UNIVERSITY OF WATERLOO
Faculty of Mathematics
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Centre for Education in
Mathematics and Computing

Grade 7/8 Math Circles

March 25/26, 2014

Gauss Contest Preparation

General Information

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

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Date and Registration

Registration Date: April 23, 2014

Test Writing Date: May 14, 2014

Format and Marking Scheme

- 60 minutes
- 25 multiple choice questions
- 150 marks:
  - Part A: 10 questions - 5 marks each
  - Part B: 10 questions - 6 marks each
  - Part C: 5 questions - 8 marks each
  - Unanswered Questions: 2 marks each (for up to 10 questions)

Contest Success Strategies

- **ELIMINATE** - choices that aren't sensible answers, making it easier to guess
- **DRAW** - diagrams representing your scenario to help clear up misconceptions
- **MOVE ON** - from questions you are stuck on to get as many marks as possible
- **FOCUS** - on Part B and Part C questions as Part A shouldn't pose a challenge
- **PRACTICE** - by studying from the contest bank on the CEMC website
- **LEARN** - techniques and short-cuts from past contest solutions

Mock Gauss Contest

Note that these are a combination of questions from the Grade 7 and Grade 8 Gauss contests. Although the grades are listed for reference, all questions are applicable for both grades.

Part A - 5 marks each

1. **Gauss Grade 8, 2011 (#3)**

   The number 0.2012 is between

   (A) 0 and $\frac{1}{10}$ **(B)** $\frac{1}{10}$ and $\frac{1}{5}$ **(C)** $\frac{1}{5}$ and $\frac{1}{4}$ **(D)** $\frac{1}{4}$ and $\frac{1}{3}$ **(E)** $\frac{1}{3}$ and $\frac{1}{2}$

2. **Gauss Grade 8, 2013 (#3)**

   The smallest number in the set $\left\{\frac{1}{2}, \frac{2}{3}, \frac{1}{4}, \frac{5}{6}, \frac{7}{12}\right\}$ is

   (A) $\frac{1}{2}$ **(B)** $\frac{2}{3}$ **(C)** $\frac{1}{4}$ **(D)** $\frac{5}{6}$ **(E)** $\frac{7}{12}$

3. **Gauss Grade 7, 2011 (#10)**

   I bought a new plant for my garden. Anika said it was a red rose, Bill said it was a purple daisy, and Cathy said it was a red dahlia. Each person was correct in stating either the colour or type of plant. What was the plant that I bought?

   (A) purple dahlia **(B)** purple rose **(C)** red dahlia

   (D) yellow rose **(E)** red daisy

4. **Gauss Grade 7, 2013 (#10)**

   UVW and XYZ are each 3-digit integers. U, V, W, X, Y and Z are different digits chosen from the integers 1 to 9. What is the largest possible value for $UVW - XYZ$

   (A) 678 **(B)** 864 **(C)** 885 **(D)** 888 **(E)** 975

Part B - 6 marks each

5. **Gauss Grade 7, 2011 (#18)**

   Three pumpkins are weighed two at a time in all possible ways. The weights of the pairs of pumpkins are 12 kg, 13 kg and 15 kg. How much does the lightest pumpkin weigh?

   (A) 4 kg **(B)** 5 kg **(C)** 6 kg **(D)** 7 kg **(E)** 8 kg

6. **Gauss Grade 7, 2013 (#13)**

Jack, Kelly, Lan, Mihai and Nate are sitting in the 5 chairs around a circular table. Land and Mihai are sitting beside each other. Jack and Kelly are not sitting beside each other. the 2 people who are seated on either side of Nate are

(A) Jack and Lan **(B)** Jack and Kelly **(C)** Kelly and Mihai

(D) Lan and Mihai **(E)** Mihai and Jack

7. **Gauss Grade 7, 2013 (#19)**

A special six-sided die is rolled. The probability of rolling a number that is a multiple of three is $\frac{1}{2}$. The probability of rolling an even number is $\frac{1}{3}$. A possibility for the numbers on the die is

(A) 1,2,3,5,5,6 **(B)** 1,2,3,3,5,6 **(C)** 1,2,3,4,6,6

(D) 1,2,3,3,4,6 **(E)** 2,3,3,3,5,6

8. **Gauss Grade 7, 2008 (#18)**

Rishi got the following marks on four math tests: 71, 77, 80 and 87. He will write one more math test. Each test is worth the same amount and all marks are between 0 and 100. Which of the following is a possible average for his five math tests?

(A) 88 **(B)** 62 **(C)** 82 **(D)** 84 **(E)** 86

9. **Gauss Grade 7, 2012 (#19)**

A set of five different positive integers has a mean (average) of 20 and a median of 18. What is the greatest possible integer in the set?

(A) 60 **(B)** 26 **(C)** 46 **(D)** 12 **(E)** 61

10. **Gauss Grade 7, 2012 (#20)**

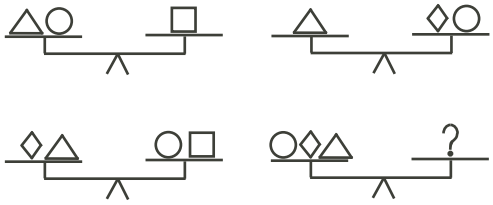
Chris lies on Fridays, Saturdays and Sundays, but he tells the truth on all other days. Mark lies on Tuesdays, Wednesdays and Thursdays, but he tells the truth on all other days. On what day of the week would they both say: "Tomorrow I will lie."?

(A) Monday **(B)** Thursday **(C)** Friday **(D)** Sunday **(E)** Tuesday

11. **Gauss Grade 7, 2012 (#18)**

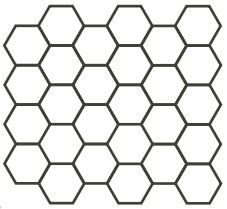
All four scales shown are balanced.
One possible replacement for the ? is

(A) △□ **(B)** ◇△ **(C)** ○□
(D) □◇ **(E)** △○



12. **Gauss Grade 8, 2013 (#19)**

Serena colours the hexagons on the tiling shown. If two hexagons share a side, she colours them with different colours. What is the least number of colours that she can use to colour all of the hexagons?



(A) 4 **(B)** 6 **(C)** 7 **(D)** 2 **(E)** 3

Part C - 8 marks each

13. **Gauss Grade 7, 2012 (#23)**

The number N is the product of all positive odd integers from 1 to 99 that do not end in the digit 5. That is, $N = 1 \times 3 \times 7 \times 9 \times 11 \times 13 \times 17 \times 19 \times ... \times 91 \times 93 \times 97 \times 99$. The unit digit of N is

(A) 1 **(B)** 3 **(C)** 5 **(D)** 7 **(E)** 9

14. **Gauss Grade 7, 2011 (#22)**

A pool has a volume of 4000 L. Sheila starts filling the empty pool with water at a rate of 20 L/min. The pool springs a leak after 20 minutes and water leaks out at 2 L/min. Beginning from the time when Sheila starts filling the empty pool, how long does it take until the pool is completely full?

(A) 3 hours **(B)** 3 hours 40 minutes **(C)** 4 hours
(D) 4 hours 20 minutes **(E)** 3 hours 20 minutes

15. **Gauss Grade 7, 2013 (#21)**

In the addition showed, P and Q each represent single digits, and the sum is $1PP7$. What is $P + Q$?

(A) 9 **(B)** 12 **(C)** 14

(D) 15 **(E)** 13

$$\begin{array}{rr} & 77P \\ & 6QP \\ + & QQP \\ \hline & 1PP7 \end{array}$$

Problem Set

1. **Gauss Grade 7, 2008 (#11)**

   Chris bought two hockey sticks at the same price. He also bought a helmet for $ 25. if Chris spent $ 68 in total, how much did one hockey stick cost?

   (A) $ 9.00 **(B)** $ 18.00 **(C)** $ 21.50 **(D)** $ 43.00 **(E)** $ 41.50

2. **Gauss Grade 7, 2009 (#7)**

   On a map of Nunavut, a length of 1 centimetre measured on a map represents a real distance of 60 kilometres. What length on the map represents a real distance of 540 kilometres?

   (A) 9 cm **(B)** 90 cm **(C)** 0.09 cm **(D)** 0.11 cm **(E)** 5.4 cm

3. **Gauss Grade 7, 2011 (#13)**

   Five children had dinner. Chris ate more than Max. Brandon ate less than Kayla. Kayla ate less than Max but more than Tanya. Which child ate the second most?

   (A) Brandon **(B)** Chris **(C)** Kayla **(D)** Max **(E)** Tanya

4. **Gauss Grade 7, 2011 (#19)**

   The sum of four numbers is T. Suppose that each of the four numbers is now increased by 1. These four new numbers are added together and then the sum is tripled. What is the value of this final result.

   (A) $3T + 3$ **(B)** $3T + 4$ **(C)** $3T + 12$ **(D)** $T + 12$ **(E)** $12T$

5. **Gauss Grade 7, 2012 (#11)**

   The perimeter of a square is 36 cm. The area of the square in cm^2, is

   (A) 24 **(B)** 81 **(C)** 36 **(D)** 1296 **(E)** 324

6. **Gauss Grade 7, 2009 (#13)**

The product $60 \times 60 \times 24 \times 7$ equals

(A) the number of minutes in seven weeks

(B) the number of hours in sixty days

(C) the number of seconds in seven hours

(D) the number of seconds in one week

(E) the number of minutes in twenty-four weeks

7. **Gauss Grade 7, 2010 (#16)**

In a magic square, all rows, columns, and diagonals have the same sum. The magic square shown uses each of the integers from -6 to +2. What is the value of Y?

+1		Y
-4		
-3		-5

(A) -1 **(B)** 0 **(C)** -6
(D) +2 **(E)** -2

8. **Gauss Grade 7, 2011 (#16)**

A 51 cm rod is built from 5 cm rods and 2 cm rods. All of the 5 cm rods must come first, and are followed by the 2 cm rods. For example the rod could be made from seven 5 cm rods followed by eight 2 cm rods. How many ways are there to build the 51 cm rod?

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

9. *** Gauss Grade 7, 2010 (#19)**

If each of the four numbers 3, 4, 6 and 7 replaces a $\square$, what is the largest possible sum of the fractions shown?

$$\frac{\square}{\square} + \frac{\square}{\square}$$

(A) $\frac{19}{12}$ **(B)** $\frac{13}{7}$ **(C)** $\frac{5}{2}$
(D) $\frac{15}{4}$ **(E)** $\frac{23}{6}$

10. *** Gauss Grade 7, 2013 (#22)**

An *arithmetic sequence* is a sequence in which each term after the first is obtained by adding a constant to the previous term. For example, 2, 4, 6, 8 and 1, 4, 7, 10 are arithmetic sequences.

In the grid shown, the numbers in each row must form an arithmetic sequence and the numbers in each column must form an arithmetic sequence. The value of x is

1			
4			25
7			x
10		36	

(A) 37 **(B)** 28 **(C)** 36

(D) 43.75 **(E)** 46

11. **** Gauss Grade 7, 2010 (#23)**

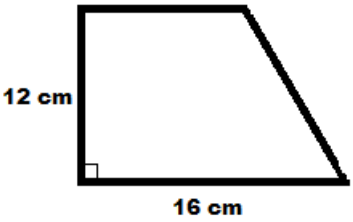
Molly assigns every letter of the alphabet a different whole number value. She finds the value of a word by *multiplying* the values of its letters together. For example, if D has a value of 10, and I has a value of 8, then the word DID has a value of $10 \times 8 \times 10 = 800$. The table shows the value of some words. What is the value of the word MATH?

Word	Value
TOTE	18
TEAM	168
MOM	49
HOME	70
MATH	?

(A) 19 **(B)** 840 **(C)** 420
(D) 190 **(E)** 84

12. **** Gauss Grade 8, 2011 (#23)**

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)** 49.6 cm
(D) 50 cm **(E)** 56 cm

13. ***** Gauss Grade 7, 2013 (#25)**

A box contains a total of 400 tickets that come in five colours: blue, green, red, yellow and orange. The ratio of blue to green to red tickets is 1 : 2 : 4. The ratio of green to yellow to orange tickets is 1 : 3 : 6. What is the smallest number of tickets that must be drawn to ensure that at least 50 tickets of one colour have been selected?

(A) 50 **(B)** 246 **(C)** 148 **(D)** 196 **(E)** 115