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LEAGUE

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MOCK EXAMINATION

AMC 8

American Mathematics Contest 8

Test Sample

MAA
MATHEMATICAL ASSOCIATION OF AMERICA

MAA American Mathematics Competitions

MOCK EXAMINATION

AMC 8

American Mathematics Contest 8

INSTRUCTIONS

1. DO NOT OPEN THIS BOOKLET UNTIL YOUR PROCTOR TELLS YOU.
2. This is a twenty-five question multiple choice test. For each question, only one answer choice is correct.
3. Mark your answer to each problem on the AMC 8 Answer Form with a #2 pencil. Check the blackened circles for accuracy and erase errors and stray marks completely. Only answers properly marked on the answer form will be graded.
4. There is no penalty for guessing. Your score is the number of correct answers.
5. Only scratch paper, graph paper, rulers, protractors, and erasers are allowed as aids. Calculators are NOT allowed. No problems on the test *require* the use of a calculator.
6. Figures are not necessarily drawn to scale.
7. Before beginning the test, your proctor will ask you to record your information on the answer form.
8. You will have 40 minutes to complete the test once your proctor tells you to begin.
9. When you finish the exam, *sign your name* in the space provided on the answer form.

AMC 8 Mock Test Problems

Problem 1

$$1-2+3-4+\cdots-2020+2021=$$

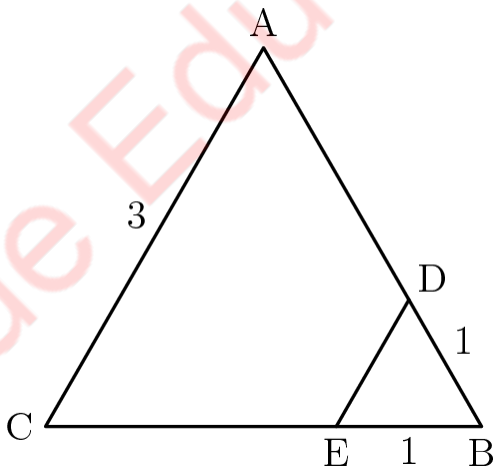
(A) -1011 (B) -1010 (C) 0 (D) 1010 (E) 1011

Problem 2

What is the number halfway between $\frac{1}{16}$ and $\frac{1}{20}$?

(A) $\frac{1}{160}$ (B) $\frac{1}{80}$ (C) $\frac{1}{18}$ (D) $\frac{9}{160}$ (E) $\frac{1}{9}$

Problem 3



A triangular corner with side lengths $\boldsymbol{DB = EB = 1}$ is cut from equilateral triangle $\boldsymbol{ABC}$ of side length 3. What is the perimeter of the remaining quadrilateral?

(A) 6 (B) $6\frac{1}{2}$ (C) 7 (D) $7\frac{1}{2}$ (E) 8

Problem 4

Estimate the time it takes to send 240 blocks of data over a communications channel if each block consists of 512 "chunks" and the channel can transmit 120 chunks per second.

(A) 0.27 seconds (B) 2.7 seconds (C) 27 seconds
(D) 27 minutes (E) 27 hours

Problem 5

If

$$\frac{b}{a} = 3 \text{ and } \frac{c}{b} = 4,$$

what is the ratio of $a + b$ to $b + c$?

(A) $\frac{1}{4}$ (B) $\frac{4}{15}$ (C) $\frac{4}{7}$ (D) $\frac{3}{4}$ (E) $\frac{4}{5}$

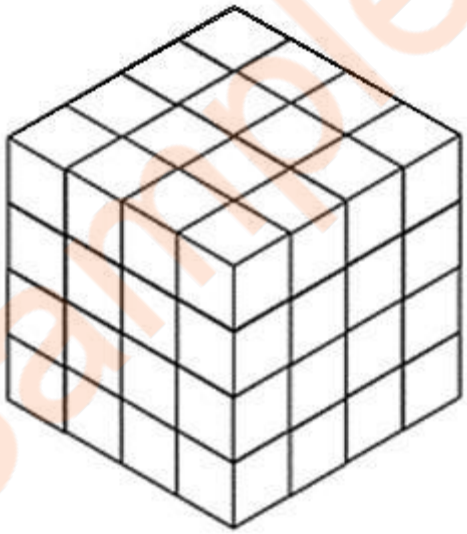
Problem 6

Each day, Alan ate 10% of the jellybeans that were in his bag at the beginning of that day. At the end of the second day, 81 remained. How many jellybeans were in the bag originally?

(A) 100 (B) 105 (C) 110 (D) 115 (E) 125

Problem 7

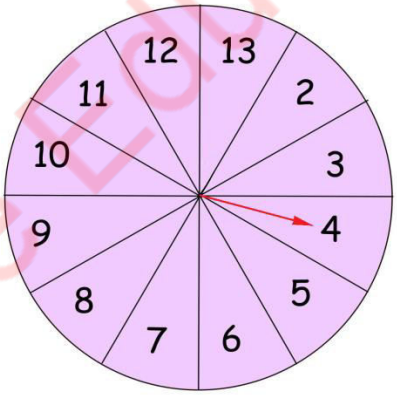
A $4 \times 4 \times 4$ cube is painted blue on the top and the 4 side faces, and red on the bottom face. Then the cube is cut into unit cubes, as shown.



How many of the unit cubes have exactly two blue faces?

(A) 8 (B) 12 (C) 16 (D) 20 (E) 24

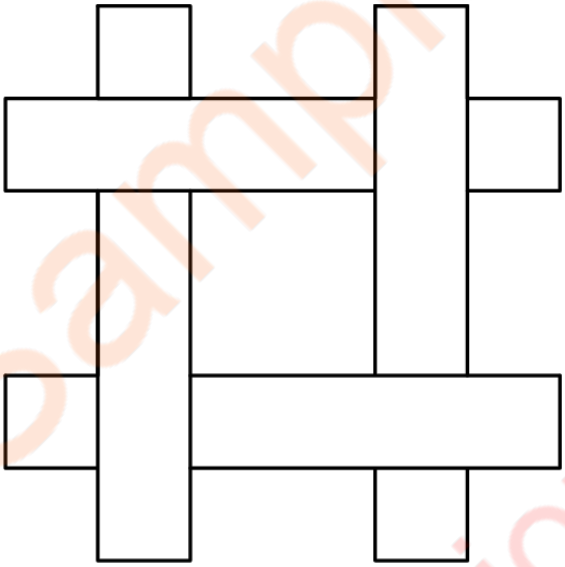
Problem 8



A circular spinner is divided into 12 equal sections, as shown. An arrow is attached to the center of the spinner. The arrow is spun once. What is the probability that the arrow stops in a section containing a prime number that is odd?

(A) $\frac{1}{12}$ (B) $\frac{1}{6}$ (C) $\frac{1}{3}$ (D) $\frac{5}{12}$ (E) $\frac{1}{2}$

Problem 9



Four rectangular paper strips of length 6 and width 1 are put flat on a table and overlap perpendicularly as shown. How much area of the table is covered?

(A) 20 (B) 22 (C) 24 (D) 26 (E) 36

Problem 10

The marked price of a computer was 40% less than the suggested retail price. Joe purchased the book for half the marked price at a Fiftieth Anniversary sale. What percent of the suggested retail price did Joe pay?

(A) 25% (B) 30% (C) 35% (D) 50% (E) 60%

Problem 11

What is the sum of the digits of the decimal form of the product

$$20^{2019} \cdot 50^{2021} \, ?$$

(A) 2 (B) 4 (C) 7 (D) 8 (E) 10

Problem 12

If $\boldsymbol{a}, \boldsymbol{b}$, and $\boldsymbol{c}$ are digits for which

$$\begin{array}{r} 7\ a\ 2 \\ -\ 4\ 8\ b \\ \hline c\ 7\ 3 \end{array}$$

(A) 13 (B) 14 (C) 15 (D) 16 (E) 17

Problem 13

If

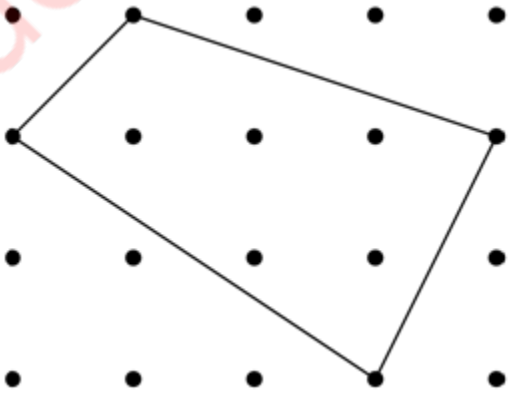
$$\boldsymbol{3^{2020} - 3^{2021} - 3^{2022} + 3^{2023} = m \cdot 3^{2020}},$$

what is the value of $\boldsymbol{m}$?

(A) 3 (B) 9 (C) 11 (D) 16 (E) 27

Problem 14

Pegs are put in a board 1 unit apart both horizontally and vertically. A rubber band is stretched over 4 pegs as shown in the figure, forming a quadrilateral. What is the area of the quadrilateral in square units?



(A) 4 (B) 4.5 (C) 5 (D) 5.5 (E) 6

Problem 15

When the decimal point of a certain positive decimal number is moved four places to the right, the new number is nine times the reciprocal of the original number. What is the original number?

(A) 0.0003 (B) 0.003 (C) 0.03 (D) 0.3 (E) 3

Problem 16

What is the value of the product

$$\left(1-\frac{1}{2^2}\right)\left(1-\frac{1}{3^2}\right)\cdots\left(1-\frac{1}{2020^2}\right)\left(1-\frac{1}{2021^2}\right)$$

(A) $\frac{1010}{2021}$ (B) $\frac{1}{2}$ (C) $\frac{1011}{2021}$

(D) $\frac{2}{3}$ (E) $\frac{1350}{2021}$

Problem 17

Jim turned his computer off at 5 p.m. Friday, at which point it had been on for exactly 100 hours. At what time had Jim turned his computer on?

(A) 1 p.m. Monday (B) 9 p.m. Monday (C) 1 p.m. Tuesday

(D) 2 p.m. Tuesday (E) 9 p.m. Wednesday

Problem 18

The positive integers $a, b,$ and c have the property that

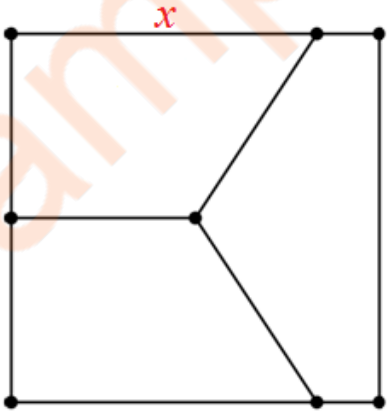
$$abc = 100.$$

What is the smallest possible value of $a + b + c$?

(A) 14 (B) 17 (C) 21 (D) 26 (E) 30

Problem 19

A square with sides of length 1 is divided into two congruent trapezoids and a pentagon, which have equal areas, by joining the center of the square with points on three of the sides, as shown.



Find x, the length of the longer parallel side of each trapezoid.

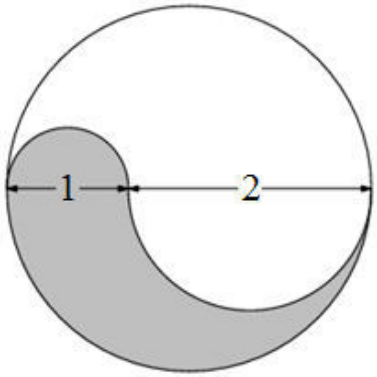
(A) $\frac{3}{5}$ (B) $\frac{2}{3}$ (C) $\frac{3}{4}$ (D) $\frac{5}{6}$ (E) $\frac{7}{8}$

Problem 20

The mean of three numbers is 20 more than the least of the numbers and 10 less than the greatest. The median of the three numbers is 15. What is their sum?

(A) 15 (B) 25 (C) 30 (D) 40 (E) 45

Problem 21



The figure shown is the union of a circle and two semicircles of diameters 1 and 2, all of whose centers are collinear. What is the ratio of the area, of the unshaded region to that of the shaded region?

(A) $\frac{4}{3}$ (B) $\sqrt{2}$ (C) $\frac{8}{5}$ (D) 2 (E) 4

Problem 22

In how many ways can five different toys be distributed among three children so that each one gets at least one toy?

(A) 120 (B) 150 (C) 180 (D) 210 (E) 240

Problem 23

How many positive integers less than 2021 have an odd number of positive integer divisors?

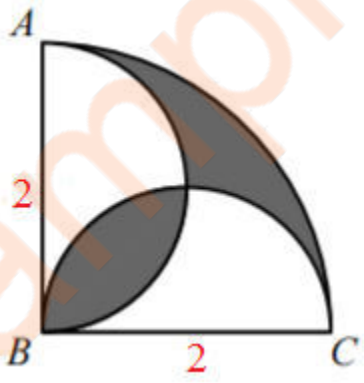
(A) 40 (B) 42 (C) 44 (D) 46 (E) 48

Problem 24

In a class, the ratio of boys to girls is $2:1$. Only $\frac{1}{2}$ of the boys join the math club, whereas $\frac{2}{3}$ of the girls join the math club. A student is selected randomly from the math club. What is the probability that the student selected is a boy?

(A) $\frac{1}{2}$ (B) $\frac{5}{9}$ (C) $\frac{4}{7}$ (D) $\frac{3}{5}$ (E) $\frac{2}{3}$

Problem 25



In the diagram, ABC is a quarter of a circle with radius 8. A semicircle with diameter AB is drawn, as shown. A second semicircle with diameter BC is also drawn. What is the area of the shaded region?

(A) $\frac{3}{4}\pi - \frac{1}{2}$ (B) $\pi - 2$ (C) $\frac{5}{4}\pi - \frac{5}{2}$

(D) $\frac{3}{2}\pi - 3$ (E) $\frac{7}{4}\pi - \frac{7}{2}$

Answer Key

1. E
2. D
3. E
4. D
5. B
6. A
7. D
8. D
9. A
10. B
11. C
12. E
13. D
14. E
15. C
16. C
17. A
18. A
19. D
20. A
21. D
22. B
23. C
24. D
25. B