Gauss School and Gauss Math Circle

2019 Gauss Math Tournament

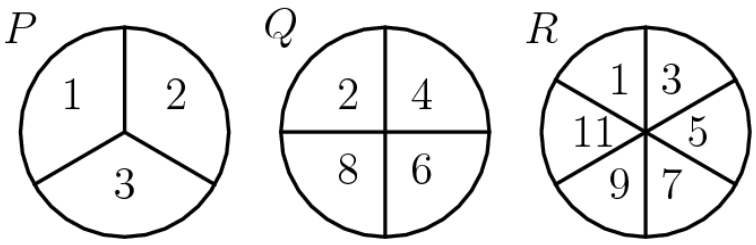
Grade 3-4 (Sprint Round 50 minutes, 40 Questions)

1. How many factors (divisors) does the number 12 have?
2. If x+y=s, what is s if x is 1 and y is 1?
3. If I add 3 to Douglas's favorite number then divide by 2, I will get 17. What is Douglas favorite number?
4. Everyday Susan can solve at most 12 math problems. How many days would it take for Susan to solve 130 problems?
5. John, the baptist, has 12 disciples. How many ways can he give a magical stone to exactly two of his disciples, given that magical stones are different?
6. For what value of x is $\frac{12x^3}{6x^2} = 24$?
7. In Kelly's barn, there are horses and chickens, each horse has 4 legs when a chicken has 2 legs. Given that there are 17 heads and 36 legs in his barn, how many chicken are there?
8. Simon has two types of candy. He has 5 jelly beans and 3 candy canes. What is the probability that if Simon randomly selects two pieces of candy without replacement that he will get a jelly bean and a candy cane.
9. What is the maximum number of 1x1x2 blocks that can completely fit inside a 3x4x4 box?
10. Carla starts mowing lawns at 8am and does not take any breaks. If she can mow one lawn in 1.5 hours, what time will it be when she finishes mowing the 5th lawn?
11. What is the area of the largest circle that can completely fit inside a 1 by 1 square?
12. How many cents total is 14 quarters, 5 dimes, and 3 cents?

13. At the ice cream store, there are 4 flavors and 5 toppings. If Julia wants to get a cone with two scoops of different flavors plus one topping, how many possible distinct cones can she purchase?
14. What is the next number in this sequence: 3, 6, 10, 15, … ?
15. Jake rolls two fair six-sided dice. What is the probability that both dice show odd numbers?
16. Anna cuts a flat pizza 5 times. What is the maximum number of pieces of pizza that she can end up with?
17. There is a 30% chance of raining today, a 40% chance of raining tomorrow, and a 50% chance of raining the day after tomorrow. What is the probability that there is at least one sunny day among one of these three days?
18. Alice can run at 5 miles per hour, while Ellen can run at 6 miles per hour. They are running a 1 mile race. In minutes, what is the difference in the time they each take to finish the race?
19. Ms. Smith is trying to make a seating arrangement for her class. If she arranges them in rows of 7, there are 2 students left over. If she arranges them in rows of 5, there are 3 students left over. Ms. Smith has less than 35 students in her class. How many students are in her class?
20. A rhombus has side lengths of 2cm, and all the angles measure 60 or 120 degrees. What is the area of the largest circle that can completely fit inside this rhombus?
21. Steve has 20 dollars in total. He wishes to buy pencils and erasers, and he wishes to buy at least one of each. Pencils cost $1 each, and erasers cost $2 each. If he spends all of his 20 dollars, what is the maximum amount of *objects* he can buy?
22. Mark wants to plan out his desserts for Monday through Friday of next week (he eats 1 dessert per day). He has unlimited supplies of cake, ice cream, and brownies in his house. However, he does not wish to have the same dessert two days in a row. How many possible dessert plans can he come up with?

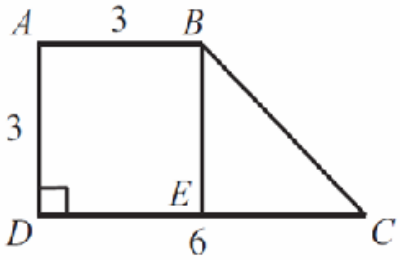
23. Jacob is playing a coin flipping game. He repeatedly flips a coin until it shows heads, at which point he stops. What is the probability that he stops after exactly 4 flips?
24. Sara has a container shaped like a cone. It has a radius of 10cm and a height of 10cm. The container contains 10 cubic centimeters of water. If Sara holds the cone such that the point of the cone is pointing downwards, what is the height of the water in the container?
25. What is the smaller angle between the hands of a clock at 5:20?
26. A *palindrome* is a number that reads the same left to right and right to left. How many 3-digit palindromes begin with the digit 9?
27. Find the smallest positive perfect square that is divisible by 27.
28. Find the smallest positive integer that is both a perfect square and perfect cube.
29. Bob lives at (0,0) on the coordinate grid, and his school is located at (2,2). If he can only walk along grid lines, and if he can only walk to the right or upwards, how many possible routes can he take to get to school?
30. What fraction of 5 days is 3 hours?
31. What is the sum of the first 20 odd numbers?
32. How many ways can 22 cents be made using dimes, nickels and pennies?
33. How many two-digit numbers have sum of digits 10?
34. Susan has two outfits. Everyday she chooses one to put on. How many different ways can she choose from these two outfits for 5 days, if she can not wear the same outfit on all 5 days.
35. In Susan's world there are 3 types of currency: DougNi, SuzyNi, and FredNi. 5 DougNi is worth 13 SuzyNi. 5 SuzyNi is worth 8 FredNi. How much FredNi is 25 DougNi?

36. What is the probability of rolling an even sum given that you roll spinner P, Q and R?



37. What is the largest prime factor of $44^2 - 1$?

38. ABED is a square with length 3. Segment DC as length 6. What is the area of this quadrilateral ABCD?



39. In the Gauss Math Academy there are 50 students. Students can like math, computer science, both or neither. Given that 44 students like math, 24 students like computer science and 2 people like neither. How many students like both?

40. What is the greatest power of two that divides 1+2+4+8+16+32+64+128+256+512+1024+2048+4096+8192-1?

End of Sprint Round

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Grade 3-4 (Target Round 20 minutes, 8 Questions)

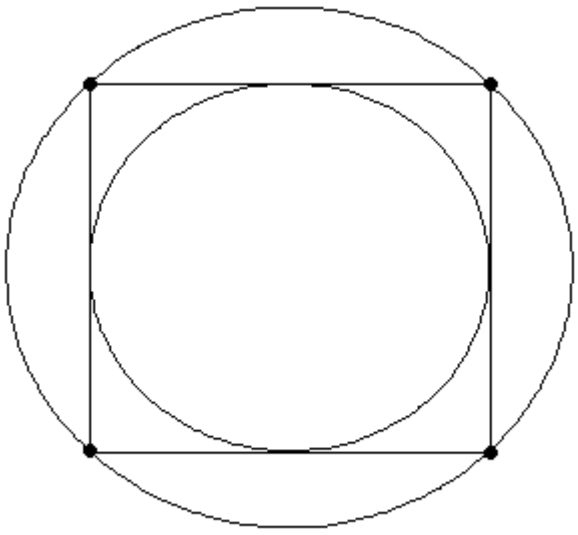
1. A fair coin is flipped 7 times. What is the probability that there are more heads than tails?

2. A small circle has a radius 1 cm and is put onto a dartboard of circle with radius 2 cm without any parts sticking out. If Andrew can hit the dartboard every time, what is the probability that Andrew hits the small circle?

3. What is the least number that is a palindrome (read same backwards as forward, e.g. 121, 12321, 151) and divisible by 6?

4. What is the area of a square with side lengths parallel to the y and x axis that has vertices on coordinate (5,2) and (8,5)?

5. If the area of the outer circle is 100π,what is the area of the inner circle?



6. If $x^2 - y^2 = 36$and $x + y = 9$,what is $x^2 + y^2$?

7. Andy and Simon alternatingly take turns annoying Greg with Simon going first. If Greg's limit to getting mad is 1 to 5 annoyances inclusive with equal chance, what is the probability that after Simon annoys him, Greg gets mad?

8. What is $5/2 + 5/4 + 5/8 + 5/16 + 5/32 + \cdots$?

End of Target Round

Answer Key:

Sprint (Morning Round):

1. 6
2. 2
3. 31
4. 11
5. 66
6. 12
7. 16
8. 15/28
9. 24
10. 3:30pm
11. pi/4
12. 403
13. 30
14. 21
15. ¼
16. 16
17. 0.94
18. 2
19. 23
20. 3pi/4
21. 19
22. 48
23. 1/16
24. $(10/pi)^{⅓}$
25. 40
26. 10
27. 81
28. 64

29. 6
30. 1/40
31. 400
32. 9
33. 9
34. 30
35. 104
36. ⅔
37. 43
38. 13.5
39. 20
40. 2

Target (Morning Round):

1. ½
2. ¼
3. 6
4. 9
5. 50π
6. 97/2
7. ⅗
8. 5