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AMC 10 Free Mock Test

25 problems · answer key included · printable edition

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AMC 10 FREE MOCK — INSTRUCTIONS

1. 25 multiple-choice questions. Each has answers A–E; only one is correct.
2. Score = **6** × correct + **1.5** × unanswered. Incorrect = **0**.
3. Scratch paper, ruler, compass, eraser allowed. No calculators, phones, or watches.
4. Figures are not necessarily drawn to scale.
5. You have **75 minutes**.

PROBLEMS

Problem 1.

A bag contains four green balls and five purple balls. Balls are randomly drawn one by one out of the bag until there are none left in the bag. What is the probability that the seventh ball drawn is green?

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

Problem 2.

If $f(x) = 2x + 3$ and $f(g(x)) = x$, what is the value of $g(5)$?

(A) 1 **(B)** 2 **(C)** 3 **(D)** 4 **(E)** 5

Problem 3.

Two sides of a non-degenerate triangle are 5 and 9. If the third side is an integer, what is the maximum possible perimeter of the triangle?

(A) 23 **(B)** 25 **(C)** 26 **(D)** 27 **(E)** 28

Problem 4.

At a local school, the ratio of teachers to students is initially $1:15$. After 2 teachers retire and 20 new students enroll, the new ratio of teachers to students becomes $1:20$. What is the total number of teachers and students currently at the school?

(A) 192 **(B)** 200 **(C)** 210 **(D)** 220 **(E)** 240

Problem 5.

A right triangle has integer side lengths. If one of its legs has a length of 15, which of the following is NOT a possible perimeter for the triangle?

(A) 40 **(B)** 60 **(C)** 80 **(D)** 90 **(E)** 240

Problem 6.

Four friends, A, B, C, and D, finish a race with no ties.
A says, "I did not finish first."
B says, "I finished third."
C says, "A finished behind D."
D says, "I finished last."
If exactly one person is lying, who finished first?

(A) A **(B)** B **(C)** C **(D)** D **(E)** $\text{Cannot be determined}$

Problem 7.

A sequence of 5 consecutive positive integers has the property that the sum of the squares of the three smallest integers equals the sum of the squares of the two largest integers. What is the smallest integer in this sequence?

(A) 8 **(B)** 9 **(C)** 10 **(D)** 11 **(E)** 12

Problem 8.

A committee of 4 people is to be chosen from a group of 6 married couples. The committee must contain exactly one complete married couple. Furthermore, one person on the committee must be named President, and one person (different from the President) named Vice President. If the President and Vice President cannot be married to each other, how many such distinct committee structures can be formed?

(A) 1920 **(B)** 2160 **(C)** 2400 **(D)** 2880 **(E)** 3120

Problem 9.

How many three-digit positive integers have the property that the product of their digits is exactly 24?

(A) 15 **(B)** 18 **(C)** 21 **(D)** 24 **(E)** 27

Problem 10.

A ball is to be thrown into one of ten bins, numbered 1 through 10 in that order, standing in a row. The probability of the ball being thrown into bin n is denoted by p_n. The probability the ball is thrown in the first or last bin is p (so $p_1 = p_{10} = p$). The probability of the ball being thrown into bin n for $1 < n < 10$ is given by $p_n = \frac{p_{n-1} + p_{n+1}}{2}$. What is p?

(A) $\frac{1}{20}$ **(B)** $\frac{1}{10}$ **(C)** $\frac{1}{9}$ **(D)** $\frac{2}{9}$ **(E)** $\frac{1}{5}$

Problem 11.

In right triangle ABC, the right angle is at B, leg AB has length 6, and leg BC has length 8. A square is inscribed in the triangle such that one vertex of the square coincides with B, and the opposite vertex of the square lies on the hypotenuse AC. What is the side length of the square?

(A) 3 **(B)** $\frac{12}{5}$ **(C)** $\frac{24}{7}$ **(D)** $\frac{18}{5}$ **(E)** 4

Problem 12.

A bag contains 8 tokens, numbered 1 through 8. Tokens are drawn one at a time without replacement, and a running sum of the drawn numbers is recorded. What is the probability that the running sum becomes a multiple of 3 for the very first time on exactly the fourth draw?

(A) $\frac{11}{140}$ **(B)** $\frac{3}{35}$ **(C)** $\frac{13}{140}$ **(D)** $\frac{1}{10}$ **(E)** $\frac{3}{28}$

Problem 13.

How many ordered pairs of positive integers (x, y) satisfy the equation $xy - 3x + 4y = 2026$?

(A) 2 **(B)** 4 **(C)** 6 **(D)** 8 **(E)** 12

Problem 14.

How many five-digit palindromes (numbers that read the same backward as forward, such as 25352) are divisible by 11?

(A) 72 **(B)** 80 **(C)** 82 **(D)** 90 **(E)** 100

Problem 15.

Let a and b be positive integers such that $a, b \leq 10000$ and

$$\operatorname{lcm}(a, b) = 74 \cdot \gcd(a, b)$$

What is the sum of all possible maximum powers of 17 that divide ab?

(A) 6 **(B)** 8 **(C)** 10 **(D)** 12 **(E)** 14

Problem 16.

Let $P(x)$ be a polynomial of degree 4 such that $P(k) = \frac{k}{k+1}$ for the integers $k = 0, 1, 2, 3, 4$. What is the value of $P(5)$?

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

Problem 17.

What is the number of integers $n \in \{1, 2, 3, \ldots, 2026\}$ such that $n^n + 1$ is a multiple of 5?

(A) 404 **(B)** 405 **(C)** 406 **(D)** 412 **(E)** 506

Problem 18.

A frog sits at one vertex of a regular cube. Every second, it randomly jumps to one of the three adjacent vertices, choosing each with a probability of $\frac{1}{3}$. What is the probability that the frog is exactly back at its starting vertex after exactly 8 seconds?

(A) $\frac{182}{729}$ **(B)** $\frac{547}{2187}$ **(C)** $\frac{183}{729}$ **(D)** $\frac{551}{2187}$ **(E)** $\frac{61}{243}$

Problem 19.

Let $ABCDEF$ be a regular hexagonal sheet of paper of side length 2. Points C and F are pinned to the ground while A and B are lifted until the trapezoid $ABCF$ is perpendicular to the trapezoid $CDEF$. Points A and E are connected, as are B and D. The volume of the polyhedron contained within the faces AEF, $ABCD$, BCD, $ABCF$, and $CDEF$ can be written in the form $\frac{m\sqrt{p}}{q}$ where p is not divisible by the square of any prime, and m and q are relatively prime positive integers. What is $m+p+q$?

(A) 10 **(B)** 11 **(C)** 12 **(D)** 13 **(E)** 14

Problem 20.

Suppose there are 77 cupcakes and 22 cookies from which you must choose exactly 12 desserts consisting of any amount of cupcakes and cookies (even 12 of one dessert and 0 of the other is permitted). Let N be the number of ways you can do this. What are the last two digits of N?

(A) 16 **(B)** 36 **(C)** 56 **(D)** 76 **(E)** 96

Problem 21.

Three distinct positive integers x, y, and z are randomly selected from the set $\{1, 2, 3, \ldots, 50\}$. What is the probability that $x^3 + y^3 + z^3 - 3xyz = 7(x + y + z)$?

(A) $\frac{47}{9800}$ **(B)** $\frac{47}{4900}$ **(C)** $\frac{141}{9800}$ **(D)** $\frac{94}{4900}$ **(E)** $\frac{47}{2450}$

Problem 22.

A right triangle T on the Cartesian plane has vertices at $A(0, 0)$, $B(21, 0)$, and $C(0, 28)$. A point P is chosen uniformly at random from the set of all lattice points (points with integer coordinates) that lie strictly inside T. What is the probability that the area of triangle PAB is an even integer?

(A) $\frac{17}{89}$ **(B)** $\frac{19}{89}$ **(C)** $\frac{21}{89}$ **(D)** $\frac{57}{269}$ **(E)** $\frac{61}{269}$

Problem 23.

Let n be the least positive integer such that the equation

$$\lfloor x^2 + 6 \rfloor = nx + 1$$

has the maximum possible number of solutions it can. What is the remainder when n^{100} is divided by 13?

(A) 1 **(B)** 3 **(C)** 4 **(D)** 7 **(E)** 9

Problem 24.

Let $P(x) = x^4 + ax^2 + b$ be a polynomial with integer coefficients. It is given that $P(x)$ has exactly four distinct integer roots. If $P(25) = 230400$, what is the sum of the absolute values of the four roots of $P(x)$?

(A) 36 **(B)** 40 **(C)** 44 **(D)** 48 **(E)** 52

Problem 25.

Let a square S on the Cartesian plane have vertices $(0, 0)$, $(2, 0)$, $(2, 2)$, and $(0, 2)$, and let a square T on the Cartesian plane have vertices $(2, 4)$, $(4, 4)$, $(4, 6)$, and $(2, 6)$. Square S will undergo a sequence of four transformations, each being either a 45°, 90°, 135°, 180°, 225°, 270°, or 315° rotation clockwise about the point $(0, 4)$. What is the probability that at the end of this sequence of transformations, S is mapped to T?

(A) $\frac{285}{2401}$ **(B)** $\frac{292}{2401}$ **(C)** $\frac{300}{2401}$ **(D)** $\frac{308}{2401}$ **(E)** $\frac{315}{2401}$

ANSWER KEY

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

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