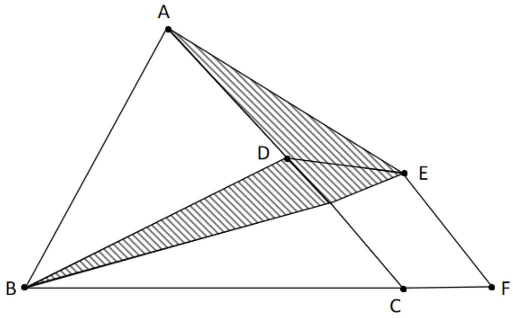
RIPMWC 2017 Round2 – Open

1. Calculate $\left(2018\times 2017.2017+2017\times 2018.2018\right)\div\left(2018\times 2017\right)$

2. In how many ways can 25 identical coins be distributed to 3 pupils Ali, Brian and Cheryl so that each person gets at least one coin?

3. In a Mathematics test, one-third of the questions were answered incorrectly by John and 14 questions were answered incorrectly by Kevin. One-fifth of the questions were answered incorrectly by both of them. Find the maximum number of questions which were answered correctly by both of them.

4. As shown in the figure below, the area of triangle ABC is 112 cm^2. D is on AC and F is on the extension of BC such that DCFE is a parallelogram. If BC = 4CF, find the area in the shaded region, in cm^2.



5. When is the first time between 4.00 pm and 5.00 pm such that the angle between the hour hand and the minute hand is exactly 32° ?

6. Calculate

$$\frac{5}{\left(\frac{1}{3}\right)}+\frac{5}{\left(\frac{1}{3}+\frac{2}{3}\right)}+\frac{5}{\left(\frac{1}{3}+\frac{2}{3}+\frac{3}{3}\right)}+\frac{5}{\left(\frac{1}{3}+\frac{2}{3}+\frac{3}{3}+\frac{4}{3}\right)}+\ldots+\frac{5}{\left(\frac{1}{3}+\frac{2}{3}+\frac{3}{3}+\frac{4}{3}+\frac{50}{3}\right)}$$

7. If we add a number x on the left of 2017 and add a number y on the right of 2017 to form a 6-digit number $\overline{x2017y}$ such that the number is divisible by 44, what is the smallest such number?

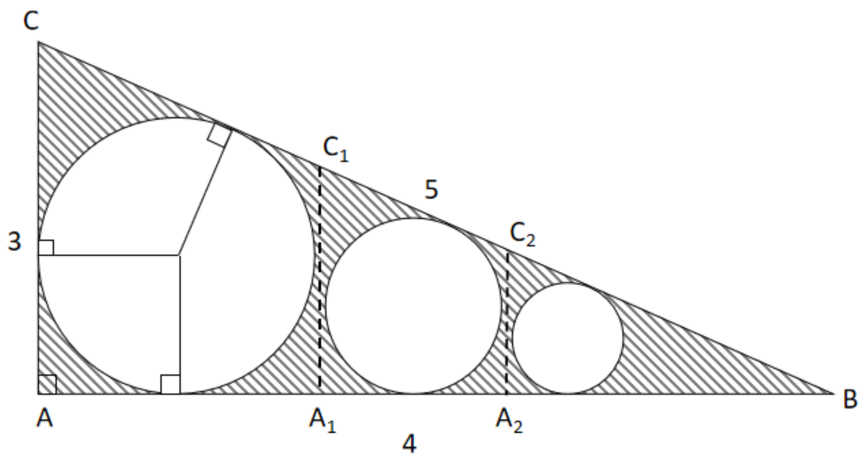
8. Three letters are selected from the 7 letters that form the word "RAFFLES" and two digits are selected from the 4 digits which form "2017". The 3 letters and 2 digits are arranged to form a password with 5 characters. How many such passwords are there?

9. Find the remainder when

$$\left(2+2^2+2^3+\ldots+2^{14}+2^{15}+2^{16}\right)+2^{2017} \text{ is divided by } 257$$

10. A family decorate their Christmas tree by placing one bauble on the uppermost level, two on the level below and so on all the way down. They get the same sized tree each year and just enough baubles to decorate it. One year, they decide to get two equally sized smaller trees, and they discover that they still have exactly the right number of baubles to decorate both trees. Given that all the trees have at least 4 levels, what is the smallest number of levels the originals trees could have had?

11. The incircle of a triangle is a circle drawn inside the triangle that touches each side exactly once. The radius of the incircle meets each side at a tight angle. The image below is made by drawing the incircle of a right angled triangle ABC with sides of length 3, 4 and 5 respectively, then drawing the incircle of the similar triangle A_1BC_1 leftover and repeating once more for A_2BC_2. .It is given that $\angle BA_1C_1 = \angle BA_2C_2 = 90°$



What is the total areas of the shaded region? (Take $\pi = \frac{22}{7}$)

12. The number 1, 2, 3, ... , 620 are filled up in Tables A and B in the following manner: In Table A, the numbers 1, 2, ... , 31 are filled up in the first row, followed by the numbers 32, 33, ... , 62 in the second row. This continues until the 20th row, where the numbers 590, 591, ... , 620 are filled up.

In Table B, the number 1, 2, ... , 20 are filled up in the last column, starting from the first row. The numbers 21, 22, ... , 40 are then filled up in the second last column, starting from the first row. This continues until the 1st column where the numbers 601, 602, 603, ... , 620 are filled up.

1	2	...	31
32	33	...	62
⋮	⋮		⋮
⋮	⋮		⋮
590	591	...	620

Table A

601	...	21	1
602	...	22	2
⋮		⋮	⋮
⋮		⋮	⋮
620	...	40	20

Table B

Determine, with working, all numbers which are in the same positions in both Tables A and B.

13. 26 different numbers are randomly arranged into a circle, can we always find 4 neighbouring numbers such that the sum of the 2 numbers in the centre is greater than the 2 numbers at the 2 ends?