UNIVERSITY OF FORT HARE

ALICE CAMPUS

MMM 411/MAT 411/MAM 412

BACHELOR OF EDUCATION: YEAR 4

JUNE EXAMINATIONS

2023

Subject: MATHEMATICS METHOD

Time: 3 Hours
Marks: 100

This paper consists of 12 pages including the cover page and 4 diagram sheets

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External Moderator: Prof Jogymol Alex

Instructions:

1. Answer all 6 questions
2. Use the mark allocation as a guide when giving responses
3. You will require a scientific calculator and a mathematics set
4. Answers should be rounded off to TWO decimal places where applicable
5. Where possible, use tables, graphs or diagrams to enhance your answers
6. Write your name and student number on the diagram sheets and hand it in with your answer sheet

DO NOT TURN THE PAGE BEFORE BEING TOLD TO DO SO

QUESTION 1

1.1 For all relevant subjects, including mathematics, the following schedule for the implementation of the CAPS curriculum was adopted:

- **2012** Implementation in Grades R – 3 and Grade 10
- **2013** Implementation in Grades 4 – 9 and Grade 11
- **2014** Implementation in Grade 12

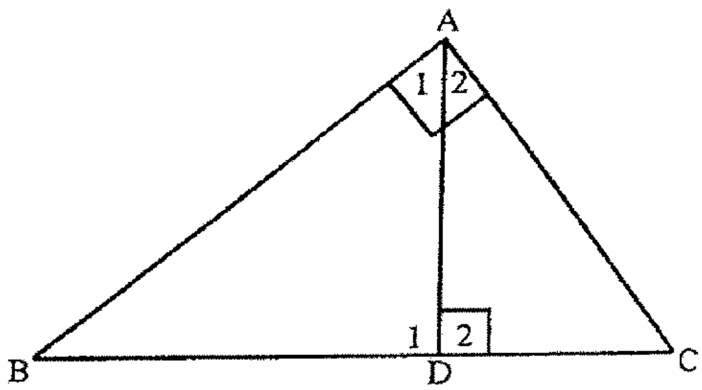
Name THREE REASONS why it was necessary for the education authorities to change the NCS curriculum to the CAPS curriculum. (3)

1.2 New CAPS changes have been added to the NCS mathematics curriculum, including incorporating the optional Geometry content for NCS into the core curriculum for CAPS.
List THREE REASONS why Geometry was considered by the curriculum writers to be included for all learners in the CAPS curriculum. (3)

1.3 Teaching formal theorems is part of the teaching Geometry in the FET phase.
(a) Complete the following theorem in words:

The perpendicular drawn from the vertex of a right-angled triangle to the hypotenuse ……………………………… (2)

(b) In the diagram below it is given that $\Delta ABC /// \Delta DBA /// \Delta DAC$



Use DIAGRAM SHEET 1 **to prove that** $BC^2 = AB^2 + AC^2$ (5)

[13]

QUESTION 2

2.1 Explain what a teaching method is.
Give ONE REASON why it is important to use different teaching methods in the Mathematics classroom. (2)

2.2 Briefly explain the following three teaching methods and give ONE ADVANTAGE of each:

(a) Direct/Explicit teaching (2)

(b) Cooperative learning (2)

(c) Investigations (2)

2.3 One example of a 'Direct/Explicit Teaching Method' in Quadratic Theory is to show Grade 11 learners how derive to the quadratic equation if the roots ($r_1$and r_2) are given. The following theory is teaching directly to your learners:

If the roots of a quadratic equation are r_1 and r_2 where r_1 is the first root and r_2 is the second root then:
$x = r_1$ or $x = r_2$
$(x - r_1)(x - r_2) = 0$
which is: $x^2 - (r_1 + r_2)x + r_1.r_2 = 0$

(a) If $r_1 = \frac{-b+\sqrt{b^2-4ac}}{2a}$ and $r_2 = \frac{-b-\sqrt{b^2-4ac}}{2a}$ show your learners that $r_1 + r_2 = \frac{-b}{a}$. (3)

(b) If $r_1 = \frac{-b+\sqrt{b^2-4ac}}{2a}$ and $r_2 = \frac{-b-\sqrt{b^2-4ac}}{2a}$ show your learners that $r_1 \times r_2 = \frac{c}{a}$. (3)

(c) Hence show your learners how do you derive the quadratic equation of $ax^2 + bx + c = 0$. (3)

2.4 Using a 'problem-solving activity' with your learners the following problem is pose to them:

If the roots of a quadratic equation is $x = 4 \pm \sqrt{5}$, now determine the quadratic equation in the form $ax^2 + bx + c = 0$.

(a) Solve the problem by using $x^2 - (r_1 + r_2)x + r_1.r_2 = 0$ (3)

(b) Hence use the equation in (a) and show your learners that the roots of the equation could NOT be determined by factorisation. (3)

2.5 Problem-solving is an important method to use in the Mathematics classroom. Outline THREE ADVANTAGES that a problem-solving method might have.

(3)
[26]

QUESTION 3

3.1 South African classrooms are continuing to change and steadily reflect the cultures of a broader society. (3)
Give THREE REASONS why a multicultural approach is important in the Mathematics classrooms in South Africa.

3.2 The migration of learners from rural areas into urban areas has seen an overflow of learners in urban schools, causing urban schools to be overcrowded. The consequence of this overcrowding has resulted in large Mathematics classes.
Name THREE DISADVANTAGES of teaching large classes in Mathematics. (3)

3.3 *Functions and its Inverses* is an important topic in the Grade 12 syllabus. The worksheet below was given to your learners the previous day. Show them whether they have worked correctly by providing answers to the following worksheet:

The function $f: x \rightarrow \log_a x$ passes through the point(4; - 2).

(a) Determine the value of *a*. (5)

(b) Hence, write down the equation of *f*. (1)

(c) Write down the equation of the <u>inverse</u> of *f* in the form of $f^{-1}(x) =$ ..... (2)

(d) Draw neat sketch graphs of *f* and f^{-1} on the same set of axes. (USE <u>DIAGRAM SHEET 2</u>). (5)

(e) Write down the domain and range of f^{-1}. (2)

(f) Determine the values of *x* for which *f* is decreasing. (1)

[22]

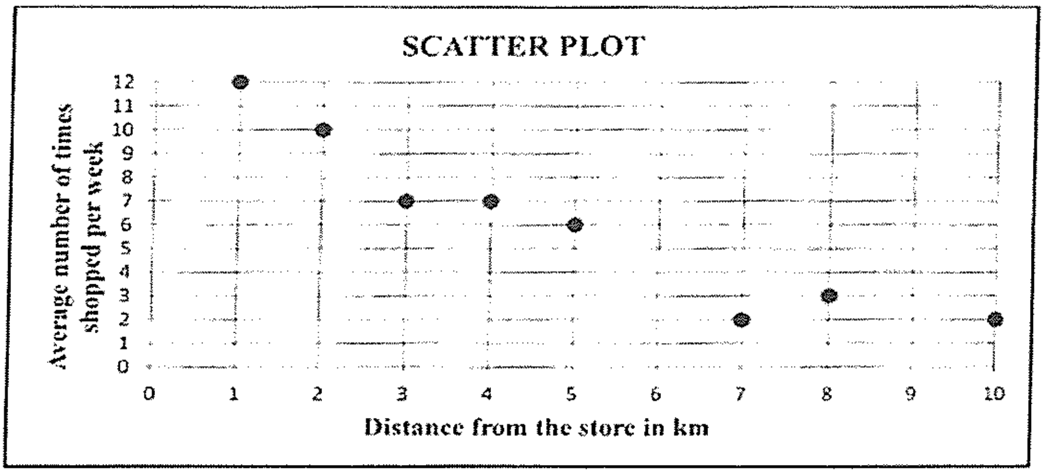
QUESTION 4

4.1 Information and Communication Technology (ICT) in schools is important to bridge the digital divide of first world countries.
Explain, by giving THREE WAYS how computers could be used to assist teachers and learners in the teaching and the learning process. (3)

4.2 The use of the calculation and interpretation skills are pivotal for learners especially in the FET phase when teachers explain Statistics.
Demonstrate to your learners these skills as part of finding the correct answers to the following exercise below:

A survey was conducted at a local supermarket relating the distance that shoppers lived from the store to the average number of times they shopped at the store in a week. The results show in the table on the next page.

Distance from the store in km	1	2	3	4	5	7	8	10
Average number of times shopped per week	12	10	7	7	6	2	3	2



(a) Use the scatter plot to comment on the <u>strength of the relationship</u> between the distance a shopper lived from the store and the average number of times she/he shopped at the store in a week. (1)

(b) Calculate the correlation coefficient of the data. (1)

(c) Calculate the equation of least regression line of the data. (3)

(d) Use your answer in (c) to estimate the average number of times that a shopper living 6 km from the supermarket will visit the store in a week. (2)

(e) Sketch the least squares regression line on the scatter plot provided on <u>DIAGRAM SHEET 3.</u> (2)

4.3 Learners in poorly resourced schools always face serious challenges when completing assessment tasks which are of an inquiry-based nature i.e. investigations and assignments.
Suggest TWO WAYS how, as a Mathematics teacher, would overcome these challenges when learners cite the lack of resources as a major problem to complete your tasks effectively? (2)

[14]

QUESTION 5

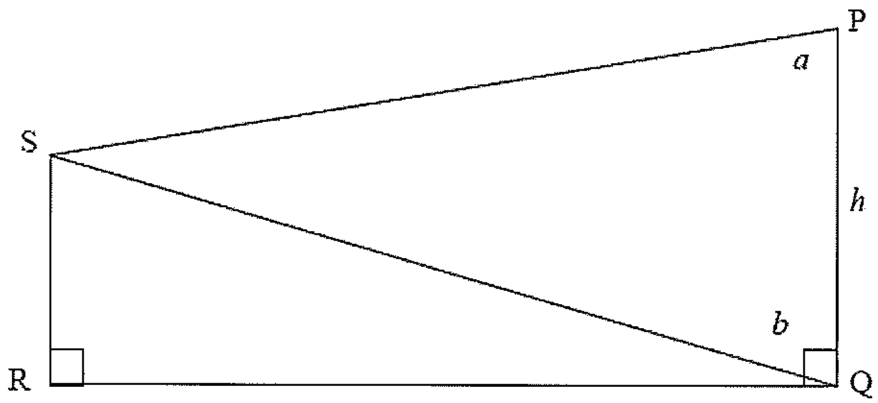
5.1 The following two statements show "errors" or "misconceptions" made by learners in a trigonometry exercise.

(1) $\cos(-\theta) = -\cos\theta$
(2) $\sin 2\theta \ = 2\sin\theta$

For each "misconception" above,

(a) State how you think this "misconception" came about. (2)
(b) Indicate how you would address this "misconception" in class and lead learners to the correct statement. (2)

5.2 In the diagram below, $S\hat{P}Q = a$, $P\hat{Q}S = b$ and PQ = h. PQ and SR are perpendicular to RQ. A separate diagram is provided for on DIAGRAM SHEET 4.



(a) Determine the distance SQ in terms of a, b and h (3)

(b) Hence show that RS = $\frac{h \sin a \cos b}{\sin(a+b)}$ (3)

5.3 Good lesson preparation is critical to good teaching. Name the FIVE ASPECTS to consider when planning mathematics lessons. (5)

[15]

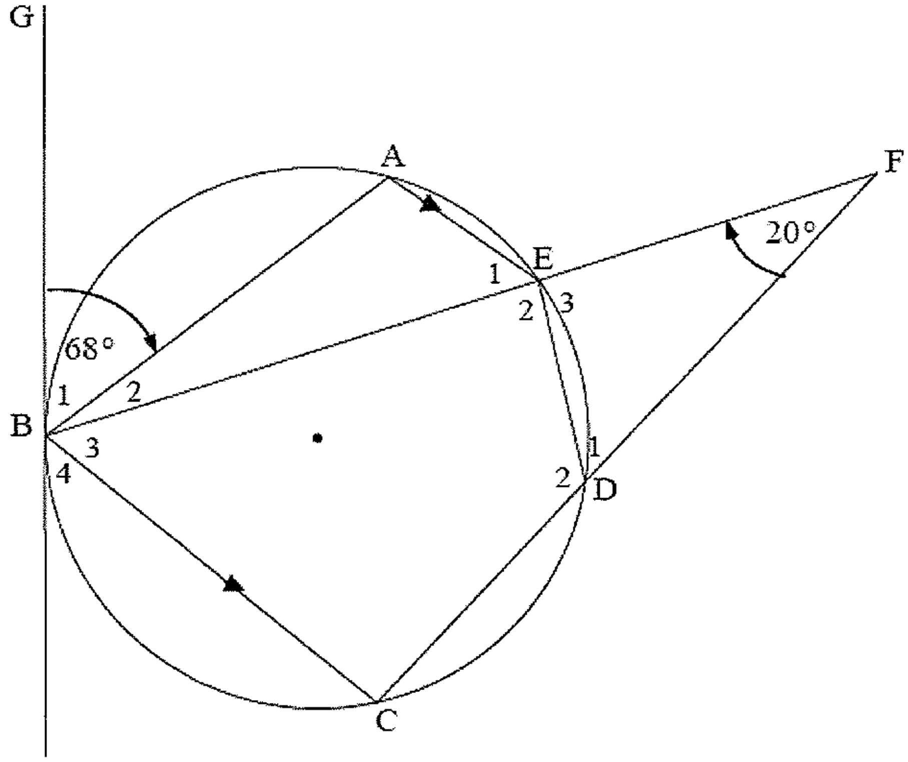
QUESTION 6

6.1 The teaching of Mathematics at all times should develop logical reasoning patterns among learners.
Explain the MAIN DIFFERENCE between inductive and deductive reasoning. (1)

6.2 Euclidean Geometry is now part of the core CAPS curriculum, which among other things use proven theorems to solve problems.

Show your Grade 11 learners how they should use proven theorems to solve problems in Geometry by solving the problem below.

In the diagram, A, B, C, D and E are points on the circumference of the circle such that AE | | BC. BE and CD produced meet in F. GBH is a tangent to the circle at B.
$\hat{B}_1$ =68° and $\hat{F}$ = 20°. A separate diagram is provided on <u>DIAGRAM SHEET 4.</u>



(a) Complete the following statement:

The angle between the tangent and the chord at the point of contact is equal to ... (1)

Determine the size of each of the following angles. Give reasons.

(b) $\hat{E}_1$ (2)

(c) $\hat{B}_3$ (1)

(d) $\widehat{D}_1$ (2)

(e) $\widehat{E}_2$ (1)

(f) $\hat{C}$ (2)

[10]

GRAND TOTAL	**{100}**

THE END OF YOUR QUESTION PAPER!

DAIGRAM SHEET 1

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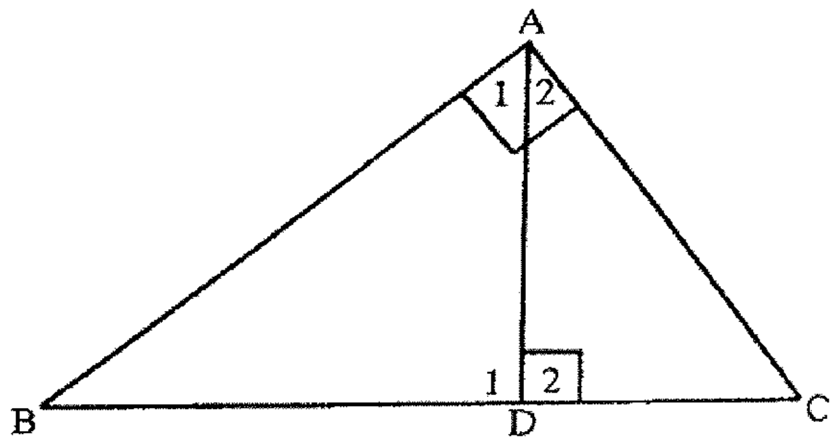
NB: The diagram sheets must be handed in with your answer book

Student Name: ______________________________
Student Number: ______________________________

Question 1.3 (b)



DAIGRAM SHEET 2

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Student Name: ____
Student Number: ____

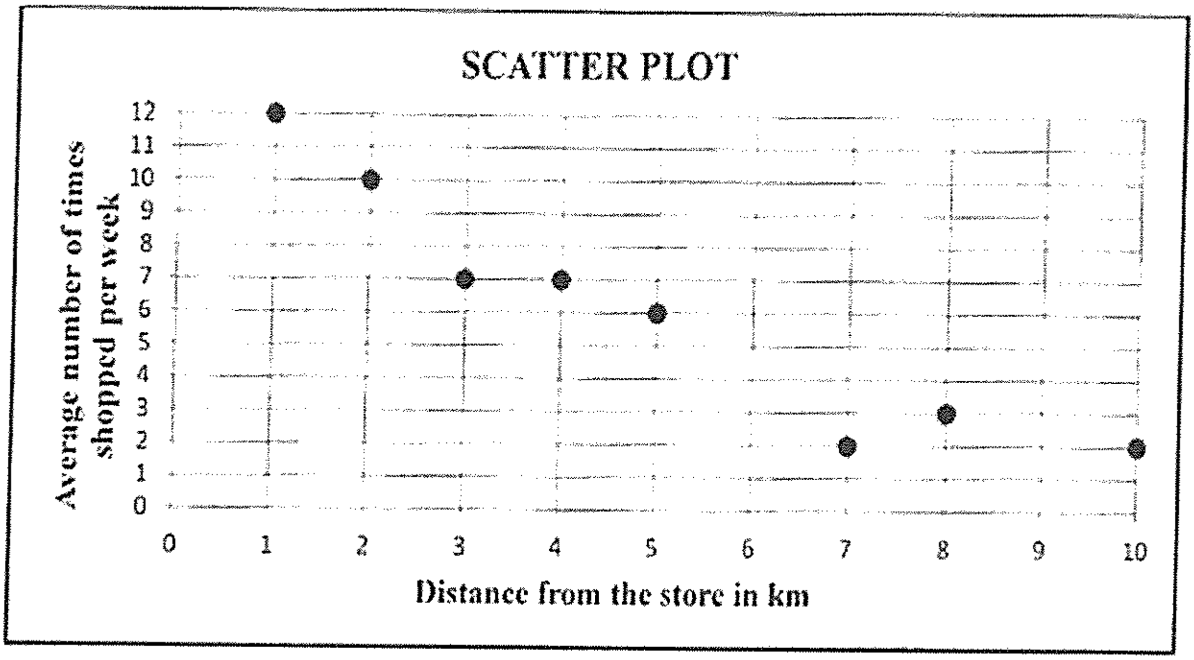
Question 3.3 (d)

DAIGRAM SHEET 3

JUNE 2023 EXAMINATIONS MMM 411/MAT 411/412
Student Name: ______________________________
Student Number: ______________________________

Question 4.2 (e)

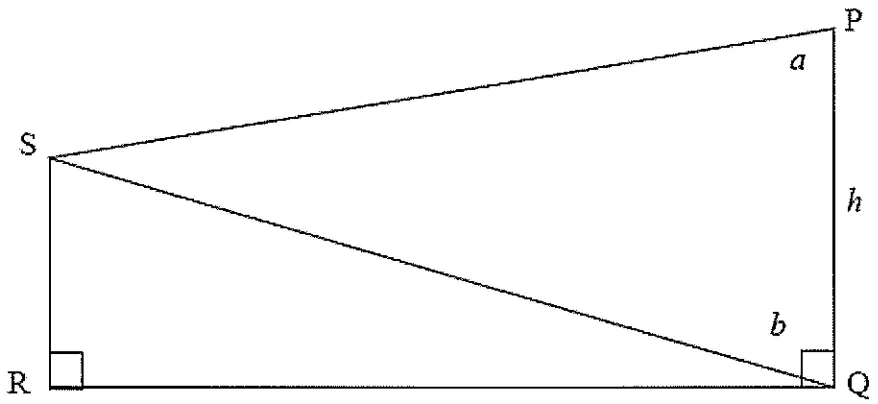
Distance from the store in km	1	2	3	4	5	7	8	10
Average number of times shopped per week	12	10	7	7	6	2	3	2



DAIGRAM SHEET 4

JUNE 2023 EXAMINATIONS MMM 411/MAT 411/MAM 412
Student Name: ____
Student Number: ____

Question 5.2



Question 6.2