SEVENOAKS SCHOOL

YEAR 9 (13+) SCHOLARSHIP

May 2022
for entry in September 2022

MATHEMATICS

Your Name:_____

Your School:_____

Time allowed: 1 hour

Equipment needed: Pen, pencil, lined paper and eraser.

Information for candidates:

1. Calculators, Rulers and Protractors are NOT allowed.
2. Write your name and school on this page.
3. Write your answers on lined paper clearly marking the question you are submitting a solution for. Please put your name on all the sheets of paper you use.
4. There are 6 questions in this paper. You should answer all of them.
5. There are 30 marks in total available for this paper. Each question is worth 5 marks. You will be marked on the clarity of your solution.
6. Show all your working and justify all answers either through explanations or clear workings. Answers without justification will receive no marks.

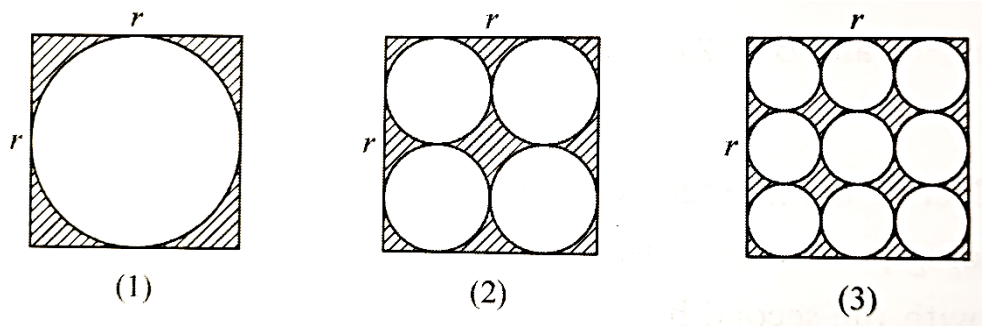
1. a) Given $(2a+3)^2+(b-2)^2=0$, find the value of a^b

   b) Given that the three points on a number line corresponding to the three rational numbers are $A: -2\frac{1}{5}$, $B: \frac{7}{10}$ and $C: x$, if $AC = 3BC$, find the value of x.

2. a) Compute $\frac{2+4+6+\cdots+150}{3+6+9+\cdots+225}$

   b) Complete the following operations with the number 1000. First, subtract $\frac{1}{2}$ of it; second, subtract $\frac{1}{3}$ of the remaining number; third, subtract $\frac{1}{4}$ of the remaining number of the second subtraction. What is the remaining number after the 1000th operation?

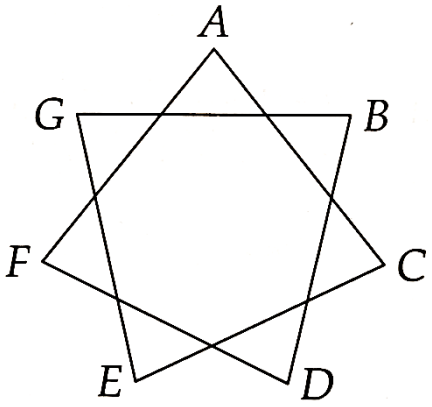
3. Below are diagrams showing a pattern of circles inside a square with side length r. Using the diagrams provided, and explaining your answer, state the shaded region in diagram (n) the square with n^2 equal circles inside.



(1) (2) (3)

4. In a three-digit number, the digit in the tens place is the square of the digit in its hundreds place, and the number in its ones place is one less than twice the number in its hundreds place. Find all three-digit numbers satisfying the given conditions.

5. Find the sum of the angles at the points of the 7-pointed star $ABCDEFG$ shown. Do not assume the heptagon in the centre is regular.



6. Ten people form a circle. Each picks a number and tells it to the two neighbours adjacent to him in the circle. Then each person computes and announces the average of the numbers of his two neighbours. The figure shows the average announced by each person (not the original number the person picked).

What number was picked by the person who announced the average 6?