



H

GENERAL CERTIFICATE OF SECONDARY EDUCATION
MATHEMATICS B (MEI)
 Paper 3 Section B (Higher Tier)

B293B

Candidates answer on the question paper.

OCR supplied materials:
None

Other materials required:

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

Monday 6 June 2011
Afternoon

Duration: 45 minutes



Candidate forename		Candidate surname	
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Centre number						Candidate number				
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INSTRUCTIONS TO CANDIDATES

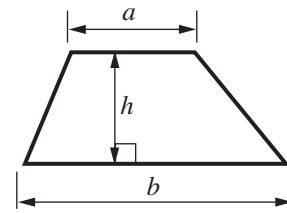
- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer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

INFORMATION FOR CANDIDATES

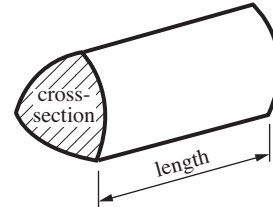
- The number of marks is given in brackets [] at the end of each question or part question.
- Section B starts with question 9.
- You are expected to use a calculator in Section B of this paper.
- Use the π button on your calculator or take π to be 3.142 unless the question says otherwise.
- The total 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

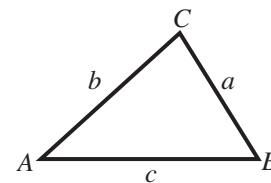


In any triangle ABC

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

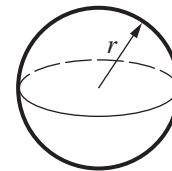
Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$

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



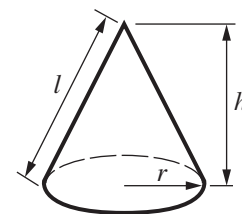
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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



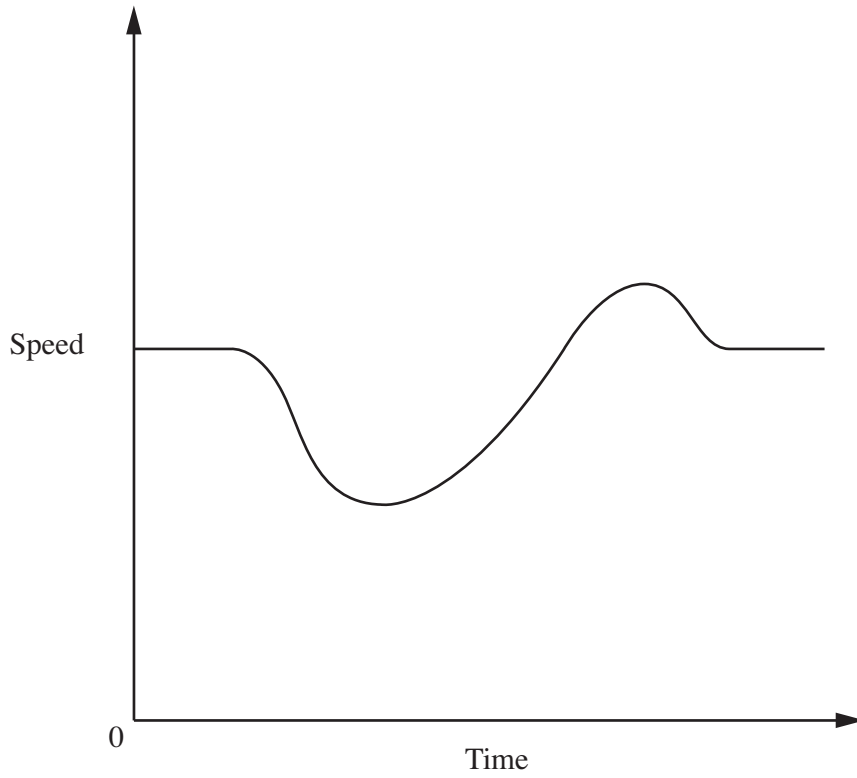
The Quadratic Equation

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 The graph illustrates John's speed during a cycle ride.



Describe what is happening to John's speed during this ride.

.....

.....

.....

.....

..... [3]

10 Paula creates a flower bed in her garden. It is a circle with radius 3 metres.

Find

(a) the circumference of the flower bed,

(a) m [2]

(b) the area of the flower bed.

(b) m² [2]

- 11 This formula can be used to convert temperatures in degrees Celsius, C , to temperatures in degrees Fahrenheit, F .

$$F = \frac{9}{5} C + 32$$

- (a) Change 140°C into $^{\circ}\text{F}$.

(a) $^{\circ}\text{F}$ [1]

- (b) Rearrange the formula so that C is the subject.

(b) [3]

- (c) Liz has an old recipe book which states that a cake needs to be baked at 350°F .

At what temperature should she set her oven in $^{\circ}\text{C}$ to bake the cake?
Show your working.

(c) $^{\circ}\text{C}$ [1]

12 The table shows the distribution of the number of visitors per day to a garden centre on the 360 days that it was open in 2009.

Number of visitors	$0 < x \leq 100$	$100 < x \leq 200$	$200 < x \leq 250$	$250 < x \leq 300$	$300 < x \leq 500$
Number of days	84	102	54	52	68

(a) Write down the maximum possible range for the number of visitors.

(a) [1]

(b) Calculate an estimate of the mean number of visitors per day to the centre on the days when it was open.

(b) [4]

(c) Explain why your answer to part (b) is only an estimate.

.....
 [1]

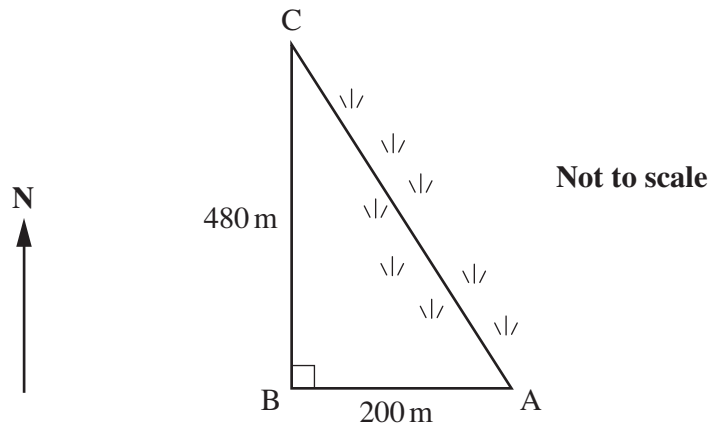
(d) In 2010 the mean number of visitors per day was 340 and the range was 550.

Make two comparisons between the numbers of visitors in 2009 and 2010.

1.

 2.
 [2]

- 13 Seth and Ruth are walking over moorland when they come to a particularly wet and boggy patch. Seth walks directly from A to C, as shown in the diagram, at 2 km per hour. Ruth takes a detour by walking 200 m due West from A to B and then 480 m due North from B to C. She walks both distances at 3 km per hour.



Who arrives at C first and by how many minutes?
Show all your working.

..... arrives first by minutes [6]

14 The following is a proof that the sum of any three consecutive whole numbers is a multiple of 3.

Any three consecutive numbers can be written as $n - 1$, n , $n + 1$.

The sum of these three numbers is $n - 1 + n + n + 1 = 3n$.

So for all values of n the sum is a multiple of 3.

(a) Give a similar proof that the sum of any five consecutive whole numbers is a multiple of 5.

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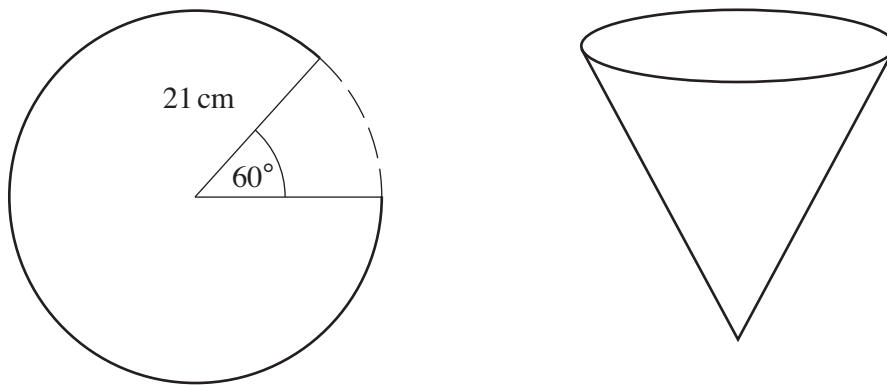
..... [3]

(b) Josie says, “*The sum of any four consecutive whole numbers is a multiple of 4.*”

Give a counter-example to show that Josie is wrong.

..... [1]

- 15 The net of a cone is formed by removing a minor sector of a circle as shown.



The radius of the circle is 21 cm and the angle of the minor sector is 60° .

When this net is made into the cone, the major arc becomes the circumference of the circular base of the cone.

- (a) Show that the radius of the circular base is 17.5 cm.

[3]

- (b) Find the volume of the cone.
Give your answer correct to 3 significant figures.

(b) cm^3 [3]

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