



**American**  
Mathematics Olympiad

## SECONDARY 1 (GRADE 7) MOCK TEST PAPER SET 1

**NAME:** \_\_\_\_\_

**Index Number:**

**SCHOOL:** \_\_\_\_\_

### 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  
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**ROUGH WORKING**

**Section A: 15 Multiple Choice Questions**  
**3 points each**

**Question 1**

Find the possible value(s) of  $\sqrt{(\sqrt{0.0081} + \sqrt{0.0001} + \sqrt{0.81})}$ .

- A. 1
- B. -1
- C. Both 1 and -1
- D. Decimal numbers do not have square roots
- E.  $\sqrt{0.019}$

**Question 2**

If 5 is added to the numerator and denominator of the fraction  $\frac{6}{11}$ , how will the value of the fraction change?

- A. No change
- B. Increase
- C. Decrease
- D. It increases by  $\frac{11}{16}$
- E. The fraction evaluates to 1

**Question 3**

If a mother makes  $x$  cakes in 2 hours and  $y$  pizzas in 3 hours, how many cakes and pizzas altogether does she make in 6 hours? Assume she is making both together and that she works just as fast as if she made them separately.

- A.  $6(\frac{x}{2} + \frac{y}{3})$
- B.  $6(\frac{y}{2} + \frac{x}{3})$
- C.  $6(2x + 3y)$
- D.  $6(3x + 2y)$
- E. 30

**Question 4**

Sasha wants to fit an image into a box on her computer screen. Her original image was  $1\frac{1}{2}$  inches wide and  $2\frac{1}{4}$  inches tall. Her computer screen box is 4 inches wide. She needs to adjust the box on her computer screen. How tall does the computer screen box need to be for her to fit the image exactly and snugly into the box, without squishing or stretching the image? The choices shown are in inches.

- A.  $\frac{9}{32}$
- B.  $\frac{27}{32}$
- C. 6
- D.  $4\frac{3}{4}$
- E.  $2\frac{1}{2}$

**Question 5**

I have a set of four numbers  $P, Q, R, S$  in ascending order. The average of  $P, Q$ , and  $R$  is 22, and the average of  $Q, R$ , and  $S$  is 24. The largest number is 27. Then, the smallest number in this set:

- A. is prime
- B. is a multiple of 9
- C. is a multiple of 11
- D. is a multiple of 7
- E. cannot be determined with this information

**Question 6**

The difference in the place values of the numeral 7 in the largest and the smallest numbers formed using 3, 4, 5, 6, 7 (each digit is used once and exactly once) is

- A. 69,993
- B. 41,976
- C. 76,536
- D. 9,999
- E. 70

### Question 7

Assume that all sections within each of the given shapes are the same size. Consider only the area represented by the flower, the circle, etc. without including any surrounding area around it. Which fraction below represents the fraction of the shaded part of any shape in the simplest form?



- A.  $\frac{6}{13}$
- B.  $\frac{4}{10}$
- C.  $\frac{1}{4}$
- D.  $\frac{2}{3}$
- E.  $\frac{1}{2}$

### Question 8

A tessellation is a set of figures that can cover a plane without overlapping or leaving any gaps. Tessellations with triangles would look like the following:

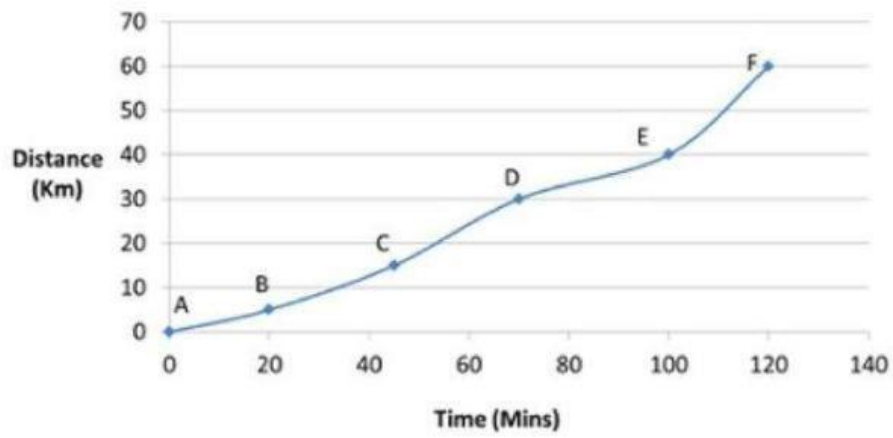


You can continue in the horizontal and vertical directions infinitely to place more such triangles to form larger such tightly fitted spaces with no gaps or overlaps. Consider three identical regular pentagons. In how many ways can 3 such pentagons be arranged so that they form a tessellation?

- A. Zero
- B. One
- C. Two
- D. Four
- E. Infinite

### Question 9

Look at the following graph. Which of the following sections of the graph have the highest rate of change?

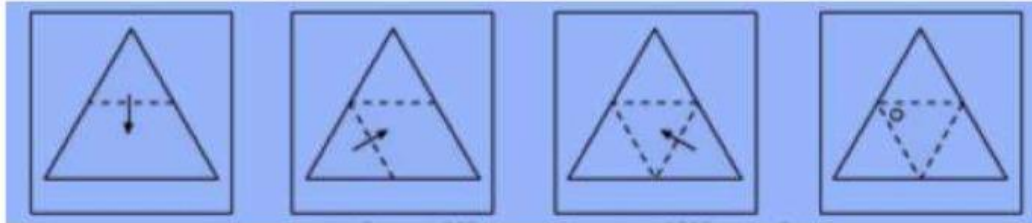


Distance-Time or D-T Graph

- A. A to B
- B. B to C
- C. A to C
- D. D to E
- E. E to F

**Question 10**

A paper is folded as shown below and punched in its folded state. When the paper is opened out again, what will be the pattern of holes formed?



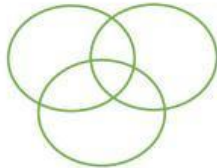
- A. A triangle with 3 holes, one near each vertex and one in the center.
- B. A triangle with 4 holes, one near each vertex and one in the center.
- C. A triangle with 5 holes, one near each vertex and one in the center.
- D. A triangle with 6 holes, one near each vertex and one in the center.
- E. None of these



**Question 11**

Which of the following Venn diagrams represents soccer players, high school Math enthusiasts, and students?

A.



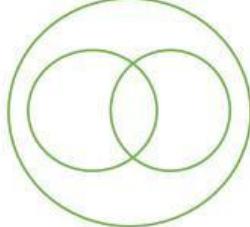
B.



C.



D.



E. None of these

**Question 12**

40 people are in a movie theatre which offers two snack options – popcorns and chips. 26 people like popcorns but they do not like chips. 32 students like popcorns. Everyone in the theatre likes at least one of the two snack options. Find the number of people who like both.

- A. 6
- B. 8
- C. 32
- D. 40
- E. Indeterminate

**Question 13**

The surface areas of the two spheres are in the ratio 4: 9. Find the ratio of their volumes.

- A. 2: 3
- B. 16: 31
- C. 3: 2
- D. 4: 9
- E. 8: 27

**Question 14**

How many three-digit natural numbers are divisible by 7?

- A. 141
- B. 142
- C. 143
- D. 128
- E. 129

**Question 15**

A lattice point is a point in a Cartesian coordinate system such that both its  $x$ - and  $y$ -coordinates are integers. How many lattice points are there in a line with  $(2,4)$ ,  $(3,6)$ ?

- A. 12
- B. 6
- C. 1
- D. 2
- E. Infinitely many

## Section B – 5 Open-Ended Questions

5 points each

### Question 16

Suppose you have a number with 2021 digits. Let  $P$  be its sum of digits. Let  $Q$  be the sum of the digits of  $P$ . Let  $R$  be the sum of the digits of  $Q$ . (Assume simple addition but not digital sum or recursive sum.) Find the largest value of  $Q$ .

### Question: 17

Given

$$\begin{array}{rcccc} & X & Y & Z & \\ + & Z & Y & X & \\ \hline A & B & A & A & \end{array}$$

where  $A, B, X, Y, Z$  are unique positive single-digit numbers, what is the number of possible combinations for  $X$  and  $Z$  to satisfy this equation?

**Question 18**

A steel cuboid is reshaped into a cube. Initially, its length, breadth, and depth were 270 cm, 100 cm, and 64 cm respectively. Find the sum of digits of the surface area of the cube.

**Question 19**

If  $(3x - 4) : (y + 15)$  is a fixed ratio and if  $x = \frac{7}{3}$ , then  $y = 12$ . Find the value of  $x + y$  when  $x = 2$ .

**Question 20**

What is the sum of prime numbers between 2000 and 2021?

**Solution:**

The prime numbers between 2000 and 2021 are:

2003, 2011, 2017

Their sum is  $2003 + 2011 + 2017 = 6031$ .

**Answer: 6031**

**Section C: 5 Open-Ended Questions**  
**6 points each**

**Question 21**

A lattice point is a point in a Cartesian coordinate system such that both its  $x$ - and  $y$ -coordinates are integers. A point lattice is constructed by plotting all of the points  $(a, b)$  such that  $a$  and  $b$  are positive integers. How many points in the point lattice lie on the line  $y = -4x + 8$ ?

**Question 22**

Several people were surveyed for their preference from 4 drinks  $A, B, C, D$ . All the people surveyed are represented in the graph below. If the fraction of people who preferred  $A$  is  $\frac{m}{n}$ , find  $m + n$ .

