University of Waterloo
Faculty of Mathematics

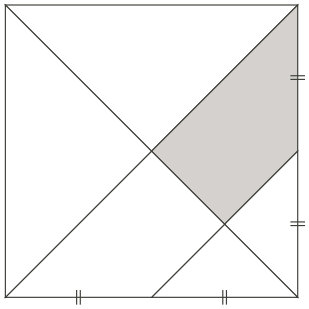
Centre for Education in
Mathematics and Computing

Grade 6 Math Circles
March 30, 2011
Jeopardy

Gauss Questions

1. The month of April, 2000, had five Sundays. Three of them fall on even numbered days. What day is the eighth day of that month?

2. A square is divided, as shown. What fraction of the area of the square is shaded?



3. In the square shown, the number in each row, column and diagonal multiply to give the same result. What is the sum of the missing numbers?

12	1	18
		4

4. Each of the integers 226 and 318 have digits whose product is 24. How many three-digit positive integers have digits whose product is 24?

5. In a softball league, after each team has played every other team 4 times, the total accumulated points are: Lions 22, Tigers 19, Mounties 14, and Royals 12. If each team received 3 points for a win, 1 point for a tie and no points for a loss, how many games ended in a tie?

Logic

1. Imagine that you have three crates, one containing oranges, one containing apples, and the third containing apples and oranges.

   The crates were originally labeled for their contents but someone has inadvertently switched the labels so that now every crate is incorrectly labeled!

   Without looking inside, you are allowed to take fruit at a time out of any hat that you wish, and by this process of sampling, you are to determine the contents of all three crates.

   What is the smallest number of drawings needed to do this?

2. In your basement are three light switches, all of them currently in the OFF position. Each switch controls one of three different lamps on the floor above. You would like to find out which light switch corresponds to which lamp.

   You may move turn on any of the switches any number of times, but you may only go upstairs to inspect the lamps just once.

   How can you determine the switch for each lamp with just one trip upstairs?

3. Kyle, Neal, and Grant were rounded up by their mother yesterday, because one of them was suspected of having grabbed a few too many cookies from the cookie jar. The three brothers made the following statements under very intensive questioning:

   * Kyle: I'm innocent.
   * Neal: I'm innocent.
   * Grant: Neal is the guilty one.

   If only one of these statements was true, who took the cookies?

4. You have two strings whose only known property is that when you light one end of either string it takes exactly one hour to burn. The rate at which the strings will burn is completely random and each string is different.

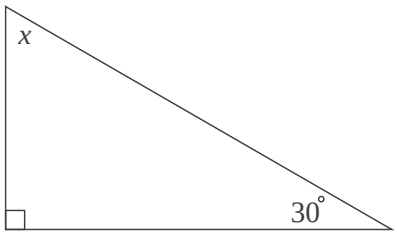
   How do you measure 45 minutes?

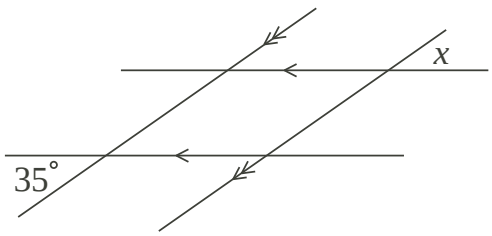
5. A king wants his daughter to marry the smartest of 3 extremely intelligent young princes. The princes are gathered into a room and seated, facing one another, and are shown 2 black hats and 3 white hats.

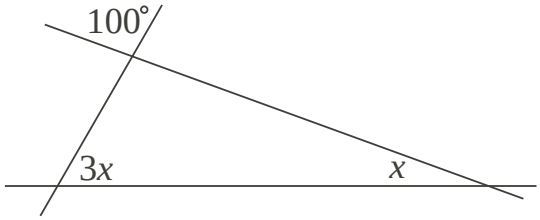
   They are blindfolded, and 1 hat is placed on each of their heads, with the remaining hats hidden in a different room. The king tells them that the first prince to deduce the color of his hat without removing it or looking at it will marry his daughter. The blindfolds are then removed.

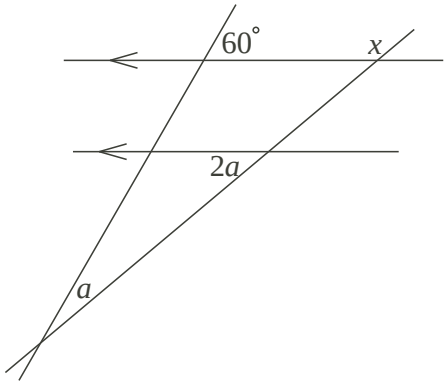
   You are one of the princes. You see 2 white hats on the other prince's heads. After some time you realize that the other prince's are unable to deduce the color of their hat, or are unwilling to guess. What color is your hat?

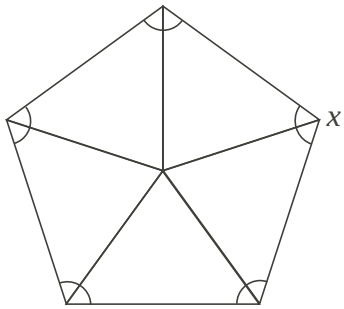
Angle Chasing

1. 

2. 

3. 

4. 

5. 

Arithmetic

1. $158 + 348 - 90$
2. $25 - 15 \times 20$
3. $45 + 58 \div [5 \div (27 - 12) \times 3]$
4. $\frac{7}{4} - \frac{2}{3} \times [3 \times 15 \div (17 - 14) + 6]$
5. $\{[3 \times 5 \times (3 + 6 \times 2) - 125] + 20\} \div \frac{35}{14}$

Spot the Pattern

1. $2, 5, 14, 41, \ldots$; what is the next term?
2. $1, 1, 3, 5, 8, 13, 21, \ldots$; what is the 10th term?
3. $2, -4, 8, -16, \ldots$; what is the 7th term?
4. $1, 3, 6, 10, 15, \ldots$; what is the 100th term?
5. $0001, 0010, 0011, 0100, 0101, 0110, 0111, 1000, \ldots$; which term in the pattern is 1101?

Final Jeopardy

1. Let x be the three-digit number with digits ABC and y be the three-digit number with digits CBA. The digits A and C are not 0. If $x - y = 495$, how many possibilities are there for x? **[Gauss8 2004 Q24]**
2. A large block, which has dimensions n by 11 by 10, is made up of a number of unit cubes and one 2 by 1 by 1 block. There are exactly 2362 positions in which the 2 by 1 by 1 block can be placed. What is the value of n? **[Gauss8 2004 Q25]**