

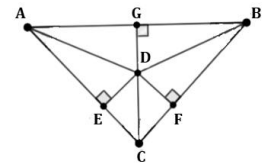
Grade Level 9 - NMT 2026

Questions

1. Compute the coefficient of x^2 when $x^2(x + 2) - 2(x^2 - 3)^2$ is written in standard form.
2. One root of $3x^2 - 28x = 55$ is $-\frac{5}{3}$. Compute the other root.
3. The area of a right isosceles triangle is 32 square centimeters. Another triangle is formed inside the original triangle by connecting the midpoints of each of its sides. Compute the area of the smaller triangle, in square centimeters.
4. If $\frac{\sqrt{117} \cdot \sqrt{20}}{\sqrt{26}}$ is written in simplest form as $a\sqrt{b}$, compute $a^2 + b^2$.
5. Two non-congruent angles are supplementary. Twice the sum of 10° and the measure of the larger angle in degrees is subtracted from 3 times the measure of the smaller angle in degrees. The result is 0. Compute the number of degrees in the smaller angle.
6. A circle defined by the equation $x^2 + y^2 - 12x + 6y = -20$ intersects the x -axis at points $(a, 0)$ and $(b, 0)$. Compute $a + b$.

7. Compute the units-digit of the expansion of 17^{2026} .

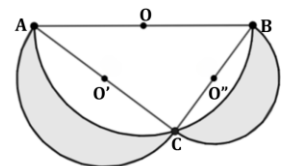
8. The accompanying diagram contains $\triangle ABC$ with $DE = DF = DG$, $AE = 12$, $AD = 13$, and $DB = \sqrt{194}$. Compute AB .



9. Using each of the letters of the word "HOFSTRA" exactly once, compute the number of 7-letter arrangements that can be made if each arrangement begins and ends with a vowel.
10. If Kevin sells an item at \$20 less than the list price, he receives 5% of his selling price as commission. If he sells the same item for \$60 less than the list price, he receives 3% of his selling price as commission. Kevin makes an additional \$10 when selling the item at \$20 less than the list price than he does when selling the item at \$60 less than the list price. Compute the list price.
11. The square of the second of three consecutive positive odd integers exceeds four times the sum of the largest and smallest of these consecutive odd integers by 105. Compute the largest of the three integers.

12. Compute the number of positive integers, n , that result in making $\frac{(20) \cdot (26)}{n}$ a positive integer.

13. The accompanying diagram contains three semi-circles with centers O , O' , and O'' as indicated with diameters $\overline{AB}$, $\overline{AC}$, and $\overline{BC}$ respectively and with $AC = 8$ and $BC = 6$. Compute the area of the shaded region.

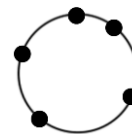


14. The volume of a cylinder with a radius of 6 is 252π in³. If the surface area of this cylinder is $k\pi$ in², compute k .
15. A bag contains 24 marbles in all. They are identical in every way except for the color of the marble and except for the number on the marble. Eight blue marbles are numbered 1 through 8. Eight red marbles are numbered 1 through 8. Eight green marbles are numbered 1 through 8. Three marbles are drawn at random without replacement. The probability that exactly one of the drawn marbles is a green marble with a prime number can be expressed in simplest form as $\frac{p}{q}$, compute $p + q$.

1. An equation of line l is $3x - 12y = 6$. Compute $100a + 10b + 4m$ if a is the x value of the x -intercept, b is the y value of the y -intercept, and m is the slope.

2. In a geometric sequence, the third term is 5 and the fifth term is 10. Compute the value of the 9th term.

3. Compute the number of distinct triangles that can be formed using the 5 distinguishable points on a circle as the vertices of the triangles.



4. Let $\sin x = \frac{1}{4 \cos x}$, where x is measured in radians between 0 and $\frac{\pi}{2}$. The greater of the two solutions for x is $\frac{a\pi}{b}$, where a and b are positive integers and relatively prime. Compute $a + b$.

5. If $y = f(x) = ax^2 + bx + c$ is a parabola with an x -intercept of 3, a y -intercept of 27, and a range of $y \geq 0$. Compute the value of $f(1)$.

6. A regular n -sided convex polygon has 14 diagonals. Compute the value of n .

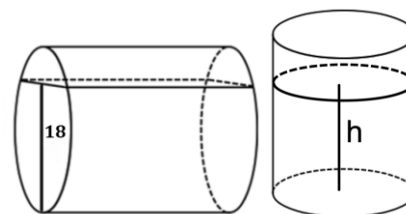
7. A circle is inscribed in a regular hexagon. If the area of the circle is 36π , then the area of the hexagon can be expressed as $a\sqrt{b}$ when written in simplest form. Note that b does not have a square factor greater than 1. Compute the value of ab .

8. An equation of circle M is $x^2 + 6x + y^2 - 8y = 11$ and an equation of ellipse N is $4x^2 - 56x + 9y^2 - 72y + 304 = 0$. Compute the minimum distance between a point on circle M and a point on ellipse N .

9. If $\frac{1}{x^2} + x^2 = 23$, where x is a positive real number, compute the numerical value of $\frac{1}{x} + x$.

10. Point A is on circle O , centered at $(-2, 3)$ with a radius of 9. Circle O' is centered at $(7, -9)$ with a radius of 5. If the maximum possible area of $\triangle AOO' = K$, compute $6K$.

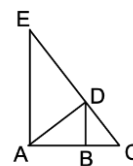
11. A cylindrical can with a radius of 12 inches and a height of 24 inches contains some water as depicted in the diagram. When it is placed on its lateral side, the depth of water measured vertically to the lowest point on the cylinder is 18 inches. The height of the water, h , is $a + \frac{\sqrt{b}}{\pi}$, when the cylinder is placed on one of its bases as shown below. Compute the value of $a + b$.



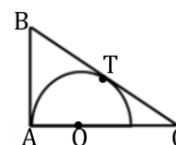
[figure not drawn to scale]

12. Let $a^2 + b^2 = 689$, where a and b are positive integers. Compute the maximum value of $a + b$.

13. In right $\triangle ACE$, $\overline{AD}$ is the altitude to hypotenuse $\overline{CE}$. If $\overline{DB} \perp \overline{AC}$ at point B , $CD = 45$, $BC = 27$ and the ratio of the area of $\triangle AEC$ to the area of $\triangle BDC$ is $\frac{a}{b}$, where a and b are positive integers and relatively prime, compute $a + b$.



14. A semicircle has a diameter of 2 on a leg of right $\triangle ABC$ with a right angle at vertex A . The semicircle is tangent to the hypotenuse of the triangle at point T . If $AB = 2$, the area of the triangle may be expressed as $\frac{a}{b}$ where a and b are relatively prime. Compute $a + b$.



15. When $x(x+2)(x+4)(x+6)+16$ is factored using integer coefficients, the result is $(ax^2+bx+c)^2$, where $a, b, c \in \mathbb{Z}$. Compute abc .

Grade Level 11 - NMT 2026

Questions

1. Compute $\frac{(27)^{5/3}(64)^{5/6}}{(16)^{3/4}}$.

2. If $\frac{x-2}{x+1} = \frac{1}{25}$, compute the value of $\frac{x^2+2x+1}{5x^2-20x+20}$.

3. Consider the complex number $z = a + bi$, where a and b are integers. If $z^2 = -105 + 88i$, compute the product ab .

4. Compute the positive value for a for which the following system of linear equations has no solution:
 $ax + 16y = 640$ and $9x + ay = 756$.

5. If $f(x)$ is a linear function with a positive slope and $f(f(x)) = 9x + 4$, compute $f(31)$.

6. A triangle has sides whose lengths are 20, 20, and 32 units. Compute the number of square units in the area of the triangle.

7. The parabolas $y = \frac{1}{8}x^2 - 2x + 34$ and $y = -2(x-8)^2 + k$ intersect at only one point. Compute the value of k .

8. If the sequence $\{a_n\}$ satisfies $a_1 = 6$ and $a_{n+1} - a_n = \frac{1}{3}$, compute the value of a_{1000} .

9. Compute the number of positive two-digit integers whose digits sum to a perfect cube.

10. In $\triangle ABC$, $m\angle CAB = 21^\circ$. The angle bisector of $\angle ACB$ intersects side $\overline{AB}$ in point D . If $\triangle ACD \sim \triangle ABC$, compute the number of degrees in $m\angle ACB$.

11. Compute the number of positive integer solutions that satisfy the inequality $\frac{(n+3)!}{(n+2)!} < 789$. Note that $x!$ means x factorial.

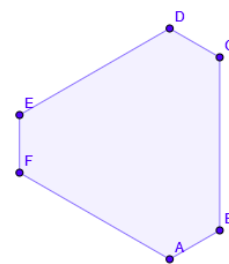
12. Compute the value of $75 \sin(2x)$ if $5 \cos x + 7 = 6 \sec x$ and $0 < x < \frac{\pi}{2}$.

13. If $x\sqrt{2} - \sqrt{x} = 6\sqrt{2}$, compute x .

14. If $\log_9(3x) + 3 \log_{27} x = \frac{13}{2}$, compute x .

15. There are 100 pencils on a table, labeled 1 to 100, with no repetition. If you choose 2 pencils at random, the probability that the sum of the numbers on the two pencils is even can be expressed as $\frac{p}{q}$, where p and q are relatively prime. Compute the sum $p + q$.

1. Compute the sum of the digits of 2026% of 50.
2. Let $f(x) = \ln(1 + x + x^2 + \cdots + x^{720})$. Compute $f'(1)$.
3. The surface area of a hemispheric solid of radius R is $n\%$ of the surface area of a spherical solid of radius R . Compute n .
4. Compute the maximum value of $f(x) = \tan^{-1}(e^{-x^2})$, in degrees.
5. Let the solutions of $3(3^x)^2 - 82(3^x) + 27 = 0$ be a and b . Compute $a^2 + b^2$.
6. A day in 2026 is selected uniformly at random. If the day chosen is the 30th of its month, the probability that the following day is 31st of its month is, in lowest terms, $\frac{p}{q}$. Compute $100p + q$.
7. The tangent lines to the graph of $y = -x^4 + 6x^2 - 2$, at the points on the graph where $x = 2$ and $x = -2$, intersect at the point (a, b) . Compute ab .
8. Equiangular hexagon $ABCDEF$ is drawn so that $AB = CD = EF = 1$ and $BC = DE = FA = 3$. The three shorter sides can be extended to form a larger equilateral triangle, and the three longer sides can be extended to form a smaller equilateral triangle. If the ratio of the areas of the two equilateral triangles is, in lowest terms, $\frac{p}{q}$, compute $p + q$.
9. Compute the number of distinct positive integer values of x which can satisfy $x^2 - 20x + y^2 + 10y = 1901$.
10. The line normal to the curve $y = \frac{x^2}{1946}$ is drawn at the point on the curve where $x = 2026$. This normal line intersects the y -axis at a point k units above the point where the normal line intersects the curve. Compute k .
11. Let z be a Gaussian integer (a complex number $a + bi$ where a and b are both integers.) If $z^2 = x + 2026i$ where x is a positive real number, compute the remainder when x is divided by 1000.
12. In rectangle $ABCD$, $AD = 20$ and $AB = 58$. Point E is chosen on segment CD such that $\overline{AE}$ is perpendicular to $\overline{EB}$ and $DE < EC$. Compute EC .
13. Point A moves along the x -axis so that its x -coordinate decreases at a constant rate of 7 units per second. Point B moves along the y -axis in such a way that $\overline{AB}$ always passes through the point $(20, 26)$. Compute the rate, in units per second, at which point B 's y -coordinate is increasing at the instant when point A is at $(22, 0)$.
14. The area of the graph, in polar coordinates, of $0 \leq r < \lfloor 3 + 2 \sin \theta \rfloor$ is $\frac{p}{q}\pi$, where $\frac{p}{q}$ is a fraction in lowest terms. Compute $p + q$. (Note: $\lfloor x \rfloor$ represents the greatest integer less than or equal to x .)
15. Peter rolls a standard 6-sided die and gets a result of n . He then rolls n standard 6-sided dice. The probability that these n dice show a sum of 4 is $\frac{k}{6^5}$. Compute k .

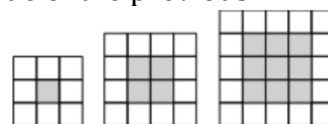


1. In isosceles $\triangle ABC$ $AB = BC = 17$ and $AC = 30$. Points P and Q are the midpoints of $\overline{AB}$ and $\overline{BC}$ respectively. Compute the area of $\triangle BPQ$.
2. Solve for x : $\sqrt{4 + \sqrt{3 + \sqrt{x}}} = 3$
3. Compute the number of integers, m , satisfying the inequality $|m^3 + 200| < 2026$.
4. Point P is placed on a line segment whose endpoints are $A(2,4)$ and $B(20,26)$ such that $AP:PB = 1:3$. If the coordinates of point P are (x,y) , compute $4x + 4y$.
5. For the arithmetic sequence $\{a_n\} = 20, 26, 32, \dots$, compute the least integer n such that $a_1 + a_2 + a_3 + \dots + a_n > 2026$.
6. Liran, Marco, and Grace participated in a go-cart race. Liran finished 100 seconds ahead of Marco because his average speed was 20% faster than Marco's. Grace's average speed was 15% slower than Liran's. All three participants raced the same distance. Compute the number of seconds that Grace finished behind Liran. Round your answer to the nearest integer.
7. The polynomial $x^6 - ax^3 + b$ has ONLY two real roots: $\sqrt[3]{10 - \sqrt{74}}$ and $\sqrt[3]{10 + \sqrt{74}}$. Compute $a + b$, given that a and b are integers.
8. A dilation centered at (a, a) maps the point $(20,26)$ to the point $(28,46)$. Compute the value of a .
9. A large block of ice in the shape of a right square pyramid is left to melt. The square base has edge length 8 cm and the edge lengths of the sides of the isosceles triangle faces are each 12 cm. If the ice melts at a rate of $1.3 \text{ cm}^3/\text{minute}$, compute the number of minutes (to the nearest integer) it will take for the entire pyramid to melt.
10. When graphed on the same coordinate plane with x values in radian measure on the interval $[-0.5, 0.5]$, the graph of $f(x) = \sin(2026x)$ intersects the graph of $g(x) = 2x$ in k distinct points. Compute k .

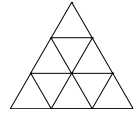
Team Problem Solving - NMT 2026

Questions

1. Compute the length of a side of a regular hexagon if its area is the sum of the areas of two regular hexagons whose sides are 5 and 12.
2. The first 3 terms of a pictures sequence of unit squares are shown. Any term of the sequence after the first term is determined by increasing the number of border unit squares on each side of the previous term by one. Interior unit squares are shaded. Border unit squares are unshaded. Create a new sequence by subtracting the number of unshaded squares from the number of shaded squares. The first three terms of the new sequence are: $1 - 8 = -7$, $4 - 12 = -8$, and $9 - 16 = -7$. Compute the largest positive 3-digit difference in the new sequence



3. Compute the number of trapezoids in the given diagram. Use the definition: A trapezoid is a quadrilateral that contains exactly one pair of opposite sides that are parallel.



4. The intersection of a plane and a large sphere is a circle of radius 235 units. The shortest distance from the center of the circle to the sphere is 47 units. Compute the radius of the sphere.

5. Given that $k! = k(k-1)(k-2) \dots \cdot 3 \cdot 2 \cdot 1$ has n terminal zeroes, compute the least positive number that n cannot be.

6. Given the functions $f(x) = -2x + 16$ and $g(x) = \frac{x}{3} + b$, compute the product of all integer values of b such that the intersection of the graphs of the functions will be a lattice point in quadrant I.

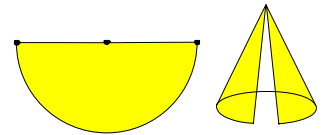
7. Compute $f(30)$ if $f(3n) = n + f(3n-3)$ and $f(3) = 1$.

8. A fish tank contains only three types of fish. None of these fish is classified in more than one group. All but 7 of the fish are Tetras. All but 12 of the fish are Guppies. All but 15 of the fish are Angelfish. Compute the number of fish in the tank.

9. The number of 4-digit whole numbers greater than 999 that have at least two identical digits is N . Compute the sum of the digits of N .

10. If $\frac{35}{12} = 2 + \frac{1}{1+\frac{1}{x}}$, compute x .

11. A semicircle with diameter 2, is cut out of paper and folded into a cone. The cross-section of a plane passing through the vertex of the cone, perpendicular to the base, is an isosceles triangle. Compute the number of degrees in the vertex angle of that triangle.



12. The following three proportions: $a:b = 6:5$, $c:d = 2:7$, and $d:b = 4:3$ are given. If $c:a$ is written as a fully reduced fraction, compute $c + a$.

13. A drawer contains 3 brown socks, 2 white socks, and 1 gray sock. If 2 socks are simultaneously removed from the drawer (without looking) and the probability that they are different in color in simplest form is $\frac{p}{q}$, compute the value of the product pq .

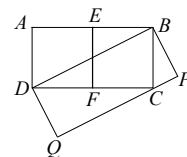
14. A rectangular prism is placed on a 3-D rectangular coordinate system such that 3 of its vertices have coordinates $(0, 0, 0)$, $(7, 0, 4)$, and $(7, 5, 0)$. Compute the sum of all the coordinates of the 8 vertices of the prism.

15. If $\frac{a+bi}{a-bi} = \frac{7+24i}{r}$, $i = \sqrt{-1}$ and a, b , and r are real numbers, compute r .

16. Tom took 4 quizzes. When he found the sums of his quiz scores taking exactly 3 distinct scores at a time, his results were 140, 124, 116, and 103. Compute the highest of his 4 quiz scores.

17. Compute the least integer value of $x^2 - y^2$ given that $\frac{x-y}{x+y} = \frac{13}{31}$ and that x and y are integers.

18. Congruent squares $AEFD$ and $EBCF$ share a common side as seen in the diagram. If $AE = \sqrt{17}$ compute the area of rectangle $DBPQ$.



19. If $(\log_{16} 7)x + (\log_3 5)y = \log_4 49$ and $(\log_{25} 3)x - (\log_7 2)y = \log_{25} 81$, compute x .
20. Compute the sum of all the integer values of k for which $k^2 - 6k - 27$ is a positive prime number.