

Gauss School and Gauss Math Circle
2019 Gauss Math Tournament
Grade 5-6 (Gut Round 60 minutes, 7 Rounds each with 3 Problems)

Round 1 (3 Points)

1.1 A bucket is $\frac{1}{2}$ full of water. After the addition of 6 gallons of water, it is $\frac{3}{5}$ full. How many gallons does it contain when it is $\frac{1}{3}$ full?

1.2 A bag contains three blue marbles and four red marbles. What is the probability that two marbles taken out at the same time will both be red?

1.3 What is the smallest positive integer k such that the sum of divisors of k is strictly greater than $2k$?

Name _____

1.1. _____

1.2. _____

1.3. _____

Gauss School and Gauss Math Circle

2019 Gauss Math Tournament

Grade 5-6 (Gut Round 60 minutes, 7 Rounds each with 3 Problems)

Round 2 (4 Points):

2.1 In how many ways can five kids form a line if two of them refuse to be next to each other?

2.2 On day 1, Jillian eats four candies. Each day after the first, she eats three times as many candies as the previous day. At the end of what day will the total amount of candies she has eaten be greater than 1,000?

2.3 Donald's dresser contains three pairs of socks. If he blindly grabs three socks, what is the probability that he grabs two socks that are a pair?

Name _____

2.1. _____

2.2. _____

2.3. _____

Gauss School and Gauss Math Circle
2019 Gauss Math Tournament
Grade 5-6 (Gut Round 60 minutes, 7 Rounds each with 3 Problems)

Round 3 (6 Points)

3.1 How many real roots are there of $x^5 - 2x^4 - 3x^3 + 2x^2 - 10x + 12 = 0$?

3.2 If 10 people, including Ronnie and Bonnie, are in a race, what is the probability that Ronnie places exactly 3 places ahead of Bonnie? For example, Ronnie could place 2nd and Bonnie could 5th. Assume there are no ties.

3.3 In a pyramid ABCD, all the sides are equilateral triangles. If $AB=1$, what is the volume of the pyramid?

Name _____

3.1. _____

3.2. _____

3.3. _____

Gauss School and Gauss Math Circle
2019 Gauss Math Tournament
Grade 5-6 (Gut Round 60 minutes, 7 Rounds each with 3 Problems)

Round 4 (7 Points)

4.1 Rectangle PAUL has area 120. D is the midpoint of PA. Points E and F trisect AU with E closer to A. What is the area of pentagon PLUFD?

4.2 What is the smallest integer greater than 200 that has at least 20 divisors?

4.3 A rectangular prism has sides with surface areas 10, 15, and 24. What is the volume of the prism?

Name _____

4.1. _____

4.2. _____

4.3. _____

Gauss School and Gauss Math Circle
2019 Gauss Math Tournament
Grade 5-6 (Gut Round 60 minutes, 7 Rounds each with 3 Problems)

Round 5 (8 Points):

5.1 If three points on a circle are randomly chosen, what is the probability that they are all contained within one semicircle?

5.2 Hector is at a party with six other people. If each person has a 50% chance to give him a handshake, what is the probability that the number of handshakes he gets is prime?

5.3 What is the largest solution to the equation $||x| - |3x-5|| = 1$?

Name _____

5.1. _____

5.2. _____

5.3. _____

Gauss School and Gauss Math Circle
2019 Gauss Math Tournament
Grade 5-6 (Gut Round 60 minutes, 7 Rounds each with 3 Problems)

Round 6 (10 Points):

6.1 If $x+y=10$ and $xy=20$, what is x^3+y^3 ?

6.2 What is the sum of all four digit palindromes?

6.3 What is the greatest possible value of 3^{-x^2+4x} ?

Name _____

6.1. _____

6.2. _____

6.3. _____

Gauss School and Gauss Math Circle
2019 Gauss Math Tournament
Grade 5-6 (Gut Round 60 minutes, 7 Rounds each with 3 Problems)

Round 7 (12 Points)

7.1 1000027 has one 3-digit prime factor. What is this factor?

7.2 How many numbers between 1 and 2019 are divisible by exactly two of the three smallest prime numbers?

7.3 Tangent circles A and B both have radius 4. What is the probability that a randomly chosen point on circle B is within 43 units of the center of A?

Name _____

7.1. _____

7.2. _____

7.3. _____

Gut Round Answers:

Guts

20	$\frac{2}{7}$	12
72	6	$\frac{3}{5}$
3	$\frac{7}{90}$	$\sqrt{2}/12$
100	240	60
$\frac{3}{4}$	$\frac{41}{64}$	3
400	495000	27
103	470	$\frac{1}{3}$