

# Questions for Maths Fair

## Round One

- 1) The ages of James, Michael and Giles adds up to 66. Michael is half the sum of James' and Giles' ages and Giles is 4 years older than Michael. How old is James?
- 2) What is the smallest integer of  $x$  such that  $180x$  is a perfect cube?
- 3)  $\frac{24x^2+25x-47}{ax-2} = -8x - 3 - \frac{53}{ax-2}$  is true for all values of  $x \neq \frac{2}{a}$  where  $a$  is constant.  
What is the value of  $a$ ?
- 4) If  $4x - y = 8$  what is the value of  $\frac{16^x}{2^y}$ ?
- 5) An integer from 50 to 750 inclusive is to be chosen at random. What is the probability that the number chosen will have the digit 8 appear in it at least once?

## Round Two

- 1) In Giles tutorial class for probability for statistics, the students all arrived to the tutorial to find a collection of \$1 coins on the ground and decided to distribute it amongst themselves. They tried taking \$7 each but the last student received only \$5. When they tried taking \$6 each, \$21 was left over. How many students were there?
- 2) If  $x$ ,  $y$  and  $z$  are positive integers such that  $x + \frac{1}{y+\frac{1}{z}} = \frac{37}{16}$  then what does  $x + y + z$  equal?
- 3) Sally is at the cafeteria. If Sally runs from the cafeteria at 10 km/h she will reach her next class in 6 minutes. At what average speed in km/h, does Sally need to run from the cafeteria to get to the same class in 8 minutes?
- 4) A sequence is made up of the integers 1, 2, 2, 3, 3, 3, 4, 4, 4, 4, 5, 5, 5, 5, ...  
What is the 800<sup>th</sup> term in this sequence?
- 5) In the magical Boonland, Sir James made up his own secret maths language called Boonlang. If 168 is 'is maths is fun' and 'not maths never fun' is 43 what is the value of 'never maths not fun'?  
Hint: Look at the words as a unit of number i.e. four thirties three ones = 123

### Round Three

- 1) Ruwan likes to listen to on average 4 different songs each hour of the day. Assuming no repetitions and that the days are consecutive, how many different songs should we expect Ruwan to listen to between 6am Friday and 7pm Saturday?
- 2) What two digit number is twice the product of its digits?
- 3) Jingyi's super hydrating soda cans contain 80% water. To concentrate the soda, 75% of just the water is removed. What is the percentage of water in the now concentrated soda?
- 4) A car and a truck are on a freeway. The car is travelling at 110 km/h and the truck, which is 20 metres long is travelling at 100km/h. How many seconds does it take the car to travel from being in line with the back of the truck to being in line with the front of the truck?
- 5) Jingyi is dozing off in a lecture so she decides to look at the clock. It's 3:00pm and she notices that the angle between the hour hand and the minute hand on a clock is exactly 90 degrees. Ten minutes later she looks at the clock again, what is the acute angle between the hour and the minute hand now?

### Round Four:

- 1) For a MUMS event, Emma has packed 37 candy bars into bags of 3 or 4 so that all are contained in those bags. What is the maximum number of bags containing 4 candy bars?
- 2) In square units, how much area is enclosed in the figure whose boundary points satisfy  $|x| + |y| = 8$  ?
- 3) Dillon went sailing. There was a storm and Dillon needs to get back to his campsite. He lost his map but he remembers that the docks are exactly three kilometres south and two kilometres west from where he was a few moments ago. Unfortunately the wind has pushed Dillon 2 km west in that time. How far away is he from the docks?
- 4) Michael is hired to manually stamp the digits for the page numbers on a Calculus book that has well over a thousand pages. The ink for the stamps is enough to produce only 280 more digits. Assuming he starts from page 1, what is the last page that he will be able to finish numbering before the ink runs out?
- 5) What is the last digit of  $7^{2016}$  ?

Round Five

- 1)  $9^{2016} + 9^{2016} + 9^{2016}$  is equal to 3 to the power of what integer?
- 2) How many different ways can 3 children share 8 identical chocolates so that each child gets at least 1?
- 3) Michael rolls two standard die. What is the probability that the number rolled on the second die will be less than the number rolled on the first die?
- 4) If  $x = \sqrt{2 + \sqrt{2 + \sqrt{2 + \sqrt{2 + \dots}}}}$  then x is equal to the square root of what positive integer?
- 5) How many three digit positive integers are 13 times the sum of their digits?