

2015 CIPHERING TIME TRIALS
THURSDAY, DECEMBER 10TH, 2015

Round 1

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1. Evaluate: $\frac{7!9!}{5!2!8!}$

2. A regular tetrahedron has a surface area of 400 m^2 . What is the surface area, in square meters, of a larger regular tetrahedron each edge of which is twice as long as those of the original tetrahedron?

3. When four identically unfair coins are flipped, the probability of getting exactly two heads is the same as the probability of getting exactly three heads. What is the probability that exactly one of the four coins shows heads?

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4. What is the circumference, in meters, of a circle with an area of $150\pi \text{ m}^2$?
5. What are the coordinates, in the form (x, y) , of the point of intersection of the lines $y = 2x - 3$ and $y = -3x + 22$?
6. Anne's dad is making goodie bags for her birthday party. He has six identical Snix candy bars to distribute among four identical bags, but gives no thought to fairness. How many different sets of four bags could he create?

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7. The product of two positive numbers is 720, and the ratio between them is 4:5. What is the sum of the two numbers?

8. What are the coordinates, in the form (x, y) , of the center of the graph of $2x^2 - 3y^2 + 4x + 9y = 100$?

9. List which of the following numbers is/are divisible by 12.
486, 7216, 15204, 901355, 1348, 906, 5353, 4512, 805, 723, 41

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Round 4

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10. Express in simplest radical form: $\sqrt[3]{540}$

11. What is the seventh term of a geometric sequence with first term 5 and common ratio 3?

12. You have 47 fence sections that are each three meters long, and a huge supply of connectors, some of which allow the fence to continue straight, some of which allow the fence to make a right-angled turn. What is the largest area you can completely enclose using these supplies?

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13. What is the sum of the number of faces on a dodecahedron, the number of inches in a foot, and the number of months in a year?

14. What is the discriminant of the equation $0 = 2x^2 - 3x - 4$?

15. A car drives around an elliptical track with equation $x^2 + 2y^2 = 243$. If the car is at position $x = -15$ in the third quadrant and the car's horizontal velocity is $\frac{dx}{dt} = 10$, what is the car's vertical velocity $\frac{dy}{dt}$?

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16. When the secret number is decreased by 38 and this result is then tripled, the final result is 369. What is the secret number?

17. What is the area, in square meters, of a 30-60-90 triangle with a long leg measuring 9 m?

18. What is the smallest positive four-digit integer that is congruent to 7 in mod 9 and 3 in mod 14?

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19. Mahen can write a math contest in ten hours, and Gregg could write one in fifteen hours. If they work together, how many **minutes** would it take the two of them to write a math contest?

20. When two cards are drawn from a standard 52-card deck, what is the probability that neither one is a face card (a Jack, Queen, or King)?

21. A planar diagram is composed of three circles and two lines. What is the largest number of regions into which the plane could be divided?

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22. Express the base five number 4124_5 as a base ten number.
23. How many subsets of the set of two-digit perfect squares contain exactly two even numbers?
24. Simplify $(3x^4 - 6x^3 + 7x^2 + 10x - 48) \div (x - 2)$.

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25. What are the coordinates, in the form (x, y) , of the leftmost x-intercept of the graph of $y = 2x^2 - 21x + 54$?

26. In the cryptarithm $AB + AC = CA$, each letter represents a different digit (0-9), so if one A is a 2, all A's are 2's and B cannot be 2. What is the largest possible value of the three-digit number ABC ?

27. What is the volume, in cubic meters, of a right rectangular pyramid with **edges** measuring 2 m, 7 m, and 1 m?

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28. Evaluate **as a mixed number**: $6\frac{7}{8} \div 2\frac{3}{4}$

29. A 45-45-90 triangle has a hypotenuse measuring 8 m. What is the radius, in meters, of its inscribed circle?

30. What is the range of the mean, median, and mode of the data set {1, 56, 7, 81, 35, 1, 68, 23, 61}?

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