## SEVENOAKS SCHOOL

## YEAR 9 (13+) SCHOLARSHIP

May 2023
for entry in September 2023

## MATHEMATICS

Your Name: $\qquad$

Your School: $\qquad$

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 5 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 6 marks. You will be marked on the clarity of your solution.
6. Show all your working on the paper and justify all answers either through explanations or clear workings. Answers without justification will receive no marks.

## Question 1

a) If $2 x-4 y=3$, find the value of $\frac{16^{x}}{256^{y}}$.
b) Given that $5^{p}=9,9^{q}=12,12^{r}=16,16^{s}=20$ and $20^{t}=25$, what is the value of pqrst?

## Question 2

a) The figure below shows a regular pentagon $P Q R S T$, together with three sides $X P, P R, R U$ of a regular hexagon with vertices $P R U V W X$. What is the size of angle $S R U$ ?

b) The diagram below shows a regular pentagon and five circular arcs. The sides of the pentagon have length 4 . The centre of each arc is a vertex of the pentagon, and the ends of the arc are the midpoints of the two adjacent edges. What is the total shaded area?


## Question 3

a) A jar contains buttons of four different colours. There are twice as many yellows as greens, twice as many reds as yellows, and twice as many blues as reds. What is the probability of selecting a green button from the jar?
b) Three six-sided dice are rolled. What is the probability that at least one comes up with a 5 or 6?

## Question 4

a) Simplify $\frac{1+3+5+\cdots+199}{2+4+6+\cdots+200}$.
b) The numbers $\frac{1}{2}, x, y, \frac{3}{4}$ are in increasing order of size. The differences between successive numbers in this list are all the same. What is the value of $y$ ?

## Question 5

a) The units digit in a two-digit number is three times the tens digit. If the digits are reversed, the resulting number is 54 more than the original number. Find the original number.
b) Find the values of $x$ and $y$ such that

$$
\frac{1}{2} \sqrt{x+1}+\frac{1}{4} \sqrt{3 y-11}=2.5 \text { and } \frac{7}{8} \sqrt{x+1}+\frac{1}{5} \sqrt{3 y-11}=\frac{137}{40} .
$$

