RIPMWC 2017 Round2 – Junior

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

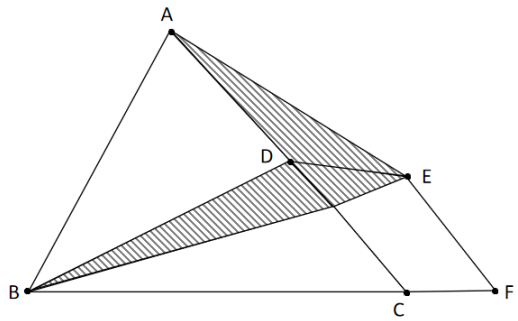
2. If $\frac{1}{5}\left\{\frac{1}{4}\left[\frac{1}{3}\left(\frac{x}{2}+5\right)-3\right]+2\right\}=1$, what is x?

3. If $H * K = \frac{H+K}{2}$, find the value of $2017\frac{5}{21} * \left(2018\frac{3}{11} * 2024\frac{1}{924}\right)$.

4. 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?

5. 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.

6. 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.

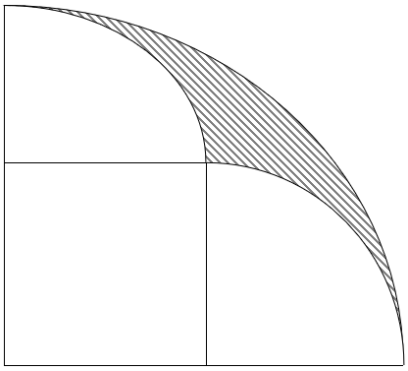


7. When is the first time between 4.00 pm and 5.00 pm such that the angle between the hour hand and the minute hand is exactly 32°?

8. Calculate
$$\frac{5}{\left(\frac{1}{3}\right)}+\frac{5}{\left(\frac{1}{3}+\frac{2}{3}\right)}+\frac{5}{\left(\frac{1}{3}+\frac{2}{3}+\frac{3}{3}\right)}+\frac{5}{\left(\frac{1}{3}+\frac{2}{3}+\frac{3}{3}+\frac{4}{3}\right)}+\cdots+\frac{5}{\left(\frac{1}{3}+\frac{2}{3}+\frac{3}{3}+\frac{4}{3}+\frac{50}{3}\right)}$$

9. 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?

10. A quadrant of a circle is split into a square, two smaller quadrants that have the same area and a shaded region, is shown. If the area of the shaded region is 112 cm^2, what is the area of the square in cm^2 ? (Take $\pi = \frac{22}{7}$)



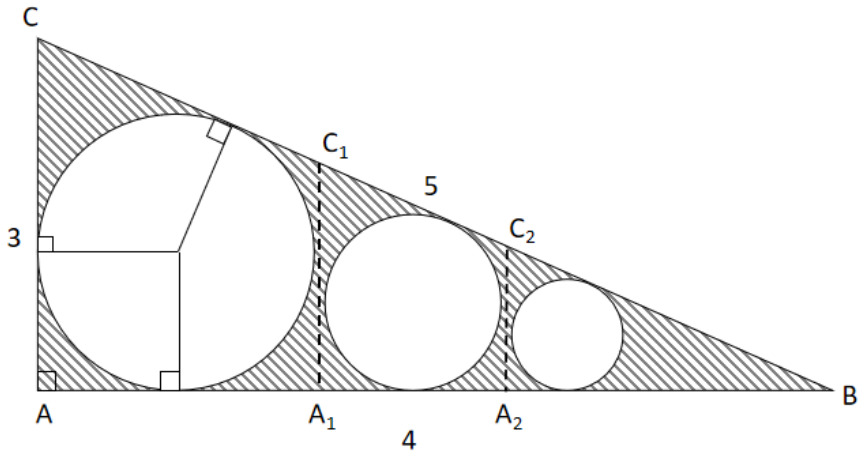
11. Find the remainder when $\left(2+2^2+2^3+...+2^{14}+2^{15}+2^{16}\right)+2^{2017}$ is divided by 257.

12. 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?

13. What is the smallest natural number whose product with 9 is a perfect cube, and whose product with 10 is a perfect square?

14. 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 original trees could have had?

15. 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 right 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 $\pi = \frac{22}{7}$)