

Mathlete Training Centre

APMOPS 2025 Paper

1. A farmer caught 94 rats and 49 squirrels. For the next n days, he caught 3 fewer rats and 2 more squirrels than the previous day until the total number of squirrels caught exceeds the total number of rats caught. Find n .

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2. How many ways are there to divide 9 people into 3 groups of 3?

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3. Find 2 numbers \overline{ABCD} where $(\overline{AB} + \overline{CD})^2 = \overline{ABCD}$. (e.g. $(20 + 25)^2 = 2025$.) Find the sum of the other 2 such number \overline{ABCD} .

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4. $\begin{matrix} 1 \\ 3 & 5 \\ 7 & 9 & 11 \\ 13 & 15 & 17 & 19 \end{matrix}$

Find the number directly below 2025

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5. The product of 2 positive numbers is equal to ten times their sum, and also equal to 15 times their difference. Find the sum of the 2 numbers.

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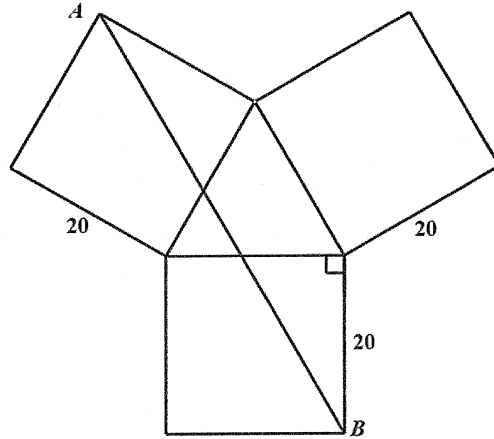
6. There is a rectangle of area 1200, if its length increases by 10% and its breath decreases by 20%, what is the new area?

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7. The distance from A to B is represented as $a + \sqrt{b}$. Find $a + b$.



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8. Find the smallest integer n such that for any prime number p , $p^2 + n$ is never a prime number.

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9. How many litres of a solution which is 10% alcohol do we have to mix with a solution of 40% alcohol to make 300 litres of a solution 20% alcohol?

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10. In the year 2024, February 29 fell on a Thursday. What is the next year in which February 29 fall on a Thursday?

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11. We call the number 1 special, and a number larger than 1 is called special on if it is relatively prime to the sum of the special numbers below it. Find the 20th special number.

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12. What is the smallest integer in which its prime factors add up to 2025?

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13. In a secondary school with 4 levels, the ratio of sec 1 to 2 students is 5:4, ratio of sec 2 to 3 students is 7:8, ratio of sec 3 to 4 students is 9:7. If there are 2158 students in the school, how many sec 1 students are there?

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14. How many prime numbers p are there such that $(4900 - p)$ is a perfect square?

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15. Tom takes 21 minutes to travel to Jerry's house, and Jerry takes 28 minutes to travel to Tom's house. They travel to each other's house at 12 noon, and after they meet each other on the way, Jerry travels back to his house at the same speed. What time does Jerry arrive back at his house?

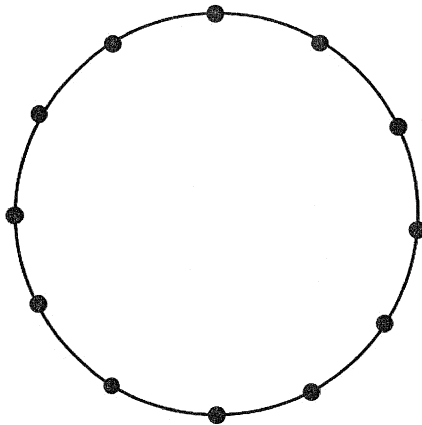
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16. How many obtuse triangles can be formed by joining any 3 points?

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17. Using 27 regular dice to form a $3 \times 3 \times 3$ cube, where 1 and 6 are opposite of each other, 2 and 5 are opposite of each other, and 3 and 4 are opposite of each other. What is the largest sum that can be formed from the numbers facing outwards?

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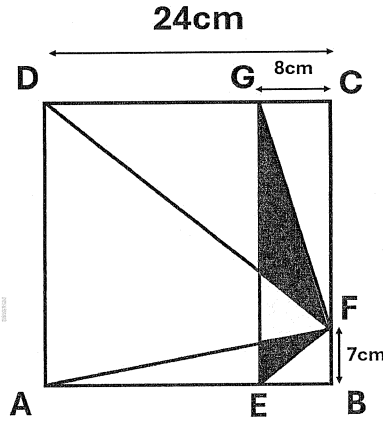
18. A 4-digit number is nice if it has only 1 pair of same digit, e.g. 2025 and 1997. But numbers like 2552 and 1991 are not nice numbers. How many 4 digit nice numbers are there?

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19. In the diagram below, ABCD is a square with side length 24cm, AE = 16cm, BF = 7cm and CG = 8cm. Find (in cm^2) of the shaded regions.



20. The area of a rectangle whose length is twice its breadth is equal to the area of a rectangle which is made by decreasing the length of the original rectangle by 14 and increasing its length by 8. What is the perimeter of the new rectangle?

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21. There is a 4-digit number. If you add 9 to it, swap the last 2 digits, then swap the first and third digit, and double the result, you get the original number. What is the number?

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22. The cost of 17 files, 25 pens and 19 erasers is \$25. The cost of 23 files, 21 pens and 31 erasers is \$36. What is the cost of 56 files, 108 pens and 52 erasers?

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23. How many numbers smaller than 2025 are there which is coprime to either 20 or 25?

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24. How many rectangles are there in the figure such that the sum of the numbers inside is divisible by 5?

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PERSEVERENCE RIGOR

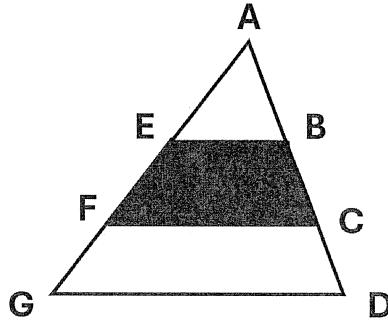
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21	22	23	24	25
16	17	18	19	20
11	12	13	14	15
6	7	8	9	10
1	2	3	4	5

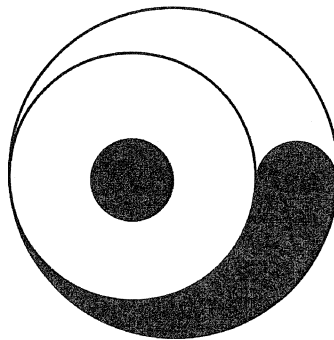
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25. In the triangle below, $AE = EF = FG$, $AB = BC = CD$, and the area of $EFCB$ is 27. What is the area of triangle AGD ?



26. In the figure, the radii of the circles are 4cm, 3cm and 1cm, and the radius of the shaded semicircle on the right is 1cm. If the ratio of the area of the shaded to unshaded regions is $m : n$ in its simplest form, find $m + n$.



27. There are 6 identical square sheets of paper, with white and black on each side. How many different 2×3 rectangles can be formed? (Rectangles formed by rotating and flipping are counted.)

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28. How many positive integers x are there such that $\frac{x}{3}$ and $3x$ are both 5-digit numbers?

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29. 2 different positive integers are called a beautiful pair if the smaller number is at least 25% the larger number, and at least one number in the pair is between 25 and 28 inclusive. How many beautiful pairs are there?

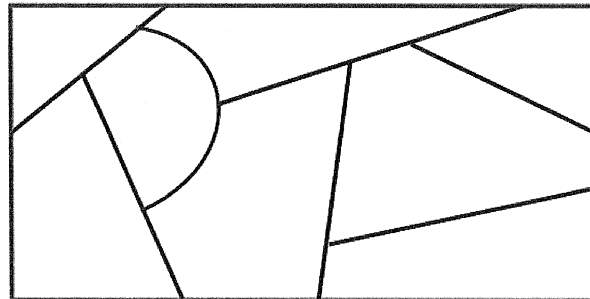
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30. How many ways are there to colour the 8 different regions of the rectangle such that no 2 regions bordering each other have the same colour?

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