UNIVERSITY OF SWAZILAND
FACULTY OF EDUCATION
FIRST SEMESTER EXAMINATION PAPER 2010

TITLE OF PAPER:	CURRICULUM STUDIES IN MATHEMATICS
COURSE CODE:	EDC 281
PROGRAMME:	B.ED 2 & PGCE
APPENDICES:	CHAPTER FROM A SCHOOL TEXT, CRITERIA FOR SCORING AN A GRADE, SELECTED SGCSE SYLLABUS TOPICS
TIME ALLOWED:	THREE (3) HOURS
TOTAL MARKS:	100
INSTRUCTIONS:	ANSWER ANY **FOUR** QUESTIONS. EACH QUESTION IS WORTH 25 MARKS.

This paper contains 3 pages excluding appendices

Question 1

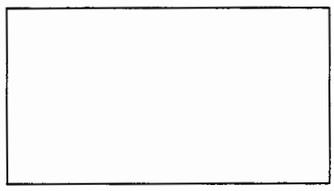
(a) What are misconceptions? [2]

(b) State **five** reasons why teachers need to study misconceptions. [5]

(c) Using examples from mathematics explain the difference between primary concepts and secondary concepts. [6]

(d) State Skemp's (1986) **two** principles of concept development. [2]

(e) You asked learners to measure and write down the length and breadth of the rectangle below in centimeters.



Musa gave the answers as follows: $4.65 \text{ cm} \leq \text{length} < 4.75 \text{ cm}$ and

$2.55 \text{ cm} \leq \text{breadth} < 2.65 \text{ cm}$

(i) Identify the source of Musa's response [2] (ii) Write a detailed response to him. [8]

Question 2

(a) Give **four** reasons why it is important to determine contributory concepts for a topic. [4]

(b) Critically analyze appendix 1(a chapter section from a school text book) in view of Skemp's principles of concept development [6]

(c) "Teaching approaches informed by constructivist theory are appropriate for an examination oriented curriculum" Support or refute the statement. [15]

Question 3

(a) State **five** reasons for lesson planning [5]

(b) In appendix 2 are criteria for scoring an "A" grade in SGCSE mathematics. Give **five** implications for you as a teacher of mathematics in preparing learners to obtain A grades. [5]

(c) "The lecture method is usually discouraged but it is more effective in teaching algebra"; support or refute the statement. [15]

Question 4

(a) Why is it important to consider the following when preparing a scheme of work?

(i) Materials to use [2]
(ii) Time frame for each topic [2]
(iii)Past examination questions [2]

(b) For the topics in appendix 3 identify factual knowledge that learners need to recall or recognize i.e. what strategies would you use to facilitate remembering of these things? [15]

(c) Write Furst's **four** suggestions about objectives [4]

Question 5

Write an essay on the importance of problem solving in the teaching and learning of school mathematics. [25]

Appendix 1

8.7 Rounding off whole numbers

There are 317 learners in a school.

(a) A visitor asks the head teacher how many learners are in the school. The head teacher says, 'There are about 300.' The head teacher does not give the exact number. He has given an approximation to the number. He gives the number to the nearest 100.

(b) All the learners are present. They want to have lunch. The head teacher tells the matron, 'There are about 320 learners.' This time he gives the number to the nearest 10.

(c) The Ministry wants to know the number of learners on the school roll. The head teacher reports that there are 317 learners, giving the exact number.

When we write a number to a given place value we say that we are rounding off the number to that nearest place value.

Using line segments to round off

■ **Example**

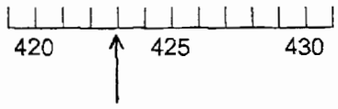
Round off 423 to:

(a) the nearest 10 (b) the nearest 100.

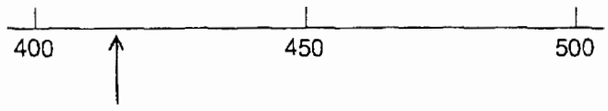
□ **Solution**

(a) 423 is between which two 10s? It is between 420 and 430.
What number is midway between 420 and 430? It is 425.
Is 423 after 425 or before 425? It is before.
Which 10 is it nearest to? It is nearest to 420.
Therefore 423 to the nearest 10 is 420.

The following line segment illustrates this. The arrow indicates the position of 423 on the line segment.



(b)



The arrow indicates the position of 423 on the 100s line segment. Therefore 423 to the nearest 100 is rounded down to 400 because it is nearest to 400.

14 Using line segments, round off:

(a) 5 736 (b) 6 358

to the nearest

(i) 10 (ii) 100 (iii) 1 000.

Draw a conclusion on how to round off without having to draw line segments. Discuss your conclusion with your neighbour and then with the teacher. Write down the conclusion that you make as a class.

Short method of rounding off:

1. Put a line under the digit in the place you are rounding to.
2. Look at the digit in the next place to the right.
3. If it is 5 or more round up by adding one to the digit you underlined and writing zeros to hold places for units, tens, hundreds, thousands etc. to the right of the place value you are rounding to. If it is less than 5 round down by leaving the digit you underlined as it is and writing zeros to hold places for units, tens, hundreds, thousands etc. to the right of the place value you are rounding to.

15 Complete the table in your workbook.

Rounding off decimal numbers

Decimal numbers can be round off to a given number of decimal places. Rounding off to one decimal place is the same as rounding off to the nearest tenth. Rounding off to two decimal places is the same as rounding off to the nearest hundredth.

16 What is rounding off to the nearest whole number the same as?

■ **Example**
Round off 15.736 to one decimal place.

☐ **Solution**
15.736 is between 15.7 and 15.8. Midway between 15.7 and 15.8 is 15.75. Since 15.736 is less than 15.75, 15.736 = 15.7 to the nearest tenth or to one decimal place.

■ **Example**
Round off 15.736 to two decimal places or to the nearest hundredth.

☐ **Solution**
Find two hundredths between which 15.736 lies. It lies between 15.73 and 15.74 and midway between these is 15.735. Since 15.736 is more than 15.735 to the nearest hundredth the rounded value will be 15.74.

The same conclusion you reached as a class about rounding off to whole numbers applies in rounding off to a given number of decimal places. You just need to know the place value you are rounding off to.

From the work you have done you should have noted that we can round off decimals by looking at the digit to the right of the one in the place value we want to round off to. If it is less than 5 the digit stays the same. If it is more than or equal to 5 the digit goes up by one unit. The following table should clarify this.

Number	To one decimal place	To two decimal places
0.352	0.4	0.35
0.273	0.3	0.27
0.345	0.3	0.35
4.699	4.7	4.70
5.0209	5.0	5.02
2.603	2.6	2.60
0.996	1.0	1.00

17 Complete the table in your workbook.

page 37

Exercise 8.7

page 38

1. Complete the table in your workbook.

page 38

2. Complete the table in your workbook.

3. Write the following measurements to the approximation given in the brackets:
   (a) 56 738 km (to the nearest thousand km)
   (b) 0.063 g (to two decimal places)
   (c) 582 m (to the nearest 10 metres)
   (d) E58.312 (to the nearest cent)
   (e) P5 162.81 (to the nearest Pula)
   (f) 28.38 sec (to one decimal place)

4. Boifang buys a radio for P53.35. The shopkeeper rounds off the cost to the nearest Pula. How much does Boifang pay for the radio?

page 125

13 Complete the table for the following division questions:

(a) $6 \div 10$ ⟶

(b) $256 \div 10$ ⟶

(c) $3\,765 \div 100$ ⟶

(d) $0.9 \div 10$ ⟶

(e) $900 \div 1\,000$ ⟶

(f) $738\,000 \div 1\,000$ ⟶

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page 127

15 Complete the following table by filling in answers in the unshaded areas:

Number	To nearest 10	To nearest 100	To nearest 1 000
63			
75			
38			
259			
384			
2 751			
5 485			

page 128

17 Complete the following table by filling in answers in the unshaded areas:

Number	To 1 decimal place	To 2 decimal places
0.458		
0.62		
0.364		
0.48		
0.075		
0.329		
0.05		

Exercise 8.7

1. Complete the following table:

Number	To nearest whole number	To one decimal place
7.83	8	7.8
82.53		
107.504		
0.909		
4.08		
10.65		
10.04		
0.505		

2. Complete the following table:

Number	To 1 decimal place	To 2 decimal places
5.741	5.7	
3.264		
4.349		4.35
10.956		
0.0652		
108.076		
75.283		
60.049		
0.9026		
82.507		
0.0708		
4.019		
70.485		
66.051		
80.507		

Appendix 2

A Grade A candidate should be able to:

• Use positive, negative and fractional indices in both numerical and algebraic work. Interpret and use fractional indices, both numerical and algebraic.

• Express any number to 1, 2, or 3 significant figures.

• Relate a percentage change to a multiplying factor and vice versa, e.g., multiplication by 1.03 results in a 3% increase.

• Obtain appropriate upper and lower bounds for solutions to simple problems given data to a specified accuracy.

• Solve problems involving solids including nets of solids.

• Relate scale factors to situations in both two and three dimensions.

• Calculate actual length, areas and volumes from scale models. Carry out calculations involving the use of right-angled triangles as part of work in three dimensions.

• Add, subtract, multiply and divide algebraic fractions.

• Manipulate algebraic equations — linear, simultaneous and quadratic.

• Write down algebraic formulae and equations from a description of a situation.

• Form and solve double linear inequalities.

• Recognize and interpret graphs of the functions $f(x) = ax^n$, and $g(x) = a^x$

• Plot, recognize and interpret graphs of functions of the form $f(x) = ax^n + bx + c$

• Draw the tangent, estimate and interpret gradients of a curve at a point.

• Solve problems involving the sine formula, cosine formula and the use of the area formula for a triangle $A = \frac{1}{2} ab \sin C$

• Use the relationships between lengths of line segments, areas, surface area, volume of similar shapes or solids to solve problems.

• Construct and interpret histograms with unequal intervals.

• Calculate the probability of simple combined events, using addition or multiplication of probabilities as appropriate.

• Recognize, describe and generalize in algebraic format patterns of non-linear sequences.

• Process data, discriminating between necessary and redundant information. Make quantitative and qualitative deductions distance/time and speed/time graphs.

• Make clear, concise and accurate mathematical statements, demonstrating ease and confidence in the use of symbolic forms and accuracy in algebraic or arithmetic manipulation.

• Give clear mathematical justifications for the conjectures made in problem solving.

CORE	EXTENDED
1. Types of Numbers and their Sequences, Sets and Set Notation and Language *[Topic Area: Number]*	
1.8 For 2 sets and a universal set, draw Venn diagrams and use the language and notation of sets (i.e., subsets, union, intersection complement number of elements).	1.15 For more than 2 sets and a universal set, draw Venn diagrams and use the language and notation of sets (i.e., subsets, union, intersection complement number of elements).
1.9 Describe and use set symbols: { } "... is a set of ..." $\in$ "... is an element of..." $\notin$ "...is not an element of..." $\varnothing$ the empty set $\cap$ intersection of $\cup$ union of $\subset$ proper subset of $\subseteq$ is a subset of $\not\subset$ is not a proper subset of A' complement of set A $\mathscr{E}$ universal set n(A) number of elements in set A	1.16 Use set builder notation to describe sets.
7. Indices *[Topic Areas: Number and Algebra]*	
All learners should be able to: 7.1 Use and evaluate positive, negative and zero indices. 7.2 Use the rules of indices $a^m \times a^n = a^{m+n}$, $a^m \div a^n = a^{m-n}$ and $(a^m)^n = a^{m \times n}$	7.3 Use, interpret and evaluate fractional indices e.g., solve $32^x = 2$.
14. Trigonometry *[Topic Area: Shape, Position and Space]*	
All learners should be able to: 14.1 Apply Pythagoras Theorem. 14.2 Calculate sides and angles of a right-angled triangle using sine, cosine and tangent ratios. 14.3 Solve simple problems involving angles of depression and elevation (from right angled-triangles).	14.4 Find sine and cosine for obtuse angles. 14.5 Use sine rule and the cosine formulae for trigonometrical problems in 2-dimensions. 14.6 Use the formulae $A = \frac{1}{2} ab \sin C$ for the area of a triangle. 14.7 Solve trigonometric problems in 3-dimensions including angle between a line and a plane.