# Gauss Math Circle Math Tournament
Grade 7 – Grade 8
(50 minutes)

1. What is the tenth root of 1024?

2. If a rectangular prism has side lengths of 3, 4, and 12, what is the length of the diagonal of the prism?

3. Find the ratio of the area of the circle inscribed in a unit triangle to the area of the unit triangle.

4. George answers two questions every hour in a Biology textbook. Dylan answers one question every hour. George and Dylan both spend all their lives answering Biology questions. How long will it take for the two of them working together to answer all 627 questions in the textbook?

5. If the difference of the square of an integer and the square of a second integer is 15, and both numbers are greater than 5, what is the sum of the two numbers?

6. A triangle has side lengths 2x+3, 3x-5, and 4x. What is the minimum integer value of x?

7. Alan and Katie are eating dinner at a restaurant.. There are 3 appetizers, 5 entrees, 3 drinks, and 2 desserts. A meal for two consists of one appetizer, two entrees, two drinks, and two desserts. How many ways can they buy a meal for two?

8. If the line y=kx+h is perpendicular to the line y=1/2x+17 and intersects the line 3x+5y=45 at (10,3), find k+h.

9. A right triangle has angles of measure 3y+60, 2x+75, and 3x+65. x and y must be integers. Find x+y.

10. A right triangle has legs length 15 and 36. What's the circumference of the circle inscribed around the triangle?

11. If a number n is less than 100 and leaves remainder 1 when divided by 3 and remainder 4 when divided by 5, how many numbers can n possibly be?

12. Angular velocity is the number of degrees an object rotates in a given amount of time. If the angular velocity of a ball with a radius of 2 meters is 70 degrees per second, how far does it roll in 10 seconds? Express your answer in terms of pi.

13. How many solutions are there to the system $9x^2 + 16y^2 = 144$ and $(x+2)^2 - y^2 = 4$?

14. ABCDEF is a regular hexagon. AC has length 6. Find the area of the hexagon.

15. At KFC, you have any choice of 4 meals. However, you don't want to have the same meal consecutively for 2 days in a row, and on Fridays you have to eat the Boneless Chicken meal. How many possible combinations of meals can you eat from Monday - Sunday?

16. Three circles of radius 6 are all externally tangent to each other and internally tangent to the larger circle as shown. Find the positive difference between the areas of the two shaded parts.
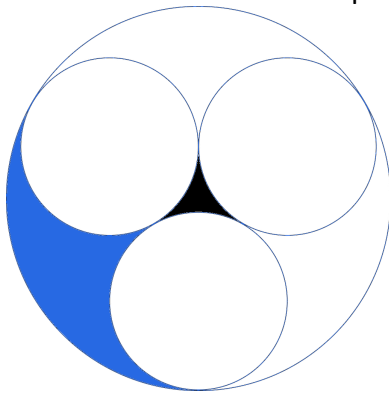
17. Find the sum of the coefficients of the polynomial $(69x^2 - 82x + 15)^5$.

18. A number is strictly decreasing if each digit is strictly less than the digit to its left. For example, 53, 6, and 962 are strictly decreasing, whereas 562, 22, and 331 are not. How many positive integers less than 1000 are strictly decreasing?

19. What is the formula for the lowest degree polynomial that passes through (-1, 13), (0,6), (1, 3), and (2,4)?

20. A rectangle with vertices at (2,5), (7,5), (7,8) and (2,8) is revolved around the line y=5 to obtain a cylinder. What is the volume of the cylinder?

21. A set of five non-negative integers has a mean of 5, a median of 6 and a mode of 7. What is the smallest possible member of the set?

22. Let P equal the sum of the measures of the interior angles of a convex polygon of n+4 sides. Let Q equal the sum of the measures of the interior angles of a convex polygon of n-4 sides. If n is an integer greater than 6 what is the value of P-Q, in degrees?

23. Triangle ABC has an area of 175 square units. Points D lies on side AB such that AD: DB=4:3. What is the area, in square units, of triangle ACD?

24. How many integers from 1 to 1000, inclusive, are divisible by neither 2 nor 5?

25. Point P is outside of circle O. Line segments PA and PB are tangent to circle O at points A and B, respectively. If angle P measures 60 degrees, what fraction of the circumference of circle O is the minor arc AB?

26. In triangle ABC, the vertices are located at A(0,4), B(12,0) and C(-4,0). What are the coordinates of the point where the perpendicular bisectors of the sides of the triangle intersect each other?

27. A rhombus has side of length 60 units each and the lengths of its perpendicular diagonals are in the ratio of 2 to 1. What is the area of the rhombus, in square units?

28. What is the area of the region enclosed by the lines y=(1/3) x -10,   y=(-7/6) x-10 and y=4?

29. If a+b+c=17 and ab+bc+ac=86, what is the value of $a^2 + b^2 + c^2$

30. In how many distinguishable orders can three identical blue, four identical red and five identical green marbles be arranged in a row?

31. Four couples are at a party. Four people of the eight are randomly selected to win a prize. No person can win more than one prize. What is the probability that both members of at least one couple win a prize?

32. A particular right pyramid has a square base, and each edge of the pyramid is four inches long. What is the volume of the pyramid? (Express as a decimal to the nearest hundredth)

33. Ben places 42 bricks per hour. Bob places 36 bricks per hour. Bob worked twice as many hours as Ben, and the two of them placed a total of 1254 bricks. How many bricks did Ben place?

34. AC is the diameter of the circle. If the measure of arc BC is 60 degree, AC is perpendicular to BE and BE=12 units, what is the length of AB?

35. A circular garden is placed inside a rectangular patio that measures 20 feet by 14 feet. The circular garden is tangent to three sides of the rectangular patio. What percent of the patio is outside of the garden? Express to the nearest whole number?

36. A bag contains five red marbles, three blue marbles and two green marbles. If six marbles are drawn without replacement from the bag, what is the probability that two marbles of each color are drawn?

37. For how many integer values of x is the following inequality -5 ≤ 2x-7 ≤ 21 true?

38. In regular octagon ABCDEFGH, what is the ratio of the area of triangle ADF to the area of triangle AHF? Express your answer as a decimal to the nearest hundredth.

39. Four children (Alice, Brad, Cathy and Dan) are arranged in a line. If Brad and Cathy cannot be next to each other, in how many ways can the four children be arranged?

40. Two red, two yellow and two green faces, all unit squares, are available for building a cube. How many distinct cubes can be built?

The End