**FMA Team Mathematics Competition - Zone**

**YEAR 13 – 2016**

Y13/1 What is the value of?

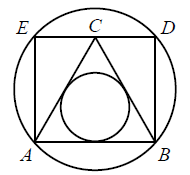
Y13/2 Five friends sat in a movie theater in a row containing $5$ seats, numbered $1$ to $5$ from left to right. (The directions "left" and "right" are from the point of view of the people as they sit in the seats.) During the movie Ada went to the lobby to get some popcorn. When she returned, she found that Bea had moved two seats to the right, Ceci had moved one seat to the left, and Dee and Edie had switched seats, leaving an end seat for Ada. In which seat had Ada been sitting before she got up?

Y13/3 For every dollar Ben spent on bagels, David spent $25$ cents less. Ben paid $$12.50$ more than David. How much did they spend in the bagel store together?

Y13/4  when simplified equals to?

Y13/5 The equation  and  have the same real solutions. What is the value of 

Y13/6 In the diagram, is equilateral and the radius of its inscribed circle is 1. A larger circle is drawn through the vertices of the rectangle What is the exact diameter of the larger circle?



Y13/7 A student performed an experiment by swinging a pendulum and recording the angle swung by the pendulum in successive swings. His record shows that in the first swing, the pendulum swung an angle of. It swung in the second swing, in the third swing and continues the pattern until it comes to rest. What is the total angle that the pendulum swung through before it comes to rest.

Y13/8 Find the area between  and  from  to 

Y13/9 The area of the circle that passes through the points and can be expressed as . What is the value of

Y13/10 A function, defined on the set of positive integers, is such that for all  and It is known that  and  What is the value of 

Y13/11 Shiu planned a 210km bike ride. However, he rode 5km per hour faster than he planned and finished his ride earlier than he planned. What is his average speed for the ride in km per hour?

Y13/12 A box contains two white socks, three blue socks and four grey socks. Tima knows that three of the socks have holes in, but does not know what colour these socks are. She takes one sock at a time from the box without looking. How many socks must she take for her to be certain she has a pair of socks of the same colour without holes?

Y13/13 Four problems were attempted by 100 contestants in a Mathematics competition. The first problem was solved by 90 contestants, the second by 85 contestants, the third by 80 contestants and the fourth by 75 contestants. What is the smallest possible number of contestants who solved all four problems?

Y13/14 On Old MacDonald's farm, the numbers of horses and cows are in the ratio 6:5, the numbers of pigs and sheep are in the ratio 4:3 and the numbers of cows and pigs are in the ratio 2:1. What is the smallest number of animals that can be on the farm?

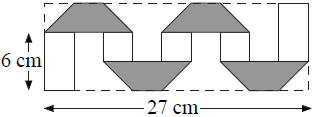
Y13/15 The integer is the mean of the three numbers 17, 23 and 2. What is the sum of the digits of ?

Y13/16 There are 2016 cows in a farm. Each of them is either grey or brown, and at least one of them is grey and at least one is brown. For every cow, we calculate this fraction: the number of cows of the other colour divided by the number of cows of the same colour as this cow (including himself). Find the sum of all the 2016 fractions calculated.

Y13/17 Angelo wrote down the word TEAM. He then swapped two adjacent letters around and wrote down the new order of the letters. He proceeded in this way until he obtained the word MATE. What is the least number of swaps that Angelo could have used?

Y13/18 It takes 4 hours for a motorboat to travel downstream from X to Y. To return upstream from Y to X it takes the motorboat 6 hours. How many hours would it take a wooden log to be carried from X to Y by the current, assuming it is unhindered by any obstacles? [Assume that the current flows at a constant rate, and that the motorboat moves at a constant speed relative to the water.]

Y13/19 A 3 cm wide strip is grey on one side and white on the other. Maria folds the strip, so that it fits inside a rectangle of length 27 cm, as shown. The grey trapeziums are identical. What is the length of the original strip in cm?



Y13/20 Twelve girls met in a cafe. On average, they ate cupcakes each, although no cupcakes were actually divided. None of them ate more than two cupcakes and two of them ate no cupcakes at all. How many girls ate two cupcakes?

TIE BREAKER

Y13/21 What is the value of such that is a perfect square?

Y13/22 When 97 is written as the difference between the squares of two positive consecutive integers, both being less than 100, then what is the value of the smaller integer?