



Oundle School  
Academic Scholarship 2008  
Preliminary Examination  
Mathematics

Time : 1½ Hours

**No calculating aids may be used.**

**Solutions are to be written on lined A4 paper.**

Candidates are encouraged to answer questions 1 to 7 to the best of their ability before proceeding to questions 8 to 14.

Candidates should avoid spending too long on a single question. If a candidate is having difficulty with a particular question then they should move on and return to it at the end.

Different marks are awarded for different questions. The total mark for each question is given in square brackets at the end of the question.

This paper is intended to be challenging. Candidates should not expect to be able to answer all of the questions. Candidates are encouraged to show their working and their reasoning. Marks can be awarded for partial answers to questions.

There is a total of 124 marks on this paper. Candidates should not be disappointed if they only manage to score about half the marks.

1. Evaluate the following, writing your answers as fractions in their lowest terms:

a.  $\frac{7}{9} + \frac{5}{7}$

b.  $\frac{5}{17} \times \frac{34}{15}$

c.  $\frac{4}{9} \div \frac{8}{81}$

d.  $\frac{5}{12} - \frac{1}{4} \div \frac{2}{3}$

e.  $\frac{1}{2} \times \frac{4}{3} \times \frac{5}{6} \times \frac{8}{7} \times \frac{9}{10}$

[12]

2. Express the following as fractions in their lowest terms:

a. 48%

b. 0.36

c.  $\frac{\sqrt{12^2+5^2}}{(2 \times 13)}$

d.  $\frac{(-2)^4}{4^2}$

e.  $\frac{5-17}{3-14}$

[12]

3. Substitute  $k = 5$ ,  $t = 4$ ,  $g = -2$  into the following expressions and work out their numerical values:

a.  $ktg$

b.  $(g + t + k)(g - t - k)$

c.  $\frac{(-g)^2}{kt}$

d.  $\frac{kt}{tg} \times \frac{g^2}{kt}$

[9]

4. Solve the following equations to find all possible values for  $x$  in each case:

a.  $x - 9 = 11$

b.  $33x = 11$

c.  $11(x + 5) = 66$

d.  $x(x + 100) = 100x + 100$

e.  $\frac{x}{5} = \frac{x}{4} + \frac{x}{3}$

[12]

5. Find the next two terms in the following sequences.

a. 44, 55, 66, 77, ...

b. 5, 7, 10, 14, ...

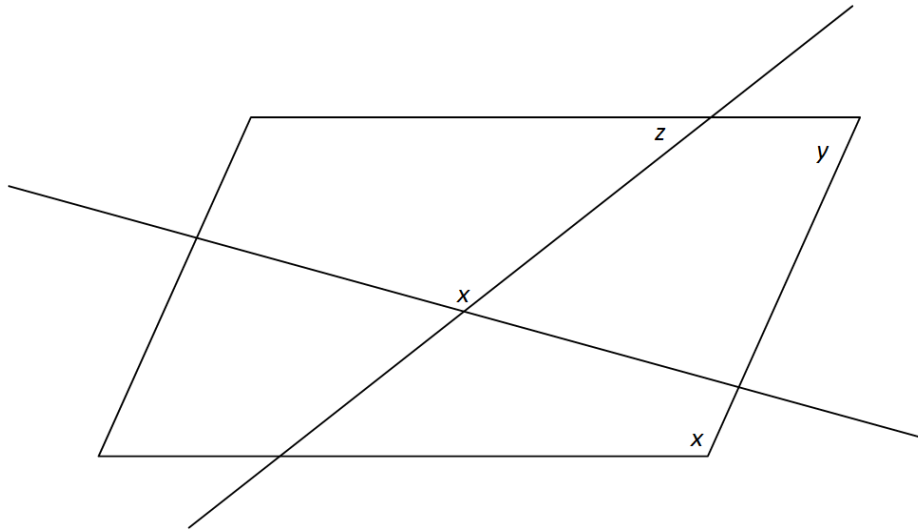
c. 343, 49, 7, ...

d. 29, 38, 47, 56...

e. 0, 1, 1, 2, 3, 5, 8, ...

[10]

6. Look at the parallelogram below. If angle  $y$  is half of angle  $x$  and angle  $z$  is half of angle  $y$ , fill in the sizes of as many of the angles as possible on the diagram below.



[8]

7. A  $40\text{cm} \times 50\text{cm}$  poster includes a  $4\text{cm}$  margin on each side. What percentage of the poster is occupied by the margin?

[8]

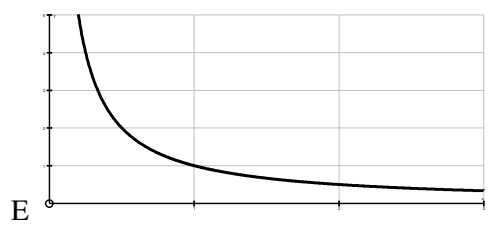
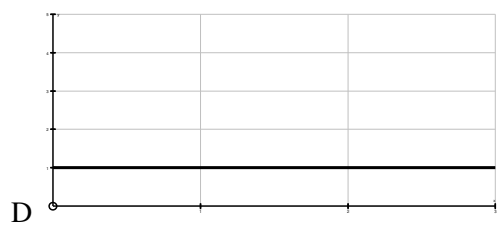
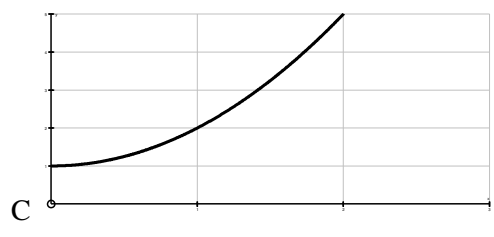
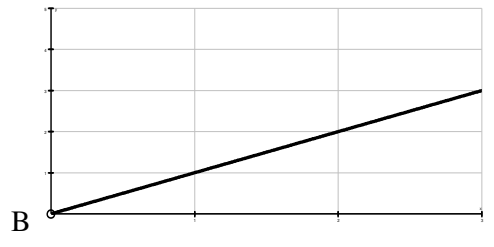
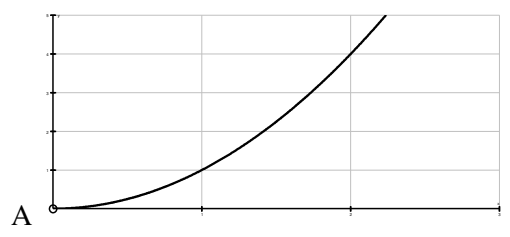
*(Candidates are advised to answer questions 1 to 7 to the best of their ability before proceeding to questions 8 to 14.)*

8. I have a bag of red and blue balls. The probability of getting a blue one if I pick one out is  $\frac{5}{7}$ . If however I were to remove 4 blue balls the probability of getting a blue ball would be  $\frac{2}{3}$ . How many balls were in the bag?

[7]

9. Which graph represents which equation? Pair up the graphs and the equations.

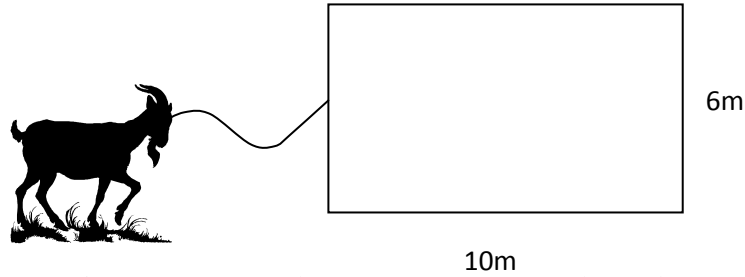
1.  $y = x^2 + 1$
2.  $xy = 1$
3.  $y = 1$
4.  $y = x^2$
5.  $y = x$



10. Mrs Woodley looks after the eggs produced at a local farm. She counted out 6 duck eggs, 5 ostrich eggs and 4 turkey eggs and took them to the local market expecting to make 22 pounds. Sadly, she fell over on the way and smashed 2 duck eggs and an ostrich egg and was only able to make 18 pounds at the market. If an ostrich egg costs twice as much as a duck egg, how much does each egg cost?

[8]

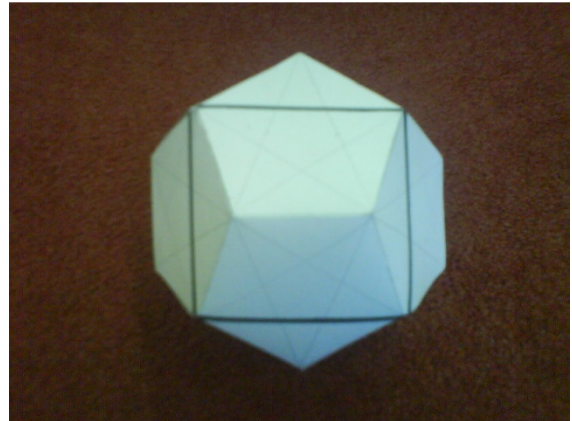
11. Gertie the goat is tied **outside** a 6m by 10m rectangular fenced enclosure by a 6m long rope which is tied to the middle of the shorter side. (See diagram)



- a) What area can Gertie graze? (Note: The rope cannot go over the enclosure, it must go round the corners.)
- b) Gertie thinks the grass is greener inside the enclosure so she jumps over the fence. What area inside the enclosure can she graze now?

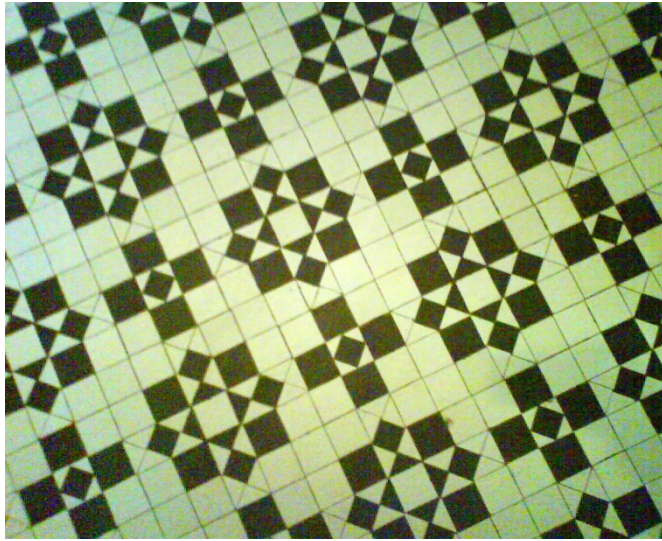
[12]

12. Look at the regular dodecahedron below. Drawn on is a cube. How many different cubes can be drawn onto a dodecahedron? (*A regular dodecahedron has 12 regular pentagonal faces*)



[8]

13. Below is a photo of the floor in Laxton, the day house at Oundle School. If this floor were infinitely wide and infinitely long, what proportion of the tiles would be black?



[10]