education

Department:
Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 11

MATHEMATICS P2

EXEMPLAR 2007

MARKS: 150

TIME: 3 hours

This question paper consists of 11 pages, 4 diagram sheets and a 2-page formula sheet.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions:

1. This question paper consists of 11 questions. Answer ALL the questions.

2. Some of the questions have to be answered on the diagram sheets attached. Write your name/examination number in the space provided and hand in ALL FOUR diagram sheets with your ANSWER BOOK.

3. Clearly show ALL calculations, diagrams, graphs, et cetera you have used in determining the answers.

4. An approved scientific calculator (non-programmable and non-graphical) may be used, unless stated otherwise.

5. If necessary, answers should be rounded off to TWO decimal places, unless stated otherwise.

6. Number the answers correctly according to the numbering system used in this question paper.

7. Diagrams are NOT necessarily drawn to scale.

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

QUESTION 1

A(0; 4), B(3; 1), C(–3; –5) and D(–6; –2) are the vertices of a quadrilateral in a Cartesian plane.

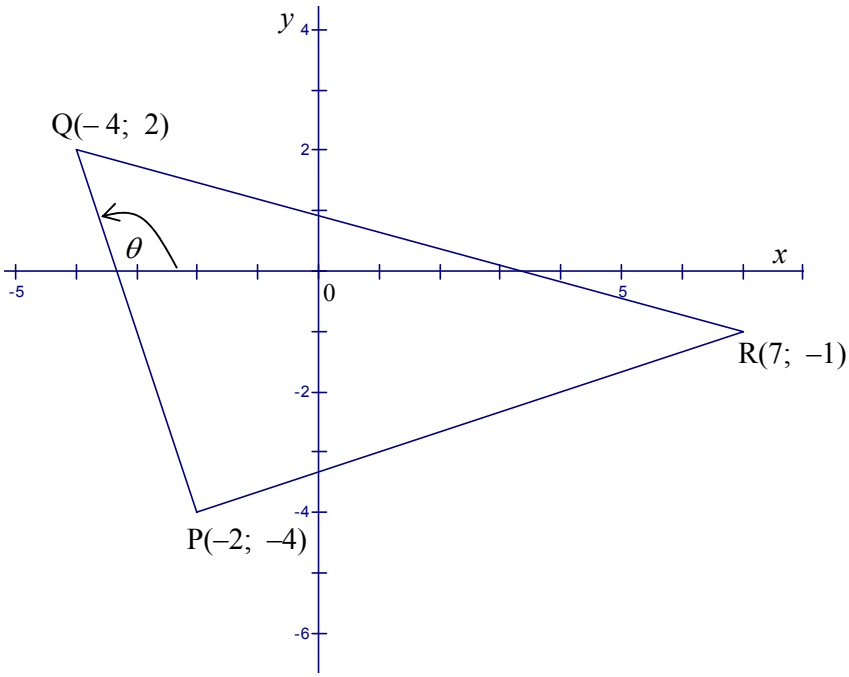
1.1 Prove that ABCD is a rectangle. (Show ALL the calculations.) (9)

1.2 Hence determine the coordinates of the point of intersection of the diagonals of rectangle ABCD. (2)

[11]

QUESTION 2

P(–2; – 4), Q(– 4; 2) and R(7 ; –1) are vertices of ΔPQR in a Cartesian plane as shown below.
θ is the angle of inclination of PQ.



2.1 Prove that ΔPQR is right-angled. (7)

2.2 Calculate the area of ΔPQR. (6)

2.3 Calculate the size of θ to the nearest degree. (3)

2.4 Determine the coordinates of midpoint M of QR. (2)

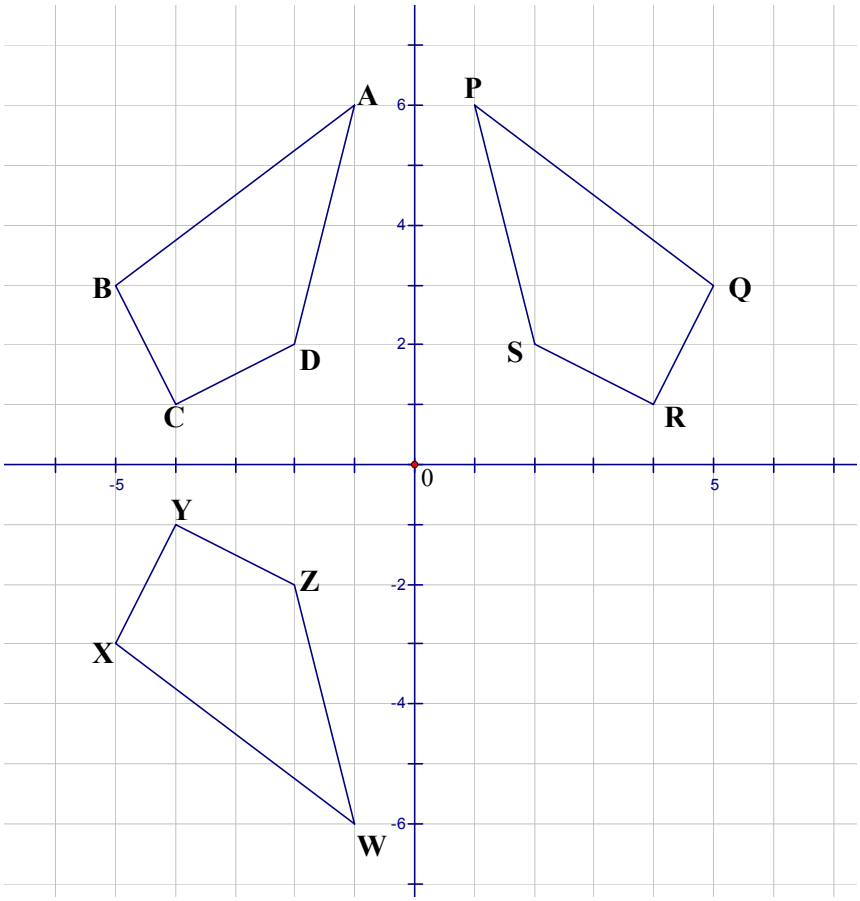
2.5 Hence determine the equation of line MN passing through M, which is parallel to PR. (5)

2.6 Determine whether the midpoint of PQ lies on line MN. (4)

[27]

QUESTION 3

The diagram below shows quadrilateral PQRS and its transformations ABCD and WXYZ.



3.1 State the general rule for the coordinates of any point representing the transformation of quadrilateral PQRS to quadrilateral ABCD. (2)

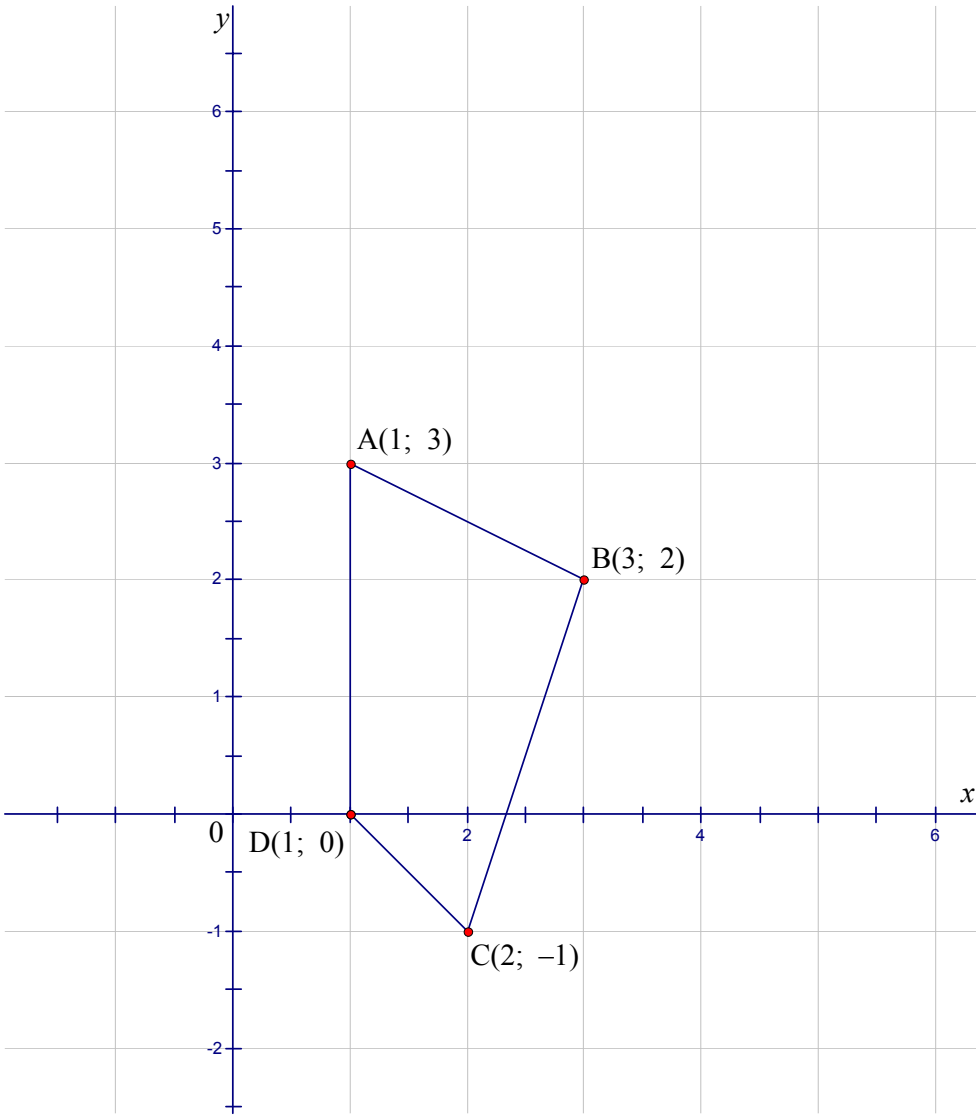
3.2 Describe TWO possible transformations of quadrilateral PQRS to quadrilateral WXYZ. (6)

3.3 Give the coordinates of the reflection of point D in the line $y = x$. (2)

[10]

QUESTION 4

A(1; 3), B(3; 2), C(2; –1) and D(1; 0) are the coordinates of the vertices of quadrilateral ABCD in the Cartesian plane as shown below.



4.1 ABCD has to be enlarged through the origin by a factor of 2.

4.1.1 Use the grid on the attached diagram sheet to draw this enlargement and clearly indicate the vertices $A^{/}B^{/}C^{/}D^{/}$. (5)

4.1.2 Give the coordinates of vertices $A^{/}$ and $C^{/}$ of the enlargement. (2)

4.1.3 If the area of ABCD is x square units, determine the area of the enlargement $A^{/}B^{/}C^{/}D^{/}$. (2)

4.2 Quadrilateral ABCD is rotated 90° in a clockwise direction through the origin.

4.2.1 State the general rule for the coordinates of a point satisfying this type of rotation. (2)

4.2.2 Give the coordinates of the vertices of $A^{//}B^{//}C^{//}D^{//}$ for this rotation. (4)

[15]

QUESTION 5

5.1 Simplify, without using a calculator, the following expressions: (Show ALL the calculations.)

5.1.1 $\dfrac{\cos 150°.\tan 225°}{\sin(-60°).\cos 480°}$ (Leave the answer in simplified surd form.) (5)

5.1.2 $\dfrac{\cos(90° + x)}{\cos(360° - x).\tan(180° - x)}$ (5)

5.1.3 $\cos^2 x\left[\dfrac{1}{\sin x - 1} + \dfrac{1}{\sin x + 1}\right]$ (6)

5.2 Determine, without using a calculator, the value of the following in terms of t, if $\sin 34° = t$:

5.2.1 $\cos 56°$ (2)

5.2.2 $\tan(-34°)$ (3)

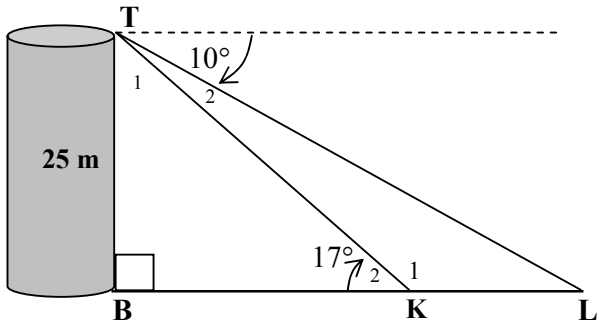
5.3 5.3.1 Solve for x if $7\cos 2x + 2 = 0$ and $x \in [0°;\ 360°]$. (6)

5.3.2 Determine the general solution of $\cos x\,(\sin x - 1) = 0$. (5)

[32]

QUESTION 6

6.1 The diagram below is a representation of a 25 m vertical observation tower TB and two cars K and L on a road. The angle of depression from T to car L is 10°. The angle of elevation from car K to the top of the tower is 17°. B, K and L lie in a straight line and lie on the same horizontal plane as the base of the tower.

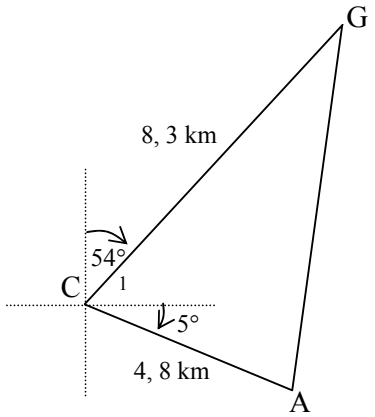


6.1.1 Calculate the size of $\hat{L}$. (1)

6.1.2 Calculate the length of KT. (3)

6.1.3 Hence calculate the distance between the two cars. (4)

6.2 A game ranger G is 8,3 km from control centre, C, at a bearing of 54° east when he receives a call that there is an injured antelope, A, that needs attention. The antelope is located 4,8 km at a bearing 5º south of east from the control centre. The diagram below is a representation of the above-mentioned situation.



6.2.1 Calculate how far the game ranger is from the injured antelope. (4)

6.2.2 Calculate the area of ΔGCA. (3)

[15]

QUESTION 7

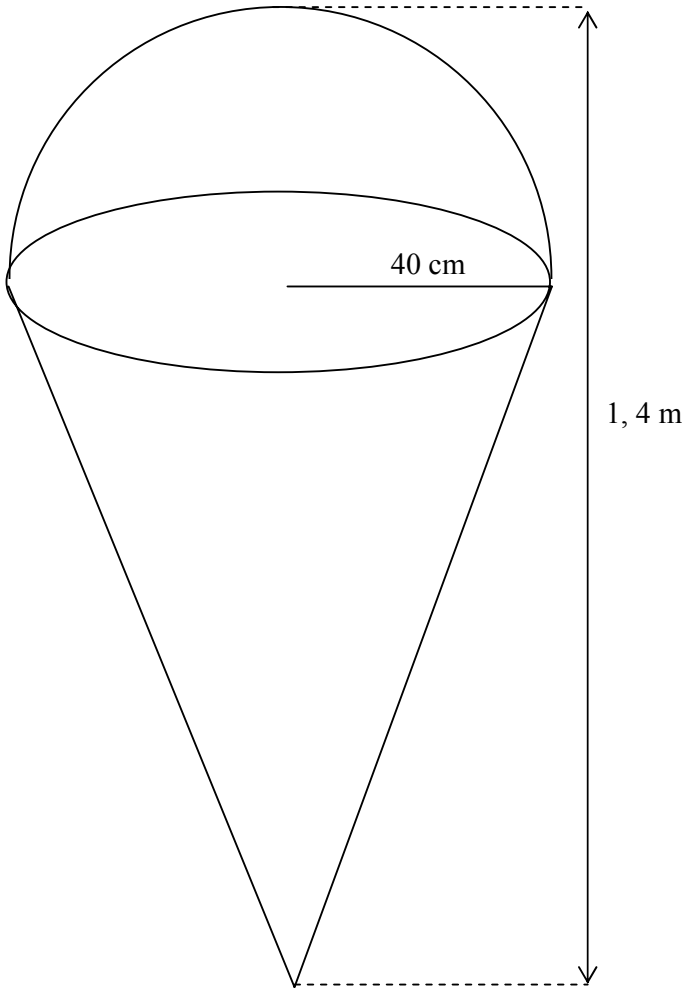
$Volume = \frac{1}{3}\pi r^2 h$

$Surface\ Area = \pi r^2 + \pi rH$ (where H is slant height)

$Volume = \frac{4}{3}\pi r^3$

$Surface\ Area = 4\pi r^2$

An owner of an ice-cream parlor wants to install a steel model of an ice-cream cone outside the entrance of the parlor. The shape of the model of the cone is constructed by using a hemisphere and a cone as shown in the diagram below.
The total height of the model is 1,4 m and the radius of the cone is 40 cm.



Calculate:

7.1 The volume of the model in cm^3 (5)

7.2 The total exterior surface area of the model in m^2 (5)

7.3 The mass of the steel model if 1 m^2 has a mass of 2,5 kg (1)

[11]

QUESTION 8

The following scores of a cricket player were recorded during one season:

88	76	12	29	39
50	64	50	42	51
62	58	33	77	48
73	80	40	55	

8.1 Determine the median score. (2)

8.2 Determine the lower and the upper quartiles. (2)

8.3 Represent the scores of the cricket player using a box and whisker diagram. (4)

8.4 What information about the player's performance can be deduced relative to the lower quartile? (1)
[9]

QUESTION 9

The table below represents the number of people infected with malaria in a certain area from 2001 to 2006:

YEAR	NUMBER OF PEOPLE INFECTED
2001	117
2002	122
2003	130
2004	133
2005	135
2006	137

9.1 Draw the scatter plot to represent the above data. (3)

9.2 Explain whether a linear, quadratic or exponential curve would be a line of best fit for the above-mentioned data. (1)

9.3 If the same trend continued, estimate, by using your graph, the number of people that will be infected with malaria in 2008. (1)
[5]

QUESTION 10

The frequency table below represents the marks out of a maximum of 180 marks, obtained by a group of Grade 11 learners in an Accounting examination.

MARKS OBTAINED	FREQUENCY	CUMULATIVE FREQUENCY
$0 \leq m < 30$	6	
$30 \leq m < 60$	12	
$60 \leq m < 90$	38	
$90 \leq m < 120$	42	
$120 \leq m < 150$	12	
$150 \leq m < 180$	10	

10.1 Use the table on the diagram sheet to complete the cumulative frequency column. (2)

10.2 Draw the ogive for the given data on the grid provided on the diagram sheet. (3)

10.3 Use the ogive to determine the median mark. (1)
[6]

QUESTION 11

A basketball team consists of 10 players. The number of points each player scored during the season are as follows:

21 32 37 38 42 51 55 62 68 74

11.1 Determine the mean number of points scored by the team. (2)

11.2 Complete the following table using the table on the diagram sheet: (3)

POINTS SCORED	$(x_i - \bar{x})$	$(x_i - \bar{x})^2$
21		
32		
37		
38		
42		
51		
55		
62		
68		
74		
	$\sum_{i=1}^{n}(x_i - \bar{x})^2 =$	

11.3 Determine the variance of the points scored. (2)

11.4 Determine the standard deviation of the points scored. (1)

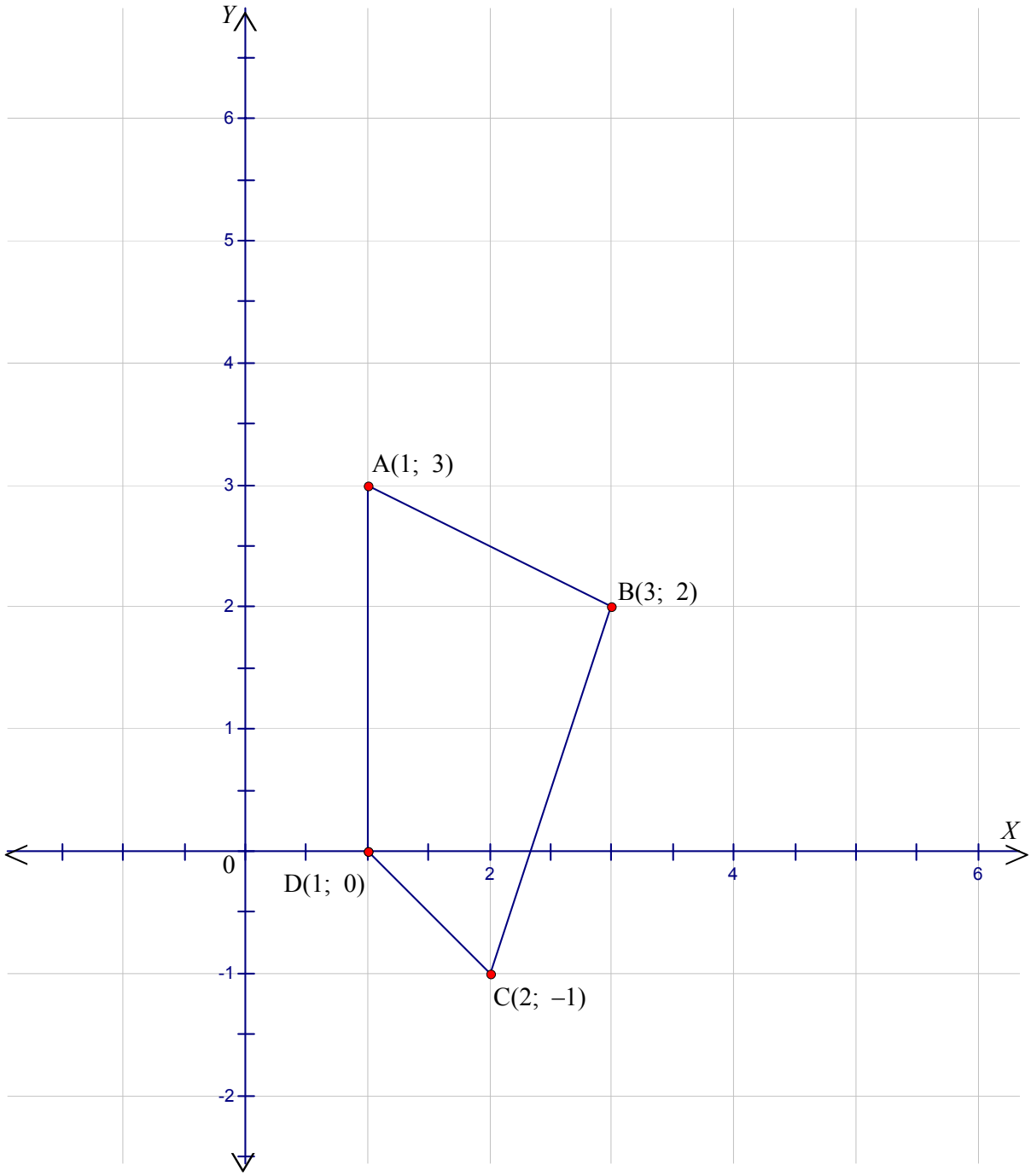
11.5 By making use of the standard deviation obtained in QUESTION 11.4, make a statement about the performance of the team. (1)
[9]

TOTAL: 150

NAME/EXAMINATION NUMBER:

DIAGRAM SHEET 1

QUESTION 4



NAME/EXAMINATION NUMBER:

DIAGRAM SHEET 2

QUESTION 9

9.1

NAME/EXAMINATION NUMBER:

DIAGRAM SHEET 3

QUESTION 10

10.1

MARKS OBTAINED	FREQUENCY	CUMULATIVE FREQUENCY
$0 \leq m < 30$	6	
$30 \leq m < 60$	12	
$60 \leq m < 90$	38	
$90 \leq m < 120$	42	
$120 \leq m < 150$	12	
$150 \leq m < 180$	10	

10.3

NAME/EXAMINATION NUMBER:

DIAGRAM SHEET 4

QUESTION 11

POINTS SCORED	$(x_i - \bar{x})$	$(x_i - \bar{x})^2$
21		
32		
37		
38		
42		
51		
55		
62		
68		
74		
	$\sum_{i=1}^{n}(x_i - \bar{x})^2 =$	

INFORMATION SHEET: MATHEMATICS
INLIGTINGSBLAD: WISKUNDE

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

$A = P(1+ni)$ $\qquad$ $A = P(1-ni)$

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

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

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

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

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

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

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

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

$y = mx + c$ $\qquad$ $y - y_1 = m(x - x_1)$

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

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

In ΔABC: $\qquad \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

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

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

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

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

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

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

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

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

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

$$s.d = \sqrt{\frac{\sum_{i=1}^{n}\left(x_i - \bar{x}\right)^2}{n}}$$

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

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