The Ivy Education Center
LEAGUE

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2022 Mock AMC 8

American Mathematics Contest 8

Test 1

MAA AMC

American Mathematics Competitions

AMC 8

MOCK EXAMINATION

INSTRUCTIONS

1. DO NOT OPEN THIS BOOKLET UNTIL YOUR COMPETITION MANAGER TELLS YOU TO BEGIN.
2. This is a 25-question multiple-choice competition. For each question, only one answer choice is correct.
3. Mark your answer to each problem on the answer sheet with a #2 pencil. Check blackened answers for accuracy and erase errors completely. Only answers that are properly marked on the answer sheet will be scored.
4. SCORING: You will receive 1 point for each correct answer, 0 points for each problem left unanswered, and 0 points for each incorrect answer.
5. Only blank scratch paper, rulers, and erasers are allowed as aids. Prohibited materials include calculators, smartwatches, phones, computing devices, compasses, protractors, and graph paper. No problems on the competition will require the use of a calculator.
6. Figures are not necessarily drawn to scale.
7. You will have 40 minutes to complete the competition once your competition manager tells you to begin.

AMC 8 Mock Test

Problem 1

The ratio $\frac{(2^3)^4}{(4^2)^3}$ equals

$\textbf{(A)}\ \frac{1}{4}$ $\textbf{(B)}\ \frac{1}{2}$ $\textbf{(C)}\ 1$ $\textbf{(D)}\ 2$ $\textbf{(E)}\ 8$

Problem 2

What is the remainder when dividing the sum $2001 + 2002 + 2003 + \cdots + 2024$ by 2024?

(A) 0 (B) 300 (C) 1012 (D) 1748 (E) 2012

Problem 3

The sum of 11 consecutive integers is 2024. What is the smallest of these integers?

$\textbf{(A)}\ 175$ $\textbf{(B)}\ 177$ $\textbf{(C)}\ 179$ $\textbf{(D)}\ 180$ $\textbf{(E)}\ 181$

Problem 4

The product of 4 distinct positive integers is 100. Their sum is:

(A) 14 (B) 18 (C) 20 (D) 29 (E) 103

Problem 5

In a class there are 9 girls and 13 boys. Half of these students have participated in a math club. How many boys at least in the math club?

(A) 0 (B) 1 (C) 2 (D) 3 (E) 4

Problem 6

Bob typed a 6-digit number, but the two 1s he typed didn't show. What appeared was 2024. How many different 6-digit numbers could he have typed?

$\textbf{(A)}\ 4 \qquad \textbf{(B)}\ 8 \qquad \textbf{(C)}\ 10 \qquad \textbf{(D)}\ 15 \qquad \textbf{(E)}\ 20$

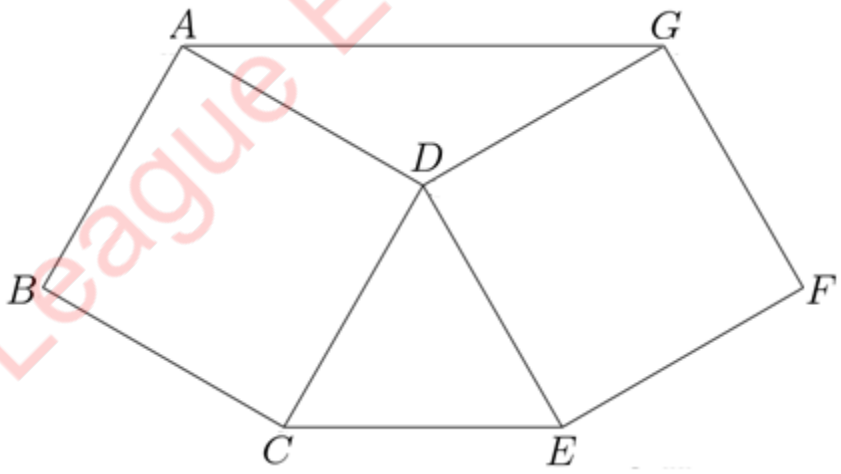
Problem 7

Which of the following numbers is a perfect square?

$\textbf{(A)}\ 4^4 5^5 6^6 \qquad \textbf{(B)}\ 4^4 5^6 6^5 \qquad \textbf{(C)}\ 4^5 5^4 6^6 \qquad \textbf{(D)}\ 4^6 5^4 6^5 \qquad \textbf{(E)}\ 4^6 5^5 6^4$

Problem 8

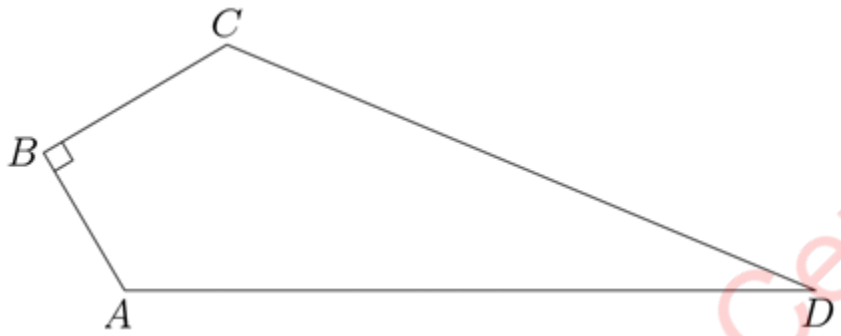
In the adjoining figure, CDE is an equilateral triangle and $ABCD$ and $DEFG$ are congruent squares. The measure of $\angle DAG$ in degrees is



(A) 20 (B) 25 (C) 30 (D) 35 (E) 40

Problem 9

In quadrilateral $ABCD$, $AB = 3, BC = 4, CD = 12, DA = 13$, and $\angle ABC$ is a right angle. What is the area of the quadrilateral?



(A) 32 (B) 36 (C) 39 (D) 42 (E) 48

Problem 10

Seven positive consecutive integers starting with a have average b. What is the average of 7 consecutive integers that start with b?

(A) $a+3$ **(B)** $a+4$ **(C)** $a+5$ **(D)** $a+6$ **(E)** $a+7$

Problem 11

Which of the following fractions has the smallest value?

(A) $\frac{44444}{55555}$ (B) $\frac{5555}{6666}$ (C) $\frac{666}{777}$ (D) $\frac{77}{88}$ (E) $\frac{8}{9}$

Problem 12

On weekdays Tom rides his bike m miles each day. On each of the two weekend days he rides it 5 miles farther. If Tom rides 87 miles each week, how many miles does he ride each weekday?

(A) 11 (B) 12 (C) 13 (D) 14 (E) 15

Problem 13

How many distinct triangles can be formed by connecting three of the points above?

(A) 680 (B) 781 (C) 786 (D) 795 (E) 816

Problem 14

Let D be a digit such that the 5-digit number $\underline{90D58}$ is evenly divided by the 3-digit number $\underline{2D8}$ with a quotient of the 3-digit number $\underline{3D1}$. What is the value of D?

(A) 0 (B) 1 (C) 3 (D) 4 (E) 5

Problem 15

On a number line, four numbers are equally spaced between $\frac{1}{2}$ and $\frac{2}{3}$. The largest of the four numbers is

(A) $\frac{17}{30}$ (B) $\frac{7}{12}$ (C) $\frac{3}{5}$ (D) $\frac{5}{8}$ (E) $\frac{19}{30}$

Problem 16

The perimeter of a rectangle with diagonal length d is 20. What is the area of the rectangle?

(A) $25 - d^2$ (B) $25 - \frac{d^2}{2}$ (C) $50 - d^2$ (D) $50 - \frac{d^2}{2}$ (E) $100 - \frac{d^2}{2}$

Problem 17

How many ordered triples of positive integers (a, b, c) satisfy

$$(a^b)^c = 729\,?$$

(A) 5 **(B)** 6 **(C)** 7 **(D)** 8 **(E)** 9

Problem 18

The number of participants in a math competition this year is 10% higher than last year. The number of boys increased by 20% and the number of girls increased by 5%. What fraction of the participants in the math competition this year are boys?

(A) $\frac{1}{3}$ **(B)** $\frac{4}{11}$ **(C)** $\frac{2}{5}$ **(D)** $\frac{4}{9}$ **(E)** $\frac{1}{2}$

Problem 19

Two walls and the ceiling of a room meet at right angles at point P. A fly is in the air 3 meters from one wall, 4 meters from the other wall, and 13 meters from point P. How many meters is the fly from the ceiling?

(A) 11 (B) $\sqrt{142}$ (C) $\sqrt{143}$ (D) 12 (E) $\sqrt{145}$

Problem 20

There are 1012 black balls and 1012 white balls in a bag. Let p_1 be the probability that two balls drawn randomly from the bag are the same color, and let p_2 be the probability that they are different colors. What is the positive difference between p_1 and p_2?

(A) 0 (B) $\frac{1}{2024}$ (C) $\frac{1}{2023}$ (D) $\frac{2}{2023}$ (E) $\frac{1}{1011}$

Problem 21

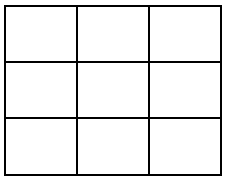
Let

$$S = 3 + 6 - 9 + 12 + 15 - 18 + 21 + 24 - 27 + \cdots + 2019 + 2022 - 2025.$$

What is the sum of the digits of S?

(A) 18 (B) 20 (C) 24 (D) 25 (E) 30

Problem 22



On a 3×3 grid as shown above, every unit square is filled with one of the letters A, B, C, and D. How many such grids are there that contain the following 2×2 grid?

A	B
C	D

(A) 256 (B) 512 (C) 1024 (D) 2048 (E) 4096

Problem 23

The integer 12 has five one-digit factors, 20 has four 1-digit factors, and together 12 and 20 have nine one-digit factors, some of which are in common. What is the total number of one-digit factors for all of the integers from 1 to 100, inclusive?

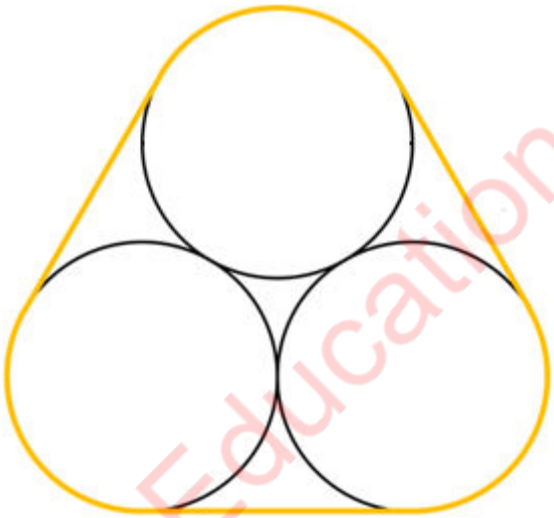
(A) 181 (B) 20 (C) 24 (D) 25 (E) 281

Problem 24

Paul rolls 3 fair standard six-sided dice. What is the probability that there is at least one pair of dice whose top faces sum to 6?

(A) $\frac{35}{108}$ (B) $\frac{73}{216}$ (C) $\frac{1}{3}$ (D) $\frac{25}{72}$ (E) $\frac{19}{54}$

Problem 25



A belt is drawn tightly around three circles of radius 10 units each, as shown above. The length of the belt, in units, can be written in the form $a + b\pi$. What is the value of $a + b$?

(A) 68 (B) 72 (C) 74 (D) 78 (E) 80