HugeMathBrain — Grade 12 Printable Quiz

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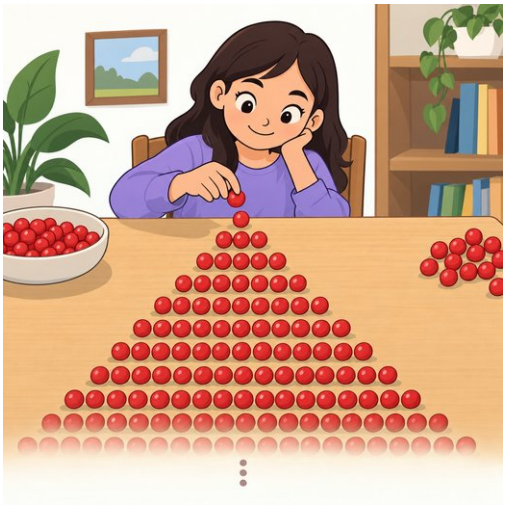
Grade 12

Problem 12.1 · 3 points — A complex number z has $|z| = 2$, and $(z + 1)^2$ and $(z - 1)^2$ have the same real part. What is $(z + i)^2 + (z - i)^2$?



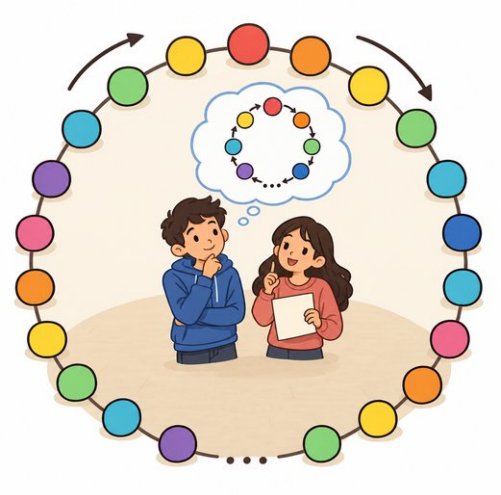
A) 6
B) -10
C) 10
D) -8
E) -6

Problem 12.2 · 5 points — Split the first N positive odd integers into two nonempty consecutive blocks. If the second block sums to exactly one more than the first, what is the smallest possible N greater than 100?



A) 239
B) 578
C) 577
D) 99
E) 408

Problem 12.3 · 3 points — Let g move each number in {0, 1, …, 2025} one step forward around a circle, wrapping from 2025 to 0. How many permutations f have no fixed points and satisfy $f(g(x)) = g^{-1}(f(x))$ for every x?



A) 1013
B) 2026
C) 2
D) 0
E) 1012

Problem 12.4 · 4 points — For which positive value of a does $|x^2 - 4x + 3| = ax$ have exactly three distinct real solutions?



A) 1/2
B) $2\sqrt{3} - 3$
C) 1
D) $4 + 2\sqrt{3}$
E) $4 - 2\sqrt{3}$

Problem 12.5 · 4 points — Let $x > 1$ satisfy $x + 1/x = 3$, and let log mean base 10. Which single logarithm equals $\log(x^3 - 1) - \log(x - 1) + \log(1 + x^{-3}) - \log(1 + x^{-1})$?



A) log(1/8)
B) log 7
C) log 3
D) log 8
E) log 9

Problem 12.6 · 5 points — Let a, b, and c be the roots of $x^3 - 3x + 1 = 0$. What is $a^8/(3a^2 - 3) + b^8/(3b^2 - 3) + c^8/(3c^2 - 3)$?



A) 0
B) 28
C) 186
D) -27
E) 6

Problem 12.7 · 3 points — Real numbers a, b, and c satisfy $a+b+c=4$ and $a^2+b^2+c^2=14$. If $u=(a-b,\ b-c,\ c-a)$ and $v=(b-c,\ c-a,\ a-b)$, what is $u\cdot v$?



A) 13
B) -21
C) -26
D) 0
E) -13

Problem 12.8 · 4 points — A robot travels within the closed first quadrant from (2,7) to (8,3). It must visit the y-axis and then the x-axis; what is the shortest possible distance it can travel?



A) √53 + √73
B) 2√29
C) 10√2
D) 2√13
E) 2√34

Problem 12.9 · 4 points — A necklace has 4 black beads and 8 white beads, with no two black beads touching. How many arrangements are possible if two arrangements count as the same exactly when one is a rotation of the other?

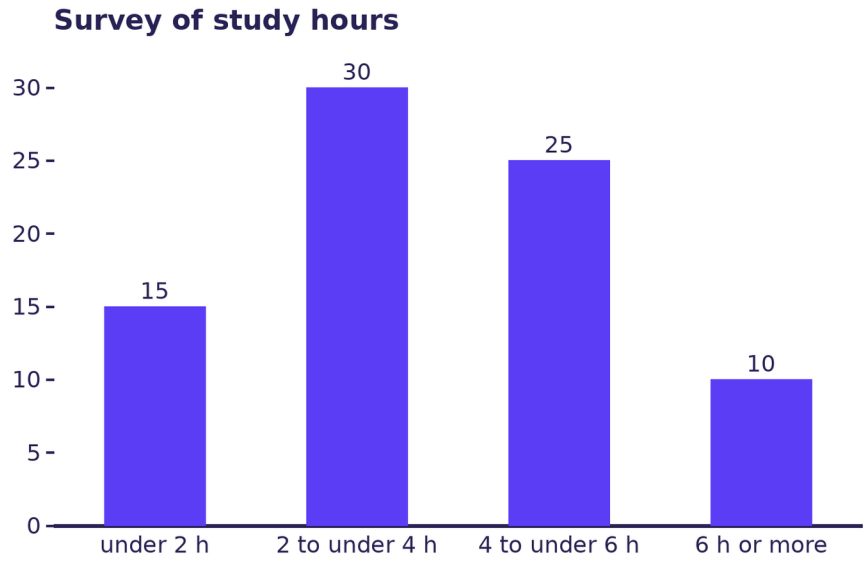
A) 10
B) 9
C) 35
D) 8
E) 105

Problem 12.10 · 5 points — When an integer’s fourth power is divided by 65, which of these numbers cannot be the remainder?



A) 35
B) 56
C) 26
D) 16
E) 61

Problem 12.11 · 5 points — Four students are chosen at random without replacement. If their study hours fall in exactly three bars of the chart, what is the probability that the bar represented twice is 4 to under 6 hours or 6 hours or more?



A) 303/724
B) 7/16
C) 23/59
D) 8/19
E) 1/2

Problem 12.12 · 3 points — A triangular LED display starts with only its top LED lit (row 0). Each new row starts dark, and every lit LED in the preceding row toggles its two children; how many LEDs are lit in row 2026?



A) 2027
B) 512
C) 1014
D) 256
E) 128

Answer key

12.1: B
12.2: C
12.3: A
12.4: E
12.5: D
12.6: B
12.7: E
12.8: C
12.9: A
12.10: B
12.11: A
12.12: D