basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

MATHEMATICS P3

FEBRUARY/MARCH 2013

MARKS: 100

TIME: 2 hours

This question paper consists of 9 pages, 4 diagram sheets and 1 information sheet.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 10 questions.

2. Answer ALL the questions.

3. Clearly show ALL calculations, diagrams, graphs, et cetera that you have used in determining your answers.

4. Answers without calculations will not necessarily be awarded full marks.

5. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.

6. If necessary, round off answers to TWO decimal places, unless stated otherwise.

7. Diagrams are NOT necessarily drawn to scale.

8. FOUR diagram sheets for answering QUESTION 1.1, QUESTION 8, QUESTION 9.1, QUESTION 9.2 and QUESTION 10 are attached at the end of this question paper. Write your centre number and examination number on these sheets in the spaces provided and insert them inside the back cover of your ANSWER BOOK.

9. An information sheet with formulae is included at the end of the question paper.

10. Number the answers correctly according to the numbering system used in this question paper.

11. Write neatly and legibly.

QUESTION 1

The time taken, in seconds, to complete a task and the number of errors made on the task were recorded for a sample of 10 primary school learners. The data is shown in the table below.

Time taken to complete task (in seconds)	23	21	19	9	15	22	17	14	21	18
Number of errors made	2	4	5	9	7	3	7	8	3	5

1.1 Draw a scatter plot of this data on the grid provided on DIAGRAM SHEET 1. (3)

1.2 What is the influence of more time taken to complete the task on the number of errors made? (1)

1.3 Determine the equation of the least squares regression line. (4)

1.4 Calculate the correlation coefficient. (2)

1.5 Predict the number of errors that will be made by a learner who takes 13 seconds to complete this task. (2)

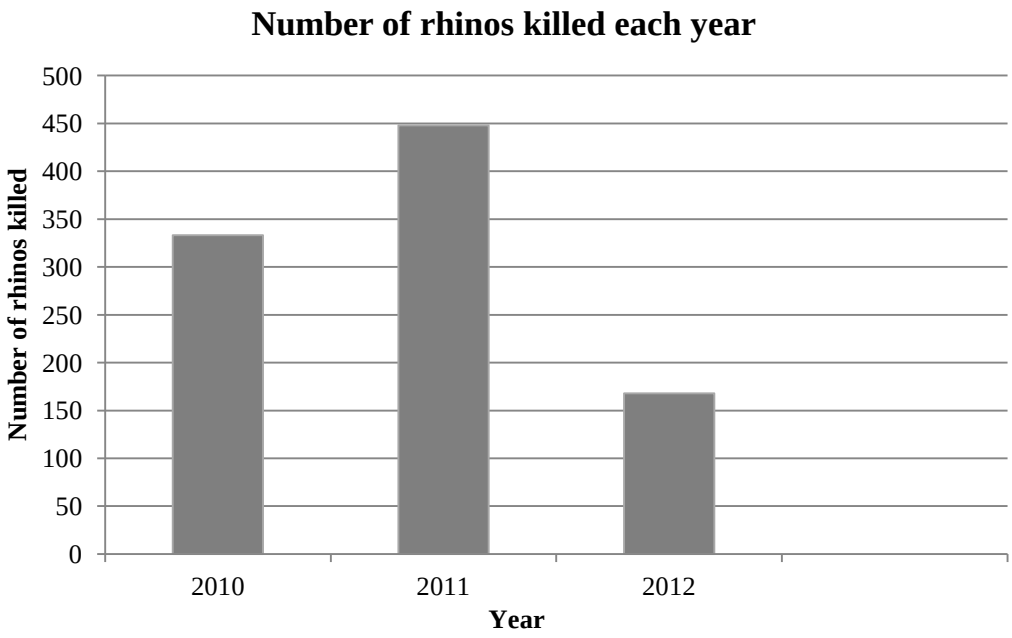
1.6 Comment on the strength of the relationship between the variables. (1)
[13]

QUESTION 2

The number of rhinos killed by poachers has resulted in an increased awareness of the wildlife in South Africa. The number of rhinos killed is given in the table below.

Year	Number killed by poachers
2010	333
2011	448
2012	168 (first 113 days of the year)

Using the information above, a learner sketched the following bar graph:



2.1 What impression is created by the bar graph above about the number of rhinos killed each year? (1)

2.2 Why can't the graph above be used to compare the number of rhinos killed each year? (1)

2.3 An environmental conservation organisation approaches you to sketch a bar graph to show that the continued poaching of rhinos will be disastrous for the country.

2.3.1 Explain how you would use the current information to show that poaching is approaching crisis levels. (1)

2.3.2 Sketch a bar graph that the organisation can use in the print media to highlight the crisis in such a way that it is not misleading. (2)
[5]

QUESTION 3

3.1 The height of each learner in a class was measured and it was found that the mean height of the class was 1,6 m. At the time, three learners were absent. However, when the heights of the learners who were absent were included in the data for the class, the mean height did not change.

If the heights of two of the learners who were absent are 1,45 m and 1,63 m, calculate the height of the third learner who was absent. (3)

3.2 There are 184 students taking Mathematics in a first-year university class.
The marks, out of 100, in the half-yearly examination are normally distributed with a mean of 72 and a standard deviation of 9.

3.2.1 What percentage of students scored between 72 and 90 marks? (2)

3.2.2 Approximately how many students scored between 45 and 63 marks? (3)
[8]

QUESTION 4

The events A, B and C are such: A and B are independent, B and C are independent and A and C are mutually exclusive. Their probabilities are $P(A) = 0,3$, $P(B) = 0,4$ and $P(C) = 0,2$.

Calculate the probability of the following events occurring:

4.1 Both A and C occur. (2)

4.2 Both B and C occur. (2)

4.3 At least one of A or B occur. (4)
[8]

QUESTION 5

Consider the word: PRODUCT.

5.1 How many different arrangements are possible if all the letters are used? (2)

5.2 How many different arrangements can be made if the first letter is T and the fifth letter is C? (2)

5.3 How many different arrangements can be made if the letters R, O and D must follow each other, in any order? (3)
[7]

QUESTION 6

A survey is conducted among 174 students. The results are shown below.

- 37 study Life Sciences
- 60 study Physical Sciences
- 111 study Mathematics
- 29 study Life Sciences and Mathematics
- 50 study Mathematics and Physical Sciences
- 13 study Physical Sciences and Life Sciences
- 45 do not study any of Life Sciences, Mathematics or Physical Sciences
- x students study Life Sciences, Mathematics and Physical Sciences

6.1 Draw a Venn diagram to represent the information above. (6)

6.2 Show that $x = 13$. (3)

6.3 If a student were selected at random, calculate the probability that he studies the following:

6.3.1 Mathematics and Physical Sciences but not Life Sciences (2)

6.3.2 Only one of Mathematics or Physical Sciences or Life Sciences (2)
[13]

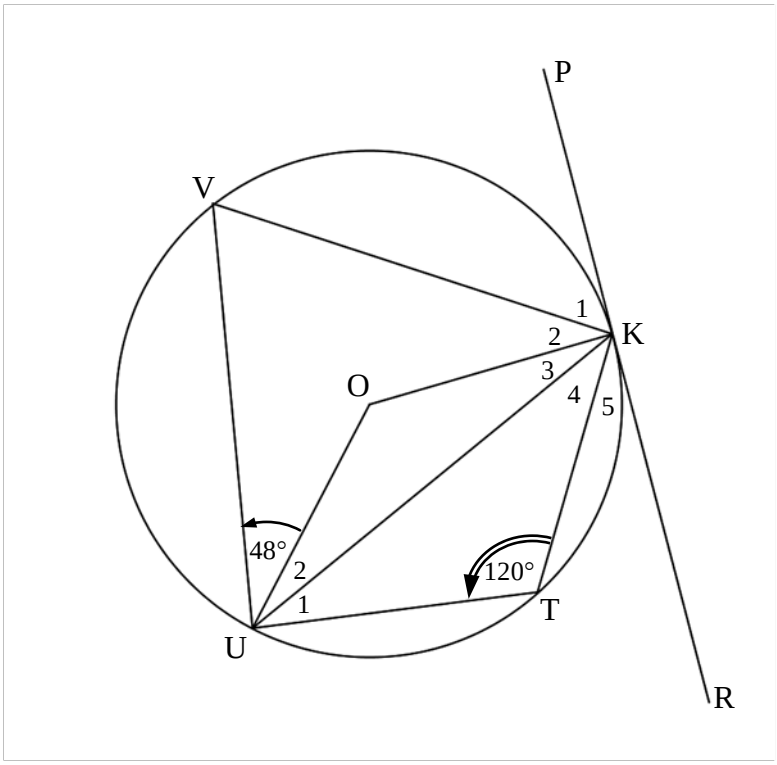
QUESTION 7

Given: $T_n = T_{n-2} + 3T_{n-1} - 4$; $T_1 = -1$; $T_2 = 5$ and $n > 2$

Write down the first 5 terms of the sequence. **[4]**

QUESTION 8

In the diagram below, O is the centre of the circle KTUV. PKR is a tangent to the circle at K. $O\hat{U}V = 48°$ and $K\hat{T}U = 120°$.



Calculate, with reasons, the sizes of the following angles:

8.1 $\hat{V}$ (2)

8.2 $K\hat{O}U$ (2)

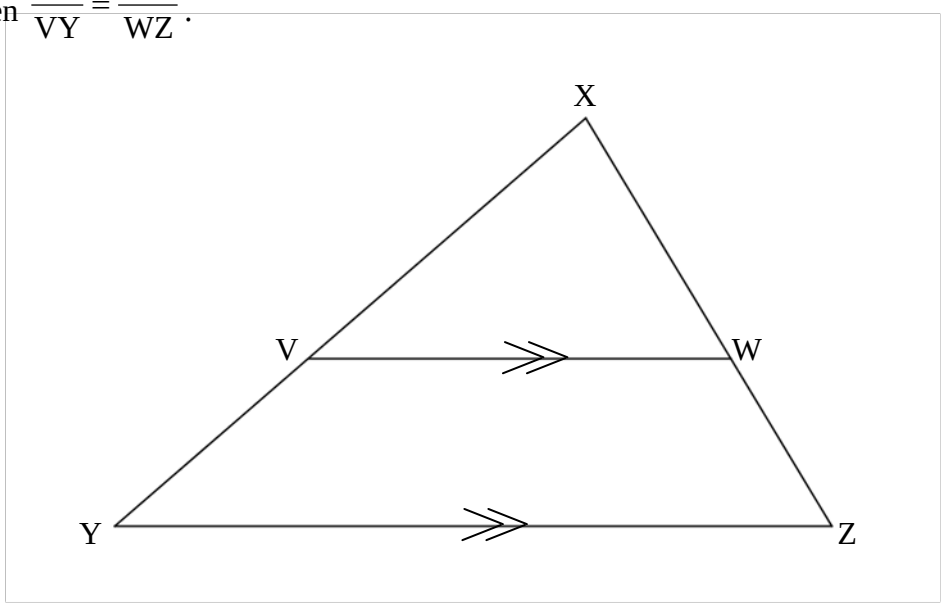
8.3 $\hat{U}_2$ (2)

8.4 $\hat{K}_1$ (2)

8.5 $\hat{K}_2$ (2)
[10]

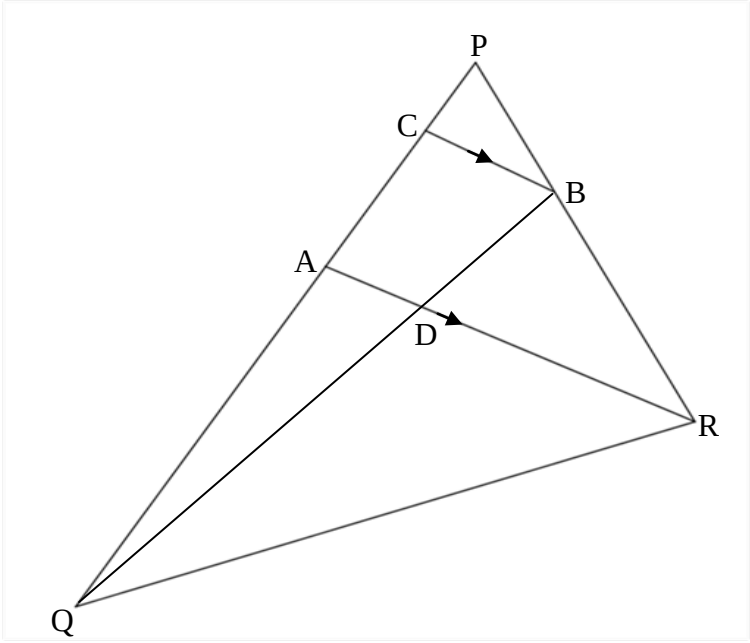
QUESTION 9

9.1 Use the diagram below to prove the theorem which states that if VW || YZ then $\frac{XV}{VY} = \frac{XW}{WZ}$.



(6)

9.2 In ΔPQR below, B lies on PR such that 2PB = BR. A lies on PQ such that PA : PQ = 3 : 8.
BC is drawn parallel to AR.



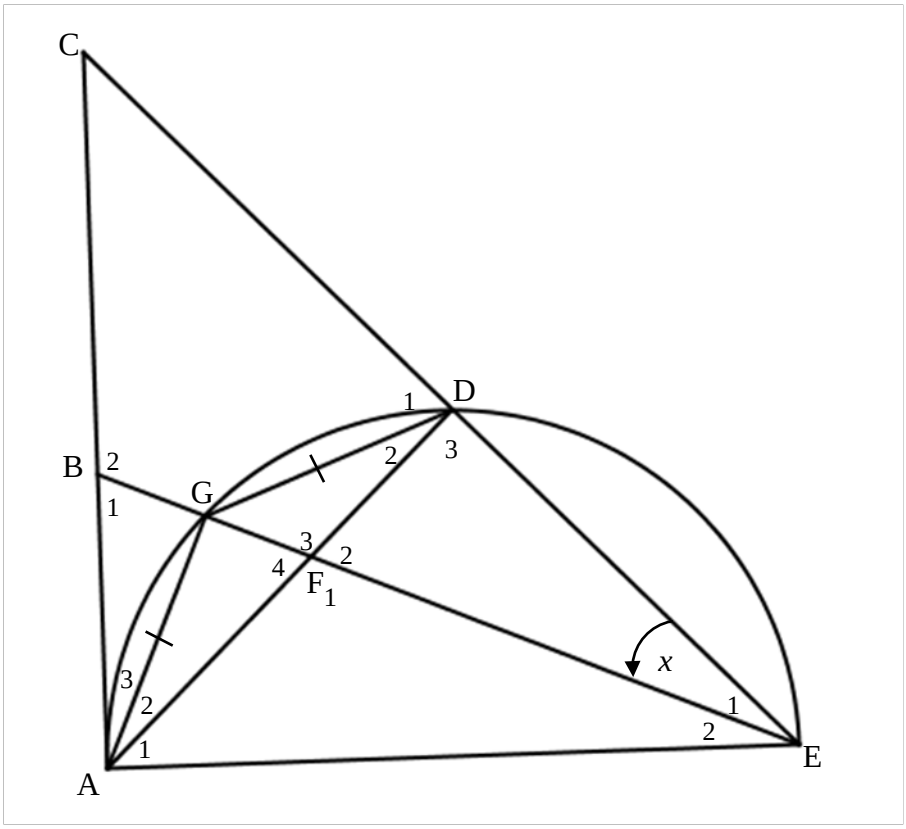
9.2.1 Write down the value of $\frac{\text{area of } \Delta PRA}{\text{area of } \Delta QRA}$ (2)

9.2.2 Calculate the value of the ratio $\frac{BD}{BQ}$. Show all working to support your answer. (5)

[13]

QUESTION 10

In the figure AGDE is a semicircle. AC is the tangent to the semicircle at A and EG produced intersects AC at B. AD intersects BE in F.
AG = GD. $\hat{E}_1 = x$.



10.1 Write down, with reasons, FOUR other angles each equal to *x*. (8)

10.2 Prove that BE.DE = AE.FE (7)

10.3 Prove that $\hat{B}_1 = \hat{D}_1$ (4)
[19]

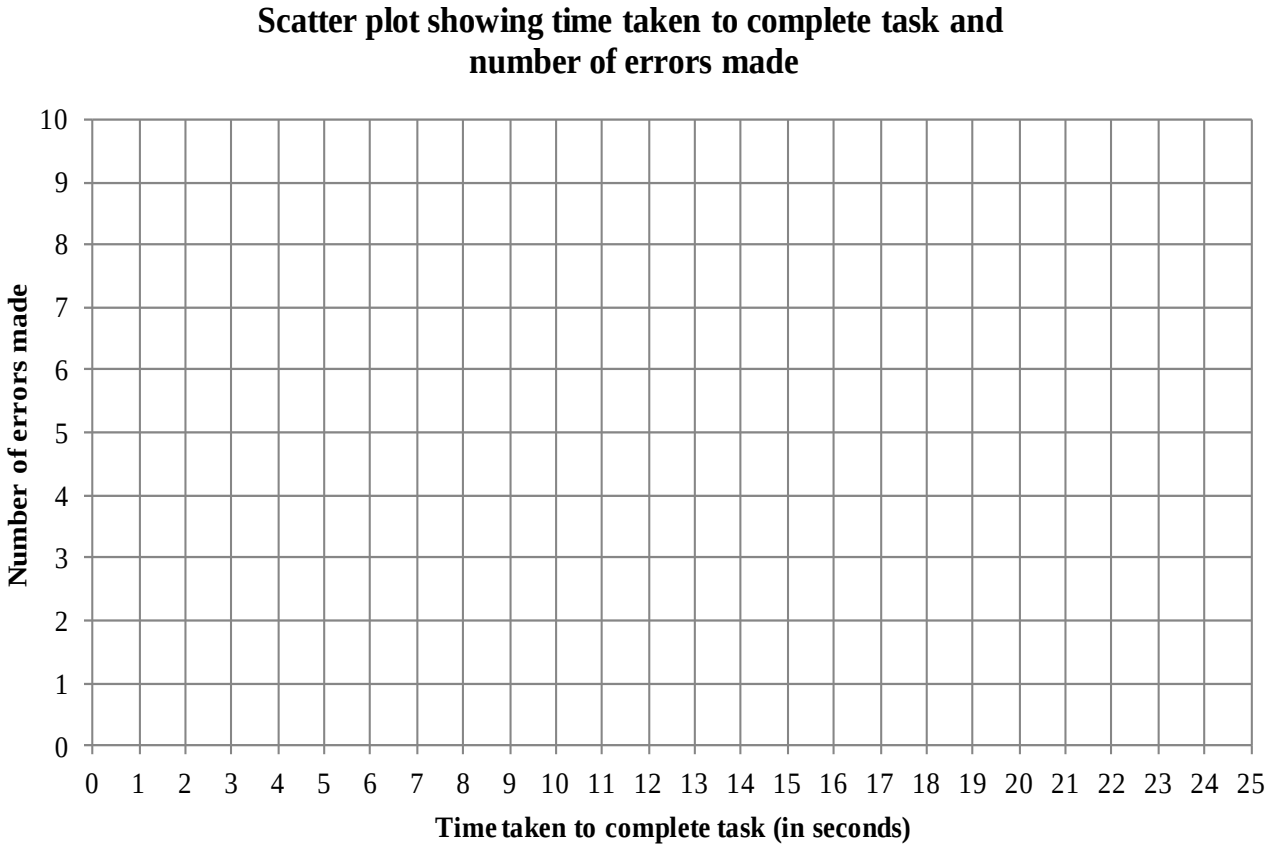
TOTAL: 100

CENTRE NUMBER: | | | | | | | | |

EXAMINATION NUMBER: | | | | | | | | | | | | | |

DIAGRAM SHEET 1

QUESTION 1.1

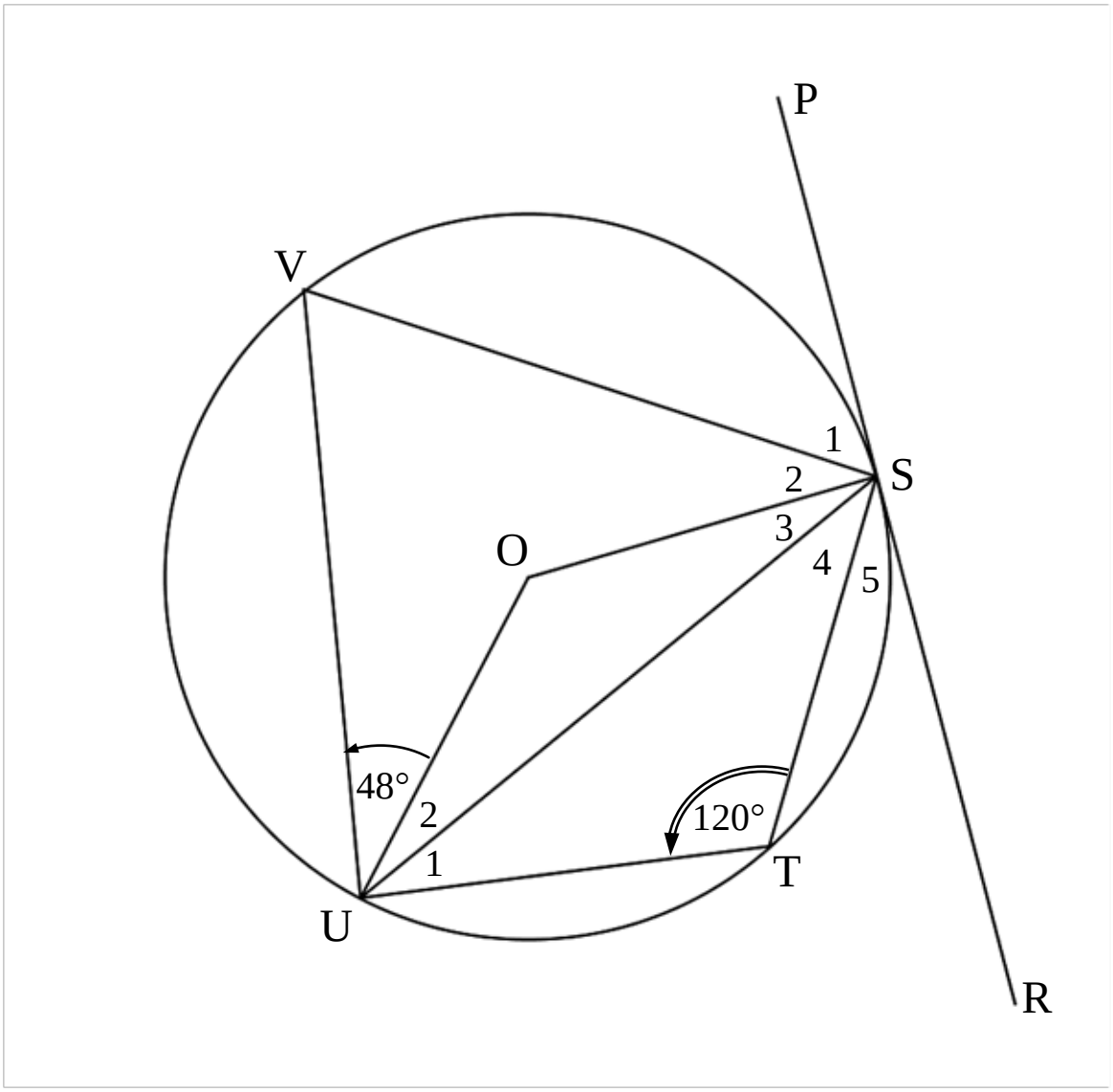


CENTRE NUMBER: | | | | | | | | |

EXAMINATION NUMBER: | | | | | | | | | | | | | |

DIAGRAM SHEET 2

QUESTION 8

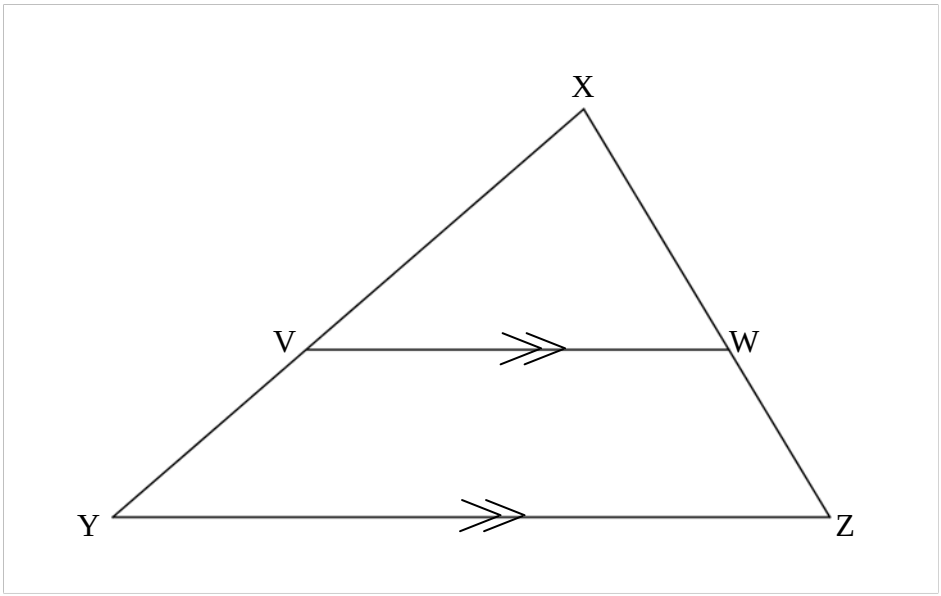


CENTRE NUMBER: | | | | | | | | |

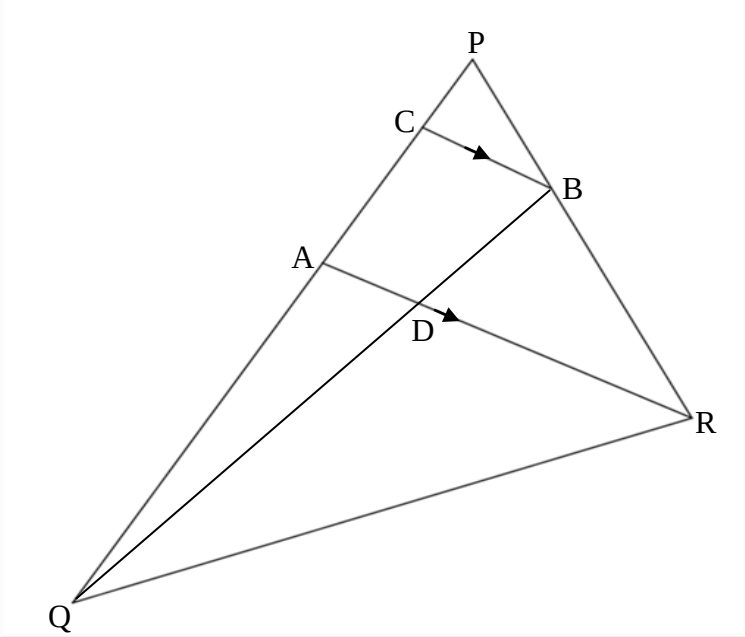
EXAMINATION NUMBER: | | | | | | | | | | | | | |

DIAGRAM SHEET 3

QUESTION 9.1



QUESTION 9.2

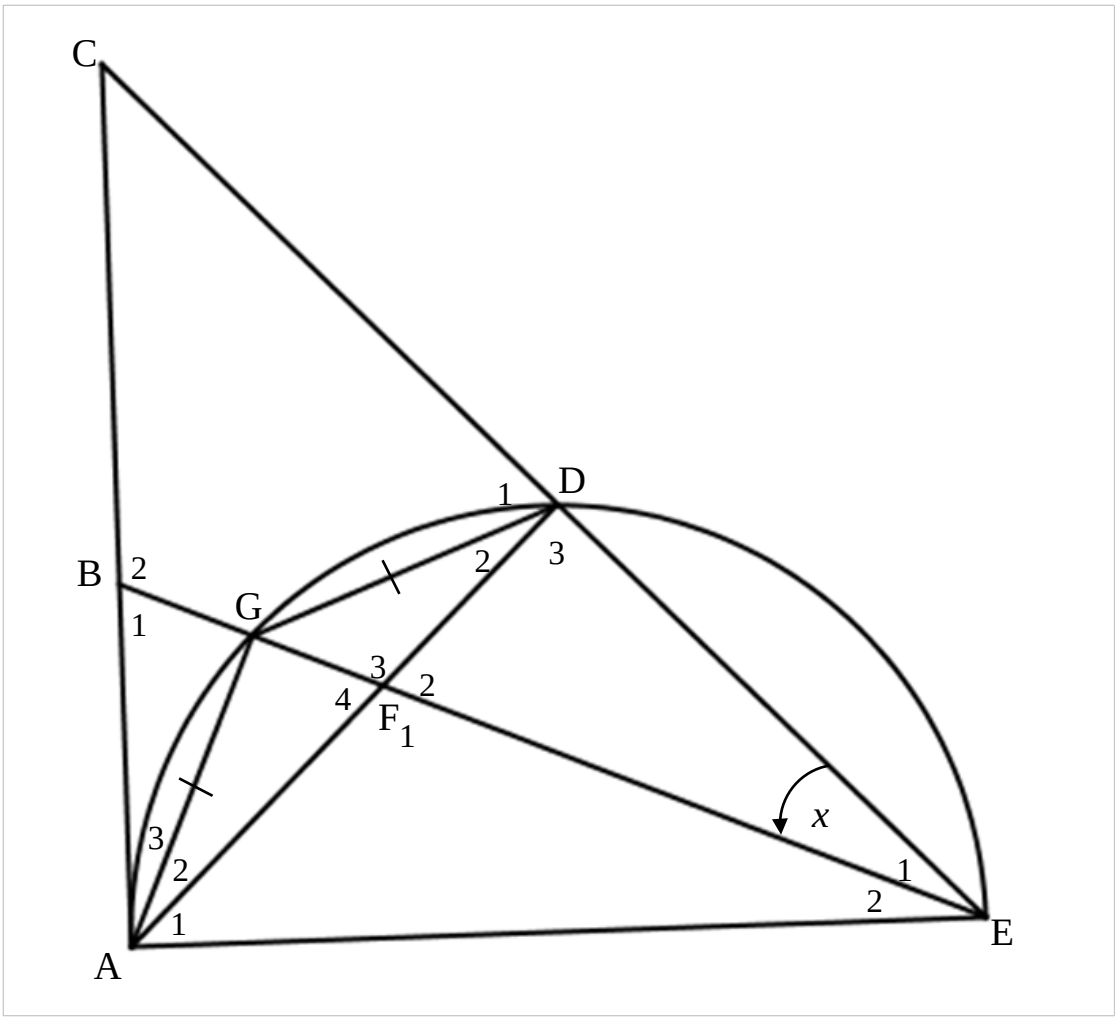


CENTRE NUMBER: | | | | | | | | |

EXAMINATION NUMBER: | | | | | | | | | | | | | |

DIAGRAM SHEET 4

QUESTION 10



INFORMATION SHEET: MATHEMATICS

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

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

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

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

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

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

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

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

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

In ΔABC: $\quad \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \qquad a^2 = b^2 + c^2 - 2bc.\cos A$

$$area\ \Delta ABC = \frac{1}{2}ab.\sin C$$

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

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

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

$$(x\,;\,y) \to (x\cos\theta - y\sin\theta\,;\, y\cos\theta + x\sin\theta)$$

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

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

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