



88127401

**MATHEMATICAL STUDIES  
STANDARD LEVEL  
PAPER 1**

Tuesday 6 November 2012 (afternoon)

1 hour 30 minutes

Candidate session number

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Examination code

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**INSTRUCTIONS TO CANDIDATES**

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- A graphic display calculator is required for this paper.
- A clean copy of the **Mathematical Studies SL information booklet** is required for this paper.
- Answer all questions.
- Write your answers in the boxes provided.
- Unless otherwise stated in the question, all numerical answers should be given exactly or correct to three significant figures.
- The maximum mark for this examination paper is [90 marks].



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Maximum marks will be given for correct answers. Where an answer is incorrect, some marks may be given for a correct method, provided this is shown by written working. Write your answers in the answer boxes provided. Solutions found from a graphic display calculator should be supported by suitable working, e.g. if graphs are used to find a solution, you should sketch these as part of your answer.

1. The height, in cm, of each of 11 students is given below.

180, 174, 177, 160, 184, 164, 158, 157, 163, 177, 183

(a) Draw an ordered stem and leaf diagram to show this information. [3 marks]

(b) Find

(i) the median height;

(ii) the interquartile range. [3 marks]

Working:

Answers:

(a)

(b) (i) .....

(ii) .....



2. The first term of an arithmetic sequence is 3 and the seventh term is 33.

Calculate

- (a) the common difference; *[2 marks]*
- (b) the 95<sup>th</sup> term of the sequence; *[2 marks]*
- (c) the sum of the first 250 terms. *[2 marks]*

*Working:*

*Answers:*

- (a) .....
- (b) .....
- (c) .....



3. The length, in cm, of six baseball bats was measured. The lengths are given below.

104.5, 105.1, 104.8, 105.2, 104.9, 104.9

(a) Calculate the **exact value** of the mean length. *[2 marks]*

(b) Write your answer to part (a) in the form  $a \times 10^k$  where  $1 \leq a < 10$  and  $k \in \mathbb{Z}$ . *[2 marks]*

Marian calculates the mean length and finds it to be 105 cm.

(c) Calculate the percentage error made by Marian. *[2 marks]*

*Working:*

*Answers:*

- (a) .....
- (b) .....
- (c) .....



4. The area of a circle is equal to  $8 \text{ cm}^2$ .

(a) Find the radius of the circle. *[2 marks]*

This circle is the base of a **solid** cylinder of height 25 cm.

(b) Write down the volume of the **solid** cylinder. *[1 mark]*

(c) Find the **total** surface area of the **solid** cylinder. *[3 marks]*

*Working:*

*Answers:*

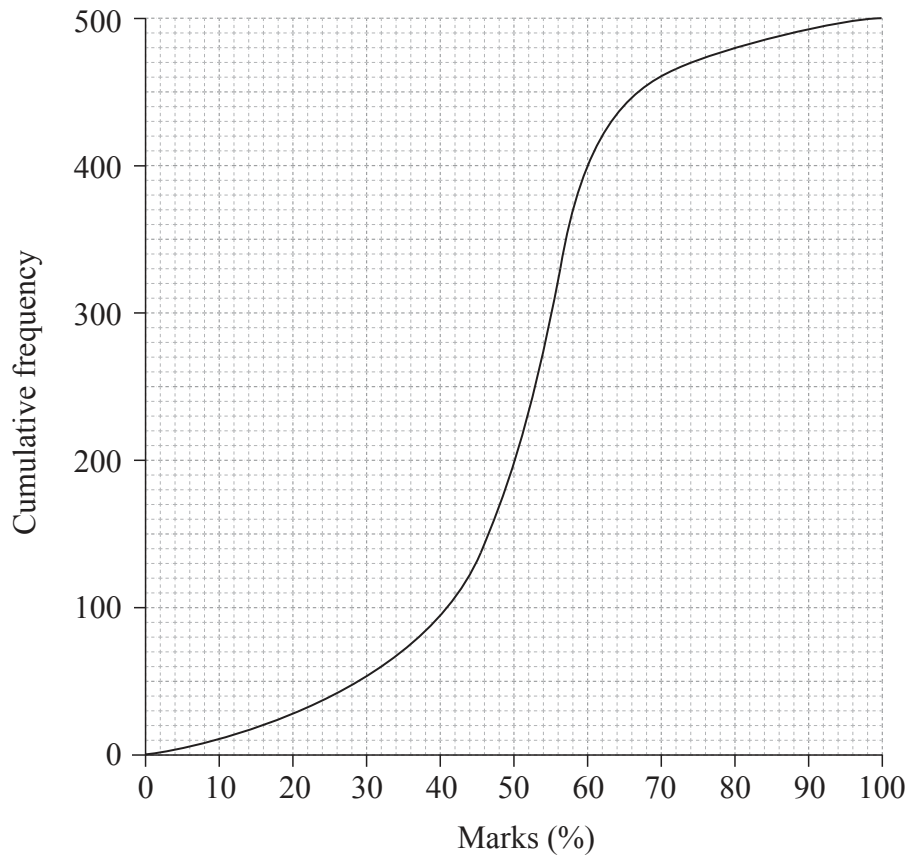
(a) .....

(b) .....

(c) .....



5. The cumulative frequency curve shows the percentage marks, given correct to the nearest integer, gained by 500 students in an examination.



The passing grades were determined as given below.

- 85 to 100 %, grade A
- 66 to 84 %, grade B
- 57 to 65 %, grade C
- 50 to 56 %, grade D

Those scoring less than 50 % failed the examination.

- (a) Find the number of students who failed the examination. [2 marks]
- (b) Find the number of students who were awarded grade C or better. [2 marks]

The top 20 % of the students are eligible for further study.

- (c) Find the lowest mark required to be eligible for further study. [2 marks]

*(This question continues on the following page)*



(Question 5 continued)

*Working:*

*Answers:*

- (a) .....
- (b) .....
- (c) .....



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Turn over

6. The first term of a geometric sequence is 2 and the third term is 2.205.

Calculate

- (a) the common ratio of the sequence; *[2 marks]*
- (b) the eleventh term of the sequence; *[2 marks]*
- (c) the sum of the first 23 terms of the sequence. *[2 marks]*

*Working:*

*Answers:*

- (a) .....
- (b) .....
- (c) .....





7. Give all answers in this question correct to two decimal places.

Isabel is travelling from Geneva to Toronto via Amsterdam.  
She changes 1240 Swiss francs (CHF) to Euros (EUR).  
The exchange rate is 1 CHF = 0.7681 EUR .

- (a) Calculate the amount of Euros Isabel receives. [2 marks]

Isabel then changes 750 EUR into Canadian dollars (CAD) and is charged 3.12 % commission.  
The exchange rate is 1 CAD = 0.7470 EUR .

- (b) Calculate the amount of Canadian dollars she receives. [4 marks]

*Working:*

*Answers:*

- (a) .....
- (b) .....



8. The straight line,  $L_1$ , has equation  $y = -2x + 5$ .

(a) Write down the gradient of  $L_1$ . *[1 mark]*

Line  $L_2$ , is perpendicular to line  $L_1$ , and passes through the point  $(4, 5)$ .

(b) (i) Write down the gradient of  $L_2$ .

(ii) Find the equation of  $L_2$ . *[3 marks]*

(c) Write down the coordinates of the point of intersection of  $L_1$  and  $L_2$ . *[2 marks]*

*Working:*

*Answers:*

- (a) .....
- (b) (i) .....
- (ii) .....
- (c) .....



9. Consider the following logic statements.

$p$ : Carlos is playing the guitar  
 $q$ : Carlos is studying for his IB exams

(a) Write in words the compound statement  $\neg p \wedge q$ . [2 marks]

(b) Write the following statement in symbolic form.

“Either Carlos is playing the guitar or he is studying for his IB exams but not both.” [1 mark]

(c) Write the **converse** of the following statement in **symbolic form**.

“If Carlos is playing the guitar then he is not studying for his IB exams.” [3 marks]

Working:

Answers:

- (a) .....
- .....
- (b) .....
- (c) .....



10. Consider the quadratic function  $y = f(x)$ , where  $f(x) = 5 - x + ax^2$ .

- (a) It is given that  $f(2) = -5$ . Find the value of  $a$ . *[2 marks]*
- (b) Find the equation of the axis of symmetry of the graph of  $y = f(x)$ . *[2 marks]*
- (c) Write down the range of this quadratic function. *[2 marks]*

*Working:*

*Answers:*

- (a) .....
- (b) .....
- (c) .....



11. Toronto’s annual snowfall,  $x$ , in cm, has been recorded for the past 176 years. The results are shown in the table.

Snowfall (cm)	$2 \leq x < 6$	$6 \leq x < 10$	$10 \leq x < 14$	$14 \leq x < 18$	$18 \leq x < 22$	$22 \leq x < 26$	$26 \leq x < 30$
Frequency	30	26	29	32	18	27	14

- (a) Write down the modal class. *[1 mark]*
- (b) Write down the mid interval value for the class  $6 \leq x < 10$ . *[1 mark]*
- (c) Calculate an estimate of the mean annual snowfall. *[2 marks]*
- (d) Find the number of years for which the annual snowfall was at least 18 cm. *[2 marks]*

*Working:*

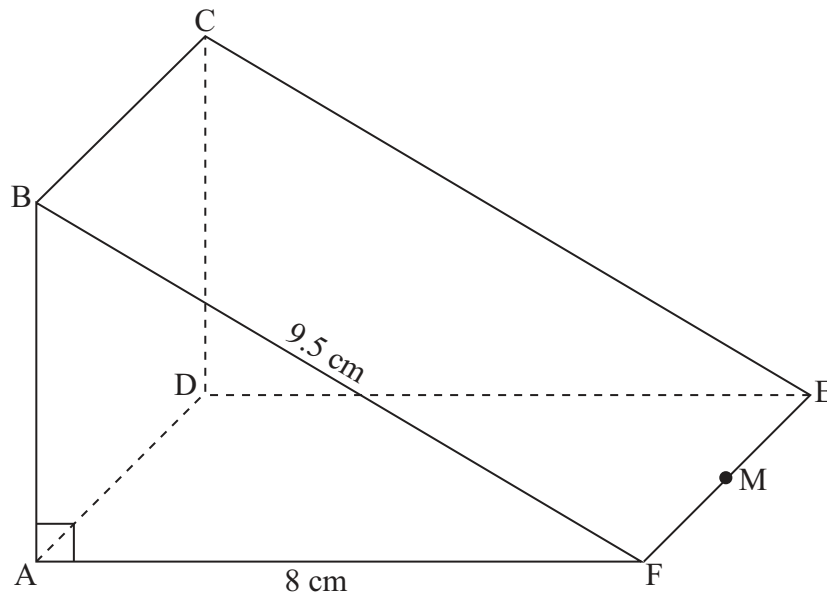
*Answers:*

- (a) .....
- (b) .....
- (c) .....
- (d) .....



12. The diagram shows a right triangular prism, ABCDEF, in which the face ABCD is a square.  
AF = 8 cm, BF = 9.5 cm, and angle BAF is  $90^\circ$ .

*diagram not to scale*



- (a) Calculate the length of AB. [2 marks]
- M is the midpoint of EF.
- (b) Calculate the length of BM. [2 marks]
- (c) Find the size of the angle between BM and the face ADEF. [2 marks]

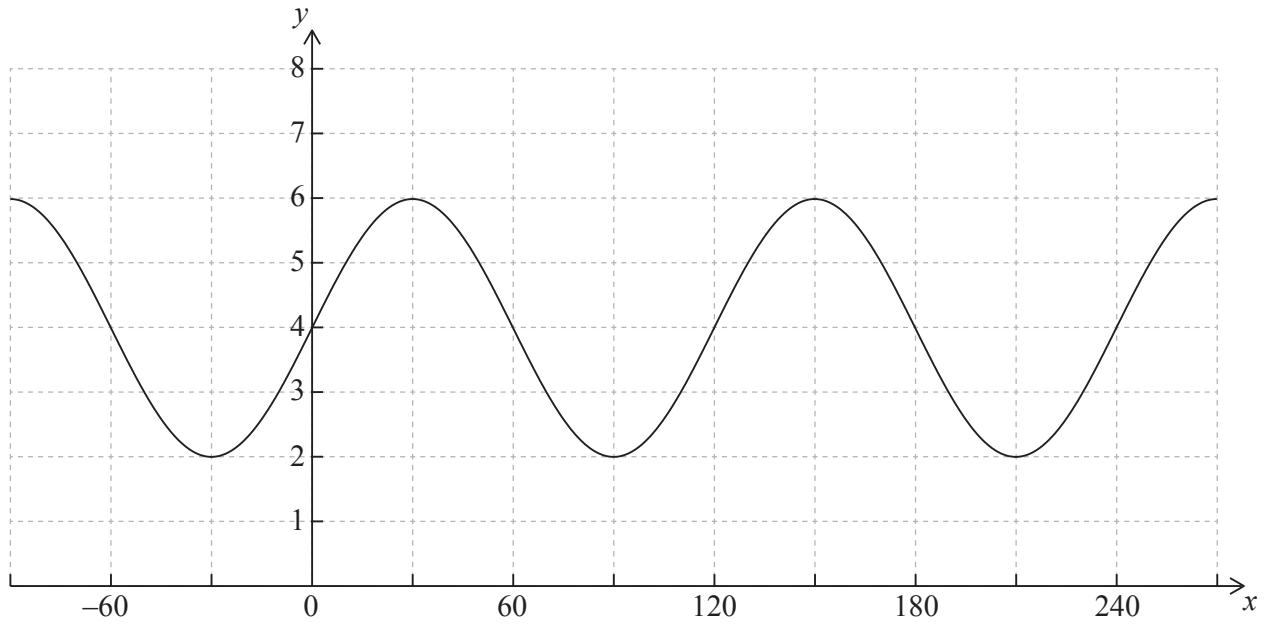
*Working:*

*Answers:*

- (a) .....
- (b) .....
- (c) .....



13. The graph of the function  $f(x) = a \sin(bx) + c$  is shown below for  $-90^\circ \leq x \leq 270^\circ$ .



(a) Find the value of

(i)  $a$ ;

(ii)  $b$ ;

(iii)  $c$ .

[4 marks]

(b) Use your graphic display calculator to solve the equation  $f(x) = 3$  for  $30^\circ \leq x \leq 150^\circ$ .

[2 marks]

Working:

Answers:

(a) (i) .....

(ii) .....

(iii) .....

(b) .....



14. Jackson invested 12 000 Australian dollars (AUD) in a bank that offered simple interest at an annual interest rate of  $r\%$ . The value of Jackson's investment doubled after 20 years.

(a) Calculate the value of  $r$ . [3 marks]

Maddison invests 15 000 AUD in a bank that offers compound interest at a nominal annual interest rate of 4.44%, **compounded quarterly**.

(b) Calculate the number of years that it will take for Maddison's investment to triple in value. [3 marks]

*Working:*

*Answers:*

(a) .....

(b) .....





15.  $f(x) = 5x^3 - 4x^2 + x$

(a) Find  $f'(x)$ . [3 marks]

(b) Find using your answer to part (a) the  $x$ -coordinate of

(i) the local maximum point;

(ii) the local minimum point. [3 marks]

*Working:*

*Answers:*

(a) .....

(b) (i) .....

(ii) .....



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