



Province of the
EASTERN CAPE
EDUCATION

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

SEPTEMBER 2011

MATHEMATICS P2

MARKS: 150

TIME: 3 hours



This question paper consists of 14 pages including a formula sheet and 4 page diagram sheet.

INSTRUCTIONS AND INFORMATION

1. This question paper consists of 11 questions. Answer ALL the questions.
2. Clearly show ALL calculations, diagrams, graphs, et cetera, which you have used in determining the answers. Answers only will not necessarily be awarded full marks.
3. An approved scientific calculator (non-programmable and non-graphical) may be used, unless stated otherwise.
4. Round off your answers to TWO decimal places if necessary, unless stated otherwise.
5. Diagrams are not necessarily drawn to scale.
6. FOUR diagram sheets for answering QUESTION 2.1, QUESTION 3.1, QUESTION 3.2, QUESTION 3.4, QUESTION 6.2.2 and QUESTION 11.2 are attached at the end of this question paper. Write your name and surname and insert it in the spaces provided in your answer book.
7. Number the answers correctly according to the numbering system used in this question paper.
8. Write legibly and present your work neatly.
9. An information sheet, with formulae, is included at the end of this question paper.

QUESTION 1

The points received by the top ten Premier Soccer League teams (in no particular order) in the 2010/2011 season are as follows:

40 35 60 58 59 37 52 60 33 40

- 1.1 Determine the mean points received. (2)
 - 1.2 Determine the standard deviation of the points received. (3)
 - 1.3 What percentage of teams received points that are within one standard deviation of the mean? (3)
- [8]**

QUESTION 2

The table below shows the CASS percentages of 8 learners in Mathematics and Physical Sciences:

MATHEMATICS %	70	50	44	63	24	55	80	46
PHYSICAL SCIENCES %	65	68	49	67	29	60	82	55

- 2.1 Draw a scatter plot for the above data using DIAGRAM SHEET 1. (2)
 - 2.2 The researcher says that learners who do well in Mathematics are likely to do well in Physical Sciences. Do you agree with the researcher? Give a reason for your answer. (2)
 - 2.3 Draw the line of best fit. (1)
 - 2.4 Use the line of best fit to estimate the Mathematics percentage of a learner who got 46% in Physical Sciences. (2)
- [7]**

QUESTION 3

A survey was conducted about the teaching experience of Mathematics teachers during a Mathematics workshop:

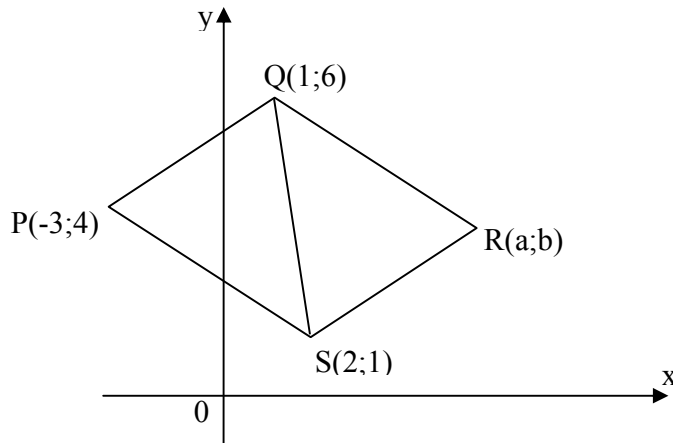
TEACHING EXPERIENCE (IN YEARS)	FREQUENCY	CUMULATIVE FREQUENCY
$5 \leq x < 10$	5	
$10 \leq x < 15$	9	
$15 \leq x < 20$	13	
$20 \leq x < 25$	11	38
$25 \leq x < 30$		46
$30 \leq x < 35$		49
$35 \leq x < 40$		50

- 3.1 Complete the frequency/ cumulative frequency table on DIAGRAM SHEET 2. (2)
- 3.2 Draw an ogive for the data on the grid provided on DIAGRAM SHEET 2. (3)
- 3.3 The least experienced teacher had 5 years teaching experience and the most experienced teacher had 39 years experience. Use this information and the ogive to write down the five number summary. (4)
- 3.4 Draw a box and whisker diagram for the above data using DIAGRAM SHEET 2. (2)
- 3.5 Comment on the distribution of data. (1)

[12]

QUESTION 4

In the diagram below, PQRS is a parallelogram with vertices $P(-3;4)$, $Q(1;6)$, $R(a;b)$ and $S(2;1)$.



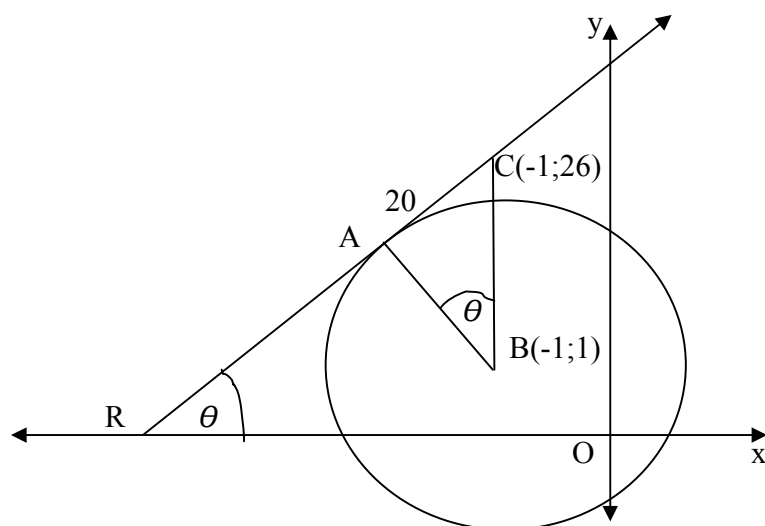
Determine:

- 4.1 the gradient of PQ. (2)
- 4.2 the co-ordinates of M, the midpoint of QS. (2)
- 4.3 the co-ordinates of R. (3)
- 4.4 the equation of RS. (4)
- 4.5 the size of \widehat{POS} . (5)
- 4.6 the lengths of PQ and PS and hence whether PQRS is a rhombus. (5)

[21]

QUESTION 5

In the figure, $B(-1;1)$ is the centre of the circle. CA is a tangent to the circle at A . C is the point $(-1;26)$, $\widehat{CBA} = \widehat{ARO} = \theta$ and $CA = 20$ units.



Calculate:

- 5.1 the length of AB and hence the value of $\tan \theta$. (4)
- 5.2 the equation of the circle. (3)
- 5.3 the equation of the tangent CR (4)
- 5.4 the equation of the radius AB (3)
- 5.5 the co-ordinates of A (4)

[18]

QUESTION 6

- 6.1 $E(5; -1)$ is a point on the Cartesian plane. Determine the coordinates of E' , the image of E , if:
 - 6.1.1 E is reflected across the line $y = -x$. (2)
 - 6.1.2 E is translated 5 units to the left and 2 units up. (2)
 - 6.1.3 E is rotated about the origin through 90° in an anti-clockwise direction. (2)

6.2 A quadrilateral REAL is transformed to its image $R'''E'''A'''L'''$ as follows:

- REAL is reflected across the line $y = 0$ (x -axis).
- Then the first image is rotated through 180° .
- The second image is then reduced by a scale factor of $\frac{1}{2}$.

6.2.1 Determine the general rule of transforming REAL to $R'''E'''A'''L'''$. (6)

6.2.2 Hence or otherwise, draw quadrilateral $R'''E'''A'''L'''$ using DIAGRAM SHEET 3 if the vertices of REAL are $R(-8;8)$, $E(-2;10)$, $A(-2;2)$ and $L(-8;2)$. (3)

6.2.3 Comment on the rigidity of the transformation of REAL to $R'''E'''A'''L'''$. (2)

6.2.4 The perimeter of REAL is p units and the area of REAL is q^2 square units. Determine the perimeter and the area of $R'''E'''A'''L'''$ in terms of p and q . (3)

[20]

QUESTION 7

The point $D(-4; q)$ is rotated about the origin through 120° in a clockwise direction to $D'(p; 2)$. Determine the values of p and q . (Leave your answer in simplest surd form). (5)

[5]

QUESTION 8

8.1 If $\sin 56^\circ = t$, determine the following in terms of t

8.1.1 $\sin(-236^\circ)$ (2)

8.1.2 $\sin 34^\circ$ (3)

8.1.3 $\cos 4^\circ$ (4)

8.2 Prove, without using a calculator, that if $\tan P = 1$ and $\tan Q = 2$, then

$$\frac{\sin(P+Q)}{\cos P \cos Q} = 3 \quad (4)$$

[13]

QUESTION 9

9.1 Simplify without using a calculator:

$$\frac{\cos(x - 180^\circ) \cdot \tan x \cdot \sin 538^\circ}{\sin(180^\circ - 2x) \cdot \cos 92^\circ} \quad (7)$$

9.2 Consider the identity:

$$\frac{\sin^2 x}{\cos x - \cos^2 x} = \frac{1 + \cos x}{\cos x}$$

9.2.1 Prove the identity. (4)

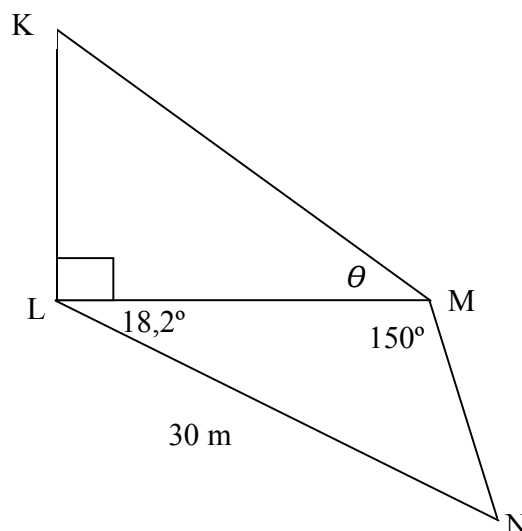
9.2.2 Determine the values of x , $x \in [0^\circ; 180^\circ]$ for which the identity is undefined. (2)

9.3 Determine the general solution of: $\cos 2x - 2\sin 2x = -1$. (9)

[22]

QUESTION 10

In the diagram below, KL is a building. Points L, M and N are in the same horizontal plane. The angle of elevation from M to the top of the building is θ . $\widehat{LMN} = 150^\circ$ and $\widehat{MLN} = 18,2^\circ$. $LN = 30$ metres.



10.1 Show that $KL = 60 \tan \theta \cdot \sin 11,8^\circ$. (5)

10.2 Calculate the height of the building, KL, if $\theta = 52,7^\circ$. (2)

10.3 Calculate the area of $\triangle LMN$. (2)

[9]

QUESTION 11

Given $f(x) = \sin(x + 30^\circ)$ and $g(x) = \cos 2x$

- 11.1 Write down the period of g . (1)
- 11.2 Sketch the graphs of f and g on the system of axes on DIAGRAM SHEET 4 for $x \in [-180^\circ; 180^\circ]$. (6)
- 11.3 Use the graph to determine the number of solutions to $f(x) - g(x) = 0$ for $x \in [180^\circ; 180^\circ]$. (1)
- 11.4 If the graph of f is shifted 60° to the right and the graph of g is moved 2 units up, write down the equations of the new graphs. (2)
- 11.5 What is the maximum value of y if $y = 2f(x)$? (2)
- 11.6 For which values of x is $f'(x) > 0$ and $g'(x) > 0$? (3)

[15]**TOTAL: 150**