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**Wednesday 11 January 2012 – Morning**

**GCSE MATHEMATICS B (MEI)**

**B293B** Paper 3 Section B (Higher Tier)

Candidates answer on the Question Paper.

**OCR supplied materials:**  
None

**Other materials required:**

- Geometrical instruments
- Scientific or graphical calculator
- Tracing paper (optional)

**Duration:** 45 minutes



Candidate forename		Candidate surname	
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Centre number						Candidate number				
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**INSTRUCTIONS TO CANDIDATES**

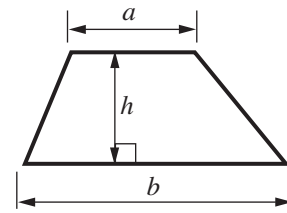
- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Show your working. Marks may be given for a correct method even if the answer is incorrect.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

**INFORMATION FOR CANDIDATES**

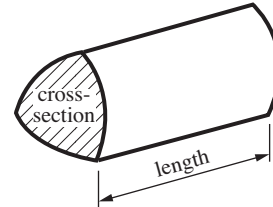
- The number of marks is given in brackets [ ] at the end of each question or part question.
- Section B starts with question 9.
- You are expected to use a calculator in Section B of this paper.
- Use the  $\pi$  button on your calculator or take  $\pi$  to be 3.142 unless the question says otherwise.
- The total number of marks for this Section is **36**.
- This document consists of **12** pages. Any blank pages are indicated.

## Formulae Sheet: Higher Tier

**Area of trapezium** =  $\frac{1}{2}(a + b)h$



**Volume of prism** = (area of cross-section)  $\times$  length

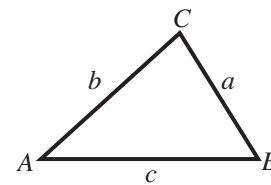


**In any triangle  $ABC$**

**Sine rule**  $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

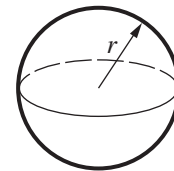
**Cosine rule**  $a^2 = b^2 + c^2 - 2bc \cos A$

**Area of triangle** =  $\frac{1}{2}ab \sin C$



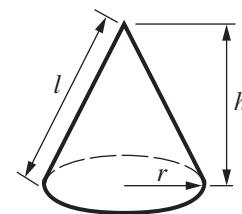
**Volume of sphere** =  $\frac{4}{3}\pi r^3$

**Surface area of sphere** =  $4\pi r^2$



**Volume of cone** =  $\frac{1}{3}\pi r^2 h$

**Curved surface area of cone** =  $\pi r l$



**The Quadratic Equation**

The solutions of  $ax^2 + bx + c = 0$ , where  $a \neq 0$ , are given by

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

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- 9 John bought a car for £7095.  
Later, he sold the car at a 40% loss.

For how much did he sell the car?

£ ..... [3]

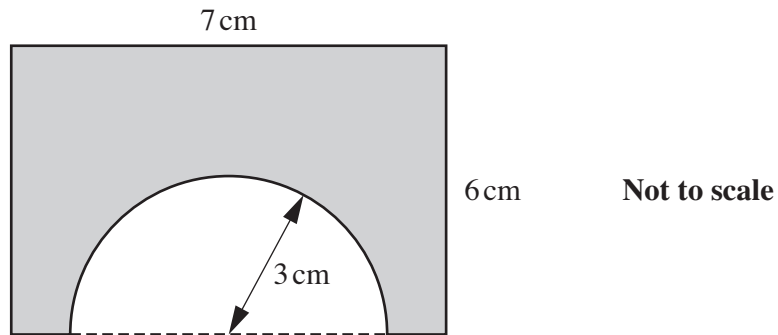
- 10 Katie has a six-sided die with numbers 1 to 6 on the faces, which she suspects is biased.  
She throws the die a large number of times to estimate the probability of getting each number.  
She shows her results in this table.

Number	1	2	3	4	5	6
Probability	0.12	0.15	0.12	0.14	0.16	

Complete the table.

[2]

- 11 A rectangular piece of card is 7 cm long and 6 cm wide.  
A semicircle of radius 3 cm is cut from the card.



Calculate the area of card that remains.

..... cm<sup>2</sup> [4]

12 A cylindrical water tank has radius 25 cm and height 110 cm.

(a) Calculate the volume of the tank.

(a) .....  $\text{cm}^3$  [2]

(b) Write your answer to part (a) in litres.

(b) ..... litres [1]

(c) Rainwater is collected in the tank from the flat roof of a garage.  
The flat roof is a rectangle 700 cm by 400 cm.  
In a heavy downpour, rain falls onto the roof at 9 millimetres per hour.  
Initially the tank is empty.

How long does it take to fill the tank?  
Give your answer to the nearest minute.

(c) ..... minutes [4]

**13** The first theoretical calculation of  $\pi$  seems to have been carried out by Archimedes of Syracuse (287–212 BC). He obtained the approximation  $\frac{223}{71} < \pi < \frac{22}{7}$ .

- (a)** Write  $\frac{223}{71}$  and  $\frac{22}{7}$  as decimals to 5 decimal places and hence write down a value for  $\pi$  as accurately as these approximations justify.

**(a)** ..... [2]

- (b)** A rule for approximating  $\pi$  was found by James Gregory (1638–1675). The more terms used, the more accurate is the approximation to  $\pi$ .

$$\pi = 4 - \frac{4}{3} + \frac{4}{5} - \frac{4}{7} + \dots$$

- (i)** Use the first four terms of this rule to find an approximation to  $\pi$ . Write down the first 6 digits on your calculator display.

**(b)(i)** ..... [1]

- (ii)** Use the first **five** terms of this rule to find an approximation to  $\pi$ . Write down the first 6 digits on your calculator display.

**(ii)** ..... [1]

- 14 Find all the integer values of  $n$  that satisfy this inequality.

$$-3 < 2n + 1 < 10$$

..... [3]

- 15 (a) Show that the equation  $x^3 + 3x - 7 = 0$  has a solution between  $x = 1$  and  $x = 2$ . [1]

- (b) Using trial and improvement, find this solution correct to 1 decimal place.  
Show all your trials and their outcomes.

(b) ..... [2]

16 The management of a school wants to carry out a survey about travel to school. To do this they wish to select a sample of 60 from the 600 students in the school.

(a) The Headteacher suggests that they select every 10th name from an alphabetical list of the 600 students to obtain the sample of 60 students.

Do you consider this to be a satisfactory method of obtaining the sample?  
Justify your answer.

.....  
.....  
.....  
..... [2]

(b) The Deputy Head suggests taking a stratified sample of 60 students based on the year groups.

Explain how he might do this in order to obtain a representative sample of all year groups.

.....  
.....  
.....  
.....  
..... [2]



- (c) The sample of 60 students was surveyed about the distance they had to travel to school. A summary is given in the table below.

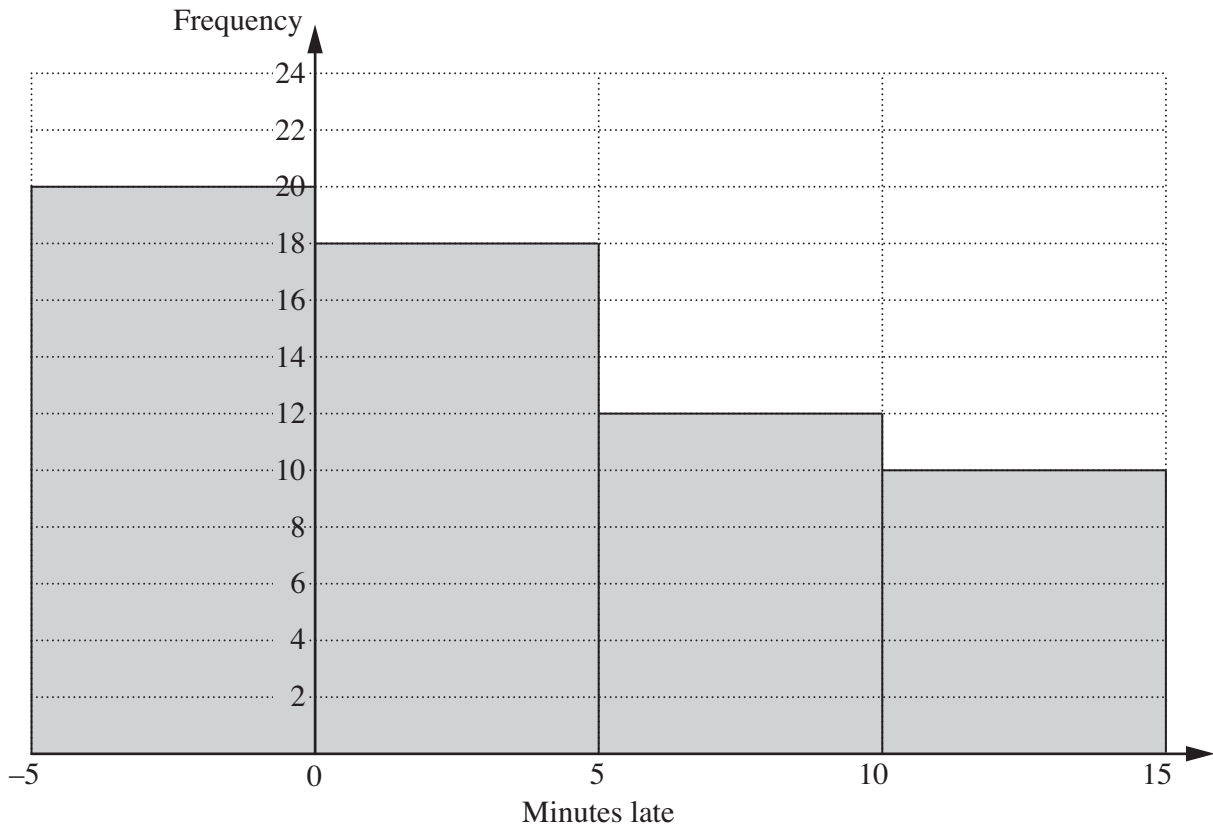
Distance ( $x$ km)	Frequency
$0 \leq x < 1$	3
$1 \leq x < 2$	13
$2 \leq x < 3$	17
$3 \leq x < 4$	15
$4 \leq x < 5$	12

Calculate an estimate of the mean distance travelled to school.

(c) ..... km [4]

**TURN OVER FOR QUESTION 17**

- 17 This frequency diagram summarises the number of minutes early or late the morning flight from Manchester to Paris arrived for the last 60 days.



Use the information on this diagram to estimate the probability that the plane will be late tomorrow.

..... [2]

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