



OUNDLE

School

Academic Scholarship 2013

Mathematics

Paper 1

Time Allowed: **1 hour and 30 minutes**

Calculators may NOT be used for this paper

Instructions to candidates:

- You may answer the questions in any order.
- Remember to **show your working** and clearly show the method you are using.

1. Work out the following:

a) 5.9×4.32

b) $\sqrt{\frac{32000}{0.002}}$

c) $\frac{2 + \frac{1}{2}}{3 - \frac{1}{3}}$

[9 marks]

2. If $\frac{37.9 \times 4.2}{8.24 + 0.53} = 18.15051311$

Without doing lots of lengthy calculations, write down the value of:

a) $\frac{0.0379 \times 0.042}{8.24 + 0.53}$

b) $\frac{37.9 \times 4.2}{824 + 53}$

c) $\frac{379 \times 2.1}{0.824 + 0.053}$

[8]

3. a) Showing your working, approximate the numbers in this calculation to estimate the

value of $\sqrt{\frac{4.87 \times 319}{9.9 - 9.89}}$, giving your answer to 1 sig fig. [4]

b) Work out $9 \times (8 \times 7 \times (6 - 5) \times 4 - 3 + 2 \times 1)$ [4]

4. Expand out if necessary and simplify the following expressions:

a) $12 - 4(x + y)$

b) $2y(y + 3) - 5y(1 - y)$

c) $2x^2y \times (3x)^3y$

[8]

5. Solve the following equations:

a) $4(x + 2) - 3(5 - 2x) = 7$

b) $\frac{3x+1}{2} - \frac{2x+3}{3} = -5$

c) $(x + 3)^2 = 100$ [12]

6. The PIN number of a debit card consists of a 4 digit number, eg. 7429 in which each digit can be 0, 1, 2, 3, 4, 5, 6, 7, 8, or 9. Hence there are 10 different digits and therefore 10000 possible PIN numbers.

a) How many PIN numbers start with a 5?

b) How many PIN number have no digits greater than 2?

c) How many PIN numbers have no digits greater than 5?

[8]

7. Ten students sit an exam which has a maximum score of 100. The average of the scores of 10 students in a class is 92. What is the lowest mark that a student in the class could have scored? Give your reasoning clearly.

[5]

8. Solve the following pair of simultaneous equations;

i) $3x - 5y = 7$

$$5x + 2y = 22$$

ii) *Using the solutions that you have obtained to this pair of equations work out all the solutions to the simultaneous equations below:*

a) $3x + 5y = 7$

b) $3x^2 - 5y^2 = 7$

c) $3y - 5x = 7xy$

$$5x - 2y = 22$$

$$5x^2 + 2y^2 = 22$$

$$5y + 2x = 22xy$$

[14]

9. By considering the last digits of powers of 2 and 5, find the last digit of $2^{34} + 5^{67}$.

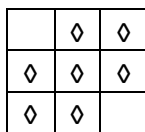
[8]

10. Deborah drew a sequence of square grid patterns with diamonds in some of the small squares as shown.

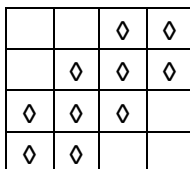
S_1



S_2



S_3



- a) Draw S_4 .
- b) How many diamonds are there in S_5 ?
- c) How many diamonds are there in S_n ? (give your answer in terms of n)
- d) How many small squares in S_n do not contain diamonds?

[12]

11. a) On the same set of axes sketch the graph of $y = x^2 - 3$ and $y = x - 3$.

$|x|$ means the modulus (or size) of x , taking no account of the sign.

So $|3.5| = 3.5$ and $|-4.8| = 4.8$

- b) On separate axes, sketch the graphs of:

- i) $y = |x|$
- ii) $y = |x - 3|$
- iii) $y = |x^2 - 3|$

Label the coordinates of any points where the graphs touch the axes.

[12]