ACADEMIC SCHOLARSHIP 2011

MATHEMATICS

PAPER 1

1½ hours

CALCULATORS MAY NOT BE USED FOR THIS PAPER.

INSTRUCTIONS TO CANDIDATES.

You are not expected to have time to do all the questions.
You may answer the questions in any order.
Choose those questions which you think you can answer best.
Remember to show your working and clearly show the method you are using.
Answers should be given to 3 significant figures where appropriate.
Some questions are longer than others.
The number of marks for each question is shown in square brackets.

1. Work out: a) $79 + 364$ c) $3120 \div 13$

b) 89×238 d) $17 + 13 \div 10$

[7]

2. Given that $261 \times 53 = 13833$, without doing any long calculations, write down the answers to the following (as decimals or fractions):

a) 2.61×5.3 b) $1383.3 \div 2610$ $261 \div 13833$

[6]

3. Put the digits 1 to 9 (each once only) into the frame so that the product of each three digits is as shown against each row and column.

	6	192	315
20			
126			
144			

[6]

4. If $\frac{1}{8} + \frac{1}{12} = \frac{1}{x}$ find the value of x. [6]

5. On the Royal Wedding Day, Mark bought 5 flags and 3 party hats for £15 altogether. His wife bought one party hat and 3 flags for a £7. By letting the cost of a party hat be p and the cost of a flag be f, form two equations and solve them to find the cost of each. (You can choose which units to use) [6]

6. Expand and simplify a) $7 - 3(x - 2)$

b) $3x(x + 4) - 2x(1 - x)$ [5]

7. Find the values of x, y and z which make all these equations true

$y + z = 78$ $z + x = 70$ $x + y = 54$

[6]

8. Simplify: a) $\frac{2x^2}{3} \times \frac{6yz}{5x} \times \frac{10xz}{3y^2}$ c) $\frac{2x+1}{3} - \frac{3x-2}{4}$

b) $\frac{2x}{3} + \frac{x^2}{12}$ d) $\frac{5}{x-1} + \frac{4}{x+2}$ [14]

9. Solve: a) $1.4(x-3)+0.2(2x-1)=0.1$

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

c) $\frac{x^2-1}{2}=12$

d) A father is three times as old as his son. In 14 years' time, he will be twice as old as his son. Use algebra to work out how old the father is now.

[15]

10. A sequence of positive whole numbers has the property that if two consecutive terms are a and b (in that order) then the next term is the difference of these, $b-a$. If the first two terms are 1 and 2011, find the sum of the first 2011 terms of the sequence.

[8]

11. a) Tom's scores on five tests have a mean of 7 and a range of 6.

(i) If he scores 4 on a sixth test, find his mean score for the six tests.

Each of the original scores is doubled and has 3 added to create a new set of scores.

(ii) What is the mean of the new set of five scores?

(iii) What is the range of the new set of five scores?

b) Five positive whole numbers have a mean of 5, a unique mode of 4 and a median of 4. How many possible combinations of numbers meet these criteria? List all the possible combinations systematically.

[14]

12. To change a fraction into a decimal, we divide the top by the bottom. If the resulting decimal never ends but has a sequence of digits which recurs, we say that the decimal is recurring and put a dot over the first and last digits of the recurring sequence.
So for example, if we consider the fraction $^3/_{11}$

we write $11\,)\,\underline{3.{}^{3}0{}^{8}0{}^{3}0{}^{8}000...}$

$\quad\quad\quad 0.2\ 7\ 2\ 7....$ so $^3/_{11}=0.\dot{2}\dot{7}$

Use $^3/_{11}=0.\dot{2}\dot{7}$ where appropriate to find the following, as recurring decimals :

a) $^3/_{110}$ b) $^1/_{11}$ c) $^{11}/_3$ d) $^{11}/_3-{}^3/_{11}$

Write the recurring decimal $0.0\dot{3}\dot{9}$ as a fraction in its lowest terms. [13]

13. A set of marbles is piled up so that the base of the pile is a rectangle containing 1080 marbles. The top level of the pile is a rectangle with 400 marbles. The fifth level up is a rectangle whose length is four times its width. Find the number of marbles in the middle layer of the pile. [10]