UNIVERSITY OF WATERLOO
University of Waterloo
Faculty of Mathematics

Centre for Education in
Mathematics and Computing

Grade 7/8 Math Circles
March 28, 2012
Gauss Contest Preparation

What is the Gauss Contest?

The Gauss contest is an opportunity for grade 7/8 students to have fun and challenge their mathematical problem solving skills.

Dates: Wednesday May 16, 2012
Registration deadline: Thursday April 19, 2012

Format:

25 multiple choice questions
60 minutes
150 total marks
- 10 questions in part A worth 5 marks for each correct response
- 10 questions in part B worth 6 marks for each correct response
- 5 questions in part C worth 8 marks for each correct response
- Each unanswered question is worth 2 marks, to a maximum of 10 unanswered questions

How to prepare:

- Practice, *practice*, **PRACTICE!**
- Try the past contests that are posted on the CEMC website
- Focus on the higher numbered problems
- Learn from the posted solutions
- Enjoy problem solving!

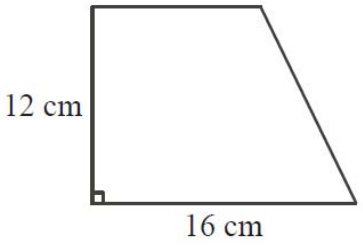
Problem Solving Strategies:

- Read and re-read the problem
- Highlight or underline the important information
- Write out what you know
- Draw a chart or diagram of the situation
- If you get stuck, move on and come back if you have time
- Process of elimination

Sample Problems:

Gauss Grade 8, 2011 - #23

1. The trapezoid shown has a height of length 12 cm, a base of length 16 cm, and an area of 162 cm^2. The perimeter of the trapezoid is:
   a) 51 cm b) 52 cm c) $49.\bar{6}$ cm d) 50 cm e) 56 cm



Gauss Grade 8, 2009 - #18

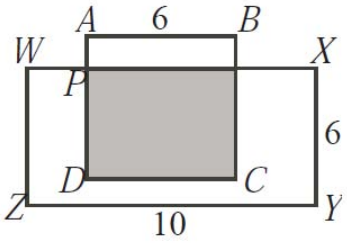
2. In a class of 40 students, 18 said they liked apple pie, 15 said they liked chocolate cake and 12 said they did not like either. How many students in the class liked both?
   a) 15 b) 10 c) 3 d) 7 e) 5

Gauss Grade 8, 2003 - #20

3. The letters G, A, U, S, and S are written on five tiles, one letter per tile. If Amy selects two tiles at random, what is the probability she gets two Ss?
   a) $\frac{3}{5}$ b) $\frac{2}{5}$ c) $\frac{1}{8}$ d) $\frac{1}{10}$ e) $\frac{1}{20}$

Gauss Grade 8, 2007 - #21

4. In the diagram, ABCD is a square with side length 6, and WXYZ is a rectangle with ZY = 10 and XY = 6. Also, AD and WX are perpendicular. If the shaded area is equal to half of the area of WXYZ, the length of AP is:
   a) 1 b) 1.5 c) 4 d) 2 e) 2.5



Gauss Grade 8, 1999 - #24

5. Raymondes financial institution publishes a list of service charges as shown in the table. For her first twenty five transactions, she uses Autodebit three times as often as she writes cheques. She also writes as many cheques as she makes cash withdrawals. After her twenty-fifth transaction, she begins to make single transactions. What is the smallest number of transactions she needs to make so that her monthly service charges will exceed the $15.95 all-in-one fee?
   a) 29 b) 30 c) 27 d) 28 e) 31

	Service Fee per Item
Cheque	$0.50
Autodebit	$0.60
Cash Withdrawal	$0.45

'All-in-one' fee is $15.95

Gauss Grade 8, 2000 - #25

6. The cookies in a jar contain a total of 1000 chocolate chips. All but one of these cookies contains the same number of chips; it contains one more chip than the others. The number of cookies in the jar is between one dozen and three dozen. What is the sum of the number of cookies in the jar and the number of chips in the cookie with the extra chocolate chip?
   a) 65 b) 64 c) 63 d) 67 e) 66

Problem Set:

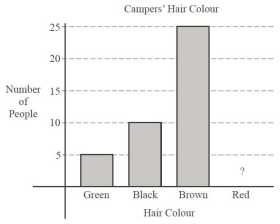
1. Evaluate each of the following:
   a) $5-[2-(1-3)]$ b) $12+6\div 3\times 2-1$ c) $5\times 10^5+5\times 10^3+5\times 10^2+5$
   d) $0.8-0.07$ e) $\frac{0.02}{0.8}$ f) $\frac{x-y}{x+y}$ when x=20 and y=12

2. Arrange the numbers $\frac{4}{5}, 81\%, 0.801, \frac{82}{100}, 0.811$ from smallest to largest.

3. Which of the following is the largest?
   a) $\frac{4}{2-\frac{1}{4}}$ b) $\frac{4}{2+\frac{1}{4}}$ c) $\frac{4}{2-\frac{1}{3}}$ d) $\frac{4}{2+\frac{1}{3}}$ e) $\frac{4}{2-\frac{1}{2}}$

4. If P=3 and Q=6, which of the following expressions is **not** equal to an integer?
   a) $P+Q$ b) $P\times Q$ c) $Q\times P$ d) $\frac{P}{Q}$ e) $\frac{Q}{P}$

5. The bar graph shows the hair colours of the campers at Camp Gauss. The bar corresponding to redheads has been accidentally re-moved. If 50% of the campers have brown hair, how many of the campers have red hair?



6. Bob has a box that contains 3 red marbles, 6 blue marbles, 6 pink marbles, and 2 purple marbles. Bob then adds a number of black marbles and tells Jack that if he now draws a marble at random, the probability of it being red or blue is $\frac{3}{7}$. How many black marbles did Bob add?

7. A perfect number is an integer that is equal to the sum of all of its positive divisors, except itself. For example, 28 is a perfect number because $28 = 1+2+4+7+14$. Which of the following is a perfect number?
   a) 10 b) 13 c) 6 d) 8 e) 9

8. When Francis wrote the Gauss Contest, he averaged 1 minute per question on the 10 questions in part A, 2 minutes per question on the 10 questions in Part B, and 6 minutes on the 5 questions in part C. What is the average time that he spent on each question in the entire contest?

9. A 250 m train travels through a 2 km tunnel at 27 km/h. How long is it from the time the front of the train enters the tunnel, to when it completely leaves it?

10. A palindrome is a number which remains the same when its digits are written in reverse order. For example, 121 is a palindrome. A cars odometer reads 15951 km. What is the least number of kilometers required for the next palindrome to appear?

11. If $N = 2^5\times 3^2\times 7\times \square$ and 100 divides evenly into N, which of the following numbers could be placed in the box?
   a) 5 b) 20 c) 75 d) 36 e) 120

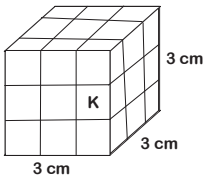
12. What is the value of $1+2-3-4+5+6-7-8+...+45+46-47-48+49$?

13. A rectangular sign that has dimensions 9 m by 16 m has a square advertisement painted on it. The border around the square is required to be at least 1.5 m wide. What is the area of the largest square advertisement that can be painted on the sign?

14. The difference between the radii of two circles is 10 cm. What is the difference, in cm, between their circumferences?

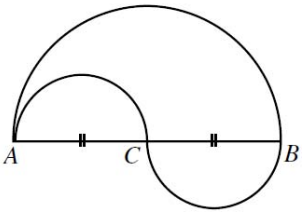
15. In a basketball shooting competition, each competitor shoots ten balls which are numbered 1 to 10. The number of points earned for each successful shot is equal to the number on the ball. If a competitor misses exactly two shots, which of the following scores is not possible?
a) 52 b) 44 c) 41 d) 38 e) 35

16. The figure shown is made up of 27 identical cubes. The cube marked K is removed. What is the effect that this has on the total surface area of the figure?



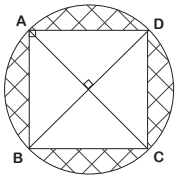
17. Peter is given three *positive* integers and is told to add the first two, and then multiply by the third. Instead, he multiplies the first two and adds the third to that result. Surprisingly, he still gets the correct answer of 14. How many different values could the first number have been?

18. In the diagram, $AC = CB = 10$ m, where AC and CB are each the diameter of the small equal semi-circles. The diameter of the larger semi-circle is AB. In traveling from A to B, it is possible to take one of two paths. One path goes along the semi-circular arc from A to B. A second path goes along the semi-circular arc from A to C and then along the semi-circular arc from C to B. What is the difference in the lengths of these two paths?



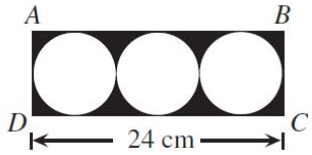
19. Chantelle had two candles, one of which was 32 cm longer than the other. She lit the longer candle at 3 p.m. and lit the shorter one at 7 p.m. At 9 p.m., they were both the same length. The longer one was completely burned out at 10 p.m. and the shorter one was completely burned out at midnight. The two candles burned at different, but constant, rates. What was the sum of the original lengths of the two candles?

20. In the diagram, $ABCD$ is a square. If diagonal $AC = 2$ cm, what is the area of the shaded part, in cm^2?



21. At present, the sum of the ages of a father and his son is 33 years. Find the smallest number of years until the father's age is 4 times the son's age.

22. In the diagram, $ABCD$ is a rectangle, and three circles are positioned as shown. What is the area of the shaded region, rounded to the nearest cm^2?



23. A sum of money is divided among Allan, Bill and Carol. Allan receives \$1 plus one third of what is left. Bill receives \$6 plus one third of what remains. Carol receives the rest, which amounts to \$40. How much did Bill receive?

24. In her backyard garden, Gabriella has 12 tomato plants in a row. As she walks along the row, she notices that each plant in the row has one more tomato than the plant before. If she counts 186 tomatoes in total, how many tomatoes are there on the last plant in the row?