1. Convert 10210_3 to base 10.

2. Find the last two digits of 2014^{2012}.

3. Suppose x satisfies the equation $x + x^{-1} = 5$. What is the value of $x^4 + x^{-4}$?

4. Find the smallest positive integer n such that $n\left(n+13\right)$ is a perfect square number?

5. Find the value of $\sqrt{\sqrt{2401} - \sqrt{1872}} + \sqrt{\sqrt{484} + \sqrt{468}}$.

6. What is the summation of digits of $66^3 - (450)(451) - 25^3$.

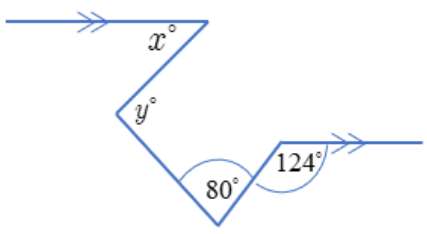
7. Consider $f(x)=\left(2x-m\right)\left(3x+n\right)-6mn$ where m and n are positive integers. It is given that the sum of the roots of the equation $f(x)=0$ is $\frac{11}{6}$, and that the product of the roots is $-\frac{35}{3}$. Find $m+n$.

8. Vin has unicycles, bicycles, and tricycles. There are twelve saddles in total, twenty-five wheels in total, and more bicycles than tricycles. From all possible solutions, what is the maximum number of unicycles does he have?

9. How many solutions does the equation $\frac{27^x+125^x}{45^x+75^x}=\frac{19}{15}$ have?

10. Let a,b,c,d,e,f be six distinct integers such that $(1+a)(1+b)(1+c)(1+d)(1+e)(1+f)=7{,}106$. If m is the maximum value of $a+b+c+d+e+f$ and n is the minimum value of $a+b+c+d+e+f$, then find the value of $m-n$.

11. From the figure below, find the value of y^o-x^o.

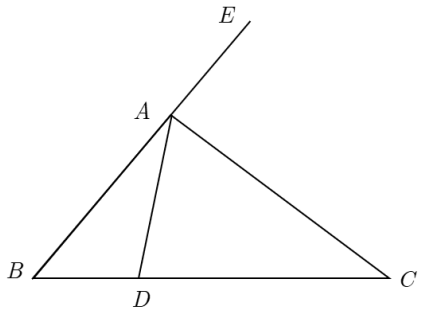


12. Let $ABCD$ be a square whose area equals 4 unit^2. Points M and N lie on the sides BC and CD, respectively. Suppose that a triangle AMN is an equilateral triangle whose area equals x unit^2. Find $\lfloor 100x \rfloor$.
(Given $\sqrt{2} = 1.414, \sqrt{3} = 1.732, \sqrt{5} = 2.236$ and $\lfloor n \rfloor$ is the greatest integer less than or equal to n.)

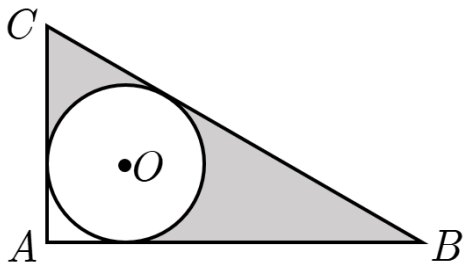
13. The number of diagonals in a regular polygon is 20. This regular polygon is inscribed in a circle whose radius is 3 units long. If the area of the polygon is $a\sqrt{b}$, then find $a^2 + b^2$.

14. One rectangle has length $2x+1$ cm and width $x-1$ cm. Another square has length x cm. The area of the square is 29 cm^2 less than the area of the rectangle. What is the difference between the perimeters of the two shapes?

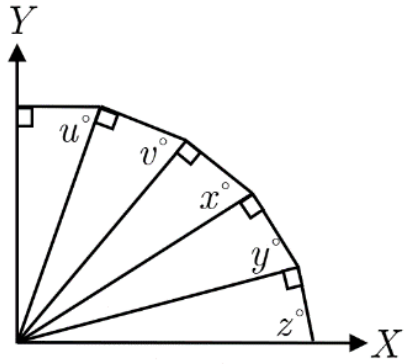
15. Given a triangle ABC as shown in Figure below. The length of the side AB is 8 units. The line AB is extended to the point E. Draw the line AD which the point D lies on the side BC and $D\hat{A}C = C\hat{A}E$. If the length of sides $BD = 4$ and $AD = 6$, then find the length of side CD.



16. In the below figure, a circle centered at O is inscribed in a right triangle ABC. Suppose that $AC = 5$ and $AB = 12$. If a shaded area is $x + y\pi$, then find $x + y$.



17. From Figure below, find $u^\circ + v^\circ + x^\circ + y^\circ + z^\circ$.



18. Let $ABCDEF$ be a hexagon whose all interior angles are equal. If the lengths of sides AB, BC, CD and DE are $5, 6, 7$ and 8 units long, respectively. Find the perimeter of the given hexagon.

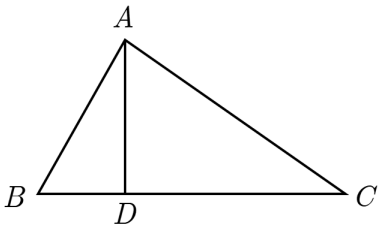
19. If $a_1 + a_2 + a_3 = 3, a_2 + a_3 + a_4 = 6, a_3 + a_4 + a_5 = 9, \ldots, a_{48} + a_{49} + a_{50} = 144$ where $a_1 = a_2 = 0$, and $a_{49} + a_{50} = 147$, then what is the sum of $a_1, a_2, a_3, \ldots, a_{50}$ that is divided by 2?

20. Let k be a positive integer less than 40 and $\gcd(k, 15) = 1$. What is the summation of all possible numbers k?

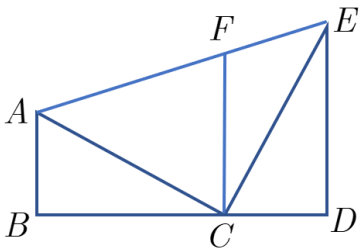
21. Evaluate $\dfrac{(2023 - 519)^2 - 4 \times 2023 + 2 \times 1038}{10^5}$.

22. The positive integers from 1 to 400 inclusive are placed in a 20 by 20 grid so that each cell contains exactly one integer. Then the multiples of 5 are given a yellow mark, the multiples of 7 are given an orange mark, and the multiples of 11 are given a red mark. How many squares have more than 1 mark?

23. In the below figure, $\overline{AD}$ is perpendicular to $\overline{BC}$. Suppose that $AB = 17, AC = 39$ and $BC = 44$. Find the area of the triangle ABC.



24. From the below figure, suppose that $AB = CD = 24$ cm. and $AC = CE$. Lines AB, FC and ED are perpendicular to the line BD. If the area of the triangle ACE is 1300.5 cm^2 and the length of the line CF is $a\frac{b}{c}$, where gcd(b, c)=1, then find $a + b + c$.



25. Jane and Judy pick a card at random one after another from a deck of cards, without replacement every time. The player who can pick a heart card wins. Suppose that $\frac{a}{b}$, where gcd$(a, b) = 1$, is the probability of Judy winning at the first turn if Jane begins the game. Find the value of $a + b$.

ANSWERS M.2

No.	Answer	No.	Answer
1	102.00	14	12.00
2	96.00	15	12.00
3	527.00	16	23.00
4	36.00	17	360.00
5	9.00	18	39.00
6	26.00	19	637.00
7	7.00	20	412.00
8	3.00	21	22.56
9	2.00	22	21.00
10	90.00	23	330.00
11	44.00	24	76.00
12	185.00	25	81.00
13	328.00		