UNIVERSITY OF JOHANNESBURG

FACULTY	: Education
DEPARTMENT	: Science and Technology Education
CAMPUS	: APK
MODULE	: TEACHING METHODOLOGY AND PRACTICUM 3A (MFSPMA3)
SEMESTER	: First
EXAM	: June 2019

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MODERATOR : DR ED SPANGENBERG

DURATION : 2 HOURS **MARKS** : 100

NUMBER OF PAGES: 5 PAGES

INSTRUCTIONS:

1. Answer ALL THE QUESTIONS.
2. Number your answers correctly according to the numbering system used in this question paper.
3. Write legibly and present your work neatly.

QUESTION 1: Nature of Mathematics, teaching and learning

1.1. Ernest (1989) developed three (3) categories of mathematics teacher beliefs: the Instrumentalist, Platonist and Problem-solving teachers. Provide a brief description of each category in terms of *the nature of mathematical knowledge.* **(9)**

1.2. What would you say is the danger of classifying mathematics teachers into such categories? **(3)**

1.3. In which category would you choose to place yourself? Provide one (1) reason for your choice. **(3)**

[15]

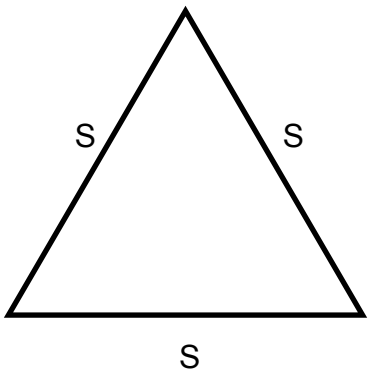
QUESTION 2: Theories of teaching and learning

2.1. One of the main challenges mathematics teachers face is to teach for understanding. Skemp (1976) proposed that there are two types of understanding, namely *relational* and *instrumental* understanding. Discuss briefly the main differences between these two types of understanding. **(4)**

2.2. List two advantages of developing relational understanding in learners studying mathematics. **(4)**

2.3. The Van Hieles (1986) developed a theory which argues that learners' geometric thinking develops through five different stages in a set order. What are these five (5) Van Hiele levels called? **(10)**

2.4. Consider the following geometry problem:
Grade 10 learners were given a triangle, with sides of length *s*, as shown below. They were instructed to calculate the area of the triangle in terms of *s.*



2.4.1 On what Van Hiele level is this question? **(1)**

2.4.2 Provide a motivation for your answer in 2.4.1 above. **(3)**

2.4.3 Discuss what you would do to move the question to the next Van Hiele level. **(3)**

[25]

QUESTION 3: Teacher knowledge

3.1 Shulman (1986) conceptualised PCK as an important type of knowledge that teachers should possess. What does PCK stand for? **(2)**

3.2 Explain clearly how (you believe) PCK is different to content knowledge and pedagogical knowledge. **(3)**

3.3 Why, would you say, is it important for teachers to develop this type of knowledge? **(5)**

[10]

QUESTION 4: Teaching Strategies

Consider the two scenarios below and answer the questions based on them.

- Scenario 1:

"Good morning class. Today we are going to be learning about patterns. You get two kinds of patterns, which are numeric patterns and geometric patterns. So, if we look at the first pattern which is 2; 4; 6; 8 and so on, we can see that it is a numeric pattern. If we look at 1; 2; 4; 7; 10 and so on, we can see that it is a geometric pattern."

- Scenario 2:

"Good morning class. Today we are going to be learning about patterns in Maths. You will find scraps of fabric on your desks. What I want you to please do, is to look carefully at the fabric, and draw on your paper what you think the next 10 centimetres of the fabric looks like. How did you decide on what the fabric will look like? Now, let's assign a number to each of the shapes in the pattern on the fabric…"

4.1. In your own words, explain the terms direct instruction and facilitation, and show the difference between these two types of instruction. **(4)**

4.2. Consider scenarios 1 and 2 above.

4.2.1. Are the two strategies similar to, or different from each other? **(2)**

4.2.2. Discuss your answer in 4.2.1 above by providing reasons. **(4)**

4.3. Which of the two strategies would you use to introduce the topic of patterns to learners? **(1)**

4.4. Provide two (2) motivations for your answer to 4.3 above. **(4)**

[15]

QUESTION 5: Assessment in mathematics education

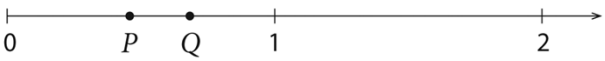
5.1. In your own words, explain what you understand by *formative assessment.* **(3)**

5.2. Feedback is considered to be one of the main characteristics of formative assessment. Discuss two (2) advantages that feedback can have on learning. **(4)**

5.3. Why is summative assessment often regarded with negativity in South Africa? **(4)**

5.4. List three (3) purposes of summative assessment. **(3)**

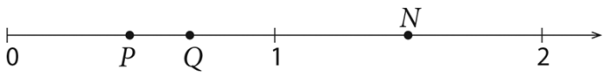
5.5. Consider the following assessment item:

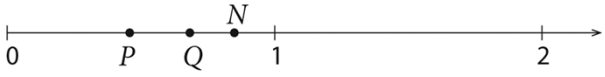


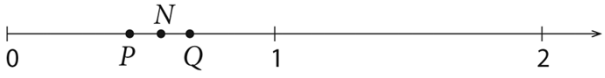
P and Q represent two fractions on the number line above.

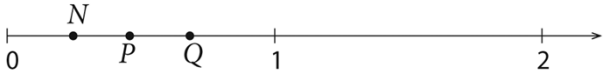
$P \times Q = N$.

Which of these shows the location of N on the number line?

Ⓐ 

Ⓑ 

Ⓒ 

● 

Discuss at least two (2) problems you think such an assessment item may pose to different learners. **(6)**

[20]

QUESTION 6: Teaching and learning of Financial Mathematics

The topic of Financial Mathematics is introduced to learners at grade 10 level. The following extract is taken from the FET CAPS document:

Grade 10 term 3
Use simple and compound growth formulae A = P(1 + in) and A = P(1 + i)n to solve problems (including interest, hire purchase, inflation, population growth and other real life problems).

6.1 Use one of the mathematics teaching and learning theories you encountered in this course, and design a short classroom activity to illustrate how you would introduce the topic of ***simple and compound interest*** to learners. In your activity, you must include:

- The theory of your choice and the reason for choosing it. **(5)**
- The teacher's activities in introducing the topic (typical questions the teacher may ask, for example); and **(5)**
- Learners' activities/actions. **(5)**

[15]

TOTAL: 100