Surname ..... **Candidate number** .....

First name .....

Current school .....

mgs Founded 1515 | The Manchester Grammar School

Entrance Examination 2011
Arithmetic Paper 2

1 Hour

Do not open this booklet until told to do so
Calculators may not be used

Write your names, school and candidate number in the spaces provided at the top of the page.

Show all your working in full, as this will be marked, and then write your answer clearly. If you run out space for an answer, use the space provided at the end of the booklet, numbering your answer carefully.

1. To bake 2 cakes, Jo uses

300g	flour
8	eggs
7	tablespoons of milk
38g	coconut
1.4 ml	vanilla essence

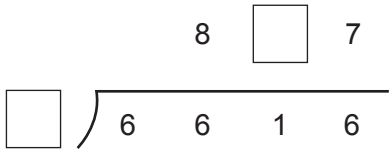
Write down the amounts she needs for 5 cakes

	flour
	eggs
	tablespoons of milk
	coconut
	vanilla essence

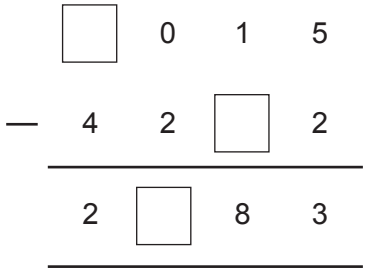
[5 marks]

2. Write numbers in the boxes to make this division correct

(a)



(b) Write numbers in the boxes to make this subtraction correct



[5 marks]

3. A clock shows 2 o'clock, with the minute hand on 12 and the hour hand on 2.

(a) How many times does the minute hand go past the hour hand between 2.00pm and 7.00pm? | 3a |

(b) What time will the clock show when the hour hand has turned through an angle of 60°? | 3b |

(c) What time will the clock show when the minute hand has turned through an angle of 900°? | 3c |

(d) Through what angle will the minute hand have turned from 2 o'clock, when the clock shows 10 o'clock? | 3d |

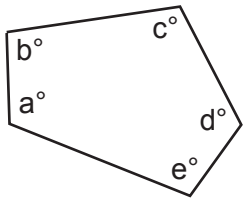
(e) Through what angle will the hour hand have turned from 2 o'clock, when the clock shows 6:30? | 3e |

[5 marks]

4. The formula to work out the sum of the angles inside any shape is

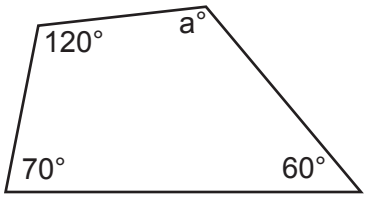
Sum of angles = 180° × number of sides – 360°

For example,



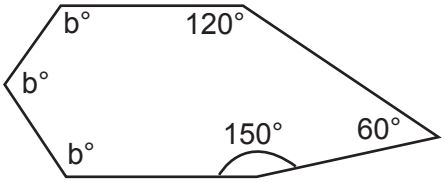
$a + b + c + d + e = 180° \times 5 - 360°$
$= 900° - 360°$
$= 540°$

(a) Find a



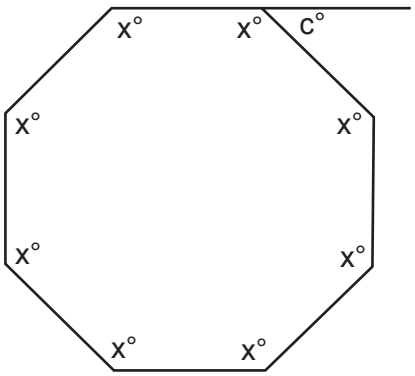
4a

(b) Find b



4b

(c) Find c

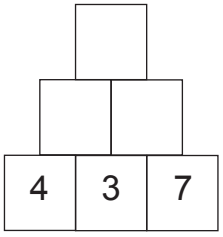


4c

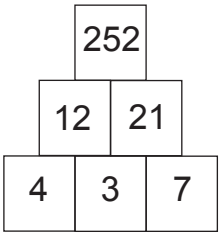
[5 marks]

5. In this pyramid of bricks, after the bottom row, the number on each brick is the product of the two bricks underneath it.

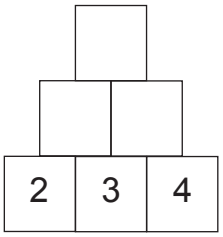
For example, if we start with



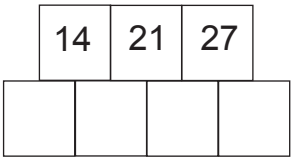
we end up with



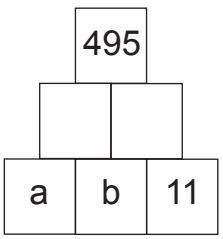
(a) Fill in the remaining numbers on the bricks



(b) Fill in the numbers on the bottom row

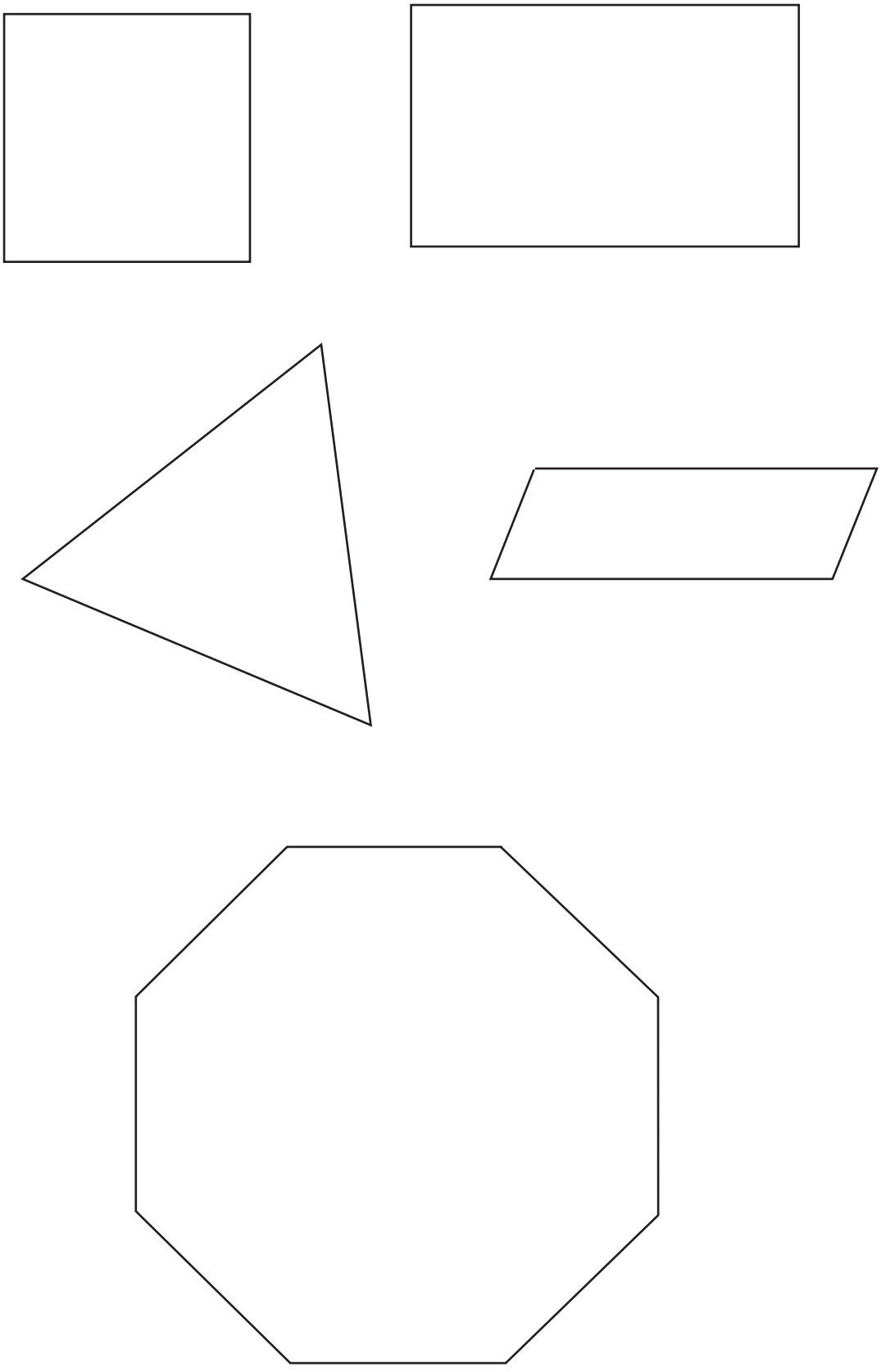


(c) a and b are whole numbers, neither of which is 1.
Find the values of a and b.



[5 marks]

6. Draw in all the axes of symmetry in these shapes.
If any shape has no axes of symmetry, write NONE inside the shape.



[5 marks]

7. (a) Write down a number which has exactly three factors, including 1 and itself.

7a

(b) Write down the smallest multiple of 17 which is greater than 200.

7b

(c) Write down a prime number between 90 and 100.

7c

(d) Write down a fraction which is between $\frac{1}{3}$ and $\frac{1}{2}$

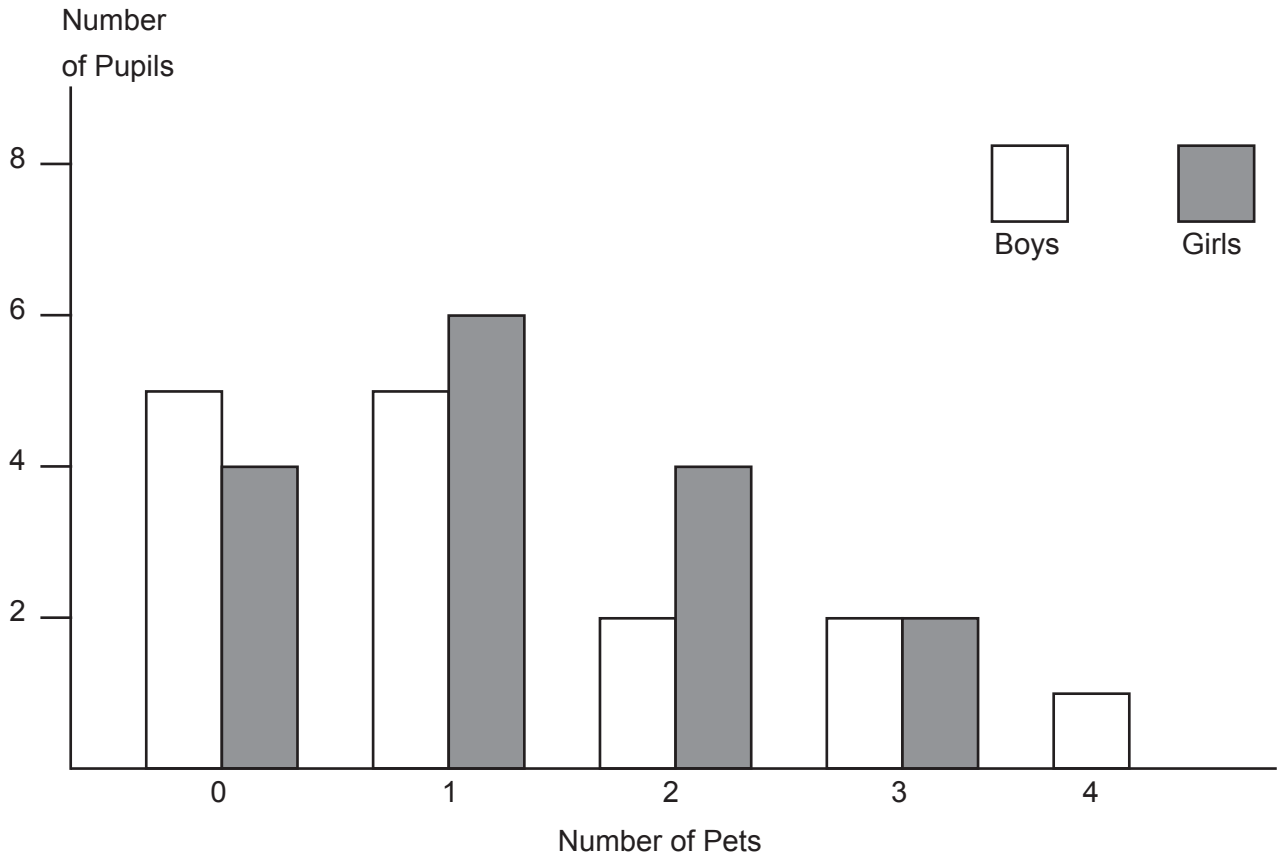
7d

(e) Write down a number whose square is between 400 and 450.

7e

[5 marks]

8.



The graph shows the number of pets owned by the children in a primary school class.

(a) How many girls own 2 pets? 8a

(b) How many more girls than boys are there in the class? 8b

(c) What fraction of the children in the class have no pets? 8c

(d) How many pets in total are owned by the boys? 8d

[5 marks]

9. When a gas meter was read in October 2010, the meter reading showed 3165 units. When it was read again, in January 2011, the meter reading was 3945.

(a) Work out how many units of gas were used in the 3 months from October to January.

9a

(b) The cost of the gas is 7p for each unit. Also there is a fixed charge of £12.50 to be paid. Work out the total cost of the gas and the fixed charge.

9b

(c) Finally, 10% of this total is then added on for tax purposes. Work out the final cost.

9c

[5 marks]

10. Using the fact that $52 \times 316 = 16\,432$, find the answers to

(a) 5.2×316 | 10a |

(b) $16\,432 \div 52$ | 10b |

(c) $5\,200 \times 0.316$ | 10c |

(d) $16\,432 \div 3160$ | 10d |

(e) 26×158 | 10e |

[5 marks]

11. The table shows part of the railway timetable for trains from Andforth to Ermston.
Some trains stop at stations between, and others are express trains.
All stopping trains take the same time between stations as each other.

	Express	Stopping	Express	Stopping	Express	Stopping
Andforth	13:18	13:43	14:24	14:41	15:20	15:34
Bowlton		14:06		15:04		
Cheeble		14:18		15:16		
Delf		14:23		15:21		
Ermston	14:02	14:38	15:08	15:36	16:04	

(a) How many minutes does it take to travel from Andforth to Cheeble?

11a

(b) Complete the times in the table for the stopping train which leaves Andforth at 15:34.

(c) How much longer does the stopping train take than the express for the journey from Andforth to Ermston?

11c

(d) David lives in Bowlton and he wants to travel to Delf. He misses the 14:06 train by 10 minutes. How long will he have to wait for the next train?

11d

(e) The stopping trains travel at an average speed of 36 miles per hour for the whole journey. Work out the distance from Andforth to Ermston?

11e

(f) Work out the average speed of the express trains in miles per hour.

11f

[10 marks]

12. In Madd arithmetic there are only four digits, 1, 2, 3, and 4.

Here are the addition and multiplication tables for Madd arithmetic:

+	1	2	3	4
1	2	3	4	1
2	3	4	1	2
3	4	1	2	3
4	1	2	3	4

×	1	2	3	4
1	1	2	3	4
2	2	4	1	3
3	3	1	4	2
4	4	3	2	1

So, for example, 2 + 3 = 1 and 3 × 4 = 2.

Use the tables to find the answers to:

(a) 3 + 3 — 12a

(b) 4 × 2 — 12b

(c) (3 × 4) × 2 — 12c

(d) (4 × 3) + (3 × 1) — 12d

(e) m + m = 2. What two possible numbers could m stand for? — 12e

(f) u + v = u × v where u and v are different numbers.
What numbers do u and v stand for? — 12f

(g) t + y = y where y can stand for any number.
What number does t stand for? — 12g

(h) (w × w) + w = w. What are the two possible numbers that w could stand for? — 12h

[10 marks]

13. This is a question which needs you to be organised, and to work in a logical manner. Set your answers out clearly.

Write down

(a) all the 3-digit numbers which can be made by using each of the digits 1, 2, and 3 once only.

(b) all the 4-digit numbers which can be made by using each of the digits 1, 1, 2, and 2 once only.

(c) all the 5-digit numbers which can be made by using each of the digits 1, 1, 1, 2 and 3 once only.

[10 marks]

END OF PAPER