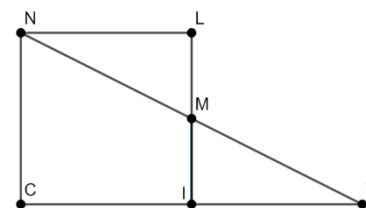
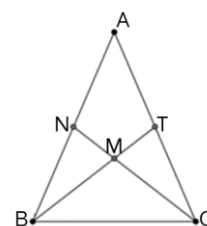
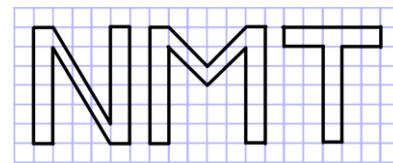


1. Compute the positive value of x that solves the equation $9x^2 - 2025 = 0$.
2. The number of students in a high school was first decreased by 75 and then increased by 20% of the newly decreased population. The result is that the high school then had 29 more students than it did before the initial decrease by 75. Compute the number of students the school had before the initial decrease.
3. If $\sqrt{n} = \sqrt{20}\sqrt{25} + \sqrt{80}$, compute n .
4. In triangle ABC , P is the midpoint of $\overline{AB}$ and Q is the midpoint of $\overline{AC}$. If the area of triangle APQ is 20.25, compute the area of triangle ABC . If necessary, round to the nearest integer.
5. The graph of $y = x^2 + 2x - 80$ intersects the x -axis at two points, P and Q . Compute PQ .
6. The product $(2x - 1)(x + 4)(2x + 1)$ is expanded and simplified completely. Compute the coefficient of the x^2 term.
7. Compute the area of the triangle drawn on a standard grid with standard coordinate axes formed by the three lines $y = 20x$, $y = 25x$, and $y = 200$.
8. In triangle ABC , $\overline{CN}$ and $\overline{BT}$ are medians that intersect in point M . If $AB = AC$, $NM = 30$, $MT = 2x + y$ and $MB = 4y - 2x$, compute $x + y$.
9. Compute the area of a triangle whose side lengths are 30, 17, and 17.
10. If $\frac{25^{20}}{20^{25}} = \frac{5^a}{2^b}$ and a and b are positive integers, compute $a + b$.
11. Compute the number of possible values for n for which $\frac{2025}{n} = k$, where n and k are both positive integers.
12. If quadrilateral $NCIL$ is a square, M is the midpoint of $\overline{LI}$, and $NMT = 20$, compute the area of square $NCIL$.
13. In rectangle $ABCD$ with diagonal $\overline{BD}$, $BD = 12$ and $m\angle DBC = 30^\circ$. The area of rectangle $ABCD$ can be expressed in simplest radical form as $a\sqrt{b}$. Compute $a + b$.
14. The line segment whose endpoints are $A(3,2)$ and $B(10,26)$ is transformed by a dilation centered at point $C(0,5)$ to the line segment whose corresponding endpoints are the coordinates $A'(9, -4)$ and $B'(s, t)$. Compute $A'B'$.
15. A number, n , is chosen at random from the set $\{1, 2, 3, \dots, 100\}$ and then a positive factor of n , call it d , is chosen at random from the same set. The probability that 7 is a factor of d is expressed as $\frac{x}{y}$ in simplest form. Compute $x + y$.





1. In the nearby diagram, the letters NMT were drawn on graph paper where each square has an area of one square unit. Compute the number of square units in the area enclosed by the letters NMT.

2. If 100 grams of liquid chocolate that contains 40% cocoa is mixed with 200 grams of liquid chocolate that contains 70% cocoa, the resulting mixture contains $k\%$ cocoa. Compute k .

3. When $\frac{100}{98}$ is expressed as a decimal, the result is $1.0204abcdef \dots$ where each of a, b, c, d, e, f are non-negative integers less than 10. Compute the value of b .

4. Compute the number of perfect square integer divisors of 2025.

5. Noah and Isabelle are running around a circular track in opposite directions. Noah takes 10 minutes to complete one lap of the circular track and Isabelle takes 5 minutes to complete one lap of the same circular track. They start at the same location and run in opposite directions. Each of them runs at a constant speed. In the time that Isabelle runs 10 complete laps, they meet k times after they start. Compute k .

6. If the given system of three equations were solved, there would be an infinite number of solutions. However, if $x = 1$, then $y = b$ and $z = c$. Compute $10c + b$.

$$2x + y + z = 3,$$

$$x - 2y - z = 1,$$

$$3x + 4y + 3z = 5$$

7. If $\sqrt[n]{n} = (\sqrt{2})(\sqrt[3]{3})$, where n is a positive integer, compute the value of n .

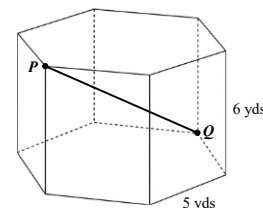
8. If $2, x - 4$, and $x^2 + 8$ are three consecutive terms of a geometric sequence and $x < 0$, compute the sum of the three terms.

9. Abe and Bob are playing a game. Each rolls a fair die and the person who rolls the higher number wins. However, if they both roll the same number, they roll again and so on, until there is a winner. Bob rolled 2 in the first round. The probability that Bob wins in the third roll or an earlier roll is $\frac{a}{b}$, where a and b are relatively prime positive integers. Compute $a + b$.

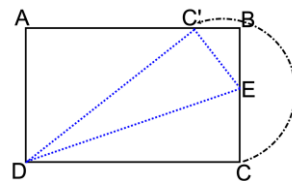
10. If b and c are positive integers and $\sqrt{c}$ is in reduced radical form, then $x^2 - \frac{bx}{\sqrt{c}} + 1 = 0$ has two positive roots. If one root of the equation is both the reciprocal of the other root and twice the other root, compute the value of $10b + c$.

11. When point $A(7,2)$ is rotated 90° counterclockwise about point $B(n,m)$, the result is point $C(3,8)$. Compute $10n + m$.

12. Points P and Q are opposite vertices of the regular right hexagonal prism depicted to the right. If the length of the base edge is 5 yards and the height of the prism is 6 yards and $PQ = a\sqrt{b}$ in simplest radical form, compute $a + b$.



13. Rectangle $ABCD$ with $AB = 5$ and $BC = 3$ is drawn on paper and folded along $\overline{DE}$, where point E is on $\overline{BC}$ so that point C lands on point C' on $\overline{AB}$. The area of $\triangle BC'E$ is $\frac{a}{b}$, where a and b are relatively prime. Compute $a + b$.



14. Region R satisfies both inequalities below. Compute the area of region R in the standard xy - coordinate system.

$$||x| - |y|| \leq 1, \quad ||x| + |y|| \leq 2$$

15. If $\sin\left(x + \frac{2\pi}{3}\right) + \sin(x + k) = 0$ for $x \in \mathbb{R}$ and $0 \leq k \leq 2\pi$, then k can be expressed as $\frac{a\pi}{b}$, where a and b are relatively prime positive integers. Compute ab .

Grade Level 11 - NMT 2025

Questions

1. Compute the least positive integer value of x such that $x > 1$ and $x^{2/5}$ is an integer.

2. If $6^{x-2} = 3$, compute the value of 6^{x+1} .

3. For a geometric series, the sum of the first four terms is 560, the sum of the first five terms is 1694, and the sum of the first six terms is 5096. Compute the common ratio of the geometric series.

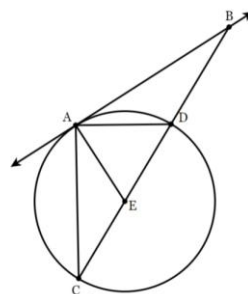
4. If $z = a + bi$ such that $\frac{1}{z-2i} = 3 - 4i$. Compute the value of $25(a + b)$, if $a, b \in \mathbb{R}$.

5. The rational function $y = \frac{x^2+5x+4}{x-1}$ has a slant asymptote that intersects the line $3x + 2y = 522$. Compute the y -coordinate of the point of intersection.

6. The system of equations $\cos x + \cos y = 1$ and $\sin x - \sin y = 0$ has two solutions (a, a) and (b, b) on the interval: $x \in [0, 2\pi)$ and $y \in [0, 2\pi)$. The positive difference of a and b can be expressed as $\frac{p\pi}{q}$, where p and q are relatively prime. Compute the product pq .

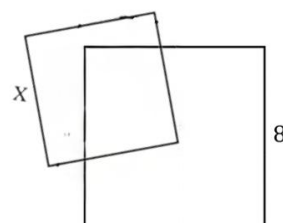
7. A function has the property that $f(xy) = f(x) + f(y)$. If $f\left(\frac{1}{2024}\right) = -42$, compute the value of $f(2024)$.

8. In the accompanying diagram of circle E , with tangent $\overline{AB}$, if $m\angle ACE = 30^\circ$ and $CD = 8$, compute the sum $(AB)^2 + (AC)^2 + (BC)^2$. The diagram is not drawn to scale.



9. Mr. Wiles can mow a lawn in 2 hours, while his friend Mr. Tao can mow the same lawn in 3 hours. They start mowing the lawn together at the same time and work at their respective individual constant rates. However, Mr. Wiles needed to stop for 15 minutes to repair his lawn mower. Mr. Wiles mowed $k\%$ of the lawn. Compute k .

10. Two squares overlap so that one of the vertices of the smaller square coincides with the center of the larger square. The side length of the larger square is 8. If the area of the overlapping region is 64% of the area of the smaller square, compute the side length of the smaller square. Note that the attached diagram is not drawn to scale.

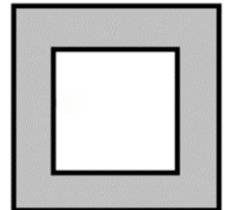


11. Given $f(x) = (x + 16)^2 - 16$, compute the product of all real values of x such that $f(f(x)) = 0$.
12. Consider a continuous function $y = f(x)$, where $f(-5) = 8$ and $y = g(x) = f(x + 3)$ is an even function. Compute the value of x , other than $x = -5$ such that $f(x) = 8$.
13. Compute the value of x such that $\log_3(x + 2) = \log_9(x + 8)$.
14. Let a, b and c be the roots of the polynomial equation $x^3 - 24x - 42 = 0$. Compute the sum $a^3 + b^3 + c^3$.
15. The permutations of the word 'NUMBER' are sorted in alphabetical order. If the position of the word 'NUMBER' itself in that list is denoted by x , compute x .

Grade Level 12 - NMT 2025

Questions

1. Abby can do a job in 10 hours working by herself at a steady rate. If Bobby works with her (also at a steady rate), the same job takes 8 hours and 20 minutes to finish. Compute the number of hours it would take Bobby to do the job by himself.
2. Let $f(x) = x^3 \cos x \tan x \csc x$. Compute $f'(7)$.
3. Compute the number of integer solutions to $|2025 - x^2| = 2025 - x^2$.
4. If $x^2 + y^2 - 26x + 12y + 205 = 0$ and if x and y are both real numbers, compute x .
5. A teacher uses a "square root" curve on a test. If a student scores a certain percentage on a test, the student's grade is curved to $\sqrt{n}$, where n is the student's original grade, expressed as a decimal. For example, a percent grade of 81% would be curved to 90% since $\sqrt{0.81} = 0.9$. Compute k , if $k\%$ is the percent grade that results in the greatest increase in grade resulting from the square root curve.
6. Let $f(z) = iz + 34$ be a complex-valued function. If $a + bi$ is a complex number such that $f(a + bi) = a + bi$ and a and b are real, compute $10a + b$.
7. Let $(x) = xe^x$. Compute $f^{(47)}(\ln 7) - f^{(34)}(\ln 7)$. (Reminder: $f^{(n)}(x)$ represents the n th derivative of $f(x)$ with respect to x .)
8. If $\log_2(\log_2 3) + \log_2(\log_3 4) + \log_2(\log_4 5) + \cdots + \log_2(\log_k(k + 1)) = 3$, compute k .
9. Let S be the larger square with side length x and let R be the set of all shaded points in the interior of S as indicated in the nearby figure. The width of the shaded frame (distance between any two corresponding sides of the squares) is 3 cm. If x is increasing at a rate of 28 cm/min, compute the rate, in cm^2/min , at which the area of R is increasing at the instant when $x = 45$ cm.
10. There are four points that are simultaneously 7 units from the graph of $2x + y = 65$ and 11 units from the graph of $y - x = 5$. Compute the sum of the 8 coordinates of these 4 points.
11. Three fair, standard, six-sided dice are rolled. The probability that exactly two of the three dice show the same number, in lowest terms, is $\frac{p}{q}$. Compute $p + q$.

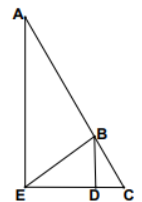


12. A right regular hexagonal prism has 18 edges, all of which have length 14. This prism is inscribed in a sphere with surface area $k\pi$. Compute k .
13. Compute the length of the diameter of the graph of the circle
 $(x + 75)(x - 25) + (y + 200)(y - 40) = 0$.
14. The set of all positive values of b for which the system $y = [x]$, $y = 3 - bx$ has no solutions is graphed on a number line for b . If the total length of all segments of the graph is k , compute $300k$. (The floor function $[x]$ is equal to the greatest integer less than or equal to x .)
15. Define a sequence $\{a_n\}_{n=1}^{\infty}$ as follows: $a_1 = 1$ and, for $n \geq 1$, $a_{n+1} = a_n + k$, where k is randomly chosen to be 1, 2, 3, or 4, each with equal probability. Let $p(n)$ be defined, for integer values of n , as the probability that the sequence contains n . Compute $720 \lim_{n \rightarrow \infty} p(n)$.

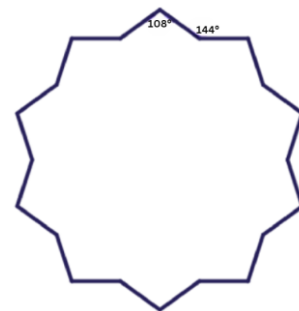
Mathletics - NMT 2025

Questions

1. A function is defined recursively by $f(n) = f(n - 1) - 5$ and $f(1) = 2025$. Compute $f(250)$.
2. An EV pulls into a charging station with its battery at 16%. After charging for 12 minutes, the battery charge level is 83%. For the first 10 minutes, the car was charging at a rate of 300 kWh per hour and for the last 2 minutes, the charging rate dropped to 60 kWh per hour. Compute the car's battery capacity measured in kilowatt-hours (kWh). If necessary, round your answer to the nearest integer.
3. Two different Cicada breeds were both active in the year 1804. The next time both breeds were active in the same year was 2025. The two breeds each hibernate for a prime number of years. One re-emerges every p years. The other re-emerges every q years. Compute the sum $p + q$.
4. The sum of the reciprocals of three consecutive integers is $\frac{299}{990}$. Compute the sum of the three integers.
5. Consider the function: $f(a, b) = \frac{a+b}{2} + \frac{|a-b|}{2}$. Compute $f(f((30, 19), 41), 54)$.
6. In the diagram of right $\triangle AEC$ with right $\angle AEC$, altitude $\overline{EB}$ is drawn to $\overline{AC}$ and altitude $\overline{BD}$ of $\triangle EBC$ is drawn to $\overline{EC}$. If $AB = 40$, $BC = 10$, and $BD = a\sqrt{b}$ in simplest radical form, compute the sum $a + b$.
7. The polynomial $x^4 - ax^2 + bx + c$ has four real roots and integer coefficients. If one of the roots is $\sqrt{5} - \sqrt{2}$, compute the sum $a + b + c$.
8. An elite class of 12 math students is randomly placed into three groups of four students each. Cody, Katherine, and Liran are in this class and are hoping to be placed in the same group of four students. If the probability that Cody, Katherine, and Liran are placed in the same group of four students is expressed as a fraction in lowest terms as $\frac{1}{n}$, compute n .
9. Compute the number of terms with rational coefficients among the 2026 terms in the simplified expansion of $(x^3\sqrt{3} + y^5\sqrt{5})^{2025}$.



10. All sides of the 20-sided polygon shown below have the same length. The area of this 20-sided polygon is 2025. As the diagram indicates, each of the non-reflex interior angles measures 108° and each of the non-reflex exterior angles measures 144° . Compute the length of the perimeter, rounded to the nearest integer.

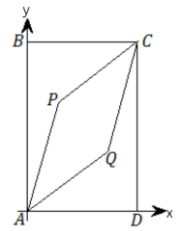


Team Problem Solving - NMT 2025

Questions

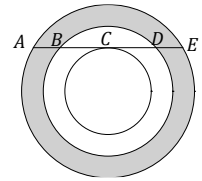
- Given that $x\Delta y = (x + y) + xy - y$, compute $(3\Delta 2)\Delta 4$. Label the answer A_1 .
 - Compute the number of positive integer divisors of A_1 .
 - Two successive discounts were placed on an item whose final cost is \$25.50. If the first discount was 15% and the second discount was 25%, compute the original price of the item. Label the answer A_3 .
 - Fred has a collection of coins worth A_3 dollars. The number of nickels he has is half the number of his quarters. The number of dimes he has is the average of the numbers of his nickels and quarters. The number of half-dollars he has is equal to the combined number of his nickels and dimes. If the number of pennies he has is twice the number of his half-dollars, compute the number of pennies he has.
 - Compute the absolute value of the sum of the coefficients of all of the terms (including the constant term) of the expansion of $(x - 4)^3$. Label the answer A_5 .
 - Points A, B, C, D , and E are collinear and, in the order listed: $\overline{ABCDE}$. Point D is midway between points A and E . If $\frac{AB}{BE} = \frac{2}{3}$, $\frac{AC}{CE} = \frac{3}{4}$, and $BC = \sqrt[3]{A_5}$ compute AE .
 - Each letter in the cryptarithm shown represents a different digit. When a letter appears more than once it represents the same digit. Compute the sum of the digits in the word STINK. Label the answer A_7 .
- | |
|-----------|
| K N I T S |
| × 4 |
| ----- |
| S T I N K |
- Compute the reciprocal of the product $\log_9(A_7) \times \log_{(A_7)} 3$.
 - Stella walks 6 yards due east, 20 yards due north, and then 15 yards due east. Compute the number of yards that Stella is from her starting position if she had walked without changing direction. Label the answer A_9 .
 - When A_9 is written in base 12, it is a 2-digit number. Compute the sum of those 2 digits.
 - The sum of 2 numbers equals 8. The sum of the squares of the 2 numbers equals 34. Compute the sum of the cubes of the 2 numbers. Label the answer A_{11} .
 - Let p and q be the 2 prime factors of A_{11} with $p < q$. Compute the maximum value for the function $f(x) = \sqrt{(p \sin x)^3 + q} - 2$.
 - The lengths of the 3 sides of a triangle are 17, 25, and 28. Compute the length of the shortest altitude in the triangle. Label the answer A_{13} .
 - The number K is formed by writing the first A_{13} positive integers in order. The number starts out as $K = 12345 \dots$ and ends with A_{13} . Compute the remainder when K is divided by A_{13} .

15. If $0 < x < \frac{\pi}{2}$, $\sin x = 2 \cos x$, and $\sin x \cos x = \frac{a}{b}$ in simplest form, compute $a + b$. Label the answer A_{15} .



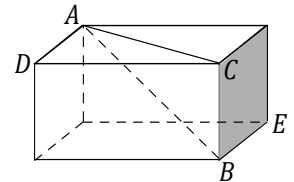
16. Parallelogram $APCQ$ is contained within rectangle $ABCD$. The coordinates of the points are: $A(0,0)$, $Q(8,6)$, and $P(3,y)$. Compute the value of y , given that the area of the parallelogram is $10 \times A_{15}$.

17. Given 3 concentric circles as shown. The tangent to the innermost circle intersects that circle at point C , intersects the middle circle at points B and D , and intersects the outer circle at points A and E . If $BD = 20$, $AE = 30$, and the area of the shaded ring is $k\pi$, compute the value of k . Label the answer A_{17} .



18. If $5x + 9y = A_{17}$ and $9x + 5y = 43$, compute the value of $11x + 7y$.

19. The dimensions of a rectangular prism are all integers. The diagonal $(\overline{AB})$ of the rectangular prism is 17. If the top face diagonal $(\overline{AC})$ is 15, compute the sum of the squares of the lengths of the front $(\overline{BD})$ and right-side $(\overline{CE})$ face diagonals. Label the answer A_{19} .



20. A small college has A_{19} senior students majoring in either math, physics, or chemistry. Eight of the students are a triple major, meaning they major in math, physics, and chemistry. Forty-five students are double majors evenly distributed among 3 possible pairs of majors. The remaining students are majoring in only one subject. If there are twice as many chemistry majors as physics majors, and three times as many math majors as physics majors, compute the number of students majoring in math. Include the double and triple majors.

