OUNDLE

School

2018 Academic Scholarship
Preliminary Examination

# Mathematics

Time Allowed: 90 minutes

**Instructions**

- **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) $94 - 37$

(b) $24 \times 15$

(c) $5 \times \frac{2}{3}$

(d) $12 \div \frac{1}{6}$

(e) $1\frac{5}{6} - \frac{3}{4}$

(f) $96 \div 8 \div 4 - 96 \div (8 \div 4)$

(g) $50\%$ of $40\%$ of 30

(h) $1.2 \times 0.8$

(i) $\sqrt{4\,900}$

(j) $\sqrt[3]{0.000064}$

(k) $\frac{3}{\sqrt{0.04}}$

(15 marks)

2. If $p = \frac{-1}{2}$, $q = 3$ and $r = -2$, find the value of :

(a) $3q - 2r$

(b) $\frac{(4p)^2}{qr}$

(4 marks)

3. Find the next two terms in each of the following sequences :

(a) 31, 38, 45, 52, ……. , ……..

(b) 8, 4, 2, 1, ……, ……

(c) $\frac{1}{4}$, $\frac{2}{9}$, $\frac{3}{16}$, $\frac{4}{25}$, ……. , …….

(6 marks)

4. Remove brackets and simplify :

(a) $2\ (3x - 5)$

(b) $(2x + 1)(x - 5)$

(4 marks)

5. Factorise fully :

(a) $6 - 18x$

(b) $12x^3 - 6x^2 + 3x$

(4 marks)

**FOR QUESTIONS 6 AND 7,** USE A CLEAR ALGEBRAIC METHOD, **NOT** A TRIAL AND ERROR APPROACH. PLEASE NOTE THAT THE EQUATIONS TO BE SOLVED DO NOT NECESSARILY ALL HAVE INTEGER (WHOLE NUMBER) SOLUTIONS. SHOW YOUR WORKING IN FULL.

6. Solve for $x$ :

(a) $\frac{3}{4}\ x\ =\ 12$

(b) $2\ -6x\ =\ 17$

(c) $2\ (\ x-3\ )=\ 3-(\ 1-x\ )$

(d) $\frac{x}{4}$ = $x\ -\ 8$

(e) $\frac{3}{x}$ = $\frac{x}{12}$

(13 marks)

7. Solve for $x$ and $y$ :

$$3x\ -\ 5y\ =\ \ 9$$

$$4x\ +\ 2y\ =\ -1$$

(4 marks)

8. (a) Expand : $(\ a\ +\ b\ )(\ a\ -\ b\ )$

(b) **Without using long multiplication**, work out the value of

$$2\,008\ \times\ 1\,992$$

(4 marks)

**FOR THE REMAINING QUESTIONS, YOU CAN ANSWER THEM IN ANY ORDER THAT YOU CHOOSE.** UNLESS THE QUESTION SAYS 'WRITE DOWN …' YOU MUST SHOW FULL WORKING TO MAKE IT CLEAR HOW YOU OBTAINED YOUR ANSWER. (ANSWERS WITHOUT WORKING WILL BE AWARDED VERY FEW MARKS)

9. An amount of money $x$ (pounds) is shared between Mary and Yusuf in the ratio 9 : 5.

(a) Write down an expression in terms of $x$ for the amount that Mary receives.

(b) If the same amount of money had been shared between them in the ratio 7 : 5 , Mary would have received £ 10 less. **By forming and solving an equation,** work out the total amount of money shared between Mary and Yusuf.

(5 marks)

10.




In November, an Apple iPhone 8 was sold in store A and store B at exactly the same price.

In the Christmas sales, store A reduced the price by 20 % and then, in the January sales, their Christmas price was reduced by a further 30 %.

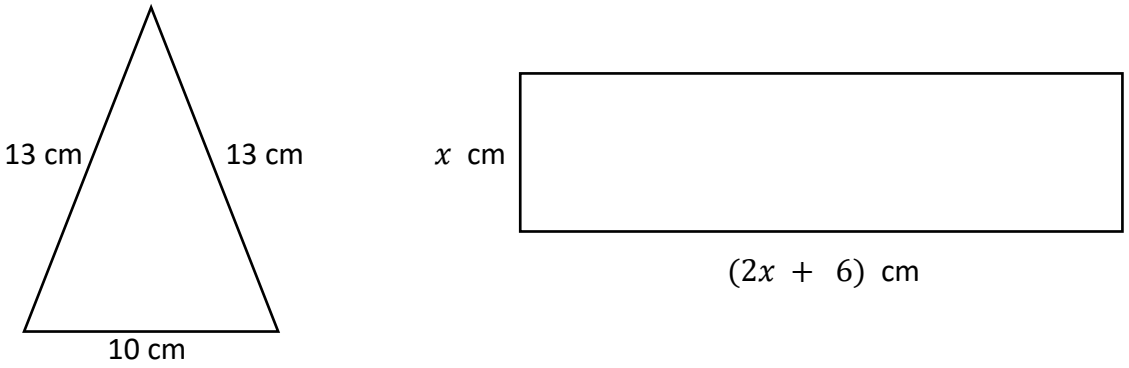
In the Christmas sales, store B reduced the price by 10 % and then in the January sales, their Christmas price was reduced by a further 40 %.

Gareth went to the January sales. At which store was he able to buy the iPhone 8 at a cheaper price ? Show calculations to explain why.

(**MAKE SURE THAT YOUR WORKING IS SHOWN CLEARLY AND IN FULL**).

(4 marks)

11.



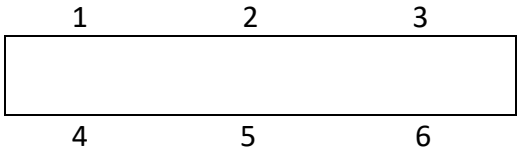

An isosceles triangle has a base of length 10 cm and equal sides of length 13 cm.
A rectangle has a width of $x$ cm and a length of $(2x + 6)$ cm.

Although they have different units, the area of the triangle is numerically equal to the perimeter of the rectangle.

**By forming and solving an equation**, work out the value of $x$.

(5 marks)

12.




A committee of six people sit at a long table on chairs that are numbered 1 to 6 (as in the diagram). The chairs are 'fixed' and cannot be moved.

Work out the number of different ways in which the committee can be seated if

(a) anyone can sit in any chair
(b) the chairperson must sit in chair no 2 and anyone else can sit in any chair
(c) the chairperson and secretary must be seated in chairs 2 and 5 (though not necessarily in that order)
(d) two committee members, Mr Summers and Mrs Gould, have had a massive argument just before the meeting, and refuse to sit next to each other

(8 marks)

13. Numbers *A* and *B* are written below as products of powers of prime factors :

$$A = 2^a \times 3^b \times 5^c \times 7$$

$$B = 2^b \times 3 \times 5^b \times 7^c$$

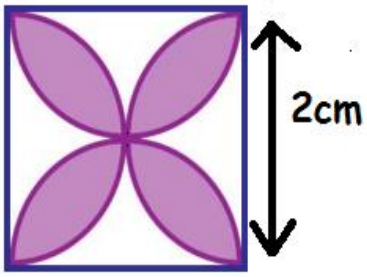
where $a, b$ and $c$ are all positive integers greater than 1 and $a < b < c$

(a) Write down the highest common factor of $A$ and $B$

(b) Write down the lowest common multiple of $A$ and $B$

(4 marks)

14. A square with side length 2 cm is shown below. From each side of the square, a semi-circle is drawn, with the side as diameter.




Work out the total area of the shaded region, giving your answer in terms of $\pi$. (**Your method must be shown clearly with full working**).

(5 marks)

**E N D**