

APMOPS 2024 Round 1

(Provided by Kangaroo Study students)

1. In a shop, the price of some item decreased by 5% at first, then it increased by 40% and now it is \$990 more expensive than the original price. What was the original price of this item in dollars?

2. As shown in the diagram below, a pattern of triangle is constructed using matchsticks. If a total of 51 sticks were used, how many triangles are there in the pattern?



3. During Chinese New Year, Mr. Lee sets up a stack of oranges in a pyramid-like formation where square base is made of 49 oranges (7 by 7). Each orange above the first level rests in the pocket formed by four oranges in the level below. The stack is completed by a single orange in the 7th level. How many oranges are there in this stack?

8. A circus has an acrobatic bicycle with front and back wheels of different sizes. The diameter of the front wheel is 140 cm and the diameter of the rear wheel is 90 cm. How many centimeters did the bike advance when the rear wheel made 10 more revolutions than the front wheel? (Take $\pi = \frac{22}{7}$)
9. Let a, b, c be three distinct positive integers whose product abc is equal to 2024. What is the smallest possible value of the sum $a + b + c$?
10. Given that p and q are prime numbers such that $3p^2q + 2pq^2 = 483$. Find the largest possible value of $p + q$.

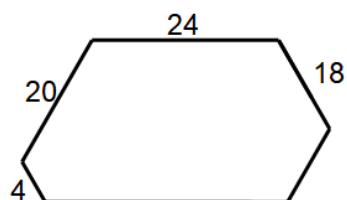
11. If we increase the length and width of a rectangle by 5cm each, the area of the rectangle will increase by 200cm^2 . Find the perimeter of the original rectangle in cm.
12. If an n -sided polygon has its sum of interior angles smaller than 2024° , what is the largest possible value of n ?
13. Dylan, Bryan and Sheldon split \$1300 among them to do investment in different ways. Each begins with a different amount. At the end of one year, they now have a total of \$1490. It is known that Dylan and Bryan's money has grown by 25% while Sheldon has unfortunately lost \$50 in his investment. What was Sheldon's original amount of money at the start of the year?

14. Find the smallest positive integer n such that the product of n , $n+1$ and $n+2$ is a multiple of 2024.

15. Yuhan wants to buy 4 donuts from a shop with sufficient supply of three flavors of donuts: original, chocolate and strawberry. How many possible combinations are there?

(Question 16 onwards may not adhere to correct sequence as presented in the exam.)

16. In the following hexagon, all the interior angles are 120° and some of the sides are given, find the perimeter of this hexagon.

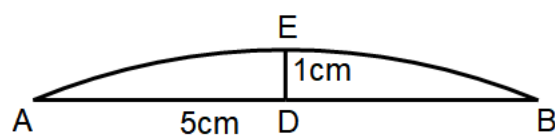


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17. Given that $\overline{SMOPS} + \overline{APMOPS} = 808182$, find $A + P + M + O + S$.

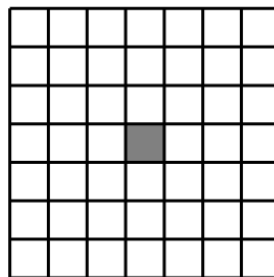
18. How many numbers between 1 and 2024 have a digit sum equal to 10?

19. AB is an arc segment within a circle, with D as the midpoint of straight line AB, and E as the midpoint of arc AB. Determine the diameter of the circle.



20. If $\frac{n}{40-n}$ is a square number, find how many possible values of n are there?

21. In the following grid, how many rectangles include the shaded square and area is even?



22. P is the product of all the divisors of 2024. How many digits does P have?

23. There are 2000 cards in a deck numbered 1 to 2000 respectively. In one operation, all the cards with numbers that are perfect squares are removed. Then all of the remaining number are renumbered 1, 2, ... How many operations must be done so that 1 card remains?
24. When a number is divided by 100, quotient is q and remainder is r . If the sum of q and r is a multiple of 11, how many four-digit numbers satisfy this?
25. Two farmers sold 400 eggs. They had a different number of eggs at first, and sold them at different prices, but they earned the same amount of money. The first farmer told the second farmer, "If I sold all my eggs with the price of your eggs, I would earn \$270." The second farmer told the first farmer, "If I sold all my eggs with the price of your eggs, I would earn \$120." How much money did the farmers earn altogether?

26. Two travelers had a total of 77kg of luggage. The first traveler paid \$14 for his excess luggage and the second paid \$20 for his excess luggage. Had all the luggage belongs to one person, the excess luggage charge would have been \$94. What is the maximum luggage weight?
27. What is the maximum number such that if you roll a dice, the product of the 5 faces showing is divisible by the number all the time?
28. How many 4-digit numbers with at least two "2" s and one "4"?

29. Given that the 49th day of this year is a Monday and the 94th day of the next year is a Saturday. Find the what day is the 1st day of the previous year.

30. Eight six-face dices were rolled. How many combinations of numbers are there? Order does not matter. (12345666 and 66654321 is the same)