



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

MATHEMATICS
(Second Paper)
NQF LEVEL 4

NOVEMBER EXAMINATION

(10501064)

4 November 2013 (Y-Paper)
13:00–16:00

Non-programmable scientific calculator may be used.

This question paper consists of 10 pages and 2 formulae sheets.

Department of Education
Republic of South Africa



Department of Education
Republic of South Africa

Department of Education
Republic of South Africa

Department of Education
Republic of South Africa

TIME: 3 HOURS
MARKS: 100

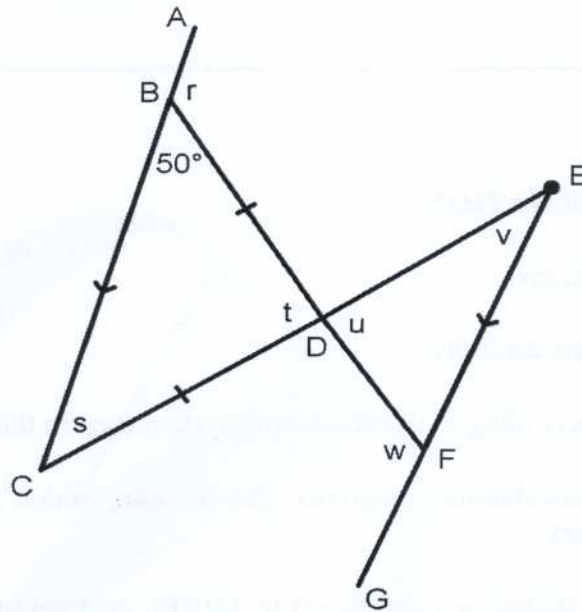
INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
 2. Read ALL the questions carefully.
 3. Number the answers according to the numbering system used in this question paper.
 4. Clearly show ALL calculations, diagrams, graphs, etc., which you have used in determining the answers.
 5. If necessary, answers should be rounded off to THREE decimal places, unless stated otherwise.
 6. Diagrams are NOT drawn to scale.
-



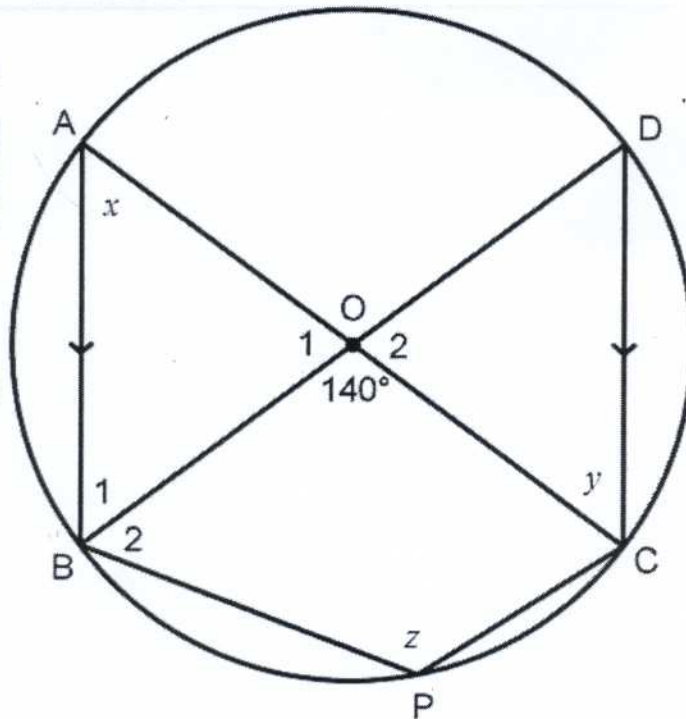
QUESTION 1

1.1 In the figure given below, $AC \parallel EG$ and $BD = CD$. $\hat{C}BD = 50^\circ$



Determine, giving reasons, the value of r , s , t , u , v and w . (6)

1.2 In the diagram below, O is the centre of the circle with diameters AC and BD . $AB \parallel DC$ and AC meets BD at O . P is any point on the minor arc BC . PB and PC are joined.



Calculate, with reasons, the measures of angles labelled x , y and z . (5)



1.3 Complete the theorem:

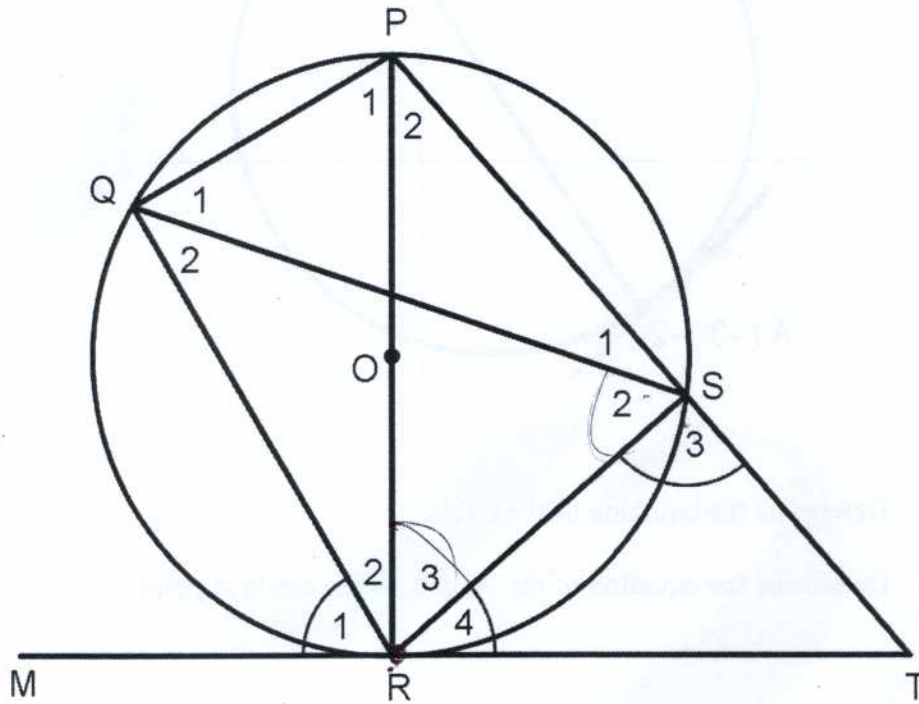
The angle between a tangent to a circle and a chord drawn from the point of contact is ...

(1)

1.4 In the figure below O is the centre of the circle. P, Q, R and S are points on the circumference of the circle.

PR is a diameter of the circle and MRT is a tangent at R.

$\hat{S}_2 = 65^\circ$ and $\hat{R}_3 = 35^\circ$.



Determine, with reason, the size of:

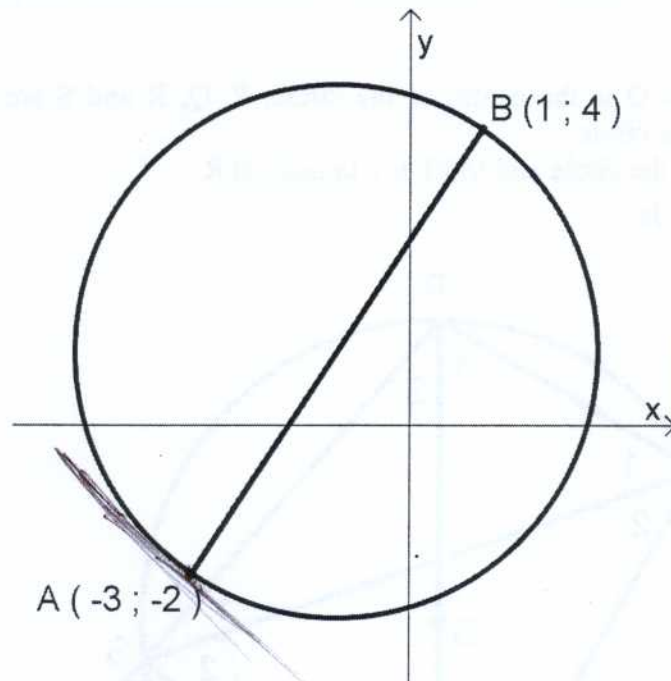
1.4.1 \hat{R}_1 (1)

1.4.2 \hat{R}_4 (2)

1.4.3 \hat{S}_3 (2)



- 1.5 Given below is a circle with diameter AB where A (-3 ; -2) and B (1 ; 4) are points on the circumference of the circle.



- 1.5.1 Determine the equation of the circle. (4)
- 1.5.2 Determine the equation of the tangent to the circle at point A. (4)
- [25]

QUESTION 2

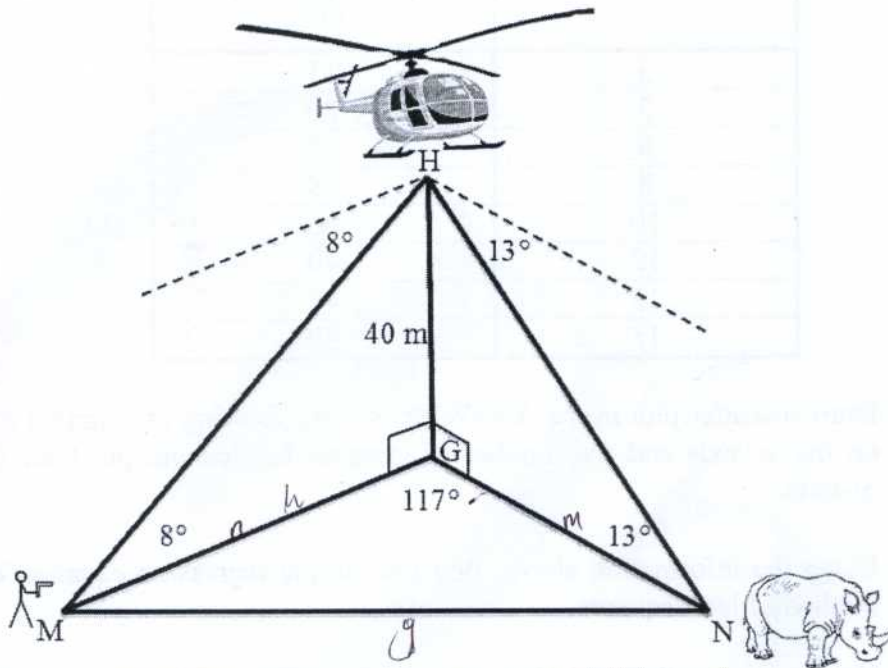
- 2.1 Prove that $\cos(A + B) - \cos(A - B) = -2 \sin A \sin B$ (3)
- 2.2 Use the formula for $\sin(\alpha \pm \beta)$ to show, without using a calculator that:

$$\sin 75^\circ + \sin 15^\circ = \frac{\sqrt{6}}{2}$$
 (7)
- 2.3. Prove that $\frac{\cos x - \cos 2x + 2}{3 \sin x - \sin 2x} = \frac{\cos x + 1}{\sin x}$ (5)
- 2.4 Calculate the value/s of x if $\cos 2x - \cos x + 1 = 0$ where $x \in [0^\circ; 360^\circ]$. (5)



2.5 Refer to the diagram below and answer the question that follows.

A helicopter at point H, is hovering 40 m vertically above the point G on the ground. The pilot sees a poacher (M) and a rhino (N) at some distance apart. The pilot establishes that the angles of depression from H to M and to N are 8° and 13° respectively. The points G, M and N are on the same horizontal plane and $\hat{MGN} = 117^\circ$.



Calculate the distance (MN) between the poacher and the rhino.

(7)
[27]

QUESTION 3

3.1 Eight people wrote the learners licence test. Their marks were as follows:

55	72	81	42	100	67	59	60
----	----	----	----	-----	----	----	----

Determine the standard deviation by showing all calculations.



(4)



3.2 Horizon College has set aside a day to hand out cheques to learners as per bursary requirements. Due to operational reasons the entire administration team could not engage in the activity from the beginning. As the day progressed additional staff members joined in. The table given below shows the number of staff allocated at various times compared to the number of cheques handed out per hour.

Number of staff (x)	Number of cheques given per hour (y)	xy	x^2	
$3 - 9 = -6$	36	$13 - 32 = -19$	39	9
$5 - 9 = -4$	16	$20 - 32 = -12$	100	25
$6 - 9 = -3$	9	$22 - 32 = -10$	132	36
$8 - 9 = -1$	1	$28 - 32 = -4$	204	64
$10 - 9 = 1$	1	$36 - 32 = 4$	360	100
$12 - 9 = 3$	4	$40 - 32 = 8$	480	144
$13 - 9 = 4$	16	$47 - 32 = 15$	611	169
$15 - 9 = 6$	36	$50 - 32 = 18$	750	225

$\sum x = 72$ $\sum y = 256$ $\sum xy = 2646$ $\sum x^2 = 772$

- 3.2.1 Draw a scatter plot in the ANSWER-BOOK showing the number of staff on the x axis and the number of cheques handed out per hour on the y -axis. (4)
 - 3.2.2 Using the information above, find the sample regression equation by the method of least squares. (5)
 - 3.2.3 Use the regression equation to determine the number of cheques that would be handed out if 20 staff were used. (2)
- [15]



QUESTION 4

- 4.1 At a local dog show the three top species were invited to compete for the first prize. The dogs were categorised into males and females and further sub-categorised into the three species, namely Husky, Pekingese and Alsatians. The contingency table below shows the distribution of the 50 entrants by species and gender.

	HUSKY (H)	PEKINGESE (P)	ALSATIAN (A)	TOTAL
MALE (M)	16	10	4	30
FEMALE (F)	4	14	2	20
TOTAL	20	24	6	50



If a dog has to be chosen at random, determine:

- 4.1.1 The probability of choosing a female. (1)
- 4.1.2 The probability of choosing a male Husky. (1)
- 4.1.3 The probability of choosing a male or a Pekingese. (3)
- 4.2 Estelle has ten coloured marbles in a bag. Four of the marbles are green and six are orange. She removes a marble at random from the bag and notes the colour but does not replace it. She then chooses a second marble at random.
- 4.2.1 Draw a tree diagram to show all possible outcomes. (3)
- 4.2.2 Determine the probability of her choosing a green marble followed by another green marble (2)
- 4.3 In a group of 100 teenagers eating at Kentucky Fried Chicken (KFC), 68 of them are eating burgers, 50 are eating chicken pieces and 32 are eating burgers and chicken pieces.



- 4.3.1 Draw a Venn diagram to illustrate the given data. (4)
- 4.3.2 Use the Venn diagram from QUESTION 4.3.1 to determine the probability of choosing a person at random who is not eating a burger or chicken pieces. (1)

[15]

QUESTION 5

5.1 Makhatini invests R500 for 5 years at an interest rate of 12,5% per annum, compounded quarterly.

Calculate:

5.1.1 The value of his investment after 5 years (3)

5.1.2 The interest earned after a period of 5 years. (2)

5.2 Paulina buys a motorbike for R20 000. It is expected to depreciate at a rate of 12% per annum. Calculate the value of the motorbike at the end of three years using the reducing balance method of depreciation.



(3)

5.3 Given below is the individual rate table obtained from the South African Revenue Services (SARS).

Rates applicable to individuals	
Taxable Income (R)	Rates of tax (R)
0 – 160 000	18% of taxable income.
160 001 – 250 000	28 800 + 25% of taxable income above 160 000
250 001 – 346 000	51 300 + 30% of taxable income above 250 000
346 001 – 484 000	80 100 + 35% of taxable income above 346 000
484 001 – 617 000	128 400 + 38% of taxable income above 484 000
617 001 and above	178 940 + 40% of taxable income above 617 000
Tax Rebates applicable to individuals are:	
• Primary rebate	R11 440
• Additional rebate (for persons 65 years and older)	R6 390
• Tertiary (person 75 or older)	R2 130
Tax thresholds applicable to individuals are:	
• Below age 65	R63 556
• Age 65 to below 75	R99 056
• Age 75 and over	R110 889
[SOUTH AFRICAN REVENUE SERVICE (SARS) 2012/2013]	

For the current tax year, if an individual is younger than 65 years of age, a tax credit for medical scheme contributions will be granted per month as follows:

R230 for the taxpayer.

R230 for the first dependant

R154 for each additional dependant

Given below are the earnings and deductions per month of Zandile Nkabinde, a 42 year old female with two dependents:

Gross monthly salary: R 22 100

Medical Aid contribution: R 1 910 for herself and her two dependants

Pension fund contribution: R 1 570 (which is not taxable)

Use the tax table to determine Zandile Nkabinde's net salary.

(6)



5.4 Puleng invested x rand at $r\%$ per annum compounded monthly. At the end of 10 years the value of her investment was $2x$ rand.

Calculate the value of r .

(4)

[18]

TOTAL: 100

ANOC



Copyright © 2014 by Academic Support Technologies (Pty) Ltd. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or by any information storage and retrieval system, without the prior written permission of Academic Support Technologies (Pty) Ltd.

123
123

001 123 456



MATHEMATICS

FORMULAE SHEET

1. $y = mx + c$

2. $m = \frac{y_2 - y_1}{x_2 - x_1}$

3. $y - y_1 = m(x - x_1)$

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

5. $M\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

6. $m = \tan \theta$

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

8. $\frac{\sin \theta}{\cos \theta} = \tan \theta$

9. $\sin^2 \theta + \cos^2 \theta = 1$

10. $\sin(\alpha \pm \beta) = \sin \alpha \cos \beta \pm \sin \beta \cos \alpha$

11. $\cos(\alpha \pm \beta) = \cos \alpha \cos \beta \mp \sin \alpha \sin \beta$

12. $\sin 2\theta = 2 \sin \theta \cos \theta$

13. $\cos 2\theta = \cos^2 \theta - \sin^2 \theta$

14. $\cos 2\theta = 1 - 2 \sin^2 \theta$

15. $\cos 2\theta = 2 \cos^2 \theta - 1$

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

17. $a^2 = b^2 + c^2 - 2bc \cos \hat{A}$

18. $\bar{x} = \frac{\sum_{i=1}^n x_i}{n}$

19. variance = $s^2 = \frac{\sum (x_i - \bar{x})^2}{n}$

20. standard deviation = $s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n}}$

21. $\hat{y} = a + bx$

22. $b = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$ or $b = \frac{n \sum xy - \sum x \sum y}{n \sum x^2 - (\sum x)^2}$

23. $a = \bar{y} - b\bar{x}$

24. $I = A_0 \times \frac{r}{100} \times t$ or $I = \frac{Prt}{100}$ or $A = P(1 + in)$

25. $A_t = A_0 \left(1 + \frac{r}{100 \times m}\right)^{t \times m}$ or $A_t = P \left(1 + \frac{r}{100}\right)^n$ or $A = P(1 + i)^n$

26. $A_t = A_0 \left(1 - \frac{r}{100}\right)^t$ or $A = P(1 - in)$ or $A = P(1 - i)^n$





$$27. \quad i = \frac{r}{100}$$

$$28. \quad P(A) = \frac{n(A)}{n(S)}$$

$$29. \quad P(A \text{ and } B) = P(A) \times P(B)$$

$$30. \quad P(A \text{ or } B) = P(A) + P(B)$$

$$31. \quad P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$32. \quad P(A/B) = \frac{P(A \& B)}{P(B)}$$



