OUNDLE

School

2018 Academic Scholarship

Mathematics

Paper II

Time Allowed: **2 hours**

Calculators may NOT be used for this paper

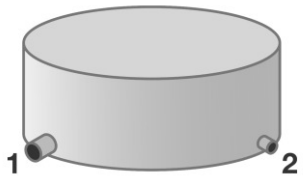
Instructions to candidates:

- You are not expected to have time to do all the questions.
- You may answer the questions in any order.
- Choose those questions which you think you can answer best.
- **Remember to show your working and clearly show the method you are using**.
- Answers should be given to 3 significant figures where appropriate.
- π may be taken as 3.14.
- **The number of marks for each question is show in square brackets**

1. Which is larger, 21% of £89 or 89% of £21? [2]

2. James wants to make a list of 9 positive whole numbers whose mean is 9. What is the largest number that he could include in his list? [2]

3. With pipe 2 closed, pipe 1 will empty the water tank in 2 hours. With pipe 1 closed, pipe 2 will empty the tank in 3 hours. If both pipes are open, how long will the tank take to empty?



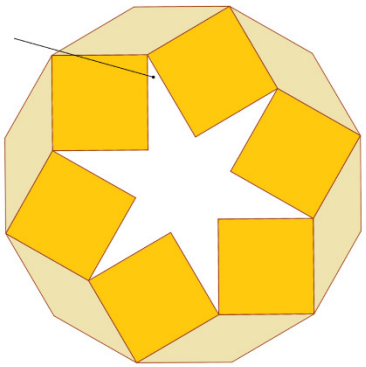
[3]

4. A farmer buys a barrel of oil that is 72% full. After he uses 25% of his oil, there are 189 litres remaining. How much oil can the barrel hold when full? [2]

5. In 2017 the new pound coin was launched in the shape of a dodecagon. Using the outline of the pound coin, 6 congruent squares and 6 rhombuses are constructed as shown.



Find the size of the angle indicated at the point of the star.

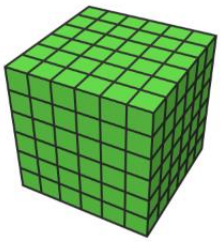


[2]

6. Replace the digits A and B in the number below so that is is divisible by 45. Include all possible solutions. [4]

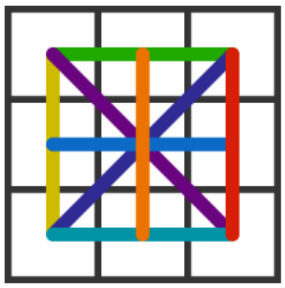
22, A2B

7. A solid cube of side 6 is constructed using smaller cubes of size 1x1x1. Once it is formed, how many of the smaller cubes are not visible by rotating the cube in any way?



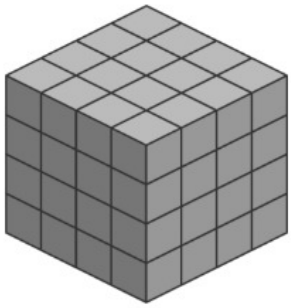
[3]

8. On a typical 3 x 3 “Noughts and Crosses” board, there are 8 possible winning lines as shown.



If we were to play Noughts and Crosses in 3 Dimensions with a 4 x 4 x 4 box, how many winning lines would there be? (Note – in this version a winning line is 4 boxes in a line)

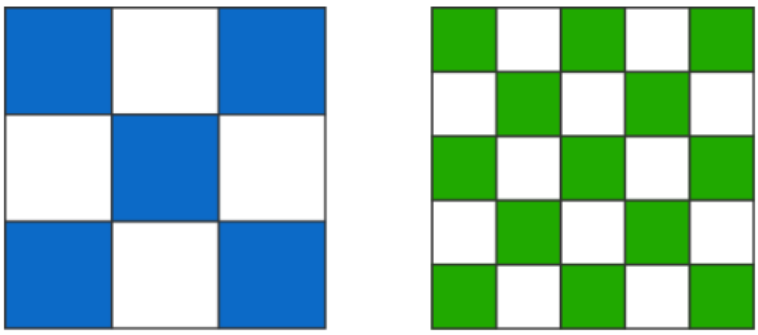
[4]



9. When Mum was giving out the pocket money, Amy received twice as much as her first brother, three times as much as the second, four times as much as the third and five times as much as the last brother. Simon complained that he had received 30p less than Dave.
Use this information to find all the possible amounts of money that Amy could have received.

[6]

10. This picture shows 2 identical squares both of which have been divided up into smaller squares. Which square has the largest area shaded in, the one with the larger squares or the smaller squares? (You must justify your answer)



[4]

11. If x and y are both integers, which of the following expressions could be equal to 2018? Justify your answer with appropriate working.

    A 28x + 82y

    B 24x + 42y

    C 48x + 84y

[4]

12. One mad mathematician likes to create larger numbers by merging together sequences of 3 consecutive numbers such as those shown below. Prove that all numbers formed in this way will always be multiples of 3.

$$\begin{aligned} 789 &= 3 \times 263 \\ 141516 &= 3 \times 47172 \\ 505152 &= 3 \times 168384 \\ 198199200 &= 3 \times 66066400. \end{aligned}$$

[4]

13. In a sequence of positive integers, each term is larger than the previous term. Also, after the first two terms, each term is the sum of the previous two terms.
    If the eighth term of the sequence is 390, what is the ninth term? [5]

14. If $\frac{a+b}{c} = \frac{6}{5}$ and $\frac{b+c}{a} = \frac{9}{2}$ then what is the value of $\frac{a+c}{b}$?

[5]

15. The curved edges of the shaded figure are made up of 5 quarter-circle arcs, each with a whole number radius. Find the area of the shaded figure. (You may leave your answer in terms of π or use 3.14 as an approximation for π)

[6]

