



American
Mathematics Olympiad

SECONDARY 2 (GRADE 8) MOCK TEST PAPER SET 1

NAME: _____

Index Number:

SCHOOL: _____

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INSTRUCTIONS:

1. Please **DO NOT OPEN** the contest booklet until the Proctor has given permission to start
2. TIME: **1 hour 30 minutes.**
3. There are 25 questions with 100 total points:
Section A: Questions 1 to 15 score 3 points each, no points are deducted for an unanswered or wrong answer.
Section B: Questions 16 to 20 score 5 points each, no points are deducted for an unanswered or wrong answer.
Section C: Questions 21 to 25 score 6 points each, no points are deducted for an unanswered or wrong answer.
4. Shade your answers neatly using a **2B lead pencil** in the Answer Entry Sheet.
5. PROCTORING: No one may help any student in any way during the contest.
6. No electronic devices capable of storing and displaying visual information are allowed during the course of the exam. Strictly **No Calculators** are allowed.
7. All students must fill and shade their **Name, School and Index Number** in the Answer Entry Sheet and Contest booklet.
8. MINIMUM TIME: Students must stay in the exam hall for at least 1 hour.
9. A student must show detailed working and transfer answers to the Answer Entry Sheet.
10. **No exam papers and written notes can be taken out by any contestant.**



SIU SOUTHERN ILLINOIS UNIVERSITY
CARBONDALE STEM EDUCATION
RESEARCH CENTER

ROUGH WORKING

Section A: 15 Multiple Choice Questions

3 points each

Question 1

How many numbers of the series have a terminating decimal expansion?

$$\frac{1}{1}, \frac{1}{2}, \frac{1}{3}, \dots, \frac{1}{98}, \frac{1}{99}, \frac{1}{100}$$

- A. 15
- B. 16
- C. 14
- D. 13
- E. 18

Question 2

Solve:

$$\sqrt{4^3} - \sqrt[3]{2^6}$$

- A. 2
- B. 4
- C. 8
- D. 12
- E. 1

Question 3

Solve the following

$$(\sqrt[3]{7} - 1) \times (\sqrt[3]{49} + \sqrt[3]{7} + 1)$$

- A. 48
- B. 50
- C. 6
- D. 8
- E. 7

Question 4

How many positive integers N satisfy the following equation.

$$441 - 42N + N^2 = 64$$

- A. 2
- B. 1
- C. 0
- D. 4
- E. 3

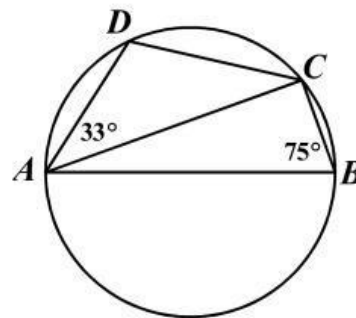
Question 5

Find the sum of all the unique prime factors of 656656.

- A. 74
- B. 1044
- C. 553
- D. 473
- E. 687

Question 6

In the adjoining figure, AB is the diameter of the circle and C, D lie on the same side of the diameter. If $\angle ABC = 75^\circ$ and $\angle DAC = 33^\circ$, then find the measurement of $\angle DCA$, in degrees.



- A. 33
- B. 24
- C. 72
- D. 42
- E. 27

Question 7

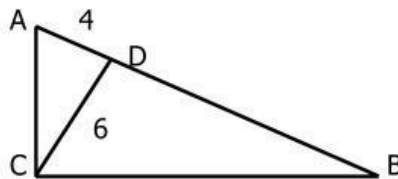
A metal cylinder is re-casted into a cone with twice the radius. If the height of the cylinder was 12 m, then what is the height of the new cone?

- A. 24 m
- B. 16 m
- C. 6 m
- D. 9 m
- E. 36 m

Question 8

In the diagram, ABC is a right-angled triangle, $AD = 4$ and $CD = 6$. Find the length of DB if CD is perpendicular to AB .

- A. 8
- B. 9
- C. 10
- D. 4
- E. 12



Question 9

A rhombus of the length 17 and the length of one of its diagonals is 16. Find the length of the other diagonal.

- A. 15
- B. 30
- C. 32
- D. 34
- E. $\sqrt{545}$

Question 10

Tom travels first 25 km with a speed of 60 km/h. Then due to the conditions of the remaining road, he had to slow down and travel the rest of the distance with a speed of x km/h. If the average speed over 50 km was found to be 40 km/h. Find the value of x .

- A. 36
- B. 20
- C. 30
- D. 15
- E. None of these

Question 11

Count the number of square numbers between $(6^4 + 1)$ and $(4^6 - 1)$.

- A. 28
- B. 17
- C. 29
- D. 16
- E. 27

Question 12

Find the 1000th root of

$$10^{(10^{10})}$$

- A. 10^{10^7}
- B. $10^{7^{10}}$
- C. $\sqrt{10^{\sqrt{10^{\sqrt{10}}}}}$
- D. $7^{10^{10}}$
- E. $10^{\frac{1}{10}}$

Question 13

A cuboid has faces of area 24, 15, 10 square units. If the lengths of the sides of the cuboid are a, b, c then find $abc + 2(a + b + c)$.

- A. 72.5
- B. 49
- C. 90
- D. 85
- E. Insufficient information

Question 14

What is the greatest number of regions can 7 lines divide a circle into?

- A. 14
- B. 28
- C. 29
- D. 15
- E. 35

Question 15

How many unique necklaces can be made such that they contain 7 equally spaced beads of 7 different colours?

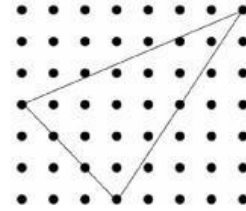
- A. 5040
- B. 720
- C. 2520
- D. 360
- E. 840

Section B: 5 Open-Ended Questions

5 points each

Question 16

In the figure, the difference between any two neighbouring horizontal and vertical dots is 1. Find the area of the triangle.



Question 17

If $n! = n \times (n - 1)! \times \dots \times 2 \times 1$, find the simplest value of the following.

$$\frac{20! + 21!}{2 \times 19! + 4 \times 19! + 16 \times 19!}$$

Question 18

What is the number of unique 4 letter words that can be formed with the word MATHS?

Question 19

In a 3-digit number XYZ, X, Y and Z are non-zero digits in an arithmetic progression. If $XYZ - ZXY = M$, find the largest value of M a 3-digit number ($X, Z \neq 0$)

Question 20

In a class of 50 students if 15 like maths, 27 like English and 13 like none then how many like both Maths and English

Section C: 5 Open-Ended Questions

6 points each

Question 21

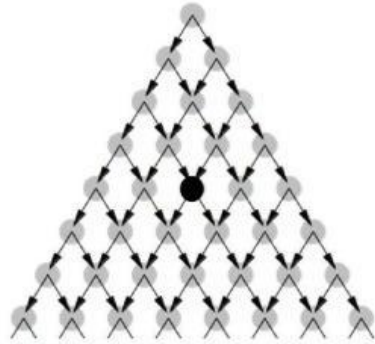
The numbers 411, 666 and 870 give the remainder when divided by a positive integer N . Find the greatest possible value of N .

Question 22

In a sequence of numbers, each subsequent term is the sum of cubes of digits of the previous term. If one such sequence starts with the number 244, find the 2021st term in it.

Question 23

In how many ways can you reach any circle on the 10th row from the circle on the top if you can only move down left or right but cannot pass through the black circle?

**Question 24**

Find the maximum value of the following expression.

$$\sqrt{781 - X} + \sqrt{X - 59}$$