MPMAT2B

**UNIVERSITY OF JOHANNESBURG**
**FACULTY OF EDUCATION**
**JANUARY EXAMINATION 2017**

**PROGRAMME:** Bachelor of Education
**MODULE:** Teaching Methodology and Practicum for Mathematics
**CODE:** MPMAT2B
**TIME:** 2 hours
**MARKS:** 100 marks
**EXAMINER:** K Fonseca
**MODERATOR:** Dr S Ramsaroop

(This paper consists of **6** pages)

**INSTRUCTIONS**

Read the following instructions carefully before answering the questions.

1. This question paper consists of TWO questions based on **TWO** case studies.
2. Answer all the questions.
3. Number the questions correctly as in the question paper.
4. Write NEATLY and LEGIBLY.

**QUESTION 1**

Read, case study 1, and answer the questions below.

**CASE STUDY FOR QUESTION 1**

*While you were on Work Integrated Learning (WIL), the grade 5 mathematics teacher asked you to mark one of the class tests, the learners wrote. The purpose of the test, was to assess learners' knowledge and skills about whole numbers. With specific reference to subtraction of whole numbers.*

*As you were busy marking you noticed that the learners represented their work in various ways. Some learners represented their answers in the following way:*

I

$$\begin{array}{r} {\scriptstyle 4\ 12} \\ \not{5}\not{0}\not{2} \\ -\ 6 \\ \hline 406 \end{array}$$

II

$$\begin{array}{r} {\scriptstyle 4\ \ 15} \\ \not{3}\not{5}00\not{8} \\ -\ \ 6 \\ \hline 34009 \end{array}$$

III

$$\begin{array}{r} {\scriptstyle 6\,9\,8\ 15} \\ \not{7}\not{0}\not{0}\not{8} \\ -\ 7 \\ \hline 6988 \end{array}$$

**Question 1**

1.1. As mathematics teachers, we aim to develop mathematical proficient learners. Explain what is meant by being mathematical proficient. (5)

1.2. Discuss the dominant strand/s of mathematical proficiency demonstrated in the three solutions above as well as the lack in mathematical proficiency strands. (5)

1.3 Differentiate between a mathematical slip, an error and misconception. Give an example of each. (6)

1.4 Critically analyse the three students' solution methods by:

- Giving a detailed description of the mathematical concepts needed to be understood to solve subtraction of whole number tasks. Explain how these concepts link to make a coherent understanding of the subtraction of whole numbers.
- Give a detailed explanation about the errors **each student** made to solve the subtraction of whole numbers task. (**Explanation 1 page long).** (16)

1.5 Discuss why you think the learners made these errors. What are possible underlying causes for these errors. (4)

1.6.1 Design an appropriate grade 5, word problem, where learners have to subtract a two-digit number from a three-digit number. (2)

1.6.2 Demonstrate how grade 5 learners can solve the task implementing a different solution method. A method other than the ones demonstrated in question 1.2. Explain the mathematical concepts needed to solve the task. (7)

1.6.3 If you were the teacher what would you write in your 'reflection for action'. Pretend to be the teacher and reflect on what and how you will approach a future lesson on subtraction of whole

numbers, using the method described in question 1.4.2. Write your 'reflection for action' in a one-page essay. (10)

**[55 marks]**

**Question 2**

Read, case study 2 and answer the following questions below.

**CASE STUDY FOR QUESTION 2**

*As, Mr Mphofu marked the activity he gave his grade 5 class on multiplication of whole numbers. He saw that one learner, Peter invented an algorithm that was different to the one Mr Mphofu taught in class. Peter's work looked like the following:*

$$
\begin{array}{r}
983 \\
\times\ 6 \\
\hline
488 \\
+5410 \\
\hline
5898
\end{array}
$$

**Question 2**

2.1.1 Give a detailed explanation of how Peter solved the multiplication of whole numbers task. As well as the mathematical concepts he demonstrated. (7)

2.1.2 Do you think Peter's approach only worked for this particular tasks, or is it applicable to all multiplication of three-digit numbers to one-digit number. Prove your answer. (5)

2.2.1 Define what a mathematical 'Big Idea' is. (3)

2.2.2 Write a suitable mathematical 'Big Idea' connecting the mathematical concepts of the task in case study 2. (2)

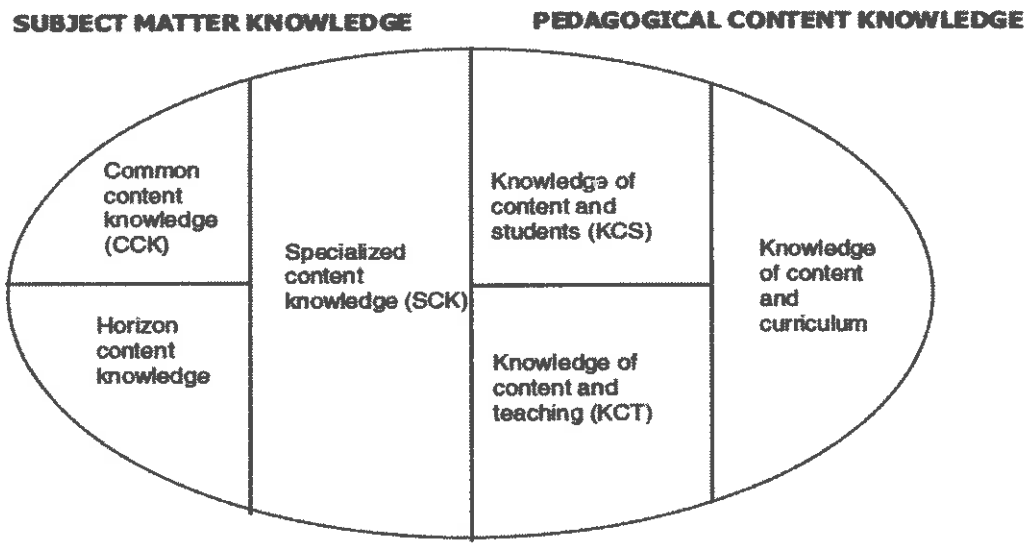
2.3. Apart from content knowledge and pedagogical content knowledge, mathematics teachers need to teach mathematics, they also need other domains of knowledge. Explain what are the knowledge domains needed to teach a lesson *'multiplication of multi-digit whole numbers'* by using the Mathematical Knowledge for Teaching (MKT), framework to analyse this knowledge domains.

**NB!**

2.3.1 You first need to explain what each of the domains mean in this framework.

2.3.2 Then apply these knowledge domains in terms of the above mentioned task on *'multiplication of multi-digit whole numbers'*. Give a detailed description. **(Combined both questions should be 1 ½ pages long).** (15)

## Domains of Mathematical Knowledge for Teaching




2.4 As a mathematics teacher we want to find out what and why our learners think about mathematics in the way they do. For instance, when one looks at the response given by Peter in the above case study. One might find that there are other learners with different algorithms. It is thus important to find out what, is the mathematical thinking behind this solution. As a mathematics teacher you should thus be:

- Able to ask appropriate questions that will elicit learners' mathematical concepts.
- Create opportunities for learners to discuss their solutions in the classroom.

2.4.1 Explain how you will create an opportunity or opportunities for learners to engage in discussion with one another during a lesson on solving multiplication of whole number problems. Give practical examples.

(7)

2.4.2 Describe how a questioning episode, during a lesson on the 'multiplication of whole numbers', which will facilitate the eliciting of the learners' mathematical thinking. **(NB! Refer to list of question type below).**

- Describe by giving examples of the various types of questions you will be posing during the lesson.
- You also need to explain why these questions are the most suitable questions to elicit learners' mathematical thinking. (6)

**List of question type**

- **Gathering information**
- **Inserting terminology**
- **Exploring mathematical meanings and/or relationships**
- **Probing, getting learners to explain their thinking**
- **Generating discussion**
- **Linking and applying**
- **Extending thinking**
- **Orienting and focusing**
- **Establish a context**

**[45 marks]**