ST EDWARD’S
OXFORD

13+ SCHOLARSHIP EXAMINATION
2017

MATHEMATICS
PAPER 1

1 hour
60 marks
Answer all questions.
Calculators are NOT permitted.
Extra Paper is available

Name: ____________________________
1. Circle all of the fractions below which are smaller than $\frac{1}{9}$

\[
\frac{1}{10} \quad \frac{4}{9} \quad \frac{1}{2} \quad \frac{1}{100} \quad \frac{1}{8}
\]

1 mark

(b) To the nearest per cent, what is $\frac{1}{9}$ as a percentage? Circle the nearest value.

0.9% 9% 10% 11% 19%

1 mark

(c) Complete the sentences below:

$\frac{1}{9}$ is half of .................

$\frac{1}{9}$ is two thirds of .................

There are ............... ninths in $6\frac{1}{3}$

3 marks

TOTAL FOR THIS QUESTION 5

2. The ancient Egyptians used fractions, but only unit fractions.

$\frac{1}{3}$, $\frac{1}{8}$, $\frac{1}{5}$ are all examples of unit fractions; the numerator must be 1 and the denominator is an integer greater than 1.

For $\frac{3}{4}$, they wrote the sum $\frac{1}{2} + \frac{1}{4}$

(a) For what fraction did they write the sum $\frac{1}{2} + \frac{1}{5}$? Show your working.

.................................

1 mark
(b) They wrote \( \frac{9}{20} \) as the sum of two unit fractions. One of them was \( \frac{1}{4} \).

What was the other? You must show your working.


3. Solve these equations:

a) \( 75 + 2t = 100 - 2t \)

b) \( 7(5y - 3) - 10 = 2(3y - 5) - 3(3-7y) \)

c) \( \frac{x}{3} + \frac{10 - 2x}{2} = 3 \)
4. (a) A rectangle is 3a units long and 5b units wide. Write a simplified expression for the area and the perimeter of this rectangle.

Area: ........................................ 1 mark

Perimeter: ................................. 1 mark

(b) A different rectangle has area $12a^2$ and perimeter $14a$. What are the dimensions of this rectangle?

Dimensions: ..................... by ..................... 1 mark

5. On a farm many years ago the water tanks were filled using a bucket from a well.

(a) The table shows the numbers of buckets, of different capacities, needed to fill a tank of capacity 2400 pints. Complete the table:

<table>
<thead>
<tr>
<th>Capacity of bucket (pints)</th>
<th>8</th>
<th>10</th>
<th>12</th>
<th>15</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of buckets</td>
<td></td>
<td></td>
<td>200</td>
<td>150</td>
<td>100</td>
</tr>
</tbody>
</table>

(b) Write an equation using symbols to connect $T$, the capacity of the tank, $B$, the capacity of a bucket, and $N$, the number of buckets.

............................................. 1 mark

(c) Now tanks are filled through a hosepipe connected to a tap. The rate of flow through the hosepipe can be varied. The tank of capacity 4000 litres fills at a rate of 12.5 litres per minute. How long in hours and minutes does it take to fill the tank? Show your working.

...................... hours ............... minutes 2 marks

TOTAL FOR THIS QUESTION 3
6. In one week James watches television for **26 hours**. In that week, he watched television for the **same** length of time on Monday, Tuesday, Wednesday and Thursday. On each of Friday, Saturday and Sunday, he watched television for **twice as long** as on Monday. How long did he spend watching television on **Saturday**? Write your answer in hours and minutes.

\[
\begin{align*}
& \text{ ................. hours} & \text{ ................. minutes} \\
\end{align*}
\]

**TOTAL FOR THIS QUESTION 2**

7. In the diagram (NOT TO SCALE), side AB is the same length as side AC. Side BD is the same length as side BC. Calculate the value of \( x \)

Show your working.

\[
x = .........................
\]

**TOTAL FOR THIS QUESTION 2**
8. A window is made with two pieces of glass - one is semi-circular, the other is square.

The area of the square is 1m². What is the approximate area of the semi-circle? Give your answer in cm² to the nearest whole number.

9. (a) Estimate the answer to \( \frac{8.62 + 22.1}{5.23} \)

Give your answer to 1 significant figure.

.........................
1 mark

(b) **Estimate** the answer to \( \frac{28.6 \times 24.4}{5.67 \times 4.02} \)

.........................
1 mark

TOTAL FOR THIS QUESTION 2

TOTAL FOR THIS QUESTION 3
10. This is a series of patterns with grey and white tiles.

The series of patterns continues by adding each time.

(a) Complete this table:

<table>
<thead>
<tr>
<th>pattern number</th>
<th>number of grey tiles</th>
<th>number of white tiles</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( n )</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(b) Write an expression to show the total number of tiles in pattern number \( n \). Simplify your expression.

1 mark

11. (a) Each of these calculations has the same answer, 60. Fill in the gaps:

<table>
<thead>
<tr>
<th>( 2.4 \times 25 = 60 )</th>
<th>( 600 \div 10 = 60 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.24 ( \times ) ........... = 60</td>
<td>6 ( \div ) ........... = 60</td>
</tr>
<tr>
<td>2400 ( \times ) ........... = 60</td>
<td>0.06 ( \div ) ........... = 60</td>
</tr>
</tbody>
</table>
12. (a) Find the values of $a$ and $b$ when $p = 10$

$$a = \frac{3p^3}{2}$$

$$b = \frac{2p^2(p - 3)}{7p}$$

$$a = \ldots$$

1 mark

$$b = \ldots$$

1 mark

(b) Simplify this expression as fully as possible:

$$\frac{3cd^2}{5cd}$$

1 mark

TOTAL FOR THIS QUESTION 3

13. (a) $m$ is an odd number. Which of the numbers below must be even, and which must be odd? Write ‘odd’ or ‘even’ under each one.

<table>
<thead>
<tr>
<th>$2m$</th>
<th>$m^2$</th>
<th>$3m - 1$</th>
<th>$(m - 1)(m + 1)$</th>
</tr>
</thead>
</table>

| even | odd | odd | even | odd | even | not possible to tell |

2 marks

(b) $m$ is an odd number. Is the number $\frac{m + 1}{2}$ odd, or even, or is it not possible to tell?

| odd | even | not possible to tell |

Explain your answer.

1 mark

TOTAL FOR THIS QUESTION 3
14. Solve these simultaneous equations using an algebraic method.

\[4x + 3y = 21\]
\[2x + y = 8\]

You must show your working.

\[x = \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \]
\[y = \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \]

TOTAL FOR THIS QUESTION 3

15. Write the next two terms in each of these sequences, and give the rule for the *nth term*:

4, 8, 12, 16, ….., …….. *nth term*: …………..

4, 9, 16, 25, ….., …….. *nth term*: …………..

TOTAL FOR THIS QUESTION 4

16. To cover a distance of 10km, Jacob runs some of the way at 15 km/hr, and walks the rest of the way at 5 km/hr. His total journey time was 1 hour. How far did Jacob run?

TOTAL FOR THIS QUESTION 3

17. David puts five cards face down on a table. All have the same design on the back – on the
other side, one shows a circle, two show squares, and two show triangles. He turns two cards over. What is the probability that at least one of the cards is a square?