# 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 | e all of the frac         | ctions below w  | hich are <b>smalle</b>       | er than $\frac{1}{9}$ |                   |                |         |
|----|--------|---------------------------|-----------------|------------------------------|-----------------------|-------------------|----------------|---------|
|    |        | 1<br>10                   | <u>4</u><br>9   | $\frac{1}{2}$                | 1<br>100              | <u>1</u><br>8     |                |         |
|    |        |                           |                 |                              |                       |                   |                | 1 mark  |
|    | (b)    | To the neares             | t per cent, wha | at is <mark>1</mark> as a pe | ercentage?            | Circle the neares | t value.       |         |
|    |        | 0.9%                      | 9%              | 10%                          | 11%                   | 19%               |                |         |
|    | (c)    | Complete the              | sentences belo  | ow:                          |                       |                   |                | 1 mark  |
|    |        | $\frac{1}{9}$ is half of  |                 |                              |                       |                   |                |         |
|    |        | $\frac{1}{9}$ is two this | rds of          |                              |                       |                   |                |         |
|    |        | There are                 | ninths          | in $6\frac{1}{3}$            |                       |                   |                | 3 marks |
|    |        |                           |                 |                              |                       | ТОТА              | L FOR THIS OUE | STION 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

|   | What was the other? You must show your working  |                        |
|---|---|------------------------|
|   | what was the other. Tou must show your working. |                        |
|   |   |                        |
|   |   |                        |
|   |   |                        |
|   |   |                        |
|   |   | 1                      |
|   |   | TOTAL FOR THIS QUESTIC |
| • | Solve these equations:                          |                        |
|   | a) $75 + 2t = 100 - 2t$                         |                        |
|   |   |                        |
|   |   |                        |
|   |   |                        |
|   | b) $7(5y - 3) - 10 = 2(3y - 5) - 3(5-7y)$       |                        |
|   |   |                        |
|   |   |                        |
|   |   |                        |
|   |   |                        |
|   |   |                        |
|   | x 10-2x   |                        |
|   | c) $\frac{1}{3} + \frac{1}{2} = 3$              |                        |
|   |   |                        |
|   |   |                        |
|   |   |                        |
|   |   |                        |
|   |   |                        |
|   |   | 3 n                    |
|   |   | TOTAL FOR THIS OUFSTIC |

**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 14*a*. What are the dimensions of this rectangle?

Dimensions: ..... by .....

1 mark

#### TOTAL FOR THIS QUESTION 3

- 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:

| Capacity of bucket (pints) | 8 | 10 | 12  | 15 | 16  |     |    |
|----------------------------|---|----|-----|----|-----|-----|----|
| Number of buckets          |   |    | 200 |    | 150 | 100 | 80 |

(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

**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.

..... hours .....minutes

### 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* = .....

8. A window is made with two pieces of glass - one is semi-circular, the other is square.



The area of the square is  $1m^2$ . What is the approximate area of the semi-circle? Give your answer in  $cm^2$  to the nearest whole number.

| 9. | (a) | Estimate the answer to $\frac{8.62 + 22.1}{5.23}$                         |                           |
|----|-----|---|---------------------------|
|    |     | Give your answer to <b>1 significant figure</b> .                         |                           |
|    | (b) | <b>Estimate</b> the answer to $\frac{28.6 \times 24.4}{5.67 \times 4.02}$ | 1 mark                    |
|    |     |   | 1 mark                    |
|    |     |   | TOTAL FOR THIS QUESTION 2 |
|    |     |   |                           |

10. This is a series of patterns with grey and white tiles.



The series of patterns continues by adding

(a) Complete this table:

| pattern number | number of <b>grey</b> tiles | number of <b>white</b> tiles |
|----------------|-----------------------------|------------------------------|
| 5              |                             |                              |
| 16             |                             |                              |
| п              |                             |                              |

4 marks

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

1 mark

#### TOTAL FOR THIS QUESTION 5

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

| $2.4 \times 25 = 60$ | $600 \div 10 = 60$     |
|----------------------|------------------------|
| 0.24 × = 60          | $6 \div \dots = 60$    |
| 2400 × = 60          | $0.06 \div \dots = 60$ |

12. (a) Find the values of a and b when p = 10

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

| <i>a</i> = |  |
|------------|--|
|------------|--|

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

*b* = .....

1 mark

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.



1 5

1 mark

14. Solve these simultaneous equations using an algebraic method.

4x + 3y = 21

2x + y = 8

You **must** show your working.

*x* =..... *y* = .....

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?

<sup>17.</sup> 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?

TOTAL FOR THIS QUESTION 4

END OF TEST