TIME : 3 HOURS
MARKS : 150

MATHEMATICS

PAPER 2

SEPTEMBER 2008

Education

Western Cape Education Department

NATIONAL STRATEGY FOR LEARNER ATTAINMENT

NATIONAL SENIOR CERTIFICATE

SEPTEMBER EXAMINATION 2008

This question paper consists of 12 pages, a formula sheet and 1 diagram sheet.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions:

1. This question paper consists of 11 questions, a formula sheet and 1 diagram sheets.

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 the numbering system used in this question paper.

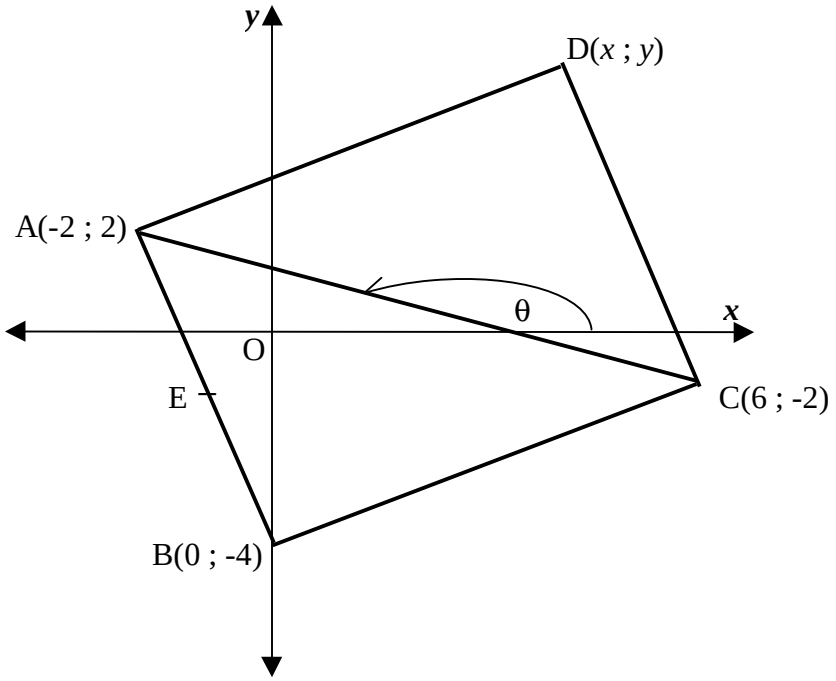
6. Diagrams are not necessarily drawn to scale.

7. It is in your own interest to write legibly and to present your work neatly.

8. A diagram sheet for answering QUESTION 3.3.1 is included at the end of this question paper. Write your name/examination number in the space provided and haand it in together with your ANSWER BOOK.

QUESTION 1

In the diagram below, ABCD is a quadrilateral with vertices
A (-2 ; 2) , B(0 ; -4) , C (6 ; -2) and D (x; y)



1.1 Calculate the length of BC. (Leave answer in surd form.) (2)

1.2 Show that ΔABC is a right angled triangle. (5)

1.3 Calculate the area of ΔABC. (3)

1.4 Determine the equation of AC. (4)

1.5 Determine θ , the angle of inclination of AC. (Round off to the nearest degree) (3)

1.6 If E is the midpoint of AB, determine the coordinates of E. (3)

1.7 If ABCD is a rectangle, determine the coordinates of D. (4)

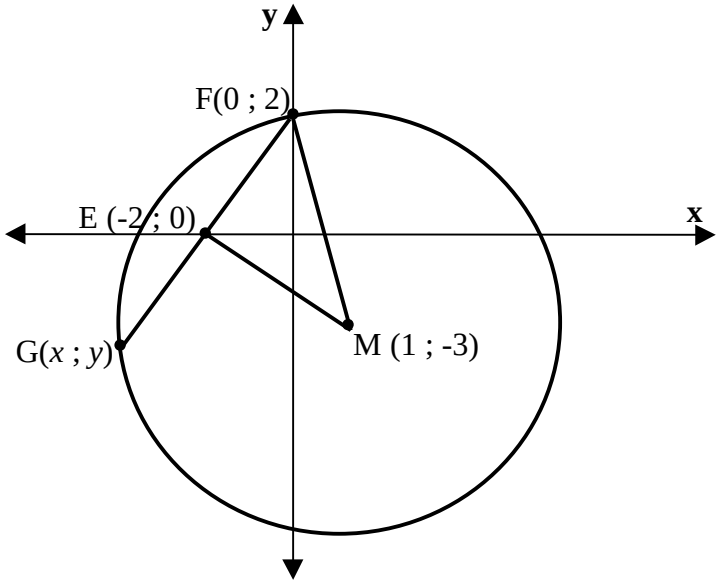
[24]

QUESTION 2

In the diagram below, F(0 ; 2) and G (x ; y) are points on the circle with midpoint

M (1 ; -3).

E (-2 ; 0) is the midpoint of FG.



2.1 Determine the equation of the circle. (4)

2.2 Calculate the coordinates of G. (4)

2.3 Determine the equation of the tangent to the circle at F. (4)

2.4 Does the point H(4 ; 7) lie inside or outside the circle? Show all your calculations to justify your answer. (4)

[16]

QUESTION 3

3.1 P is the point (2 ; -3). Write down the image of P after each of the following transformations.

3.1.1 Reflection about the line y = x. (2)

3.1.2 An anticlockwise rotation about the origin through an angle of 90^{-}. (2)

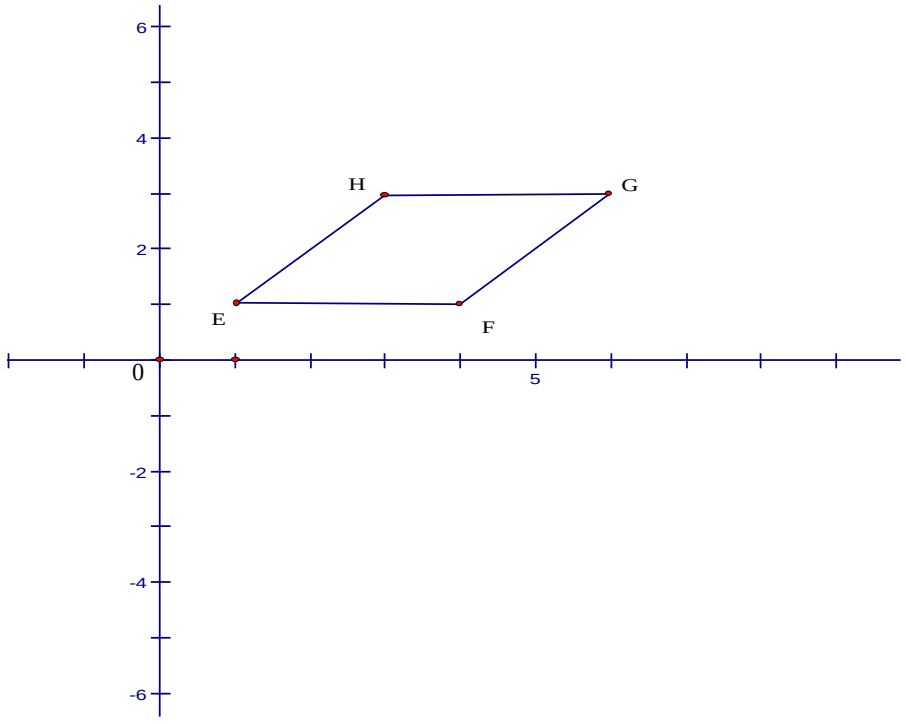
3.2 A(4 ; 6) , B (2 ; -2) and C (1 ; -4) are the vertices of ΔABC. ΔABC is enlarged by a factor of $2\frac{1}{2}$ through the origin.

Answer the following questions.

3.2.1 Write down the vertices A', B' and C' of the enlargement of ΔABC. (3)

3.2.2 If the area of ΔABC is $4x$ square units, determine the area of the enlargement $\Delta A'B'C'$. (1)

3.3 In the figure below, E (1 ; 1) , F(4 ; 1) , G(6 ; 3) and H(3 ; 3) are the vertices of EFGH .

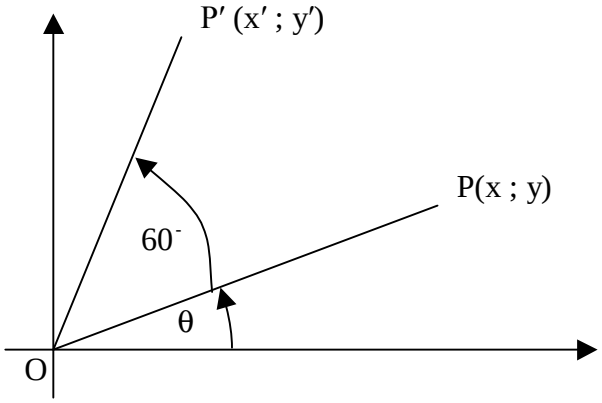


3.3.1 Use the grid on diagram sheet 1 to sketch the image of EFGH according to the following transformation: (4)

$$(x\,;y) \longrightarrow (x+2\,;-y)$$

3.3.2 Describe the transformation on EFGH in words. (2)

3.4 Show that the coordinates of P′, the image of P(x ; y) after a rotation through an angle of 60^{-} in an anticlockwise direction about the origin is $\left(\frac{x}{2}-\frac{\sqrt{3}}{2}y;\frac{y}{2}+\frac{\sqrt{3}}{2}x\right)$.



(8)

3.5 C′ and D′ are the images of C(6 ; 3) and D(4 ; 2) after a rotation through an angle of 60^{-} in an anticlockwise direction about the origin .

By using the results of 3.4, determine the coordinates of C′ and D′. (4)

[26]

TRIGONOMETRY

QUESTION 4

Answer this question without the use of a calculator.

Simplify the following to its simplest form:

4.1 $$\frac{\cos 300° - \tan(-315°)}{\sin 150° + \tan 135°}$$ (5)

4.2 $$\frac{\sin(x-450°).\tan(180°+x).\sin(90°-x)}{\cos(x-360°).\sin(90°+x).\tan(-x)}$$ (7)

[12]

QUESTION 5

Answer this question without the use of a calculator.

5.1 Given that $\sin\alpha = -\frac{3}{5}$ and $\cos\beta = -\frac{8}{17}$
where $\alpha, \beta \in [-90°;180°]$, calculate

5.1.1 $\cos\alpha + \sin\beta$ (6)

5.1.2 $3\tan\alpha + \sin\alpha$ (3)

5.2 Prove the following :

5.2.1 $\cos 105° = \frac{\sqrt{2}-\sqrt{6}}{4}$ (6)

5.2.2 $\frac{\sin\alpha.\sin 2\alpha}{\cos\alpha} + \cos 2\alpha = 1$ (4)

[19]

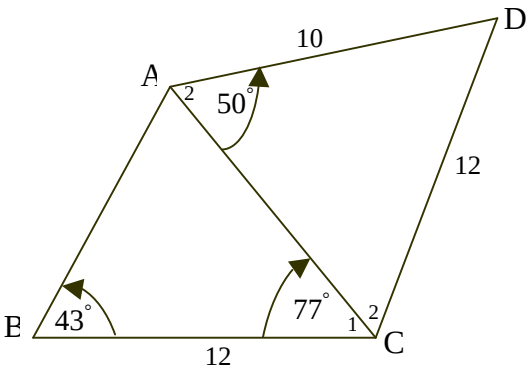
QUESTION 6

ABCD is a quadrilateral in the diagram alongside

BC = 12 m , AD = 10 m

CD = 12 m

$\hat{B}=43°$ and $\hat{C}_1=77°$ and $\hat{A}_2=50°$



Calculate the following(**correct to 2 decimal places**) :

6.1 Length of AC (4)

6.2 Area of ΔADC (3)

[7]

QUESTION 7

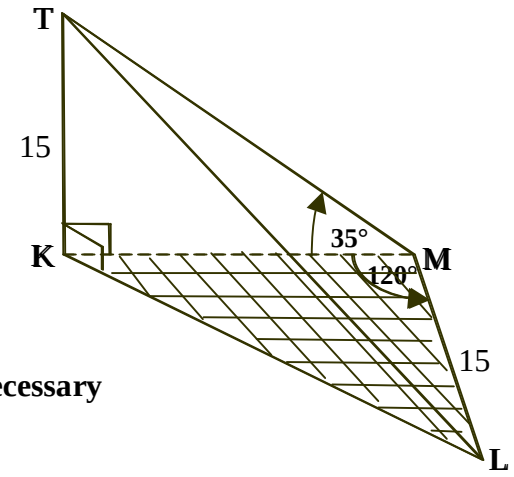
In the sketch below, K, L and M are three points in the same horizontal plane such that $K\hat{M}L=120°$.

T represents a point vertically above K such that

TK = LM = 15 m and

$T\hat{K}M = T\hat{K}L = 90°$.

$T\hat{M}K = 35°$



Round answers correct to 2 decimal places where necessary

7.1 Determine the length of KM. (3)

7.2 Show that the length of KL = 31,7 m (Show all your calculations.) (4)

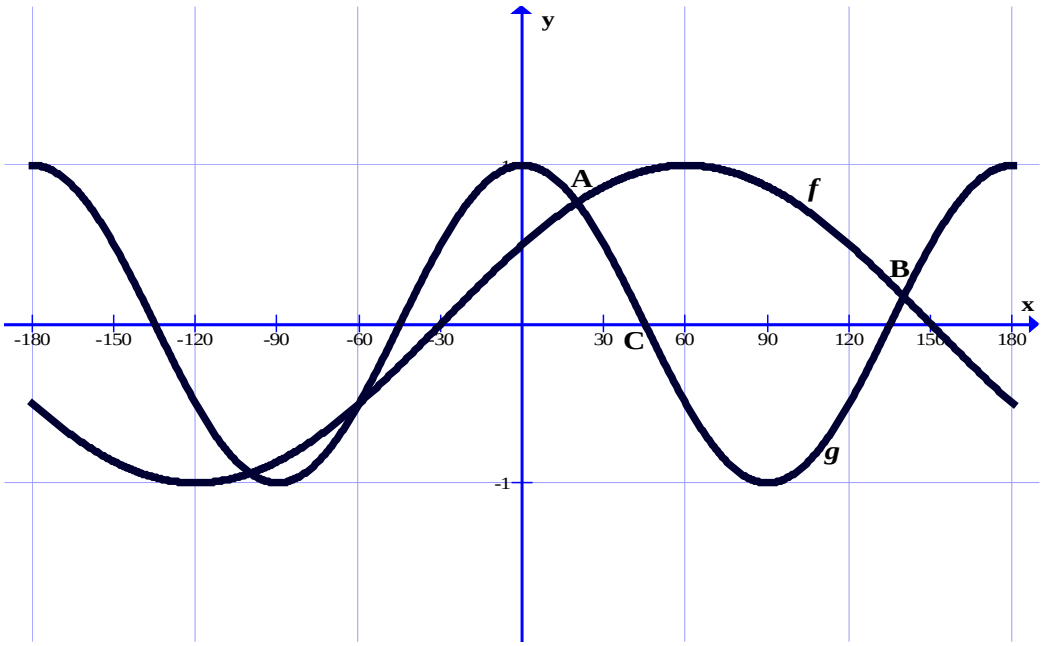
7.3 Determine the size of $K\hat{T}L$. (3)

[10]

QUESTION 8

The graphs below represent the functions

$g(x) = \cos \boldsymbol{a}x$ and $f(x) = \sin (x + \boldsymbol{b})$ where a and b are constants.



8.1 What is the period of g? (1)

8.2 Write down the coordinates of C. (2)

8.3 Determine the values of a and b (2)

8.4 For which values of x is $f(x) = g(x)$ at A and B? (2)

8.5 Hence, write down the general solution for $f(x) = g(x)$ (2)

8.6 For which values of x is $g(x) < f(x)$ for $[0^\circ ; 180^\circ]$? (3)

[12]

QUESTION 9

The table below shows the life expectancy of males in some African countries.
Source : 2004 World population Data Sheet of the Population Reference Bureau

AFRICA	Life Expectancy
	Male
Angola	39
Botswana	35
Central African Republic	41
Democratic Rep of Congo	46
Lesotho	37
Mozambique	38
Namibia	48
Seychelles	67
South Africa	49
Swaziland	45
Zambia	35
Zimbabwe	43

9.1 Write down the five number summary for the life expectancy of the males (3)

9.2 Draw box and whisker diagrams for the data set . (4)

9.3 Use the box and whisker diagram to make one comment about life expectancy of this sample. (2)

[9]

QUESTION 10

The table below illustrates the number of hours studied and the marks obtained for a science test of six learners in grade 12.

Hours	2	5	1	4	2	3
Marks	80	88	70	90	60	75

10.1 Draw a scatter plot of the number of hours studied compared to the examination mark received (4)

10.2 Decide which of the following graphs fit the above-mentioned data best: straight line, parabola or exponential. (2)

[6]

QUESTION 11

The goals scored by two shooters of a netbal team are given in the table below.

Thembalethu	20	16	10	3	12	10	11	14	5	19
Elizabeth	13	12	11	13	13	11	12	12	11	12

11.1 Calculate the mean of each data set (2)

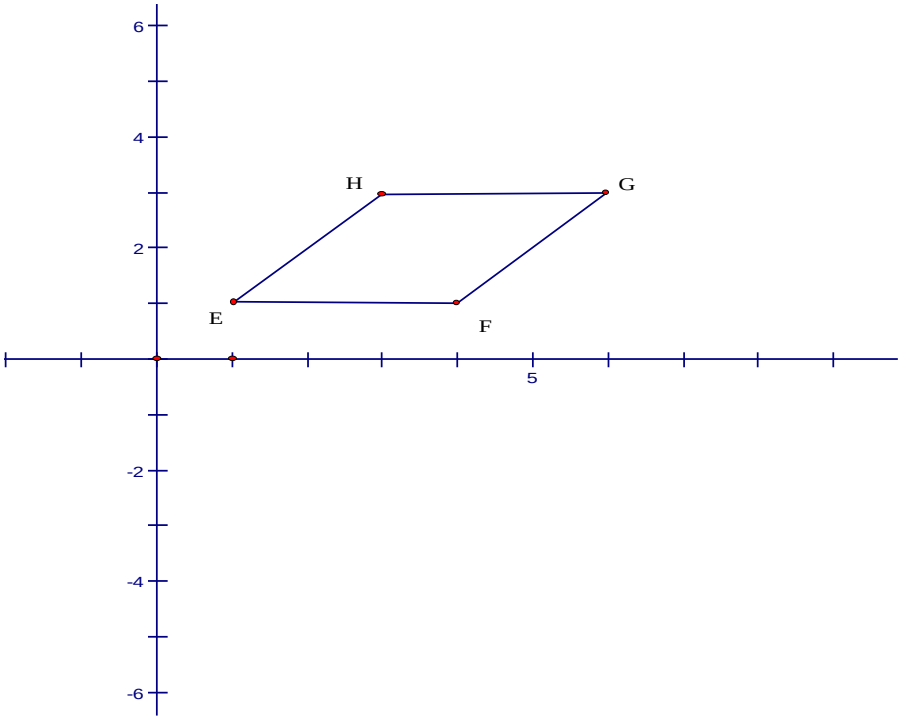
11.2 Calculate the standard deviation of each data set (4)

11.3 You are asked to compare the two netball players.Using measures of central tendency and measures of dispersion what can you say about Thembalethu's performance against that of Elizabeth ? (3)

[9]

DIAGRAM SHEET NAME : ……..

Question 3.3.1



Information Sheet: Mathematics

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \qquad A = P(1+i.n) \qquad A = P(1+i)^n$$

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

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

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

$$F = \frac{x[(1+i)^n - 1]}{i} \qquad P = \frac{x[1-(1+i)^{-n}]}{i} \qquad f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

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

$$y - y_1 = m(x - x_1) \qquad m = \frac{y_2 - y_1}{x_2 - x_1} \qquad m = \tan\theta \qquad (x-a)^2 + (y-b)^2 = r^2$$

$$In\ \Delta ABC; \qquad \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

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

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

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

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

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

$$\cos 2\alpha = \cos^2\alpha - \sin^2\alpha \qquad \cos 2\alpha = 1 - 2\sin^2\alpha \qquad \cos 2\alpha = 2\cos^2\alpha - 1$$

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

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

$$SD = \sqrt{\frac{\sum_{i=1}^{n} (x - \bar{x})^2}{n}} \qquad P(A) = \frac{n(A)}{n(s)} \qquad P(A\ or\ B) = P(A) + P(B) - P(A\ and\ B)$$