



education

Department:
Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

**MATHEMATICS P3
EXEMPLAR 2008**

MARKS: 100

TIME: 2 hours

This question paper consists of 9 pages, 2 diagram sheets and a 1-page formula sheet.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 9 questions. Answer ALL the questions.
2. Show ALL calculations, diagrams, graphs, et cetera clearly, which you have used in determining the answers.
3. An approved scientific calculator (non-programmable and non-graphical) may be used, unless stated otherwise.
4. If necessary, answers should be rounded off to TWO decimal places, unless stated otherwise.
5. Number the answers correctly according to the numbering system used in this question paper.
6. Diagrams are NOT necessarily drawn to scale.
7. It is in your own interest to write legibly and to present the work neatly.

QUESTION 1

A sequence is defined as follows: $T_1 = 5$ and $T_{k+1} = T_k + 3$ for $k \geq 1$.

- 1.1 Write down the FIRST FIVE terms of the sequence. (3)
- 1.2 Give an explicit formula for the sequence. (2)
- [5]

QUESTION 2

The following extract was taken from a television news report during May 2007.

“Transnet bosses claim that a change in driving attitudes is necessary to combat accidents at railways crossings. Sixty one people were killed over the last three years in collisions involving trains and motor vehicles. Twenty farm workers lost their lives in one accident last year.

A train travelling at reasonable speed requires 2 kilometres to come to a stop. In a survey carried out at the same site where the farm workers were killed, the reporter noted that in a two-hour period one in 10 vehicles stopped before crossing the railway line, therefore confirming the claim made by the Transnet bosses.”

- 2.1 Calculate the average number of people killed annually in collisions involving trains and motor vehicles over the last three years. (1)
- 2.2 How does the accident, involving the farm workers, influence the average? (2)
- 2.3 Is the news reporter’s observation valid? Explain. (2)
- [5]

QUESTION 3

Mary is employed as a human resources officer at a company. She collected data on the hourly earnings of all non-salaried employees at her company and organised the data into the following table:

Hourly earnings (Rands)	Number of women	Number of men
9,70 – < 9,90	6	5
9,90 – < 10,10	31	16
10,10 – < 10,30	15	25
10,30 – < 10,50	29	30
10,50 – < 10,70	19	24

- 3.1 Calculate the mean for the hourly earnings of the men. (4)
- 3.2 Calculate the standard deviation for the hourly earnings of the men. (5)
- 3.3 As part of her analysis Mary also calculated the statistics for women.
They are: Mean: R10,25
Standard deviation: R0,25
- Mary reached the conclusion that there was little difference in the hourly earnings between men and women. Do you agree with Mary? Explain. (2)
- 3.4 Draw an ogive (cumulative frequency curve) for the hourly earnings for the men. (4)

[15]

QUESTION 4

4.1 A candidate writes an Accounting examination and a Mathematics examination. The candidate believes that he has a 40% chance of passing the Mathematics examination, a 60% chance of passing the Accounting examination and a 30% chance of passing both of them. What is the probability that the candidate passes Mathematics or Accounting? (3)

4.2 A box of 40 calculators is sent to a store. The owner of the store is not aware that 5 of the calculators are defective. Two calculators are selected at random from the box, the first one not being replaced before the second one is selected.

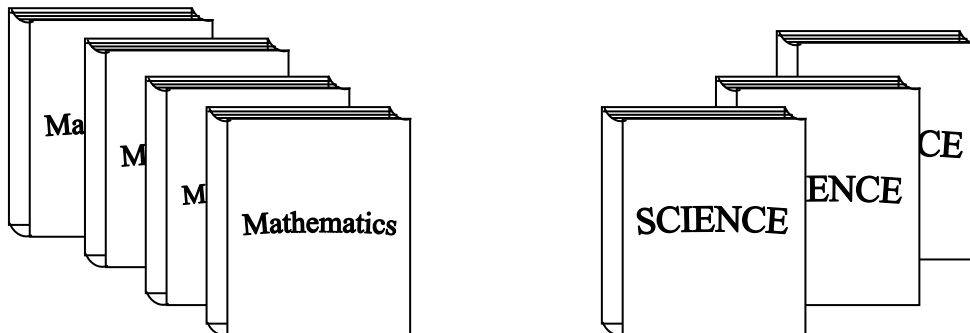


4.2.1 What is the probability that the first one chosen is not defective? (2)

4.2.2 What is the probability that of the two calculators selected one calculator is defective and the other is not? (4)

4.2.3 What is the probability that both the calculators selected are defective? (3)

4.3 Four Mathematics books and three Science books were left on the table. You need to place these books on a shelf.



4.3.1 If you decide to place any book in any position, in how many different ways can you arrange the books on the shelf? (3)

4.3.2 If two particular books must be placed next to each other, in how many different ways can you arrange the books on the shelf? (2)

4.3.3 If all the Mathematics books must be placed next to each other and all the Science books must be placed next to each other, in how many different ways can you arrange the books on the shelf? (3)

[20]

QUESTION 5

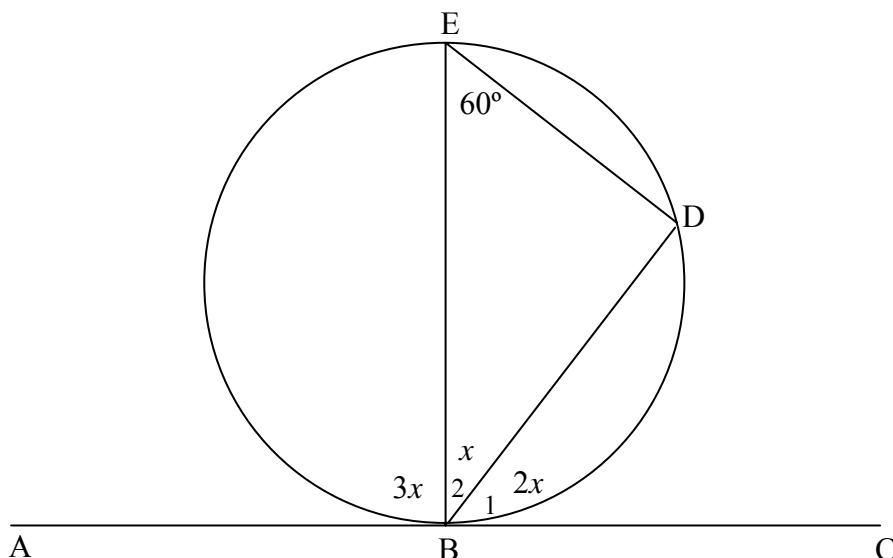
The owner of Star Travel and Tours compiled the following data which illustrates the relationship between the annual profit of the business and its annual advertising expenditure (both in thousands of rands)

Annual advertising expenditure (x)	12	14	17	21	26	30
Annual profit (y)	60	70	90	100	100	120

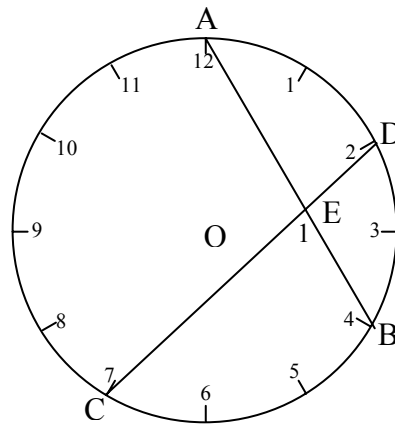
- 5.1 Draw a scatter plot for the data. (3)
- 5.2 Calculate the equation of the least squares line for the data. (4)
- 5.3 Draw the least squares line for the data. (1)
- 5.4 Predict the annual profit if the annual advertising expenditure is R25 000. (2)
- 5.5 Calculate the correlation coefficient. (3)
- 5.6 What conclusion can you reach about the strength of the relationship between the annual profit and the annual advertising expenditure? (2)
- [15]**

QUESTION 6

- 6.1 In the adjacent figure, $\hat{E} = 60^\circ$. ABC is a straight line.
- 6.1.1 Calculate the value of x . (3)
- 6.1.2 Prove AC is a tangent to the circle. (2)



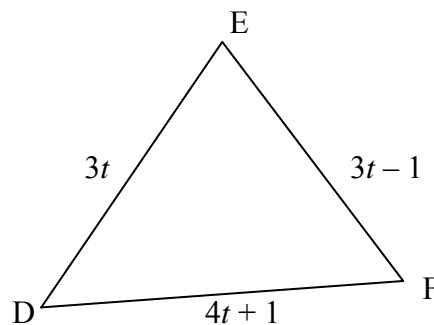
6.2 The diagram below shows a clock face. 12 is joined to the 4 and 2 to the 7 with straight lines AB and CD respectively. O is the centre of the clock face.



- 6.2.1 If AO and DO are joined, show that $\hat{AOD} = 60^\circ$. (2)
- 6.2.2 If CO and BO are joined calculate acute \hat{COB} . (2)
- 6.2.3 Hence, or otherwise, calculate \hat{E}_1 . (3)
- [12]**

QUESTION 7

In the figure below $\triangle DEF$ is drawn with $DE = 3t$ units; $DF = (4t + 1)$ units and $EF = (3t - 1)$ units with $t > 0$.

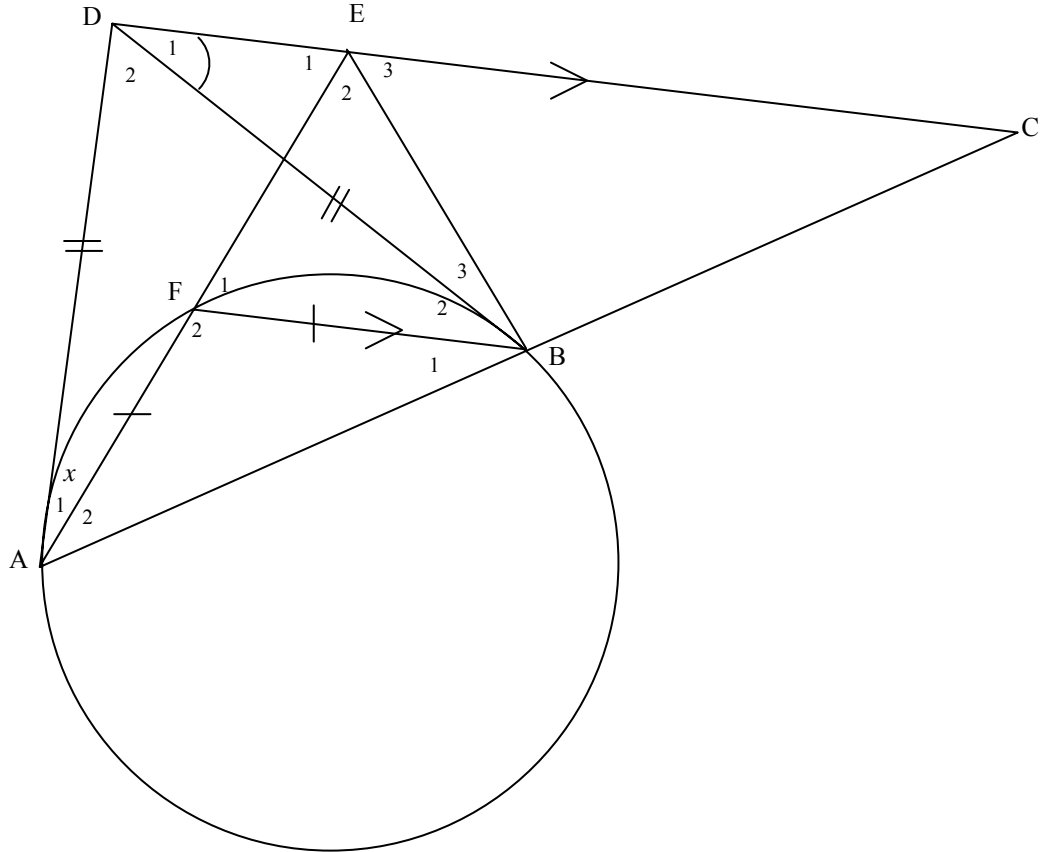


- 7.1 Which side of $\triangle DEF$ is the longest side? Motivate your answer. (2)
- 7.2 Now calculate the values of t for which $\triangle DEF$ will be right angled. (4)
- [6]**

QUESTION 8

In the sketch below, DA and DB are tangents to the circle at A and B. AF=FB. AB produced cuts the line through D, which is parallel to FB, at C. AF produced meets DC at E and

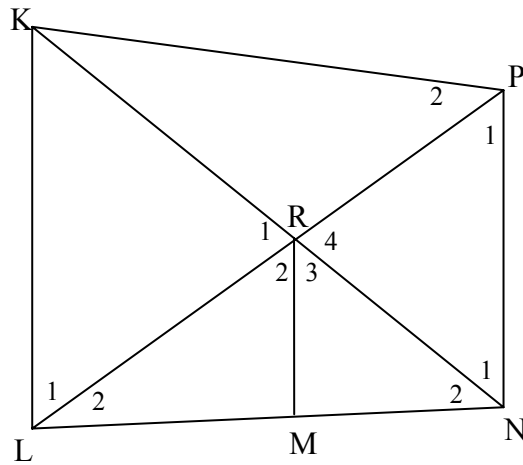
$\hat{DAE} = x$.



- 8.1 Find, with reasons, 5 angles each equal to x . (5)
 - 8.2 Prove that ABED is a cyclic quadrilateral. (2)
 - 8.3 Prove $\hat{ABE} = 3\hat{DAE}$ (3)
 - 8.4 Prove $AD = BC$. (3)
- [13]**

QUESTION 9

In the figure alongside, MR bisects \hat{LRN} with M on LN. LRP and NRK are straight lines and $LK \parallel MR \parallel NP$.



Prove that:

- 9.1 $\frac{LR}{RN} = \frac{LM}{MN}$ (4)
- 9.2 KLNP is cyclic (2)
- 9.3 $\Delta KLP \parallel \Delta MRN$ (3)

[9]

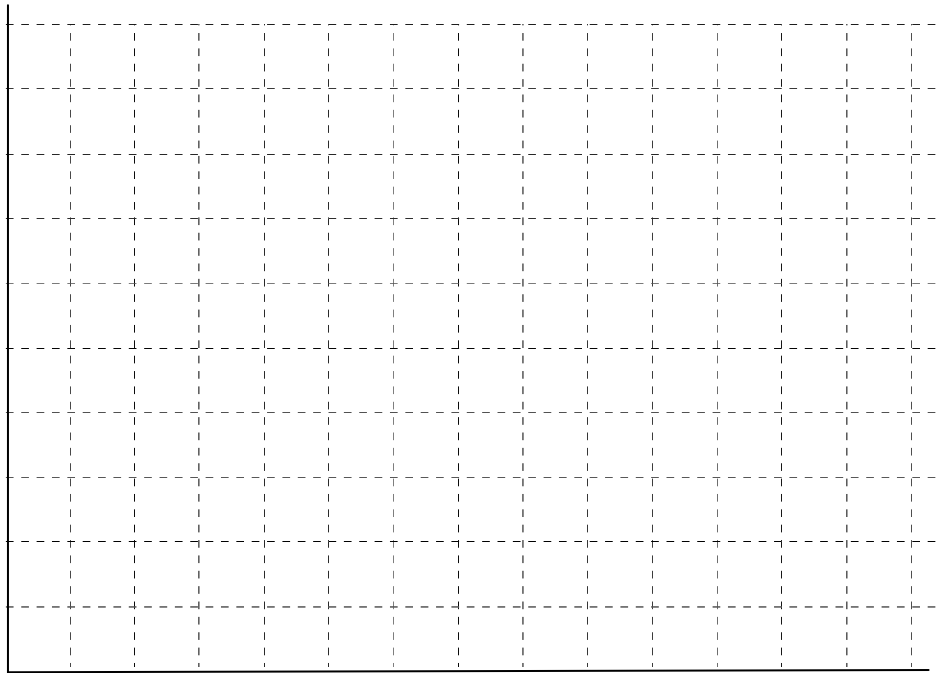
TOTAL : 100

NAME/EXAMINATION NUMBER:

DIAGRAM SHEET 1

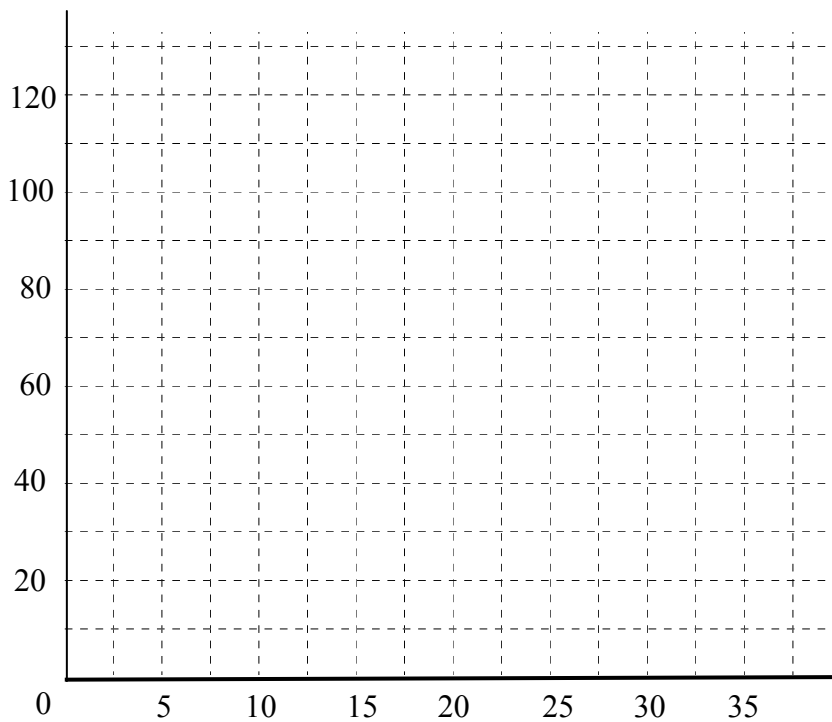
QUESTION 3

3.4



QUESTION 5

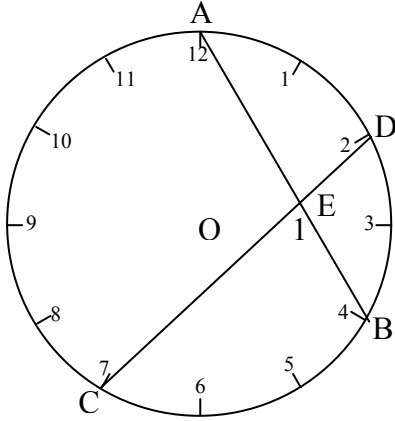
5.1



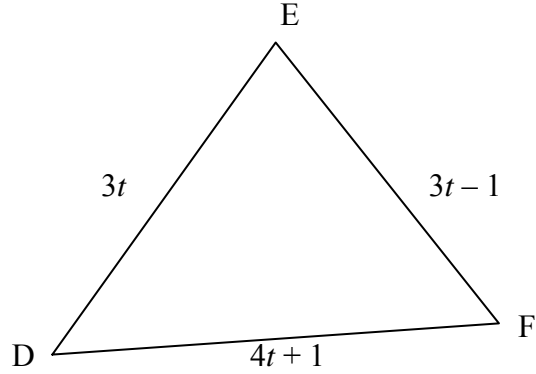
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DIAGRAM SHEET 2

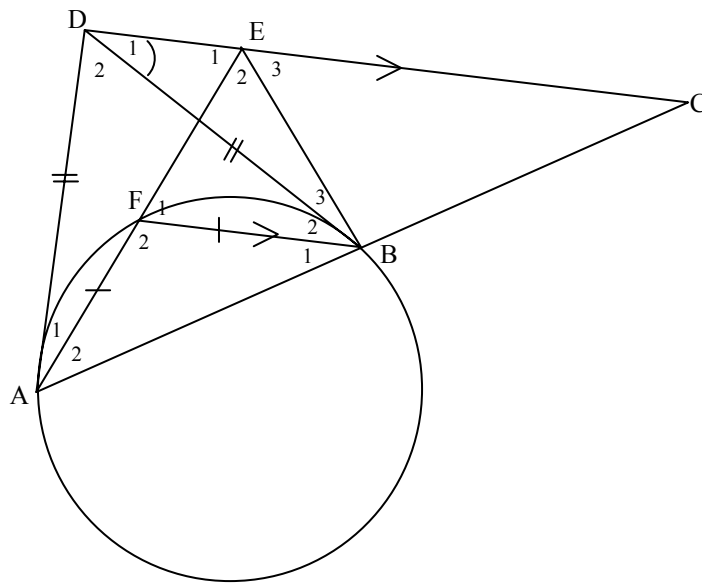
QUESTION 6



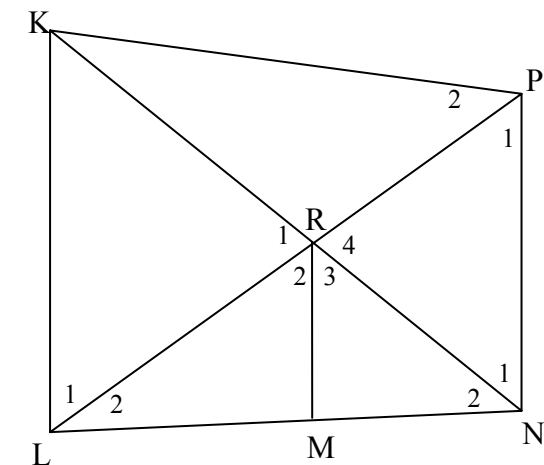
QUESTION 7



QUESTION 8



QUESTION 9



INFORMATION SHEET: MATHEMATICS
INLIGTINGSBLAD: WISKUNDE

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

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

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

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

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

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

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

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

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

$$y = mx + c$$

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

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

In ABC :

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$m = \tan \theta$$

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

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

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

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