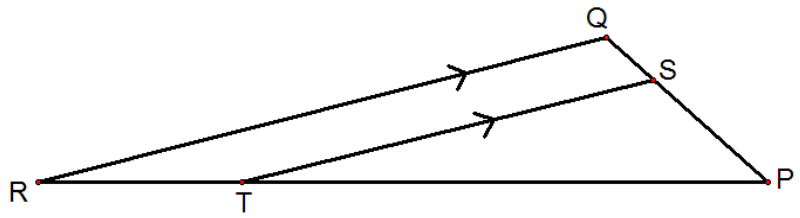
QUESTION 8

a) In ΔPQR, $QR \parallel ST$, PR = 36 mm, PT:TR = 7:2 and PS = 14 mm.



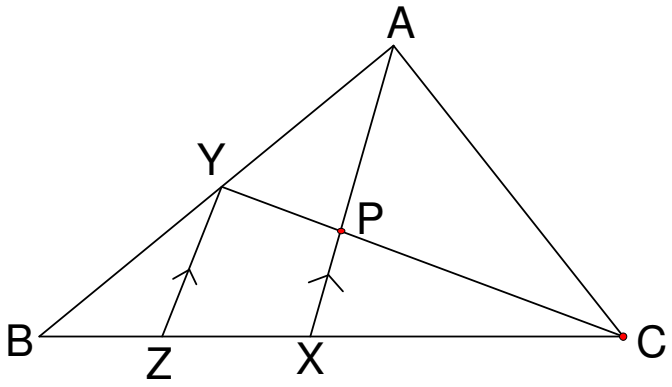
Determine without reasons the value of

1) TR (1)

2) SQ (2)

3) PQ (2)

b) In the diagram, X is a point on the side BC of ΔABC, such that BX:XC = 3:5, and Y is a point on BA such that BY:YA = 1:2. AX and CY cut at P and $YZ \| AX$, with Z on BC.

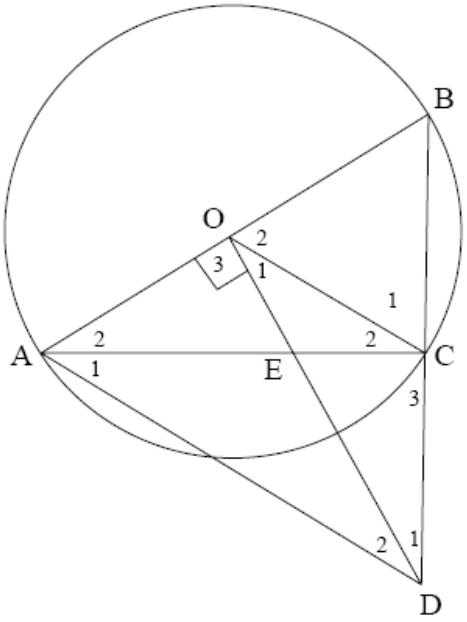


Calculate, giving reasons, the ratio CP:PY. (4)

[9]

QUESTION 9

In the diagram below, AB is a diameter of circle ABC with centre O. Chord BC is produced to D. $AB \perp OD$ and OD cuts AC at E.



Prove, with reasons, that:

a) AOCD is a cyclic quadrilateral. (4)

b) $\hat{C}_2 = \hat{D}_1$ (2)

c) $\Delta OCE \text{ III } \Delta ODC$ (3)

d) $OE.OD = OC^2$ (2)

[11]

TOTAL: 100