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

First name .....

Current school .....

mgs Founded 1515 | The Manchester Grammar School

Entrance Examination 2014
Arithmetic Section B

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 this page.

For each question, show all your working in full, as this will be marked, and then write your answer clearly in the space provided.

You have 1 hour for this paper which is worth 80 marks.

Marker	Short Problems Q1 - 6	Longer Problems Q7 - 11	**TOTAL**
Score			
out of	**30**	**50**	**80**

The first six questions on this paper are each worth 5 marks.

1. You are given that 47 x 382 = 17954
   Use this information to answer the following questions

(a) 17954 ÷ 382 = | 1a |

(b) 4.7 x 3.82 = | 1b |

(c) 179.54 ÷ 38.2 = | 1c |

(d) 94 x 191 = | 1d |

[5 marks]

2. (a) In a triangle, one of the angles is 39°, the second is 81°, what is the size of the third angle?

2a	°

(b) A second triangle is isosceles, and one of its angles is 48°. What are the TWO possible pairs of values for the other two angles?

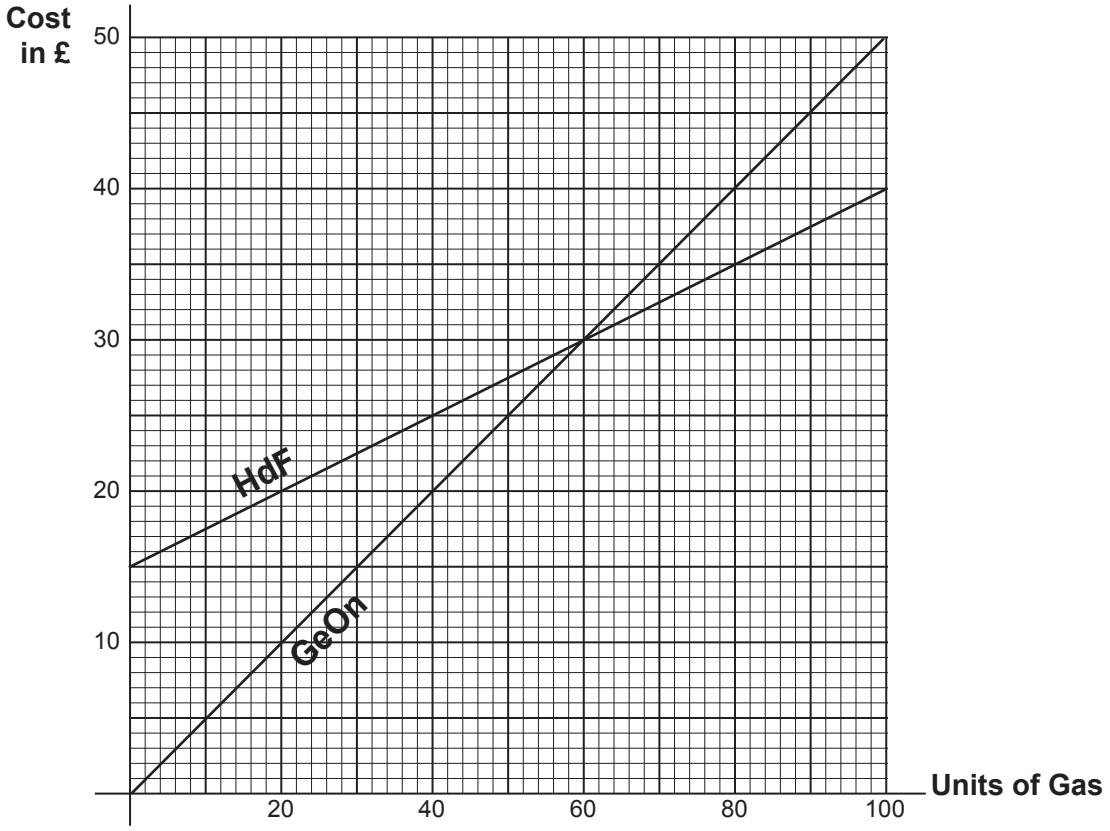
2b	° ° ,
or	° ° ,

(c) In a third triangle ABC, angle B is two times the size of angle A and angle C is 40° more than angle A. What is the size of angle A?

2c	°

[5 marks]

3. Andy has done some research on the internet and found two different companies he could pay for the gas he uses, known as GeOn and HdF. The graph below shows the cost of gas for the two different companies, so Andy can compare the costs.



(a) How much does it cost for 40 units of gas from GeOn?

3a	£

(b) How much does it cost for 50 units of gas from HdF?

3b	£

(c) For how many units of gas would the cost from each company be the same?

3c	

(d) If Andy uses 80 units of gas, which company would be cheaper and by how much?

3d	
and	£

[5 marks]

4. Farmer Burrows owns four chickens, each of which he knows by name.

Anna lays 2 eggs each day

Bethan lays 3 eggs each day

Connie lays 4 eggs each day

but Deborah lays 1 egg <u>every other day,</u> starting on day 1. (ie on day 1, then day 3 etc)

(a) How many eggs are laid on day 1? 4a

(b) How many eggs are laid on day 8? 4b

(c) One chicken is ill on a particular day,
so Farmer Burrows is only able to collect 8 eggs.
Which chicken is ill? 4c

(d) How many eggs were laid in total on all the days 1 to 8,
if no chickens were ill on those days? 4d

[5 marks]

5. In an **IFTHEN sequence**, the next number in the sequence is determined by a rule which depends on the previous number.

So for the following rule IF the number is odd THEN add 1 to it,
but IF the number is even THEN add 3 to it

then if the sequence starts with 3, it will continue <u>after</u> 3 as follows
4, 7, 8, 11 and so on.

List the **<u>next</u>** four numbers after the starting number in each of the following IFTHEN sequences by applying the rules given

(a) IF the number is odd THEN multiply by 2,
but IF the number is even THEN subtract 1.
Starting number of sequence is 3

5a	3, , , ,

(b) IF the number is greater than 10,
THEN divide by 2, but IF the number
is less than 10 THEN multiply by 3.
Starting number of sequence is 16

5b	16, , , ,

(c) IF the number is prime THEN add 5,
but IF the number is not prime
THEN divide by 2.
Starting number of sequence is 11

5b	11, , , ,

[5 marks]

6. In a set of cuboids, the three measurements, length, width and height are always in the ratio 5 : 4 : 3

i.e. Ratio of Length : Width : Height = 5 : 4 : 3 for each of the cuboids

(a) Find the length of the first cuboid if the width is 20 cm.

6a ____ cm

(b) Find the width of the second cuboid if its length is 12 cm more than its height.

6b ____ cm

(c) Find the height of the third cuboid if its volume is 480 cm^3

6c ____ cm

[5 marks]

Please turn over

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Short problems	**/30**

The remaining longer problems on this paper are each worth 10 marks.

7. The **"BACT"** of two numbers is found by adding together the common factors of the two numbers. So to find the **BACT** of 20 and 30 which is written as B(20,30) we would work out

Factors of 20 are **1, 2,** 4, **5, 10,** 20

and **Factors of 30** are **1, 2,** 3, **5,** 6, **10,** 15, 30

the Common Factors, underlined in bold are **1, 2, 5, 10**

and then the **BACT** of 20 and 30 is B(20,30) = 1 + 2 + 5 + 10 = 18
Using this method

(a) Find the BACT of 10 and 15, written as B(10,15)

Factors of 10 are

Factors of 15 are

So common factors are

7a	B(10,15) =

(b) Find the BACT of 24 and 36, written as B(24,36)

7b	B(24,36) =

(c) For any pair of numbers, what is the smallest value the BACT could have?

7c

(d) If the BACT of two numbers is 7 and both of the numbers are less than 15, write down a pair of possible numbers that you could be using

7d

The BACT of three numbers is worked out in the same way as for two numbers by adding the common factors of all three numbers.

(e) What is the BACT of 6, 12 and 30, i.e. B(6,12,30)?

7e B(6,12,30) =

[10 marks]

8. A class of students is set a test with 20 questions. A correct answer scores 5 marks, but a wrong answer loses 3 marks. An answer space left blank scores 0 marks.

(a) Adil answers all of the questions, leaving no blank answer spaces and gets 12 right. What is his score?

8a	

(b) Brett answers 6 out of the 20 questions correctly but leaves 8 answers spaces blank. What is his score?

8b	

(c) Caroline answers all the questions and scores 28 marks. How many questions did she get right?

8c	

(d) David unfortunately scored zero. Give **TWO** ways in which this could have happened, **other than** him leaving **all** the answer spaces blank.

8d	1)
or	2)

(e) Eve got twice as many right as she got wrong and scored 35. How many answer spaces did she leave blank?

8e	

[10 marks]

9. Ayton & Eeport are connected by a railway on which 5 trains run each way every day. For all the journeys in the same direction the trains travel at the same speed and take the same time. At one station, only part of the timetable was displayed as a section had been washed off by the rain.

Station	Train 1	Train 2	Train 3	Train 4	Train 5
Ayton	10.50	12.00	12.50	14.00	14.50
Beeswater	11.04	12.14	13.04	14.14	15.04
Ceebridge	11.16	12.26	13.16	14.26	
Deeville	11.24	12.34	13.24		
Eeport	11.28	12.38	13.28		
Eeport	11.40	12.50	13.40		
Deeville	11.44	12.54	13.44		
Ceebridge	12.00	13.10	14.00	15.10	
Beeswater	12.12	13.22	14.12	15.22	16.12
Ayton	12.26	13.36	14.26	15.36	16.26

(a) Complete the missing parts of the timetable by filling in the empty unshaded boxes in the grid above

(b) When does train 5 arrive at Eeport?

9b	

(c) When does train 4 leave Eeport to return to Ayton?

9c	

(d) Nancy lives in Ceebridge and wants to travel to Ayton but she misses train 2 by 12 minutes. How long will she have to wait for the next train?

9d	

(e) There is a steep downhill section between two of the towns on the journey. Between which towns is the slope?
Give a reason for your answer.

9e	and
Reason	

[10 marks]

10. Each day a shoal of small fish increases in number by 50% but each night a shark eats 300 of them.
So if there are 1000 fish on Monday morning, then there will be 1500 by Monday evening but only 1200 left by Tuesday morning!

Complete the following tables showing the number of fish each morning

(a)

Day	Mon morning	Tues morning	Wed morning	Thurs morning
Number of Fish	2000			

(b)

Day	Mon morning	Tues morning	Wed morning	Thurs morning
Number of Fish	520			

(c)

Day	Mon morning	Tues morning	Wed morning
Number of Fish			1050

(d) If the number of fish each morning is the same on each of the four days, how many fish were there on Monday morning?

10d	

(e) Word got round amongst the sharks that there was a good meal to be had in this part of the sea! During the day there is still a 50% increase in the number of fish, but if 15 sharks came each night, eating 300 fish each, complete the table below.

Day	Mon morning	Tues morning	Wed morning	Thurs morning
Number of Fish	12000			

[10 marks]

11. The numbers 21 to 29 inclusive are to be written in the spaces below so that each number satisfies the condition given on the line where you have written it, with each number appearing **only once.**

(a) ..... is an even number

(b) ..... is a factor of 144

(c) ..... is a power of 3

(d) ..... is a prime number

(e) ..... has digits which differ by 1

(f) ..... has exactly 3 factors

(g) ..... is a multiple of 7

(h) ..... is equal to the sum of all its factors(except the number itself)

(i) ..... has its second digit greater than its first digit

Remember each of the numbers 21 to 29 should appear **only once.**

[10 marks]

The End

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Long problems	**/50**