Grade 7/8 Math Circles
February 26-29, 2024
Gauss Contest Prep

What is the Gauss Math Contest?

The Gauss Contests introduce students in Grades 7 and 8 to a broader perspective of mathematics in a fun, accessible way. Intriguing problems and a multiple-choice format make the Gauss Contests a wonderful opportunity for all students in these grades to grow their interest in and get curious about the power of math. Students below grade 7 can also write either exam.

How is it formatted?

It is **25 multiple choice** questions and covers a range of topics from probability to geometry; it is not focused on one topic, so each question is often much different form the last!

The questions focus less on content, and more on problem solving/logical thinking!

The contest is divided into three parts: Part A, B, and C. Part A (10 questions) has simpler questions that can be thought of more as a "warm up". Part B (10 questions) is medium difficulty with a bit more thinking and calculation involved. Part C (5 questions) will have fewer questions than parts A & B, but the questions will typically be the most difficult and require deep thinking and problem solving skills. The questions in each section get progressively more difficult, on average. In summary:

Fees

- $5.00 per participant

Format

- Number of questions: 25 multiple-choice questions split into parts A, B & C

- Duration: 60 minutes

- Score: 50 points for Part A, 60 points for Part B, 40 points for Part C (150 points total)

- Contest delivery: paper or online

Recognition

- A Certificate of Participation is provided for each participant.

- A Certificate of Distinction is provided for each participant scoring in the top 25% of all participants within their own school, for schools with at least 4 participating students.

- A Certificate of Outstanding Achievement is provided to the highest achieving participant in their school on each of the Grade 7 and 8 Contests, for schools with at least 10 participating students.

- The names of some of the top-scoring participants among all those writing the contests are posted online.

Note

There is a Grade 7 Gauss contest and a Grade 8 Gauss contest. Although they might share some questions, they are different contests. If you are in grade 7 or lower, you may choose to write either one of Gauss 7 or Gauss 8. If you are in grade 8, you **cannot** write Gauss 7.

Note

At the time of the contest, you will be given a package which contains BOTH Gauss 7 and Gauss 8. One side of the package will be Gauss 7 and the reverse side of the package will be Gauss 8. Please make sure to check that you are writing the correct one.

Standard calculating devices are allowed if they do not have internet access and are non-programmable.

How to get the most marks possible

Below is the mark breakdown in order of points awarded for each question:

1. A correct answer for Part C (**8 marks each**)

2. A correct answer for Part B (**6 marks each**)

3. A correct answer for Part A (**5 marks each**)

4. An unanswered question (**2 marks**) up to 10 questions

5. An incorrect answer for any parts (**0 marks**)

If you know the correct answer, select it!

- **Fort Part A**, a question is worth 5 marks. If you are choosing between 2 options, your probability of getting it right is $\frac{1}{2}$ and $\frac{1}{2} \times 5 = 2.5 > 2$. This means you can expect to get an average of 2.5 marks if you guess, so it would be a good idea to guess. If you are choosing between 3 options, you can expect to get $\frac{1}{3} \times 5 \simeq 1.7$ marks. This is less marks than the 2 you would get for not answering, so in this case you should not guess (leave it blank). Similarly, if you are choosing between 4 or 5 options, you should leave the question blank to earn the most expected number of marks.

- **For Part B**, if you are choosing between 4 or 5 options, you are better to leave it blank. If you are choosing between 3 options, you can expect to get an average of $\frac{1}{3} \times 6 = 2$ marks, so you can either guess or leave it blank. If you are choosing between 2 options, it is better to guess.

- **For Part C**, if you are choosing between all 5 options, it is better to leave it blank. If you are choosing between 4 options, either guess or leave it blank. If you are choosing between 2 or 3 options, it is better to guess.

Do not forget to count the number of unanswered questions, since only up to 10 unanswered questions would gain you marks! The rest are counted as an incorrect answer (0 marks).

Problem Solving Strategies

Some useful strategies when writing Gauss Contests:

1. **Use the information given.** When you're given information, that's a hint at what you will probably need to solve the problem! You will need to choose where and when to use it, but keep it in the back of your mind when you are thinking of solutions. Question A4.

2. **Work from the 5 possible answers.** Remember, 1 out of 5 possible answers must be correct. You can look at the possible answers first, and rule out the ones that cannot be the correct answer. Once you narrow down the potential answers, continue solving the problem. Question A1.

3. **Use diagrams!** Remember, diagrams are not drawn to scale, so drawing your own diagram sometimes helps. If the question does not provide a diagram, draw your own! Incorporating some information provided in the question on the diagram will be crucial to problem solving. For example, if they provide a length, indicate that on your diagram. No one will be judging your diagrams, so draw them however they help you visualize the problem best. Question A2.

4. **Look for patterns.** If you are asked to find the 2024$^{\text{th}}$ number in a sequence, you are NOT expected to write down all numbers that come before. Always look for patterns and think about ways to apply that pattern to find your answer.

5. **Trial and error.** You may not be sure about what to select as an answer. Since you are given 5 possible answers, you can always try them one by one and find the one that makes the most sense. Remember, there is no penalty for an incorrect answer. Question B1.

Past Contest Problems

Part A

1. The smallest number in the list $\{1.0101, 1.0011, 1.0110, 1.1001, 1.1100\}$ is

   (A) 1.1100   (B) 1.0110   (C) 1.0101   (D) 1.1001   (E) 1.0011

2. Keegan paddled the first 12 km of his 36 km kayak trip before lunch. What fraction of his overall trip remains to be completed after lunch?

   (A) $\frac{1}{3}$ (B) $\frac{5}{6}$ (C) $\frac{3}{4}$ (D) $\frac{2}{3}$ (E) $\frac{3}{5}$

3. In the triangle shown, the value of x is
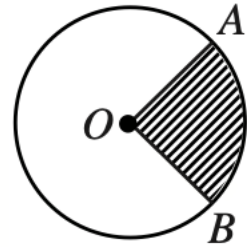
   (A) 30   (B) 45   (C) 60   (D) 90   (E) 55
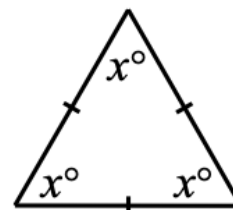
4. The number of faces (F), vertices (V) and edges (E) of a polyhedron are related by the equation $F + V - E = 2$. If a polyhedron has 6 faces and 8 vertices, how many edges does it have?

(A) 12 (B) 14 (C) 16 (D) 18 (E) 10

5. In the circle with centre O, the shaded sector represents 20% of the area of the circle. What is the size of angle AOB?

(A) 36° (B) 72° (C) 90° (D) 80° (E) 70°

Part B

1. Which of the following numbers is an odd integer, contains the digit 5, is divisible by 3, and lies between 12^2 and 13^2?

(A) 105 (B) 147 (C) 156 (D) 165 (E) 175

2. The area of the figure on the right, in square units, is
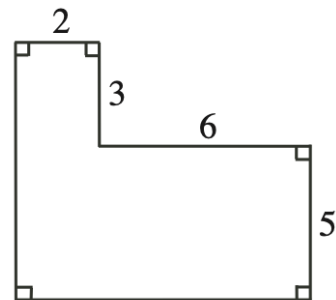
(A) 36 (B) 64 (C) 46 (D) 58 (E) 32

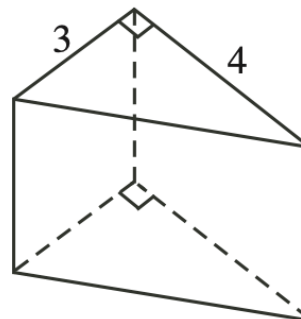3. If the mean (average) of five consecutive integers is 21, the smallest of the five integers is

(A) 17 (B) 21 (C) 1 (D) 18 (E) 19

Part C

1. A triangular prism has a volume of 120 cm³. Two edges of the triangular faces measure 3 cm and 4 cm, as shown. The height of the prism, in cm, is

   (A) 12   (B) 20   (C) 10   (D) 16   (E) 8

2. The values 2, 3, 4, and 5 are each assigned to exactly one of the letters V, W, X, and Y to give $Y^X - W^V$ the greatest possible value. The value of $X + V$ is equal to

   (A) 5   (B) 6   (C) 7   (D) 8   (E) 9

3. Pete is given three *positive* integers and is told to add the first two, and then multiply the result by the third. Instead, he multiplies the first two and adds the third to that result. Surprisingly, he still gets the correct answer of 14. How many different values could the first number have been?

   (A) 5   (B) 4   (C) 6   (D) 3   (E) 7