



# education

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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 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. Clearly show ALL calculations, diagrams, graphs, et cetera, 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. TWO diagram sheets for answering QUESTION 3.4, QUESTION 5.1 and QUESTIONS 6 – 9 are attached at the end of this question paper. Write your name/examination number in the spaces provided and hand them in together with your ANSWER BOOK.
8. 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 Write down the formula for  $T_n$  in its simplest form. (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 railway crossings. Sixty-one people were killed over the last three years in collisions involving trains and motor vehicles. 20 farm workers lost their lives in one such 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 only 1 out of 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 4**

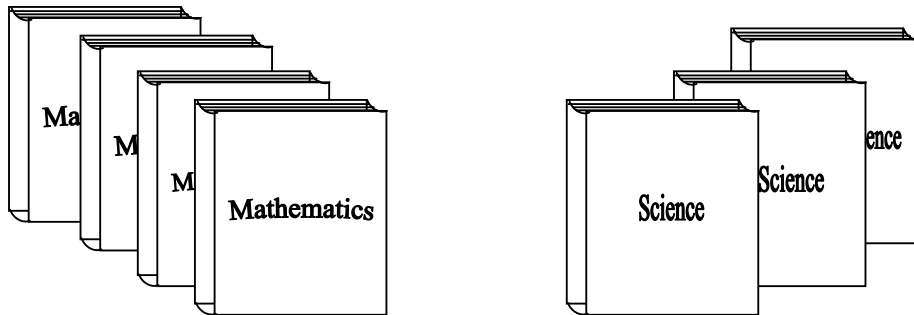
- 4.1 A candidate writes an accounting examination and a mathematics examination. The candidate believes that he has a 40% chance of passing the mathematics examination, a 60% chance of passing the accounting examination and a 30% chance of passing both of them. What is the probability that the candidate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

- 4.2 A box of 40 pocket calculators is sent to a store. The owner of the store is not aware that 5 of the pocket calculators are defective. Two pocket 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 pocket calculators selected, one calculator is defective and the other is not? (4)
- 4.2.3 What is the probability that both the pocket calculators selected were defective? (3)

- 4.3 Four different mathematics books and three different 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**

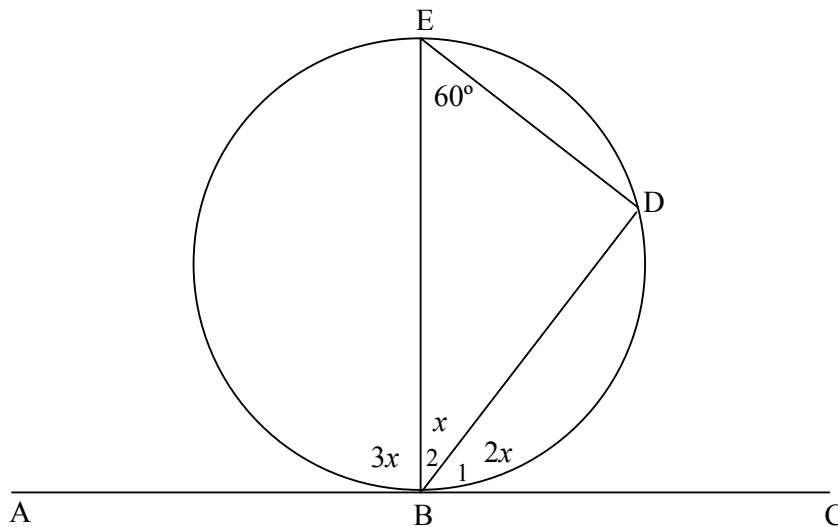
The owner of Star Travel and Tours compiled the following data which illustrate the relationship between the annual profit of the business and its annual advertising expenditure (both in thousands of rand).

<b>Annual advertising expenditure (<math>x</math>)</b>	12	14	17	21	26	30
<b>Annual profit (<math>y</math>)</b>	60	70	90	100	100	120

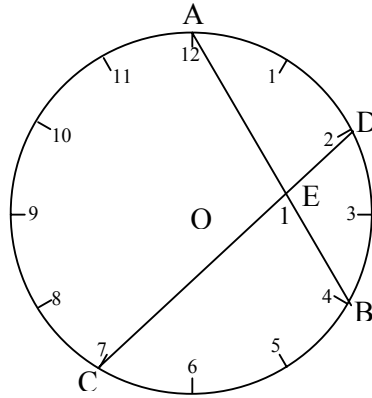
- 5.1 Plot a scatter diagram for the data. (3)
  - 5.2 Calculate the equation of the least squares line for the data. (4)
  - 5.3 Draw the least squares line for the data. (1)
  - 5.4 Predict the annual profit if the annual advertising expenditure is R25 000. (2)
  - 5.5 Calculate the correlation coefficient. (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 figure below,  $\hat{E} = 60^\circ$ . ABC is a straight line.
  - 6.1.1 Calculate, with reason, the value of  $x$ . (3)
  - 6.1.2 Prove that AC is a tangent to the circle. (2)



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



6.2.1 If AO and DO are joined, show that  $\hat{AOD} = 60^\circ$ . (2)

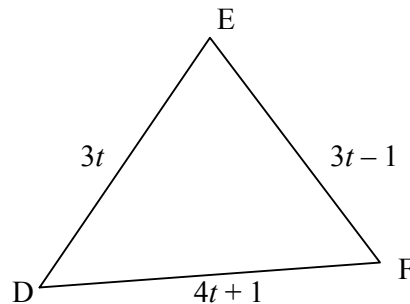
6.2.2 If CO and BO are joined calculate  $\hat{COB}$ . (2)

6.2.3 Hence, 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  $t > 0$ .



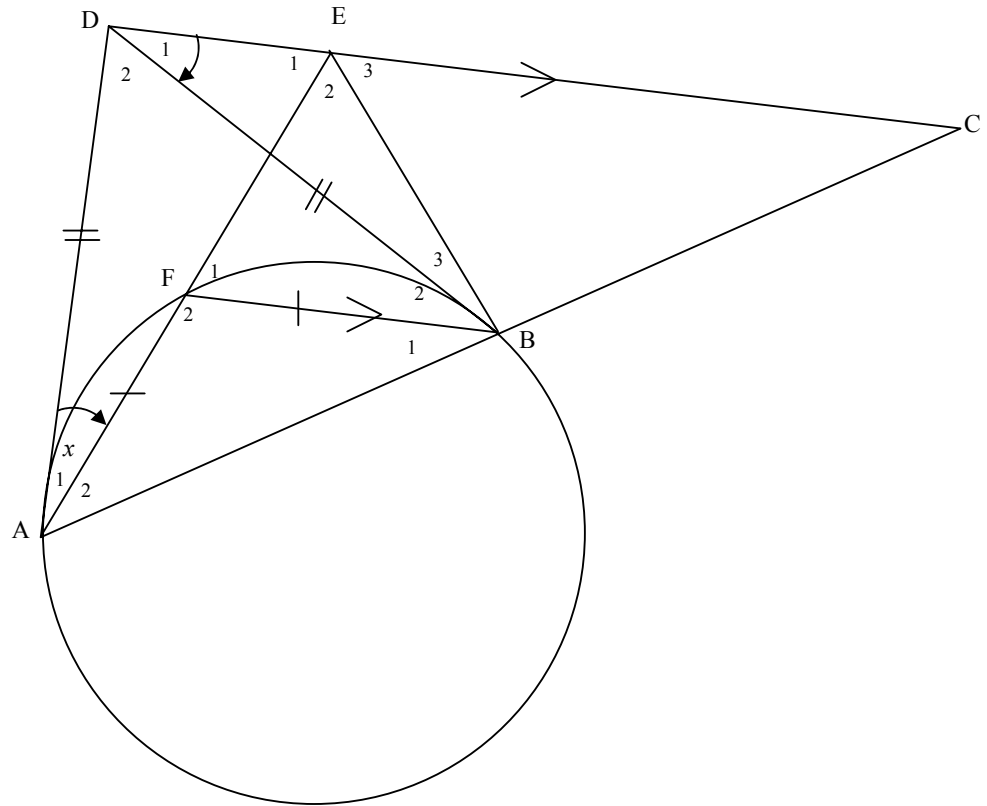
7.1 Which side of  $\triangle DEF$  is the longest side? Motivate your answer. (2)

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  $\hat{DAE} = x$ .

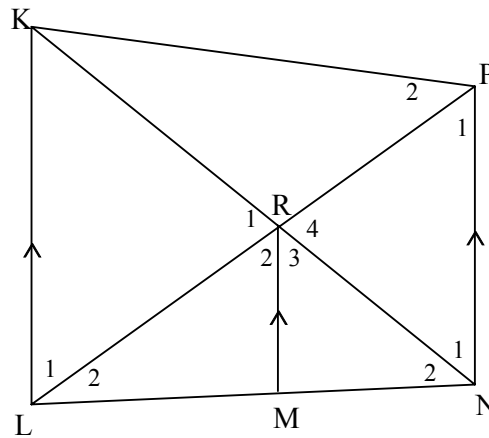


- 8.1 Find, with reasons, 5 angles each equal to  $x$ . (5)
  - 8.2 Prove that ABED is a cyclic quadrilateral. (2)
  - 8.3 Prove that  $\hat{ABE} = 3 \hat{DAE}$ . (3)
  - 8.4 Prove that  $AD = BC$ . (3)
- [13]**



**QUESTION 9**

In the figure below, 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]**

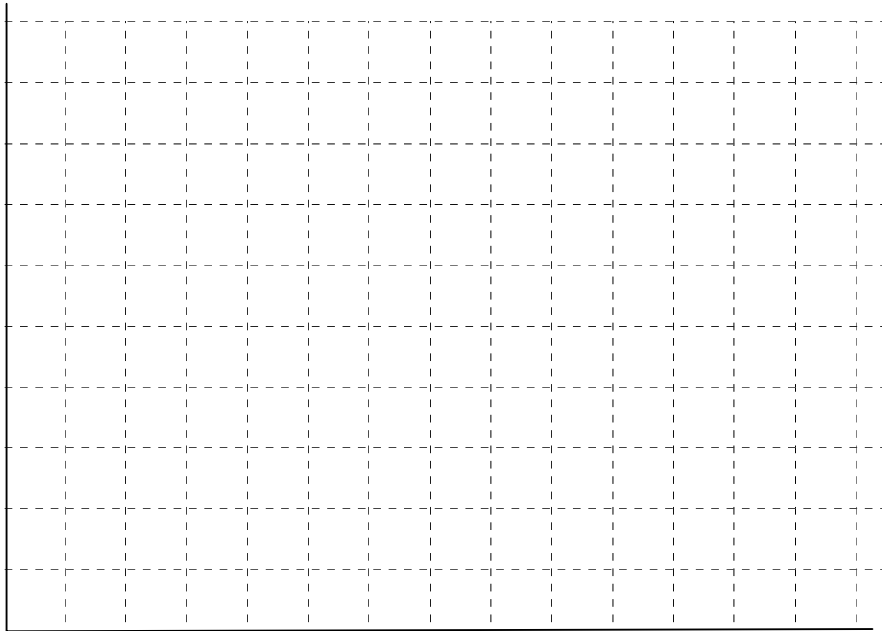
**TOTAL: 100**

**NAME/EXAMINATION NUMBER:**

**DIAGRAM SHEET 1**

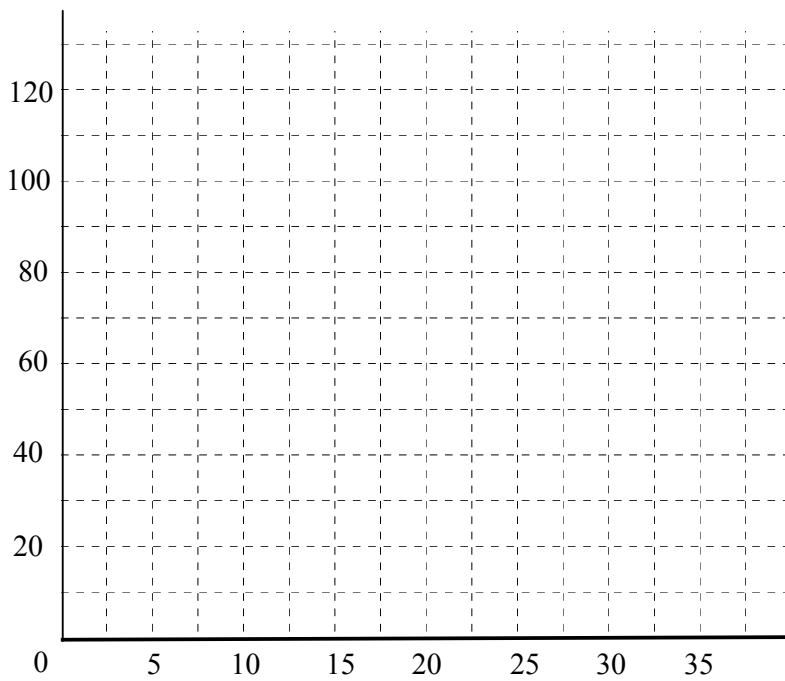
**QUESTION 3**

**3.4**



**QUESTION 5**

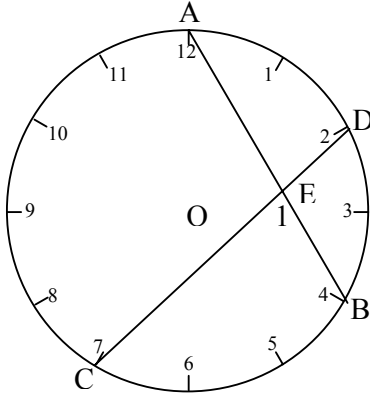
**5.1**



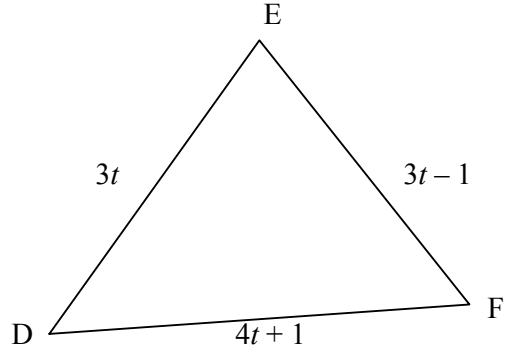
NAME/EXAMINATION NUMBER:

**DIAGRAM SHEET 2**

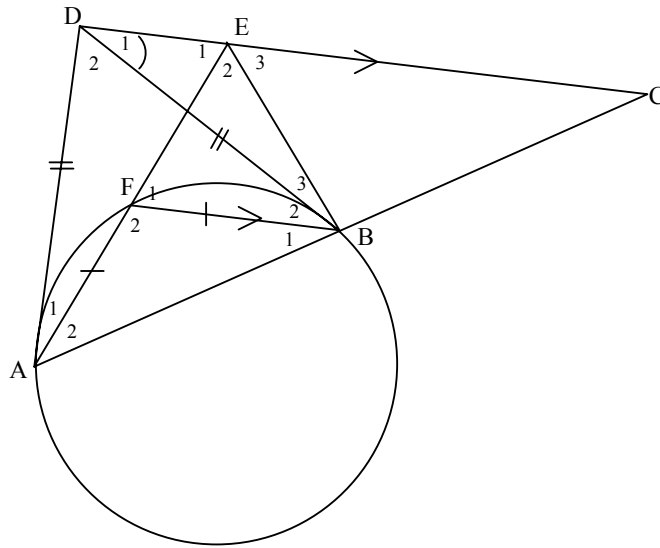
**QUESTION 6**



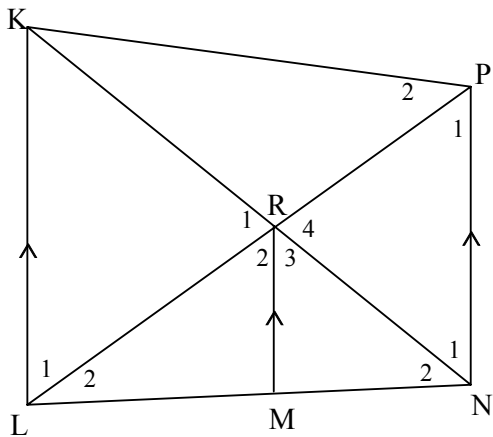
**QUESTION 7**



**QUESTION 8**



**QUESTION 9**



**FORMULA SHEET: MATHEMATICS**  
**FORMULEBLAD: 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  $\triangle ABC$ :

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

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

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

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

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

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

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

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

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

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

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

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

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