REGISTRATION NUMBER:……

UNIVERSITY OF CAPE COAST

COLLEGE OF EDUCATION STUDIES

NATURE OF MATHEMATICS Credit: 3hours

QUIZ 1 **Time Allowed: 1hour**

INSTRUCTION: *There are two sections of this paper- Section A and Section B.*

*Answer **all** questions in both sections.*

Section A(24Marks)

Read each statement/question carefully and decide on what the answer is, and write the letter that corresponds to your answer on the answer sheet provided.

Award 2 marks for each correct response

1.There is no general agreement on precisely what mathematics is.

A. False
B. True

2. The equation $x^n + y^n = z^n$ has no solution in integers for $n \geq 3$.

A. False
B. True

3. Who defined mathematics as: "*The science of quantity".*

A. Aristotle
B. Comte
C. Peirce
D. Sawyer

4. The philosophy that expresses Mathematics as "*the manipulation of meaningless symbols of a first-order language according to explicit, syntactical rules"* is_____.

A. Absolutism
B. Formalism
C. Intuitionism
D. Platonism

5. One of the highest values in mathematics, like science is its_____.

A. abstractness
B. openness
C. preciseness
D. proofs

6. Who claims "A mathematician is a blind man in a dark room looking for a black cat that isn't there."?

A. Darwin
B. Hardy
C. Poincaré

D. Wigner

7. Who claims that "*Mathematics is a creative* or *inventive process"*?
   A. Darwin
   B. **Kline**
   C. Russell
   D. Skemp
8. A Cycle of Mathematics Investigation involves *representation, manipulation* and_____.
   A. factorization.
   B. simplification.
   C. validation.
   D. verification.
9. Modern view of mathematics is that it is a *"science of pattern and* _____.
   A. facts.
   B. numbers.
   C. order.
   D. theorems.
10. Multiplication is regarded as repeated addition. Thus "3 lots of 9" means "3 × 9" and this means that_____
    A. 3 + 3 + 3+ 3+ 3 + 3 + 3 + 3 + 3 = 27
    B. 9 + 9 + 9 = 27

11 Which one of the following solids is composed of 20 triangular faces?

   A. Dodecahedron
   B. Icosahedron
   C. Octagon
   D. Tetrahedron

12 6 is an exam[le of a perfect number.

   A. True
   B. False

SECTION *B*(26 Marks)

Answer all questions in this section.

In each question show all details of working including your answer.

13. (a) State the p*rinciple of mathematical induction*. (**2 Marks**)

(b) Use the principle of mathematical induction to prove that "the sum of the first *n* even positive integers is $n(n+1)$. (**8 Marks**)

MARKING SCHEME

(a) *A statement involving the natural number n is true for every* $n \in N$ *provided that*:
the statement is true in the special case $n = 1$
the truth of the statement for $n = k$, $k \in N \Rightarrow$ the truth of the statement for $n = k + 1$. **B2**

(b) The preposition is $\sum_{r=1}^{n} 2r = 2 + 4 + 6 + \ldots + 2n = n(n+1)$ **B1**

(i) Verify for $n = 1$:
When $n = 1$: LHS = 2 **M1**
RHS = $1(1+1) = 2$ **A1**
Hence the preposition is true for $n = 1$.

(ii) Suppose it is true for $n = k$
That is $\sum_{r=1}^{k} 2r = 2 + 4 + 6 + \cdots + 2r = k(k+1)$ **B1**
Is the statement also true for $n = k + 1$?
When $n = k + 1$:
LHS = $\sum_{r=1}^{k+1} 2r = 2 + 4 + 6 + \cdots + 2r + 2(k+1) = k(k+1) + 2(k+1)$ **M1A1**
$= (k+1)(k+2)$ **A1**
= RHS for $n = k + 1$ **B1**

14. (a) (a) Find the HCF of 108 and 300 **(6 m arks)**

Marking Scheme

(a) $108 = 2 \times 2 \times 3 \times 3 \times 3 = 2^2 \times 3^3$ **M1A1**

$300 = 2 \times 2 \times 3 \times 5 \times 5 = 2^2 \times 3 \times 5^2$ **M1A1**

Representatives with the smallest exponent: $2^2 \times 3$. **M1**

Therefore, HCF of 108 and 300 is 12. **A1**

(b)

$108 = 2\times2\times3\times3\times3 = 2^2\times3^3$ **M1A1**

$144 = 2\times2\times2\times2\times3\times3 = 2^4\times3^2$ **M1A1**

Representatives with the highest exponent: $2^4\times3^3$. **M1**

The product of $2^4\times3^3$ is 432. Therefore, LCM of 108 and 144 is 432. **A1**

(C) Use partterns to show that $-3\times-5=15$ **(4 Marks)**

$-5\times5=-25$

$-5\times4=-20$

$-5\times3=-15$

$-5\times2=-10$

$-5\times1=-5$

$-5\times0=0$

$-5\times-1=5$

$-5\times-2=10$

$.-5\times-3=15$ **B2**

Observe from the pattern that in the first case the second factor decreases by 1 from 5 to 0 while the product consistently increases by 5 from -25 to 0. Following the pattern we should expect the next second factor to be -1 and the next product to be 5 more than zero and so should be 5, giving $-5\times-1=5$ indicating a product of two negative numbers yielding a positive number. The next product, $-5\times-2=10$ also yielded a positive number. Observing the pattern in the remaining THUS $-5\times-3=15$ **B1 B1**