

Name:



# OUNDLE

School

Academic Scholarship 2012

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) 40% of 350.

(b)  $240 \times 25$

(c)  $5^3$

(d)  $\sqrt{64}$

(e)  $3\frac{1}{2} \times 1\frac{1}{3}$

(f) 
$$\frac{\frac{3}{5} - \frac{1}{4}}{\frac{7}{8} \div \frac{1}{4}}$$

(g)  $\frac{2}{3} \times 12 + 3 \div 0.2$

2. (a) Remove brackets :

$$2(3 - 4x)$$

(b) Factorise fully :

$$6xy^2 - 12x^2y$$

(c) Multiply out the brackets and simplify :

$$(x + 3)(x + 2)$$

(d) If  $a = 2$ ,  $b = -3$  and  $c = \frac{1}{4}$ , work out the value of :

(i)  $a^2 - b^2$     (ii)  $\frac{a}{c} - b$     (iii)  $-\frac{2}{3}abc$

3. Solve for  $x$  :

(a)  $5x - 3 = 9 - x$

(b)  $\frac{2}{3}(2x - 3) = 8$

4. Solve for  $x$  and  $y$  :  $2x - 3y = 13$

$$3x + 2y = 0$$

5. A rectangle has adjacent sides of length  $(2x + 3)$  cm and  $(5x - 1)$  cm. The perimeter is 102 cm. Find the value of  $x$ .

6. The best sprinters in the world run the 100 metres in about 10 seconds.

(a) Work out their average speed during the race in kilometres per hour (km/h).

(b) Using a simple conversion (of kilometres to miles), work out their approximate average speed in miles per hour (mph).

7. A class of 8 pupils sat an Algebra test. Their average mark was 65%. Jenny was absent for the test, but sat it the following day. When her mark was included, the class average was 60%. What was her mark for the test ?

8.

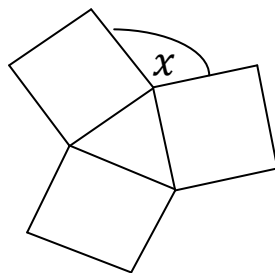
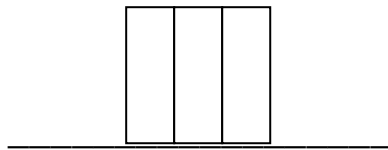


Diagram not accurately drawn.

The diagram shows three squares of the same size. What is the size (in degrees) of the angle marked  $x$  ?

9. James is a property developer. He bought two homes and sold them both a year later. He sold each of them for £ 990 000. On the first home, he made a profit of 10%, but on the second home he made a loss of 10%. Overall, what percentage profit or loss has he made on the two houses, or was his profit/loss exactly zero ?
10. When a barrel is 30% empty, it contains 30 litres more than when it is 30% full. How many litres does the barrel hold when it is full ?
11. (a) Three different Mathematics books are to be placed side by side on a shelf, as shown below :

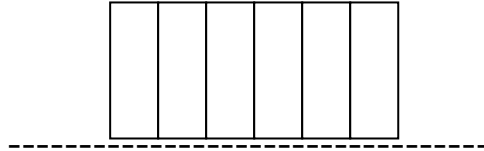


Let's call the books A, B and C. Using these letters, write down all the different ways in which the books can be placed.

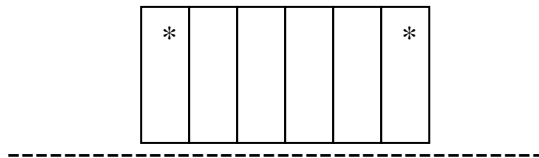
- (b) I now add a fourth Mathematics book (call it D) to the collection. Work out the number of different ways in which the four books can be arranged on the shelf.

(note : you will not get full marks by just writing out all the different ways and counting them – try to think of a clever method of calculating the answer, and remember to show your working so that your method is clear).

- (c) Six different Mathematics books are to be placed on a shelf, as shown below.



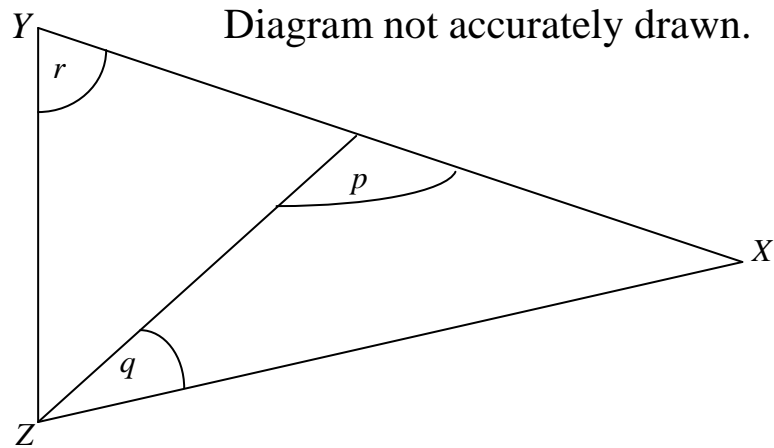
- (i) In how many different ways can this be done ?
- (ii) I now decide that two particular books must occupy the two 'end' positions (marked with a \* below). (note : it does not matter which goes on which end).



In how many different ways can I now arrange the books ?

12. At a holiday camp, the ratio of boys to girls is 3 : 4. The ratio of girls to adults is 5 : 7. What is the ratio of children to adults at the camp ?

13.



In the diagram, triangle  $XYZ$  is isosceles, with  $XY = XZ$ .  
Three angles have been labelled as  $r$ ,  $p$  and  $q$ .  
Find the size of  $r$  in terms of  $p$  and  $q$ .

14. Find the value of  $\frac{1}{x+2}$  if  $\frac{1}{x} = 3.5$

15. In Mathematics,  $n!$  is called n factorial and this is how it works :

$$n! = 1 \times 2 \times 3 \times 4 \times \dots \times n$$

So, for example :

$$3! = 1 \times 2 \times 3 \quad \text{and} \quad 7! = 1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7$$

Amazingly, the exact number of seconds in 6 weeks is equal to  $b!$  ( $b$  is a whole number).

Work out the value of  $b$ .

**E N D**