OUNDLE

School

2016 Academic Scholarship

Mathematics

Paper I

Time Allowed: **90 minutes**

Calculators are **NOT** allowed

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.

Give answers to 3 significant figures where needed.

Π may be taken to be 3.14.

The number of marks for each question are shown in square brackets.

1. Work out the following:

   a) 20% of 30 plus 30% of 20

   b) $\left(\frac{3 \times 0.02 \times 2}{0.03}\right)^2$

   c) $3\frac{1}{2} \times 4\frac{5}{7}$ (leave your answer as a mixed number) [9]

2. Simplify the following expressions:

   a) $-4a + 3a \times b - 4b + 3a - 2 \times b$

   b) $5x^2 - 2x(4 + 2x)$

   c) $63x^3 \div 9x^2$

   d) $6x - 4(2 + x) - (2x + 3)$ [10]

3. Solve the following equations:

   a) $4(2x - 1) - 3 = 17$

   b) $\frac{x}{4} - \frac{3-5x}{2} = 0$

   c) $y^2 - 81 = 0$ [9]

4. a) I think of a number and add 3. I multiply the result by 4 and get 8. What was my number?

   b) I think of a number, multiply it by 6 and then subtract 5. Three times the result is 39. What was my number?

   [4]

5. The six angles of two different triangles are listed in decreasing order. The list starts 115°, 85°, 75° and 35°. What is the last angle in the list?

   [4]

6. The integer 113 is prime, and its 'reverse' 311 is also prime. How many two-digit primes are there between 10 and 99 which have the same property?

   [4]

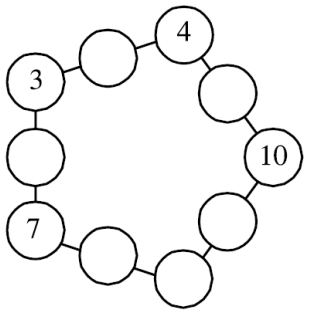
7. Solve the following pair of equations for x and y:

$$x + 2y = 12$$

$$x - 2y = 6$$

[3]

8. Each of the numbers from 1 to 10 is to be placed in the circles so that the sum of each line of three numbers is equal to *T*. Four numbers have already been entered.



Find all the possible values of *T*. [5]

9. How many positive square numbers are factors of 1600? [4]

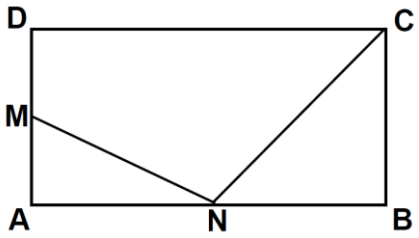
10. Alex has to do a punishment for his teacher by writing all the numbers from 1 to 2007 (each one once only!) How many times does Alex write the digit 1 ?

[4]

11. My four pet monkeys and I harvested a large pile of peanuts. Monkey A woke in the night and ate half of them; then Monkey B woke and ate one third of what remained; then Monkey C woke and ate one quarter of the rest; finally Monkey D ate one fifth of the much diminished remaining pile. What fraction of the original harvest was left in the morning?

[6]

12. M and N are midpoints of the sides AB and AD. What is the ratio of the area of Δ AMN to the area of the quadrilateral MNCD ?



[6]

13. Explain why three consecutive odd integers cannot all be prime numbers.

[6]