basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

MATH.2

MATHEMATICS P2

FEBRUARY/MARCH 2011

MARKS: 150

TIME: 3 hours

This question paper consists of 9 pages, 5 diagram sheets and 1 information sheet.

MORNING SESSION

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 12 questions.
2. Answer ALL the questions.
3. Clearly show ALL calculations, diagrams, graphs, et cetera that you have used in determining the answers.
4. Answers only will not necessarily be awarded full marks.
5. An approved scientific calculator (non-programmable and non-graphical) may be used, unless stated otherwise.
6. Round your answers off to TWO decimal places if necessary, unless stated otherwise.
7. Diagrams are NOT necessarily drawn to scale.
8. FIVE diagram sheets for QUESTION 1.2, QUESTION 2.1, QUESTION 2.2, QUESTION 3.1, QUESTION 8.1 and QUESTION 12.3 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 this question paper.
10. Number the answers correctly according to the numbering system used in this question paper.
11. Write legibly and present your work neatly.

QUESTION 1

The table below gives a breakdown of the PSL log standings for the 8 top teams at the end of 2008/2009.

POSITION	TEAM	POINTS
1	SuperSport	55
2	Orlando Pirates	55
3	Kaizer Chiefs	50
4	Free State Stars	47
5	Golden Arrows	x
6	Bidvits Wits	x
7	Ajax Cape Town	x
8	Amazulu	42

[Source: http://www.safa-_psl log]

1.1 If the average points for these 8 teams is 48,375, show that $x = 46$. (2)

1.2 Draw a box and whisker diagram of the information given on DIAGRAM SHEET 1. (4)

[6]

QUESTION 2

The individual masses (in kg) of 25 rugby players are given below:

78	102	88	93	81	90	75	60	76	75
68	90	80	77	81	69	60	83	91	100
80	70	81	64	70					

2.1 Complete the following table on DIAGRAM SHEET 1

MASS (kg)	FREQUENCY	CUMULATIVE FREQUENCY
$60 \leq x < 70$		
$70 \leq x < 80$		
$80 \leq x < 90$		
$90 \leq x < 100$		
$100 \leq x < 110$		

(4)

2.2 Draw an ogive (cumulative frequency curve) of the above information on the grid provided on DIAGRAM SHEET 2. (3)

2.3 Calculate the mean mass of the rugby players. (2)

2.4 How many rugby players have masses within one standard deviation of the mean? From your calculations, calculate the percentage of the rugby players who have masses within one standard deviation of the mean. (5)

[14]

QUESTION 3

A group of 12 learners was asked to measure their arm span (from fingertip to fingertip) and their height. The data below was gathered.

Arm span (cm)	156	157	160	161	162	165	170	177	184	188	188	194
Height (cm)	162	160	155	160	170	166	170	176	180	187	192	193

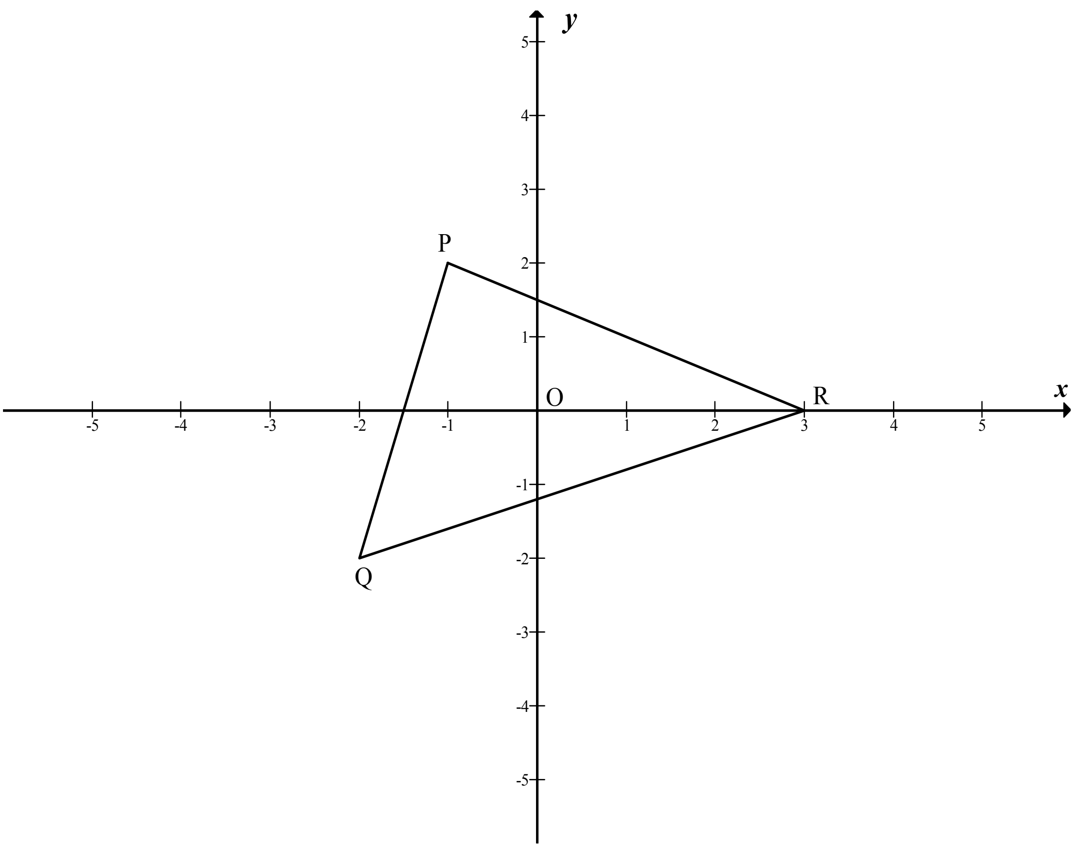
3.1 Represent the data as a scatter plot on the grid provided on DIAGRAM SHEET 3. (4)

3.2 Draw a line of best fit for this scatter plot. (2)

3.3 Would you expect a person with below average arm span to be below average in height? Give a reason for your answer. (2) **[8]**

QUESTION 4

In the diagram below ΔPQR with vertices P(– 1 ; 2), Q(– 2 ; – 2) and R(3 ; 0) is given.



4.1 Calculate the angle that PQ makes with the positive x-axis. (3)

4.2 Determine the coordinates of M, the midpoint of PR. (2)

4.3 Determine the perimeter of ΔPQR to the nearest whole number. (5)

4.4 Determine an equation of the line parallel to PQ that passes through M. (3) **[13]**

QUESTION 5

5.1 The equation of a circle is $x^2 + y^2 - 8x + 6y = 15$.

5.1.1 Prove that the point (2 ; – 9) is on the circumference of the circle. (2)

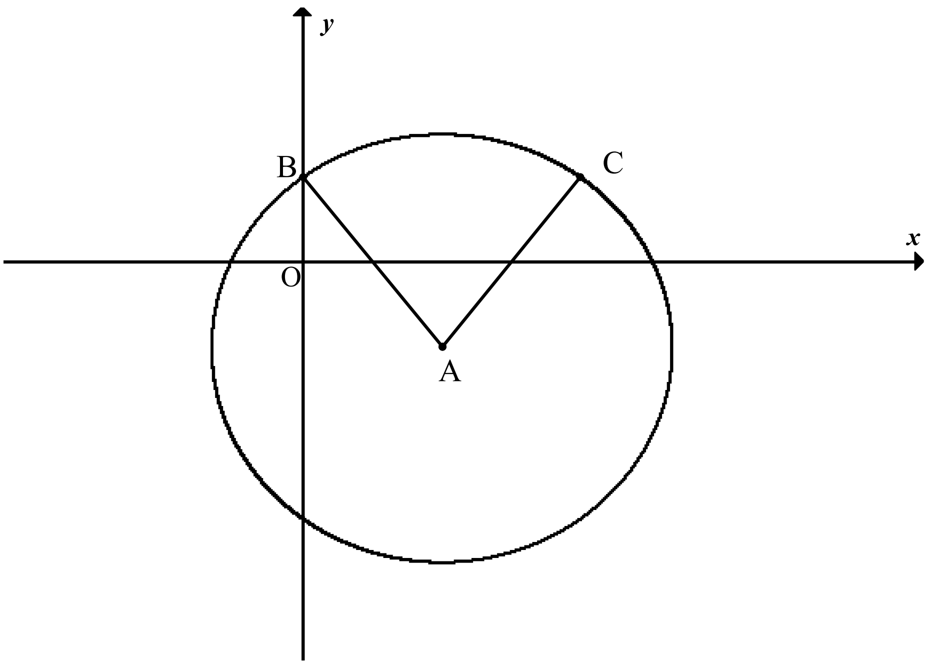
5.1.2 Determine an equation of the tangent to the circle at the point (2 ; – 9). (7)

5.2 Calculate the length of the tangent AB drawn from the point A(6 ; 4) to the circle with equation $(x-3)^2 + (y+1)^2 = 10$. (5)

[14]

QUESTION 6

The circle, with centre A and equation $(x-3)^2 + (y+2)^2 = 25$ is given in the following diagram. B is a y-intercept of the circle.



6.1 Determine the coordinates of B. (4)

6.2 Write down the coordinates of C, if C is the reflection of B in the line $x = 3$. (2)

6.3 The circle is enlarged through the origin by a factor of $\frac{3}{2}$.

Write down the equation of the new circle, centre $A^{/}$, in the form $(x-a)^2 + (y-b)^2 = r^2$. (2)

6.4 In addition to the circle with centre A and equation $(x-3)^2 + (y+2)^2 = 25$, you are given the circle $(x-12)^2 + (y-10)^2 = 100$ with centre B.

6.4.1 Calculate the distance between the centres A and B. (2)

6.4.2 In how many points do these two circles intersect? Justify your answer. (2)

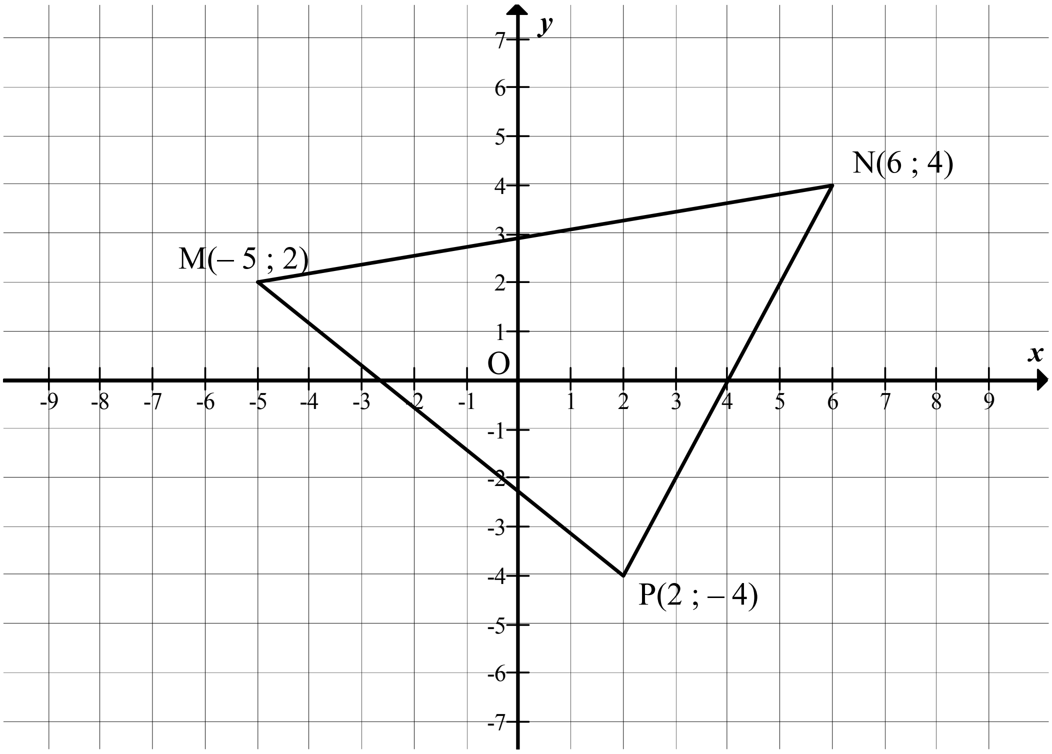
[12]

QUESTION 7

The point $(x\ ;\ 2)$ is rotated about the origin through an angle of 150° in an anticlockwise direction to give the point $(-3\ ;\ y)$. Calculate the values of x and y. **[5]**

QUESTION 8

In the diagram below ΔMNP is given with vertices M(– 5 ; 2), N (6 ; 4) and P(2 ; – 4).
ΔMNP is enlarged by a factor of 1,5 to $\Delta M^{/}N^{/}P^{/}$.



8.1 Draw $\Delta M^{/}N^{/}P^{/}$ on the grid provided on DIAGRAM SHEET 4. (3)

8.2 Write down the values of:

8.2.1 $\dfrac{MN}{M^{/}N^{/}}$ (2)

8.2.2 $\dfrac{\text{area } \Delta MNP}{\text{area } \Delta M^{/}N^{/}P^{/}}$ (2)

8.3 If the above transformation is applied to ΔMNP n more times to get the image $\Delta M^{//}N^{//}P^{//}$, write down the value of $\dfrac{\text{area } \Delta MNP}{\text{area } \Delta M^{//}N^{//}P^{//}}$. (2)
[9]

QUESTION 9

Consider the point A (– 12 ; 6). The point is reflected about the x-axis to $A^{/}$.

9.1 Write down the coordinates of $A^{/}$. (1)

9.2 An alternative transformation from A to $A^{/}$ is a rotation about the origin through α°, where $\alpha \in 0 \quad 90$. Calculate α. (6)

[7]

QUESTION 10

10.1 If sin 28° = a and cos 32°= b, determine the following in terms of a and/or b :

10.1.1 $\cos 28°$ (2)

10.1.2 $\cos 64°$ (3)

10.1.3 $\sin 4°$ (4)

10.2 Prove without the use of a calculator, that if sin 28° = a and cos 32° = b, then $b\sqrt{1-a^2} - a\sqrt{1-b^2} = \frac{1}{2}$. (4)

10.3 Evaluate each of the following without using a calculator. Show ALL working.

10.3.1 $\dfrac{\sin 130°.\tan 60°}{\cos 540°.\tan 230°.\sin 400°}$ (7)

10.3.2 $(1-\sqrt{2}\sin 75°)(\sqrt{2}\sin 75° + 1)$ (4)

10.4 Determine the general solution of: $\sin^2 x + \cos 2x - \cos x = 0$ (7)

10.5 Consider: $\dfrac{\cos 2x.\tan x}{\sin^2 x}$

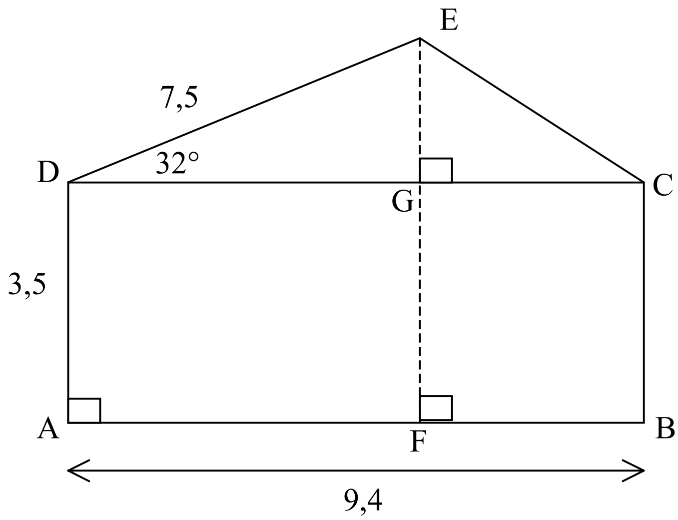
10.5.1 For which values of x, $x \in [0° ; 180°]$, will this expression be undefined? (3)

10.5.2 Prove that $\dfrac{\cos 2x.\tan x}{\sin^2 x} = \dfrac{\cos x}{\sin x} - \tan x$ for all other values of x. (5)

[39]

QUESTION 11

The sketch below shows one side of the elevation of a house. Some dimensions (in metres) are indicated on the figure.



Calculate, rounded off to ONE decimal place:

11.1 EC (3)

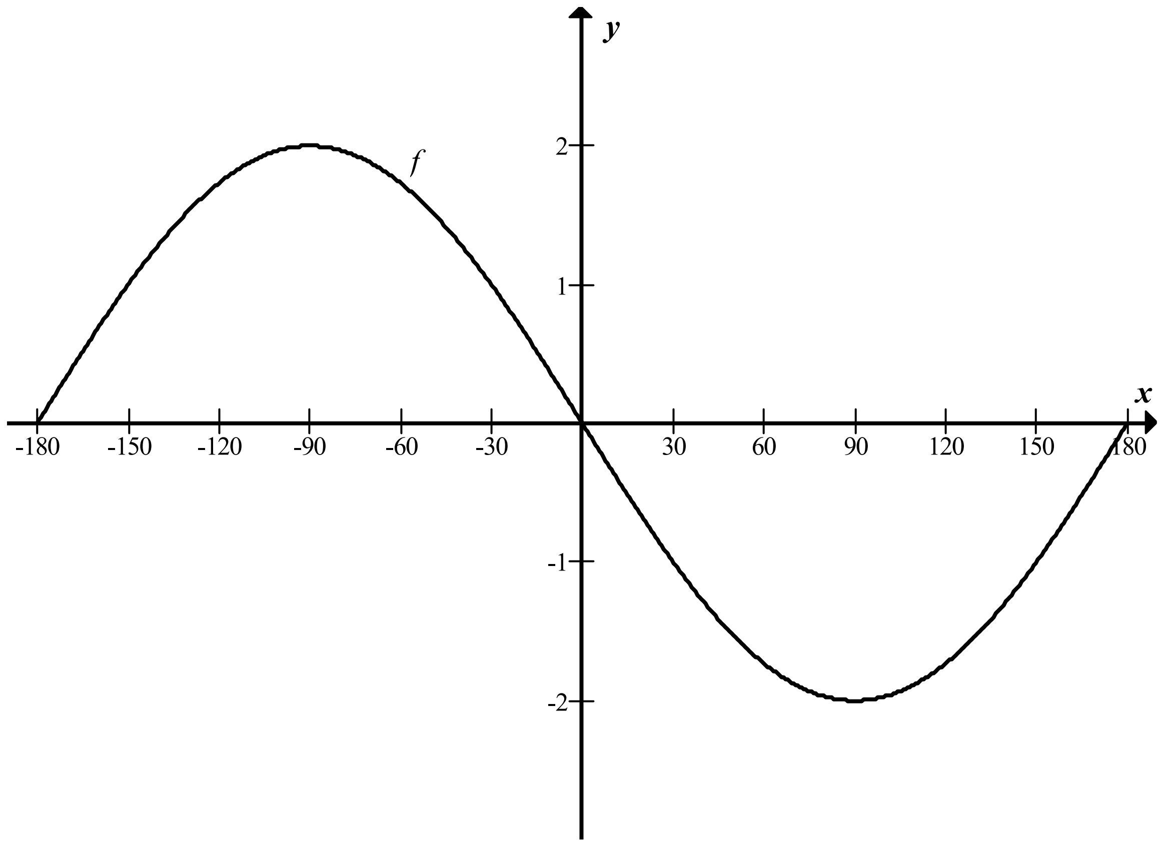
11.2 $D\hat{C}E$ (3)

11.3 Area of ΔDEC (2)

11.4 The height EF (3)
[11]

QUESTION 12

The graph of $f(x) = -2\sin x$ is drawn below.



12.1 Write down the period of *f*. (1)

12.2 Write down the amplitude of h if $h(x) = \dfrac{f(x)}{4}$. (2)

12.3 Draw the graph of $g(x) = \cos(x - 30°)$ for $x \in [-180° ; 180°]$ on the grid provided on DIAGRAM SHEET 5. (3)

12.4 Use the graph to determine the number of solutions for $-2\sin x = \cos(x - 30°)$, $x \in \; -180° \quad 180°$. (1)

12.5 For which values of x is $g(x) \geq 0$? (2)

12.6 For which values of x is $f'(x) < 0$ and $g'(x) > 0$? (3)

[12]

TOTAL: 150

INFORMATION SHEET: MATHEMATICS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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