

NOVEMBER 2023
EBS 417
MATHEMATICAL INVESTIGATIONS
2 HOURS

Candidate's Index Number
Signature:

UNIVERSITY OF CAPE COAST
COLLEGE OF EDUCATION STUDIES
SCHOOL OF EDUCATIONAL DEVELOPMENT AND OUTREACH
INSTITUTE OF EDUCATION

COLLEGES OF EDUCATION
FOUR-YEAR BACHELOR OF EDUCATION (B.ED)
FOURTH YEAR, END-OF-SECOND SEMESTER EXAMINATION, NOVEMBER 2023

9TH NOVEMBER 2023 MATHEMATICAL INVESTIGATIONS 9:00 AM – 9:30 AM

This paper consists of two sections, A and B. Answer ALL the questions in Section A and TWO questions from Section B. Section A will be collected after the first 30 minutes.

SECTION A
[20 MARKS]

Answer ALL the questions in this Section.

For items 1 to 18, each stem is followed by four options lettered A to D. Read each item carefully and circle the letter of the correct or best option.

- Which of the following statements does **not** represent a value of teaching mathematics through problem-solving?
 - It places the focus of the students' attention on ideas and sense-making.
 - It provides ongoing assessment data that can be used to make instructional decisions.
 - Students are engaged in the five mathematical processes of "doing mathematics."
 - Students learn how mathematics can be frustrating as they solve challenging tasks.
- Which of the following is/are a characteristic(s) of a good mathematics problem?
 - Easily solvable
 - High cognitive demand
 - Multiple entry points
 - Relevant context
 - I only
 - II only
 - I, III, and IV
 - II, III and IV

3. In mathematical investigations students are encouraged to make their own decisions about which of the following?
- I. Having no pathway to the solution.
 - II. Knowing where to start.
 - III. Knowing how to describe what they have discovered.
 - IV. Knowing how to communicate their ideas.
- A. I only
 - B. II only
 - C. I, III, and IV only
 - D. II, III, and IV only
4. A task where students know what is asked and the formula to use is referred to as a/an
- A. exercise.
 - B. investigation.
 - C. problem.
 - D. test.
5. A characteristic of a good problem in mathematics is that
- A. it is a routine task.
 - B. it is complicated.
 - C. it is rejected by the student.
 - D. there is no blockage.
6. A student after being presented with a problem responded with the correct answer immediately but could not explain how she obtained the answer. This example illustrates which of the following strategies used in problem solving?
- A. Checking for the reasonableness of answers
 - B. Conjectures
 - C. Looking for a pattern
 - D. Visualising
7. The second step in Polya's strategy for problem solving is
- A. carrying out a plan.
 - B. devising a plan.
 - C. looking back.
 - D. understanding the problem.
8. What is the **most** critical aspect of the *After* phase of the lesson?
- A. Ensure adequate preparation for assessment.
 - B. Ensure that all students participate in the lesson.
 - C. Potential to engage students in problem solving.
 - D. The main ideas of the lesson are visible to all students.
9. Which of the following stages in the '**IDEAL**' model for problem solving is similar to Polya's model for problem solving known as *devising a plan*?
- A. Anticipate outcomes and act.
 - B. Define goals and represent the problem.
 - C. Explore possible strategies.
 - D. Identify a problem and opportunities.

10. Selecting problem solving tasks that require higher levels of cognitive demand should include which one of the following?
- Ambiguity of what needs to be done to solve it.
 - Use of a specific procedure.
 - Use of non-algorithmic thinking.
 - Use of previously learned procedure.
11. Selecting, designing or adapting a worthwhile task requires that a teacher asks which of the following question. Does this task
- have potential for students to demonstrate mathematical understanding?
 - only require or need the use of one problem solving strategy?
 - require more than one class period to solve?
 - require students to activate prior knowledge?
12. Which is the **most** accurate statement regarding posing a worthwhile problem?
- Enables students to make relationships between mathematical concepts.
 - Should have the potential to be solved by students using a memorized procedure.
 - The problems selected should involve words and nothing else.
 - There should be agreement among students that there is one correct answer.
13. *Anticipated outcome* means
- checking your solution.
 - determining that there is a blockage.
 - determining what the task is about.
 - identifying possible strategies worth trying.
14. A characteristic of a student operating as a doer of mathematics is a/an
- ability to apply mathematical concepts to everyday problems.
 - ability to memorize mathematical rules and conventions.
 - sense of having some understanding of mathematical structure.
 - sense of not belonging in mathematics class.
15. Which of the following describes the role of the mathematics teacher teaching using problem-solving approach?
- Intervening whenever students are stuck on a problem.
 - Isolating and addressing students' alternative conceptions.
 - Leaving students to struggle fruitlessly.
 - Teaching problem solving as an independent concept.
16. The approach to teaching where the teacher presents the mathematics, the students practise the skills and finally solve story problems that require using the skill is known as teaching problem solving.
- about
 - as
 - for
 - through
17. Which of the following is an instructional example of teaching **through** problem solving? Students
- are provided with a list of formulas to use.
 - are taught an algorithm which they then use to solve related problems.
 - develop their own word problems using a learned algorithm.
 - use concrete materials to find the area of a triangle and then generalize.

18. Teaching *through* problem solving benefits all students in what way? Focusing
- A. on procedures that will effectively find answers.
 - B. on the single strategy need to solve most problems.
 - C. on the technology that will guide them to solutions.
 - D. students on ideas and sense making.

Items 19 and 20 are statements followed by True and False options. Read each statement carefully and indicate whether it is True or False by circling the letter of the correct option.

19. A heuristic is a strategy that is dependent on a particular topic that helps problem solvers approach and understand a problem.
- A. True
 - B. False
20. The second phase of John Mason's model for problem solving is the Attack Phase.
- A. True
 - B. False