

# Edexcel GCSE

## Mathematics

# Higher Tier

## Number: Bounds

### Information for students

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The marks for individual questions and the parts of questions are shown in round brackets: e.g. (2). There are 9 questions in this selection.

### Advice for students

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Show all stages in any calculations.  
Work steadily through the paper. Do not spend too long on one question.  
If you cannot answer a question, leave it and attempt the next one.  
Return at the end to those you have left out.

### Information for teachers

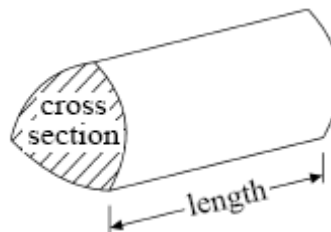
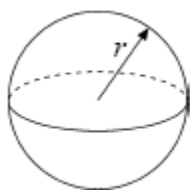
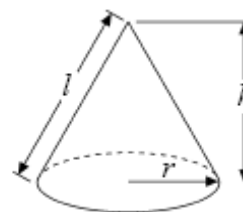
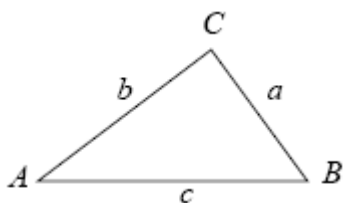
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The questions in this document are taken from the 2009 GCSE Exam Wizard and include questions from examinations set between January 2003 and June 2009 from specifications 1387, 1388, 2540, 2544, 1380 and 2381.

Questions are those tagged as assessing “Bounds” though they might assess other areas of the specification as well. Questions are those tagged as “Higher” so could have (though not necessarily) appeared on either an Intermediate or Higher tier paper.

## GCSE Mathematics

Formulae: Higher Tier

**You must not write on this formulae page.****Anything you write on this formulae page will gain NO credit.****Volume of prism** = area of cross section  $\times$  length**Volume of sphere**  $\frac{4}{3} \pi r^3$ **Surface area of sphere** =  $4\pi r^2$ **Volume of cone**  $\frac{1}{3} \pi r^2 h$ **Curved surface area of cone** =  $\pi r l$ **In any triangle ABC****The Quadratic Equation**The solutions of  $ax^2 + bx + c = 0$ where  $a \neq 0$ , are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

**Sine Rule**  $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ **Cosine Rule**  $a^2 = b^2 + c^2 - 2bc \cos A$ **Area of triangle** =  $\frac{1}{2} ab \sin C$

1. The weight of a bag of potatoes is 25 kg, correct to the nearest kg.

(a) Write down the smallest possible weight of the bag of potatoes.

..... kg  
(1)

(b) Write down the largest possible weight of the bag of potatoes.

..... kg  
(1)  
(Total 2 marks)

2. The length of a line is 63 centimetres, correct to the nearest centimetre.

(a) Write down the **least** possible length of the line.

..... centimetres  
(1)

(b) Write down the **greatest** possible length of the line.

..... centimetres  
(1)  
(Total 2 marks)

3. The weight of a suitcase is 14 kg correct to the nearest kilogram.

What is the **greatest** possible weight of the suitcase?

14.04 kg      14.05 kg      14.4 kg      14.5 kg      14.9 kg

**A**                      **B**                      **C**                      **D**                      **E**  
(Total 1 mark)

4. Katy drove for 238 miles, correct to the nearest mile.  
She used 27.3 litres of petrol, to the nearest tenth of a litre.

$$\text{Petrol consumption} = \frac{\text{Number of miles travelled}}{\text{Number of litres of petrol used}}$$

Work out the upper bound for the petrol consumption for Katy's journey.  
Give your answer correct to 2 decimal places.

..... miles per litre  
(Total 3 marks)

5. A ball is thrown vertically upwards with a speed  $V$  metres per second.

The height,  $H$  metres, to which it rises is given by

$$H = \frac{V^2}{2g}$$

where  $g$  m/s<sup>2</sup> is the acceleration due to gravity.

$V = 24.4$  correct to 3 significant figures.

$g = 9.8$  correct to 2 significant figures.

- (i) Write down the lower bound of  $g$ .

.....

- (ii) Calculate the upper bound of  $H$ .  
Give your answer correct to 3 significant figures.

.....

**(Total 3 marks)**

6. The length of a piece of wood is 123 mm, correct to the nearest mm.

What is the greatest length that the piece of wood could be?

123.4 mm

122.5 mm

123.48 mm

124 mm

123.5 mm

**A**

**B**

**C**

**D**

**E**

**(Total 1 mark)**

7. Jomo takes 35 seconds, to the nearest second, to run a race.

What is the least possible time this could be?

35.5 seconds

34.4 seconds

34.5 seconds

34 seconds

34.9 seconds

**A**

**B**

**C**

**D**

**E**

**(Total 1 mark)**

8. The length of a piece of string is 16 cm, correct to the nearest cm.

What is the greatest possible length the piece of string could be?

15.95

15.5

16.05

16.4

16.5

**A**

**B**

**C**

**D**

**E**

**(Total 1 mark)**

9. The length of a line is 7 cm measured to the nearest cm.

What is the greatest length the line could be?

7 cm

7.05 cm

7.49 cm

7.4 cm

7.5 cm

**A**

**B**

**C**

**D**

**E**

**(Total 1 mark)**

01. (a) 24.5 1  
*BI cao*
- (b) 25.5 1  
*BI for 25.5 or 25.4 $\dot{9}$*
- [2]**
02. (a) 62.5 1  
*BI cao*
- (b) 63.5 1  
*BI for 63.5 (accept or 63.4 $\dot{9}$  or 63.49.. any evidence that the 9 is recurring or 63.499 or better)*
- [2]**
03. D **[1]**
04. 238 has an UB 238.5, a LB of 237.5  
 27.3 has an UB of 27.35, a LB of 27.25
- Upper:  $\frac{238.5}{27.25} = 8.75229$   
 8.75 3
- BI for one of 238.5, 237.5, 27.35, 27.25, 238.4 $\dot{9}$ , 27.34 $\dot{9}$  seen*  
*M1 for 'UB no of miles'  $\div$  'LB no of litres'*  
*Where  $238 < \text{'UB no of miles'} \leq 238.5$  and  $27.25 \leq \text{'LB no of litres'} < 27.3$*   
*A1 8.75 or 8.752 or 8.7522 or 8.7523 or better*  
*SC 238.4 27.25 which leads to 8.748...BI M1 A0*
- [3]**

05. (i) 9.75

*BI cao*

$$\begin{aligned}
 \text{(ii)} \quad & \frac{24.45^2}{2 \times 9.75} \\
 & = \frac{597.8025}{19.5} \\
 & = 30.6565 \dots
 \end{aligned}$$

30.7

3

*MI for  $\frac{V_{UB}^2}{2 \times g_{LB}}$  where  $24.4 < V_{UB} \leq 24.45$  and  $9.75 \leq g <$*

*9.8 or  $\frac{V_{UB}^2}{2 \times '9.75'}$  (= 30.6565...)*

*AI for 30.7 or 30.66 or 30.657 or 30.6565 or 30.65654 or better coming from 30.6565384...*

**[3]**

06. E

**[1]**

07. C

**[1]**

08. E

**[1]**

09. E

**[1]**



- 01.** It was clear that nearly all candidates were not familiar with this area of the syllabus with only a few candidates getting either part correct. Part (a) had a 28% success rate and part (b) had only a 4% success rate.
- 02.** Part (a) was answered correctly by about 80% of the candidates.  
About half of the candidates were successful in part (b), giving an answer of 63.5 or 63.49 recurring. The most common incorrect answer was 63.4. Often candidates did not give enough decimal places for a recurring decimal and wrote 63.49.
- 03.** No Report available for this question.
- 04.** Many candidates could identify at least one upper or lower bound correctly, but then used commonly  $\frac{238.5}{27.35}$ . Many candidates simply used  $\frac{238}{27.3}$  and then rounded off or  $\frac{238.4}{27.25}$ . Most candidates sensibly avoided recurring decimals saving themselves a problem when using their calculator.  
The vast majority of candidates simply divided the given numbers. A number of these candidates having carried out this division then attempted to find a bound for their answer. Of those candidates that recognized the need to use bounds, the most popular decision was to use both the upper bounds. Only about 16% of candidates were able to gain full marks for this question. A useful strategy used by a number of candidates who gained full marks was to find 4 answers by using every combination of UB and LB then looking for the highest result, thereby avoiding the error of doing UB/UB.
- 05.** Approximately 20% candidates obtained the correct answer in part i) but part (ii) was very poorly done. 9.7 or 9.8 were the most frequent incorrect answers for part (i). Most candidates failed to use the correct values in part (ii). Most frequently, 24.4 and 9.8, i.e. the given values, were used suggesting that they had little understanding of the use of bounds. A very few candidates used the correct values but failed to include the 2 in the denominator.
- 6–9.** No Reports available for these questions.