

Markhor Junior Contest 2024

Aspirant Level (Class IX & X, O/A Level's)

Mathematics

Time Allowed 60 Minutes

There are 19 problems, graded as follows:

Questions 1-5 are 1 point each,

Questions 6-10 are 2 points each,

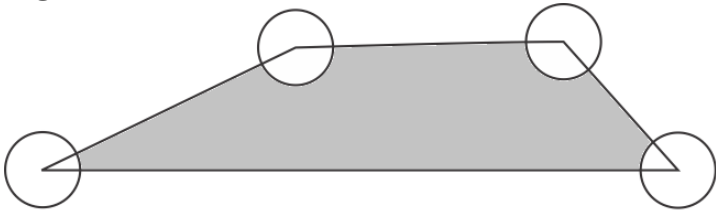
Questions 11-15 are 3 points each,

Questions 16-19 are 5 points each.

- 1. Imagine you are racing alongside a car with special wheels. Each wheel of the car is 1.25 meters around and the car is traveling at a speed of 18 kilometers per hour. If you continue racing for 5 seconds, how many complete rotations will one of the car's wheels make?**
 - a) 15
 - b) 20
 - c) 25
 - d) 30
- 2. The overall average score of a chef's dishes was 7 points. Exactly 60% of the dishes earned a passing grade. The average score of the passing dishes was 9 points. What was the average score of the dishes that didn't quite make the cut?**

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- a) 2
b) 3
c) 4
d) 5
3. A trapezoid has an area of 10 square centimeter square. Four identical circles, each with a radius of 3 centimeters, are inscribed in its corners. Determine the area of the shaded region.

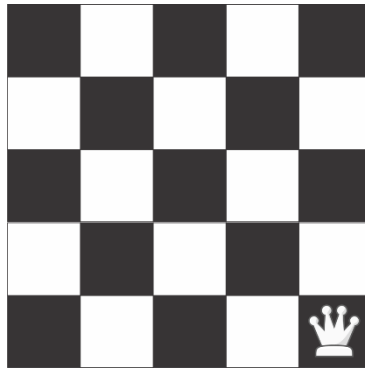


- a) $10-9\pi$
b) $9\pi-100$
c) $100-9\pi$
d) $100-360\pi$
4. A chef prepares four dishes, scoring 0, 1, 2, 3, 4, or 5 stars on each dish. After the fourth dish, their average rating is 4 stars. Which of the following statements is not true?
- a) Each dish earned a maximum 4-star rating.
b) Exactly two dishes received 3 stars.
c) Three dishes received 3 stars.
d) Two dishes received 4 stars.

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5. The queen wants to explore a 5x5 chessboard but gets tired after the first move. She can still move in any direction in a straight line, up, down, left, right, or diagonally but each move must be shorter than the previous (fewer squares). Queen don't visit a square twice. What are the most squares she can visit?

- a) 25
- b) 4
- c) 10
- d) 13



6. Consider all pairs of distinct numbers formed from the set of integers $\{1, 2, 3, \dots, 25\}$, How many such pairs have a sum that is a perfect square?
- a) 20
 - b) 25
 - c) 32
 - d) 36

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7. Alex arranges one 6×6 -inch square white tile and some 2×2 -inch square red tiles to form one large square with a red boundary, with no overlapping tiles and no space between adjacent tiles. How many red tiles are used to form the large square?"
- a) 7
 - b) 9
 - c) 16
 - d) 36
8. A shopkeeper marks the price of a smartphone 40% above its cost price. He then offers a 20% discount on this marked price to attract customers. Despite the discount, he still makes a profit. What is the ratio of the marked price to the selling price?
- a) 5:4
 - b) 6:5
 - c) 3:2
 - d) 11:12
9. A real estate investor acquired two properties. He sold the first property for a 50% gain and the second property for a 70% gain. The combined sales revenue was 62% higher than the combined purchase price. The ratio of the investor's purchase prices for the first and second property was:

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- a) 5:7
- b) 2:3
- c) 3:2
- d) 7:5

10. Jax and Lila are playing a game of spin the wheel. Jax's wheel has 9 equal sections numbered 1 to 9, while Lila's wheel has 4 sections with the numbers 3,4,5, and number 6. The player with the higher number wins, unless they tie. What is the probability that Lila will win the game?

- a) $\frac{9}{15}$
- b) $\frac{7}{15}$
- c) $\frac{4}{9}$
- d) $\frac{7}{18}$

11. A library contains 2024 books, each with a unique catalog number from 1 to 2024. Books with equal sums of their numerical digits have identical covers, while books with different digit sums have distinct covers. How many different cover designs are there in the library?

- a) 25
- b) 27
- c) 28
- d) 29

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- 12. Imagine we have a game where 100 people stand in a circle. They take turns counting upwards (1, 2, 3,...) but anyone saying an even number is out! We keep going, starting the count over at 101 whenever there's only one person left. The question is, which number did the last person standing say in the very beginning (when there were 100 people)? Can you figure it out?**
- a) 19
 - b) 21
 - c) 37
 - d) 73
- 13. As a rectangle expands, its length L is always 10 meters longer than its width W . If the width increases at 2m/sec , at what rate is the area of the rectangle increasing when the width is 5 meters?**
- a) $20\text{ m}^2/\text{sec}$
 - b) $30\text{ m}^2/\text{sec}$
 - c) $40\text{ m}^2/\text{sec}$
 - d) $44\text{ m}^2/\text{sec}$
- 14. A person 6 feet tall is walking away from a street light 20 feet high at a rate of 7 ft/sec . At what rate is the length of the person's shadow increasing?**
- a) 2 ft/sec
 - b) 3 ft/sec
 - c) 4 ft/sec
 - d) 5 ft/sec

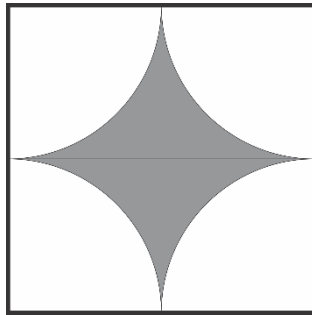
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15. The median of a set of 200 consecutive even integers is 501. What is the sum of these integers?

- a) 200100
- b) 100200
- c) 200501
- d) Cannot be determined

16. The area of the black region is $(9-2.25\pi)$ square meters. A square circumscribes the four congruent quarter-circles. What is the perimeter of the square?

- a) 10π
- b) 12
- c) 12π
- d) 81



17. Two planes at the same altitude are approaching an airport, one from the north and one from the west. The plane from the north is flying at 250 mph and is 30 mi from the airport. The plane from the west is flying at 200 mph and is 40 mi from the airport. How fast are the planes approaching each other at that instant?

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- a) 450 mph
- b) 300 mph
- c) 310 mph
- d) 320 mph

18. Two particles begin moving from the same point O along two paths that form a 60° angle between them. The first particle travels at a constant speed of 5 m/s, while the second particle's distance from O is given by $S = 2t^2 + t$, where s is in meters and t is in seconds. How quickly is the distance between the two particles changing at the moment when the first particle is 10 meters from O?

- a) 10 m/s
- b) 7 m/s
- c) 9 m/s
- d) 4 m/s

19. How many of the first million positive integers do not share any common factors with 2024, other than 1?

- a) 396040
- b) 592200
- c) 404010
- d) 548520