

Surname						Other Names					
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General Certificate of Secondary Education  
March 2006



**MATHEMATICS (MODULAR) (SPECIFICATION B)  
Module 3 Higher Tier Section A**

**33003/HA**

**H**

Monday 6 March 2006 9.00 am to 9.40 am

<p><b>For this paper you must have:</b></p> <ul style="list-style-type: none"> <li>• a calculator</li> <li>• mathematical instruments</li> <li>• a treasury tag</li> </ul>	
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For Examiner's Use			
Section A		Section B	
Pages	Mark	Pages	Mark
3		2-3	
4-5		4-5	
6-7		6-7	
8			
Total Section A			
Total Section B			
TOTAL			
Examiner's Initials			

Time allowed for Section A: 40 minutes

**Instructions**

- Use blue or black ink or ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Answer the questions in the spaces provided.
- Do all rough work in this book.
- This paper is divided into two sections: Section A and Section B.
- After the 40 minutes allowed for Section A, you must put your calculator on the floor under your seat. You will then be given Section B.
- When you have answered Section B you may work again on Section A but you may **not** use your calculator. It must remain on the floor under your seat.
- At the end of the examination tag Section A and Section B together with Section A on top.

**Information**

- The maximum mark for Section A is 32.
- The marks for questions are shown in brackets.
- You may ask for more answer paper and graph paper. These must be tagged securely to this answer book.
- You are expected to use a calculator where appropriate.

**Advice**

- In all calculations, show clearly how you work out your answer.

**There are no questions printed on this page**

Answer **all** questions in the spaces provided.

1 Find the value of  $\frac{2}{3.6^3}$

(a) Write down the full calculator display.

Answer ..... (1 mark)

(b) Write your answer to 3 significant figures.

Answer ..... (1 mark)

2 The ratio of girls to boys in a school is 13:12  
There are 572 girls in the school.

(a) How many pupils are there in the school altogether?

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Answer ..... (3 marks)

(b) Harry is a Year 10 pupil at the school.  
He says that the ratio of girls to boys in Year 10 will also be 13:12

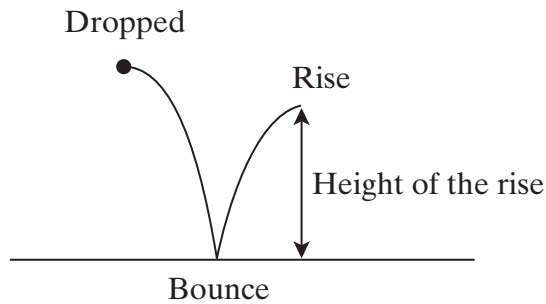
Explain why Harry may **not** be correct to say this.

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(1 mark)

Turn over ►

- 3 When a ball is dropped onto the floor, it bounces and then rises. This is shown in the diagram.



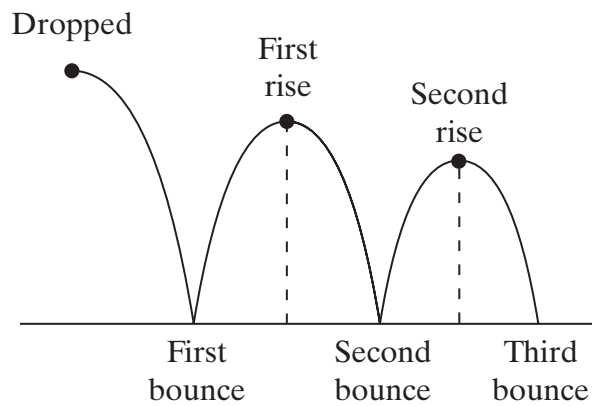
The ball rises to 80% of the height from which it is dropped. The ball is dropped from a height of 4 metres.

- (a) Calculate the height of the rise after the first bounce.

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Answer ..... metres (1 mark)

- (b) The ball bounces a second time. It rises to 80% of the height of the first rise.



- (i) Calculate the height of the second rise.

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Answer ..... metres (1 mark)

- (ii) The ball carries on bouncing in this way.  
Each time it rises to 80% of the last rise.

For how many bounces does it rise to a height greater than 1.75 metres?  
You **must** show your working.

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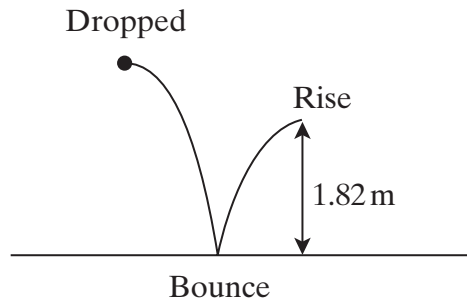
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Answer ..... (2 marks)

- (c) A different ball is dropped onto the floor.  
This ball rises to 70% of the height from which it is dropped.  
The height of the rise after the first bounce is 1.82 metres.



Calculate the height from which the ball is dropped.

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Answer ..... metres (3 marks)

Turn over ►

4 In 2002 the number of visitors to four tourist attractions is shown in the table.

Blackpool Pleasure Beach	6.2 million
Edinburgh Castle	1 153 000
Giant's Causeway	$4.07 \times 10^5$
Tate Modern	4.6 million

(a) Write the number of visitors to Edinburgh Castle in standard form.

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Answer ..... (1 mark)

(b) Blackpool Pleasure Beach claimed that it had more visitors than the other three added together.

Is this claim true?

You **must** show your working.

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(2 marks)

5  $y$  is inversely proportional to  $x$ .  
When  $y = 16.5$ ,  $x = 20$

(a) Find an equation connecting  $y$  and  $x$ .

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Answer ..... (3 marks)

(b) Find the value of  $x$  when  $y = 75$

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Answer  $x =$  ..... (2 marks)

6 Emily drives her car a distance of 310 miles which is correct to 2 significant figures.  
Her car uses 50 litres of petrol which is correct to the nearest litre.

Find, in miles per litre, the maximum value for the petrol consumption of her car.  
You **must** show your working.

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Answer ..... miles per litre (4 marks)

**Turn over for the next question**

**Turn over** ►

7 Work out  $2\sqrt{3}(\sqrt{3} + \sqrt{8})$

Give your answer in the form  $a + b\sqrt{6}$  where  $a$  and  $b$  are integers.

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Answer ..... (3 marks)

8 Ranjit started work in 2003.

In 2004 he moved to a different job and his pay decreased by 15%.

At the end of each of the years 2004 and 2005 he was given an increase in pay.

The percentage increase in pay was the same each time.

Ranjit worked out that he was now paid 22.4% more than he was paid in 2003.

Calculate the percentage increase that he received at the end of 2004 and 2005.

You **must** show your working.

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Answer ..... % (4 marks)

**END OF SECTION A**



Surname		Other Names	
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General Certificate of Secondary Education  
March 2006



**MATHEMATICS (MODULAR) (SPECIFICATION B)  
Module 3 Higher Tier Section B**

**33003/HB**

**H**

Monday 6 March 2006 9.45 am to 10.25 am

<p><b>For this paper you must have:</b></p> <ul style="list-style-type: none"> <li>• mathematical instruments</li> </ul> <p>You must <b>not</b> use a calculator.</p>	
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Time allowed for Section B: 40 minutes

**Instructions**

- Use blue or black ink or ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Answer the questions in the spaces provided.
- Do all rough work in this book.
- You may **not** use your calculator in Section B. Your calculator must remain on the floor under your seat.
- When you have answered Section B you may work again on Section A but you may **not** use your calculator. It must remain on the floor under your seat.
- At the end of the examination tag Section A and Section B together with Section A on top.

**Information**

- The maximum mark for Section B is 32.
- The marks for questions are shown in brackets.
- You may ask for more answer paper and graph paper. These must be tagged securely to this answer book.

**Advice**

- In all calculations, show clearly how you work out your answer.

Answer **all** questions in the spaces provided.

- 9 Write 108 as the product of its prime factors.  
Give your answer in index form.

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Answer ..... (3 marks)

- 10 (a) Write 0.000 000 397 in standard form.

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Answer ..... (1 mark)

- (b) Evaluate  $500 \times 30 \times 10^8$

Give your answer in standard form.

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Answer ..... (2 marks)

(c) Evaluate  $\frac{6 \times 10^7}{8 \times 10^{11}}$

Give your answer in standard form.

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Answer ..... (2 marks)

11 Work out  $1\frac{3}{4} \div 1\frac{4}{11}$

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Answer ..... (3 marks)

**Turn over for the next question**

Turn over 

- 12 (a) Complete the table of values for  $y = 2x^2 + x - 6$

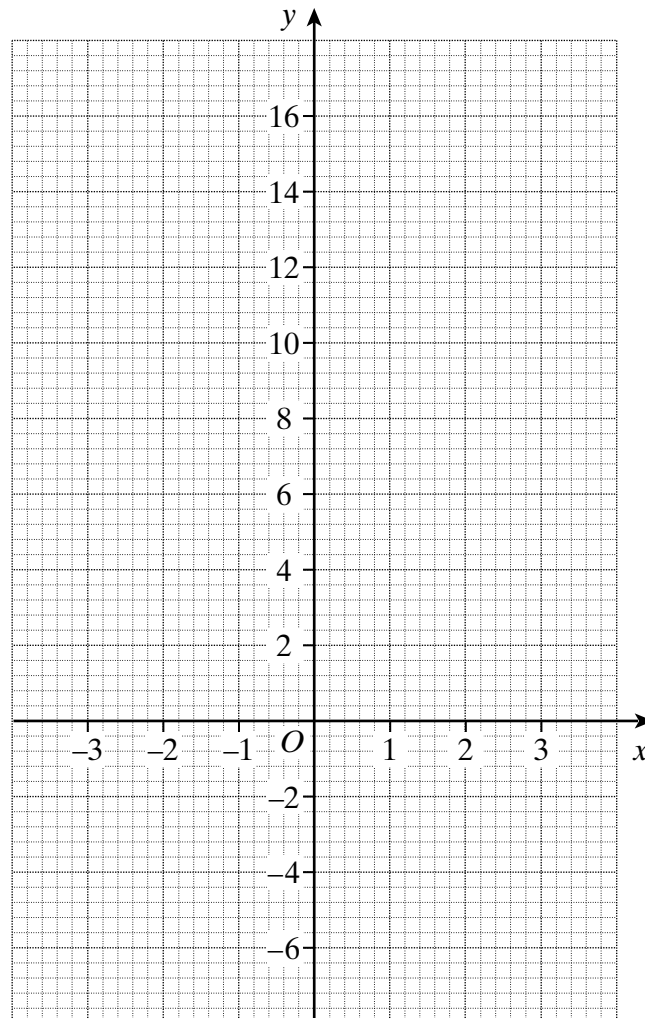
$x$	-3	-2	-1	0	1	2	3
$y$	9	0		-6	-3		15

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(2 marks)

- (b) On the grid below, draw the graph of  $y = 2x^2 + x - 6$  for values of  $x$  between  $-3$  and  $+3$ .



(2 marks)

(c) Use your graph to write down the solutions of the equation

$$2x^2 + x - 6 = 0$$

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Answer ..... and ..... (1 mark)

(d) By drawing an appropriate linear graph, write down the solutions of

$$2x^2 + x - 6 = 2x + 1$$

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Answer ..... and ..... (2 marks)

13 Show that  $(\sqrt{50} - \sqrt{2})^2$  is an integer.

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(2 marks)

**Turn over for the next question**

Turn over 

14 (a) Evaluate  $16^{\frac{1}{4}} \times 5^{-2} \times 36^0$

You **must** show your working.

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Answer ..... (4 marks)

(b) Write  $64^{-\frac{2}{3}}$  as a fraction.

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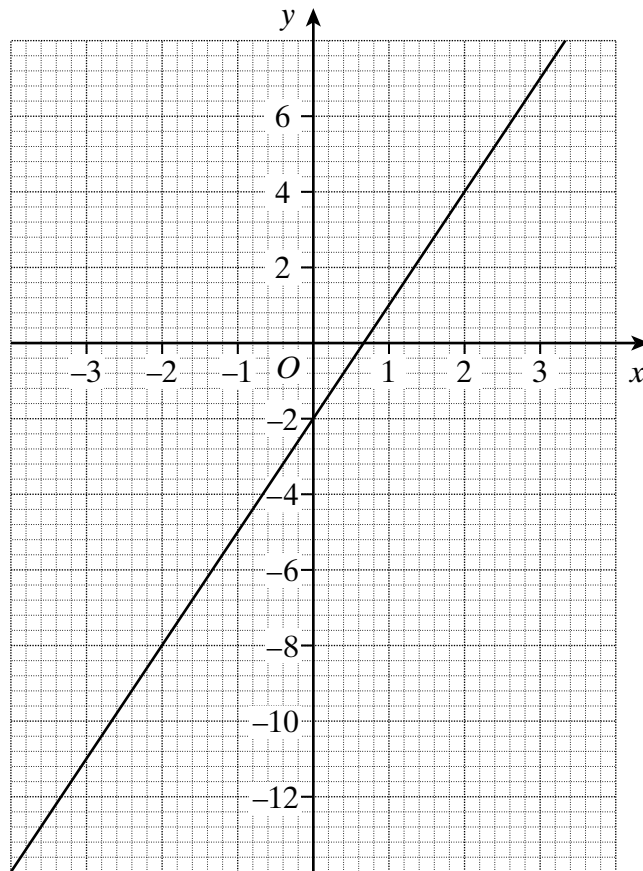
Answer ..... (2 marks)

15 Prove that  $0.2\dot{1}\dot{6} = \frac{107}{495}$

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(3 marks)

16 Bruce is given this graph of the linear equation  $y = 3x - 2$



He is going to draw a second graph on the same axes.

He wants the  $x$ -coordinates of the points of intersection of the two graphs to be the solutions to the quadratic equation

$$x^2 + x - 7 = 0$$

Work out the equation of the graph that needs to be drawn.

(You do **not** need to draw the graph.)

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Answer ..... (3 marks)

**END OF QUESTIONS**

**There are no questions printed on this page**