Problem Set - 13 Jan 2025

PROBLEM 1 (2022 AMC 10B #1)

Define $x \diamond y$ to be $|x-y|$ for all real numbers x and y. What is the value of

$$(1 \diamond (2 \diamond 3)) - ((1 \diamond 2) \diamond 3)?$$

(A) -2 **(B)** -1 **(C)** 0 **(D)** 1 **(E)** 2

PROBLEM 2 (2017 AMC 12A #1)

Pablo buys popsicles for his friends. The store sells single popsicles for $\$1$ each, 3-popsicle boxes for $\$2$, and 5-popsicle boxes for $\$3$. What is the greatest number of popsicles that Pablo can buy with $\$8$?

(A) 8 **(B)** 11 **(C)** 12 **(D)** 13 **(E)** 15

PROBLEM 3 (2012 AMC 12A #10)

A triangle has area 30, one side of length 10, and the median to that side of length 9. Let θ be the acute angle formed by that side and the median. What is $\sin\theta$?

(A) $\frac{3}{10}$ **(B)** $\frac{1}{3}$ **(C)** $\frac{9}{20}$ **(D)** $\frac{2}{3}$ **(E)** $\frac{9}{10}$

PROBLEM 4 (2023 AMC 10A #18)

-Note: this page was griefed by Alac 16 and I am trying my best to restore it. Formatting help would be much appreciated-Toucan2009hz -fixed? wTaoTao

A rhombic dodecahedron is a solid with 12 congruent rhombus faces. At every vertex, 3 or 4 edges meet, depending on the vertex. How many vertices have exactly 3 edges meet?

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

PROBLEM 5 (2012 AMC 10B #17)

Jesse cuts a circular paper disk of radius 12 along two radii to form two sectors, the smaller having a central angle of 120 degrees. He makes two circular cones, using each sector to form the lateral surface of a cone. What is the ratio of the volume of the smaller cone to that of the larger?

(A) $\frac{1}{8}$ (B) $\frac{1}{4}$ (C) $\frac{\sqrt{10}}{10}$ (D) $\frac{\sqrt{5}}{6}$ (E) $\frac{\sqrt{5}}{5}$

PROBLEM 6 (2016 AMC 10A #17)

Let N be a positive multiple of 5. One red ball and N green balls are arranged in a line in random order. Let $P(N)$ be the probability that at least $\frac{3}{5}$ of the green balls are on the same side of the red ball. Observe that $P(5) = 1$ and that $P(N)$ approaches $\frac{4}{5}$ as N grows large. What is the sum of the digits of the least value of N such that $P(N) < \frac{321}{400}$?

(A) 12 **(B)** 14 **(C)** 16 **(D)** 18 **(E)** 20

PROBLEM 7 (2020 AMC 12B #20)

Two different cubes of the same size are to be painted, with the color of each face being chosen independently and at random to be either black or white. What is the probability that after they are painted, the cubes can be rotated to be identical in appearance?

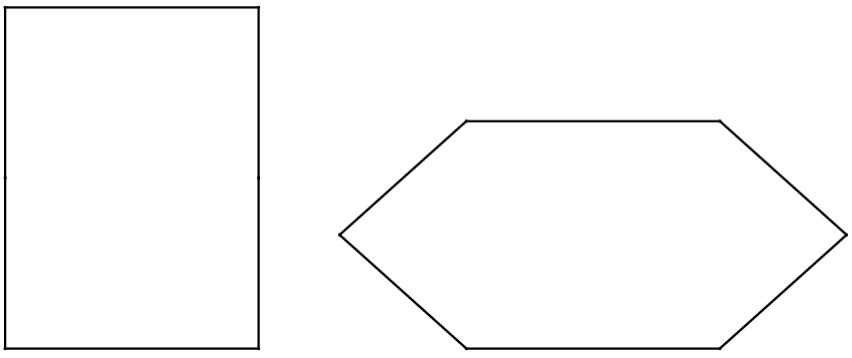
(A) $\frac{9}{64}$ **(B)** $\frac{289}{2048}$ **(C)** $\frac{73}{512}$ **(D)** $\frac{147}{1024}$ **(E)** $\frac{589}{4096}$

PROBLEM 8 (2014 AIME I #5)

Let the set $S = \{P_1, P_2, \ldots, P_{12}\}$ consist of the twelve vertices of a regular 12-gon. A subset Q of S is called "communal" if there is a circle such that all points of Q are inside the circle, and all points of S not in Q are outside of the circle. How many communal subsets are there? (Note that the empty set is a communal subset.)

PROBLEM 9 (2014 AIME II #3)

A rectangle has sides of length a and 36. A hinge is installed at each vertex of the rectangle, and at the midpoint of each side of length 36. The sides of length a can be pressed toward each other keeping those two sides parallel so the rectangle becomes a convex hexagon as shown. When the figure is a hexagon with the sides of length a parallel and separated by a distance of 24, the hexagon has the same area as the original rectangle. Find a^2.



PROBLEM 10 (2022 AMC 12A #20)

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