Grade 6 Math Circles
April 4, 2012
Mathified Jeopardy

Arithmetic Tricks:

100 points: Multiply the following: $64 \times 52$

200 points: Multiply the following: $31472 \times 11$

300 points: Is $157696$ divisible by 11?

400 points: For what value(s) of $z$ is $62z$ divisible by 8?

500 points: For what values of $p$ and $r$ is $5p09r$ divisible by 3 and 4?

Math Puzzles:

100 points: What is a logic puzzle? Give 3 examples of different kinds of logic puzzles.

200 points: Jackson bought 7 t-shirts for $9.95 each. The cashier charged an additional $13.07 in sales tax. When he left the store, he had only $7.28 in his pocket. How much money did he start with?

300 points:

400 points: The magic square below contains each of the integers from 10 to 25. What is the magic constant? Fill in the rest of the magic square.

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 10  24  25
  23  
  22  19  13
  17   18
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500 points: Four children: Heather, Laura, Grace, and Natalia went to a carnival. At the end of the day, they took a picture together, each holding a different coloured balloon (one was orange). From the following clues, determine where each child stood in the picture, and which colour balloon they were holding.

- Laura stood two to the left of Natalia, who was holding a yellow balloon.
- The two girls on the ends were holding a blue balloon and a red balloon in some order.
- Heather was not standing on the far right side of the picture.
- Grace did not have a blue balloon.
**Number Theory:**

100 points: Determine the GCD and LCM of 15 and 24.

200 points: Determine the GCD and LCM of 48 and 52.

300 points: Determine the GCD and LCM of 15, 24, and 42.

400 points: A florist has 16 red flowers, and 24 white flowers. What is the largest number of identical bouquets that she can create without having any left over flowers? How many red and white flowers will be in each bouquet?

500 points: A science teacher wants to make science kits full of supplies. Lab coats come 4 to a box, test tubes come 27 to a box, and safety glasses 12 to a box. What is the least number of kits she can make if she wants all the kits to be identical, each kit having 1 of each material and have no supplies left over? How many boxes of each type of supplies should she buy?

**Geometry- Angles:**

100 points: State each of the properties for complementary angles, supplementary angles, and opposite angles.

200 points: Determine the values of $x$ and $y$.

300 points: A dodecagon is a 12 sided polygon. Determine the sum of interior angles of a regular dodecagon and the measure of each interior angle.

400 points: Determine the values of $x$ and $y$ in the diagram below.
500 points: Determine the values of $a$, $b$, $c$, and $d$ in the diagram below.

Probability of Games:

1. On a game of coin toss, the organizing party decides that if you land on head, then you get $1 back. Otherwise you get nothing back. It costs $1 to play a game. What is your expected gain?

2. From a deck of 52 cards (with no jokers), what is the probability that if you draw a random card, it’s NOT a face card?

3. A wheel is cut into 9 equal slices such that 1 slice is yellow, 1 slice is red and the rest green. I keep spinning until I get red or yellow. What is the probability that I spin exactly 3 times?

4. Claw cranes - the ones that you pay to grab a stuffed animal. The probability that I get an animal is 1 in 4 games. Each of the animal is worth, let’s say, $5. It costs me a Toonie to play a game. After playing 10 games, what is my total expected gain (loss)?

5. I have a spinning wheel cut into 9 equal slices, 1 red, 1 yellow, the rest green. I keep spinning until it lands on red or yellow, which I then stop (same spinning rule as the one in question 3). If I win $5 for spinning the wheel exactly 5 times, $3 for spinning the wheel exactly 3 times, and $1 for spinning the wheel exactly once, nothing otherwise, and the game costs me $2 to play each time. (A play is defined as spinning it until it lands on red or yellow, in which I stop spinning.) What is my expected gain? Is this game worth playing?

Geometry-Combined:

1. A trapezoid has top 5cm, bottom 10cm, and height 8cm. What is its area?

2. A right-angled triangle has hypotenuse 41, one of the sides 9, the length of its other side is $x + 10$. What is the value of $x$? (This question makes use of the Pythagorean Theorem)

3. Let $ABCD$ and $EFGH$ be squares. If points $E, F, G, H$ are the midpoints of $AB, BC, CD$ and $DA$ respectively, and the perimeter of square $EFGH$ is 24, what is the area of the shaded region?
4. What is the area of the shape outlined in black?

![Diagonal shape](image)

5. \(B\) is the center of the larger circle and \(C\) is the center of the smaller circle. \(A\) is a point on the larger circle such that \(\triangle ABC\) form a right-angled triangle, and the length of \(AC\) is 5. The bigger circle has area \(9\pi\). What is the ratio of the PERIMETER of bigger circle to the PERIMETER of the smaller circle?

![Circle with triangle](image)

**Final Jeopardy:**

You cannot see anything in a dark drawer. This drawer contains 7 pairs of red gloves and 9 pairs of white gloves. You pull out 1 glove at once. What is the minimum number of gloves you need to pull out to ensure that you have at least 1 pair of gloves (left and right hand) of the same colour?