Mission Math Winter Competition 2025 6-8 Exam

You will have 40 minutes to complete as much of this test as you can. There are 30 free response questions total, and questions are arranged roughly from easiest to most difficult. Units are not needed. Write answers on the given line below each question. Calculators are not allowed. Do not begin the test until told to do so. Good Luck!

Full Name: _____

Grade: _____

Age: _____

1. Billy wants to buy 100 notebooks for his classes. Each notebook is \$30. How much would it cost Billy?

_____

2. Ravi wants to buy a TV that costs 800 dollars. All his friends are contributing money to buy it. He has 4 people including him willing to contribute. How much would each person have to pay?

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3. What is the probability of drawing a heart or an ace or both from a standard deck of 52 cards? Express your answer as a common fraction.

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4. Jimmy is a very unconventional spender, for every \$1 that he makes in his YouTube videos, he spends \$10. How much money does Jimmy spend if he makes \$100?

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5. A triangle has side lengths of 10 and 8. What is the maximum integer side length of the third side of the triangle?

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6. Mona has a monthly payment of \$4670 per month to a dealer where she bought a brand new Lamborghini for $\$191,000$. How many months would it take her to repay her load?

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7. If one mole can dig 5 holes in an hour, how many holes can 15 moles dig in 3 hours?

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8. What is the cube root of 1728?

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9. If Travis made an album composed of 13 songs, how many ways are there to pick 10 songs for a playlist? Order does not matter.

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10. 400 people are participating in a student body election. The three candidates are Joe, Donald, and Farris. Joe has $3x + 12$ votes, Donald has $5x + 3$ votes, and Farris has $3x$ votes. What is x?

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11. Consider a regular hexagon inscribed in a circle of radius 5. Calculate the area of the hexagon. Express your answer in simplest radical form.

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12. How many distinct ways can the letters of the word "ALGEBRA" be arranged?

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13. 8 apples and 6 oranges cost 20 dollars, and 4 apples and 2 oranges costs 12 dollars. What is the price of 1 apple and 1 orange?

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14. 3 gaggles are equal to 7 goggles. 14 goggles are equal to 19 giggles. If I have 57 giggles, how many gaggles do I have?

_____

15. What is the value of $\frac{13!}{11!}$?

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16. If r and s are the solutions to the equation $x^2 + 5x + 6 = 0$, what is $\frac{1}{r} + \frac{1}{s}$? Express your answer as a common fraction.

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17. If x has a remainder of 6 when divided by 8, a remainder of 5 when divided by 7, and a remainder of 1 when divided by 3, what is the smallest possible x?

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18. What is the length of a diagonal of a square with a perimeter of 48? Express your answer in simplest radical form

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19. If the number $4A6$ is divisible by 9, what is the value of A?

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20. There are 6 people sitting in a row including Ann and Billy. Ann refuses to sit next to Billy. How many arrangements can be made?

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21. ABC is a triangle with $AB = 6$, $AC = 4$ and $BC = 5$. Point D lies BC so that $DB = 3$ and $DC = 2$. Find the length of AD.

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22. What is $142_5 + 1A7_{11}$? Express your answer in base 10.

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23. How many zeros does 625! end with?

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24. Find the sum of all the integers that could be the value of k such that $x^2 - (k+2)x + 9 + k = 0$ has 2 negative solutions.

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25. There exists a positive integer n such that $\frac{11}{26} = 0.\overline{2024}_n$. Find n.

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26. Let $n = \underline{wxyz}$ be the unique four digit number, where w, x, y, z are nonnegative, single digit integers representing the digits of n, such that n satisfies the property $\underline{wx} \times \underline{yz} = \frac{n}{5} + 95$. Find n.

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27. Circle ω has diameter of length 18. Circles $\gamma_1, \gamma_2, \gamma_3, ..., \gamma_8$ are all congruent with radius 1, and have their centers along the diameter of ω such that the centers of these 8 circles divide the radius of ω into 9 equal segments of length 1. Find the value of the shaded area. Express your answer as a common fraction in simplest radical form in terms of π.

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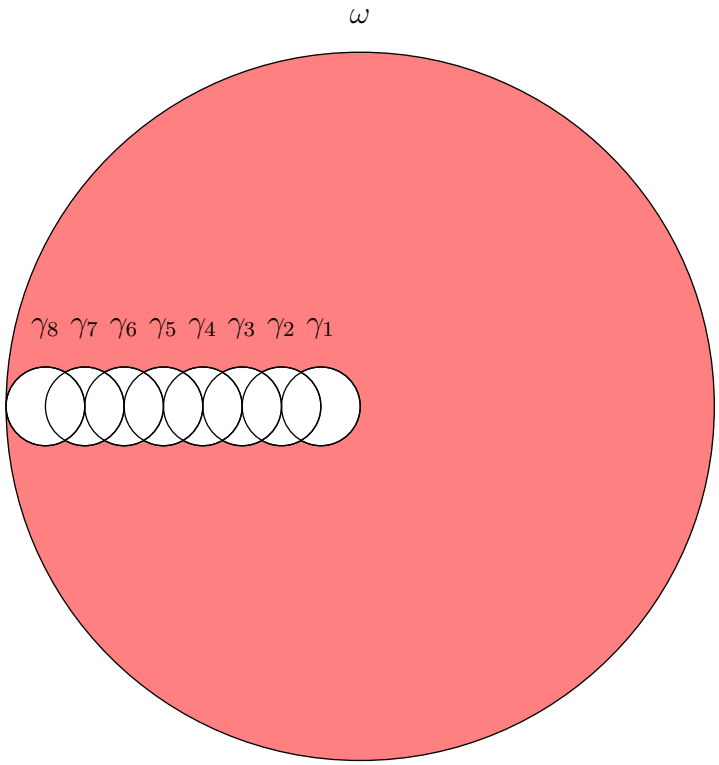

28. Find the sum of all $n \leq 100$ such that n^{2047} ends with the digits 69 .

29. How many positive integers less than or equal to 2024 have base three representations contain no 0's?

30. Let ABC be a triangle with $AB = 10, BC = 17, AC = 21$. Point D is on $\overline{AC}$ such that $\overline{BD}$ bisects $\angle B$. Let O be the circumcenter of $\triangle ABD$, and P be the point on $\overline{BC}$ such that $\overline{OP} \parallel \overline{AC}$. Compute the area of $\triangle OPD$.