



OUNDLE

School

Academic Scholarship 2014

Preliminary Examination

Mathematics

Time Allowed: 1½ hours

- **Calculators may NOT be used.**
- Write your answers on **lined paper** and **show as much working as possible**. **Answers without clear logical working will gain little credit.**
- Do not spend too long on any single question. If you are having difficulty with a particular question, move on and return to it at the end if you have time. Do not be concerned if you cannot answer all of the questions.
- **At the end of the examination**, hand in both the question paper and your answers with your name clearly indicated on all sheets.

1. Work out :

(a) $95 - 47$

(b) 26×82

(c) $\sqrt{81}$

(d) 2^5

(e) $1000 - 100 - 10 - 1$

(f) $12 \div \frac{2}{3}$

(g) $3\frac{1}{4} - 2\frac{2}{3}$

(h) $3^4 - 4^3$

(i) 25% of 25

(j) 8.48×0.4

(k) $84.8 \div 0.04$

(l) $4 + 12 \div 8 \times (5 - 3)$

(m) $\sqrt[3]{27\,000}$

(n) $\frac{\frac{3}{4} - \frac{1}{3}}{\frac{1}{2} + \frac{1}{3}}$

2. If $a = 2$, $b = -3$ and $c = 4$, find the value of

(a) $2b - a$

(b) $\frac{a-c}{ab}$

(c) $a^3 - bc$

(d) $\frac{(a+c)^2}{4b}$

3. Remove brackets and simplify fully :

(a) $4(x + 2)$

(b) $x^3(x - 1)$

(c) $2(3x - 4) - (3 - x)$

4. Factorise fully :

(a) $8 - 4y$

(b) $6x^3 - 2x^2$

(c) $4a^2b^3 - 6a^3b^2$

FOR QUESTIONS 5 AND 6, YOU MUST USE A CLEAR ALGEBRAIC METHOD, NOT A TRIAL AND ERROR APPROACH.

5. Solve each equation for x :

(a) $2(x - 3) + 5 = 1$

(b) $\frac{x-3}{4} = 3$

(c) $\frac{4}{x-3} = 3$

6. Solve for x and y :

$$\begin{aligned} 4x + 3y &= 8 \\ 6x - y &= 1 \end{aligned}$$

7. You are told that $138 \times 72 = 9936$.
Without any further calculations, write down the values of :

(a) 13.8×0.72

(b) $1.38 \times 7\,200$

(c) $99.36 \div 7.2$

(d) 69×144

8. Work out the value of :

$$\left(1 - \frac{1}{2}\right) \times \left(1 - \frac{1}{3}\right) \times \left(1 - \frac{1}{4}\right) \times \left(1 - \frac{1}{5}\right) \times \left(1 - \frac{1}{6}\right) \times \left(1 - \frac{1}{7}\right) \times \left(1 - \frac{1}{8}\right)$$

9. In the local squash club, $\frac{2}{9}$ of the members are left-handed, while $\frac{3}{5}$ of the members are married. What is the smallest possible answer to the question :

“ How many members are there in the squash club ? “

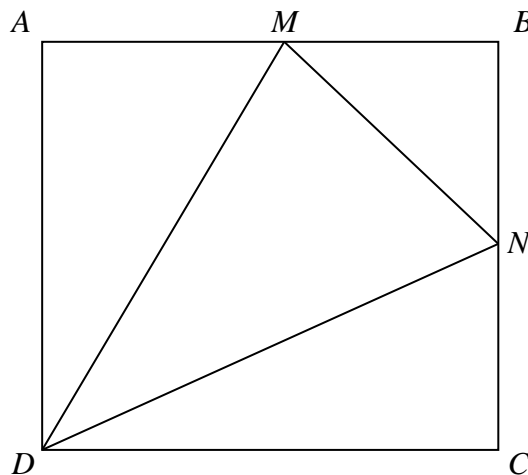
(you must give some explanation along with your answer).

10. In a sequence, each term after the first is the sum of the squares of the digits of the previous term. So if

$$\begin{aligned} \text{1st term} &= 12 \\ \text{2}^{\text{nd}} \text{ term} &= 1^2 + 2^2 = 5 \\ \text{3}^{\text{rd}} \text{ term} &= 5^2 = 25 \\ \text{4}^{\text{th}} \text{ term} &= 2^2 + 5^2 = 29 \text{ and so on.} \end{aligned}$$

- (a) Find the first five terms of the sequence whose first term is 25.
(b) Find the 2001st term of the sequence whose first term is 25.

11.

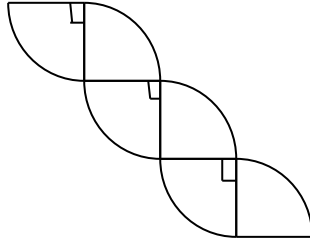


$ABCD$ is a square with each side of length 2 units.
 M is the midpoint of AB and N is the midpoint of BC .
Work out the area of triangle DMN .

12. Find a number less than 100 which is increased by 20% when its digits are reversed.

(An answer obtained by 'trial and error' will earn a maximum of 2 marks, but an answer obtained using algebra to set up an equation can earn 6 marks).

13.



In the figure shown, each arc has a radius of 1. What is the perimeter of the figure ?
(You will need to give your answer in terms of π).

14. It takes 4 gardeners 4 hours to dig 4 circular flower beds, each of diameter 4 metres.
How long will it take 6 gardeners to dig 6 circular flower beds, each of diameter 6 metres ?

15. If $\frac{1}{x} < 2$ what can you say about x ?

16. Two boxes, P and Q , each contain 3 jewels. When a jewel worth £5 000 is transferred from P to Q , the average value of the jewels in each box increases by £1 000. What is the total value of all 6 jewels ?