



# M10

**GENERAL CERTIFICATE OF SECONDARY EDUCATION**  
**MATHEMATICS C (GRADUATED ASSESSMENT)**  
 MODULE M10 – SECTION B

## B280B

Candidates answer on the question paper.

**OCR supplied materials:**  
None

**Other materials required:**

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

**Thursday 20 January 2011**  
**Morning**

**Duration: 30 minutes**



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

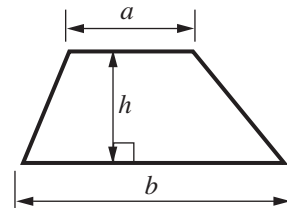
- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Show your working.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

**INFORMATION FOR CANDIDATES**

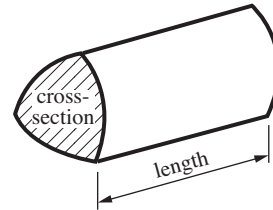
- The number of marks is given in brackets [ ] at the end of each question or part question.
- Section B starts with question 6.
- You are expected to use a calculator in Section B of this paper.
- Use the  $\pi$  button on your calculator or take  $\pi$  to be 3.142 unless the question says otherwise.
- The total number of marks for this Section is **25**.
- This document consists of **8** pages. Any blank pages are indicated.

## Formulae Sheet

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



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

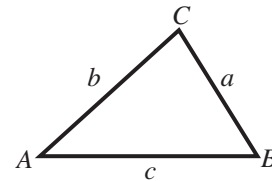


**In any triangle  $ABC$**

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

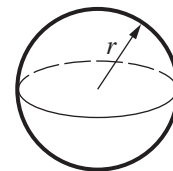
**Cosine rule**  $a^2 = b^2 + c^2 - 2bc \cos A$

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



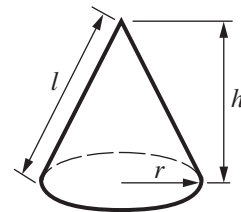
**Volume of sphere** =  $\frac{4}{3}\pi r^3$

**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

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

**PLEASE DO NOT WRITE ON THIS PAGE**

- 6 In a chemical reaction, the mass of a substance is decreasing.  
Its mass,  $M$  mg,  $t$  seconds after the reaction begins is given by this formula.

$$M = 250 \times 10^{-0.3t}$$

- (a) What mass of this substance is present at the start of the reaction?

(a)..... mg [1]

- (b) What mass of this substance is present two seconds after the start of the reaction?

(b)..... mg [1]

- (c) How many seconds after the start of the reaction does the mass remaining become less than 1 mg?  
Show how you decide.

(c)..... [2]

7 (a) Factorise.

$$5x^2 - 21x + 4$$

(a) ..... [2]

(b) Solve this equation.

$$5x^2 - 17x + 4 = 0$$

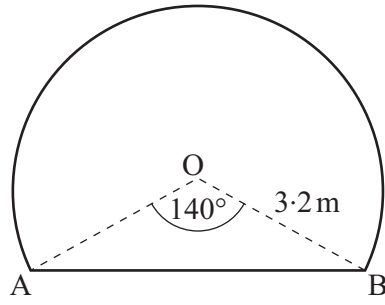
Give your answers correct to 2 decimal places.

(b) ..... [3]

- 8 Shenaz has a bag containing six pens.  
Three pens are red, two are blue and one is green.  
She takes pens out of the bag at random, **without** replacing them.

Calculate the probability that the first two pens she takes out are the same colour.

..... [4]



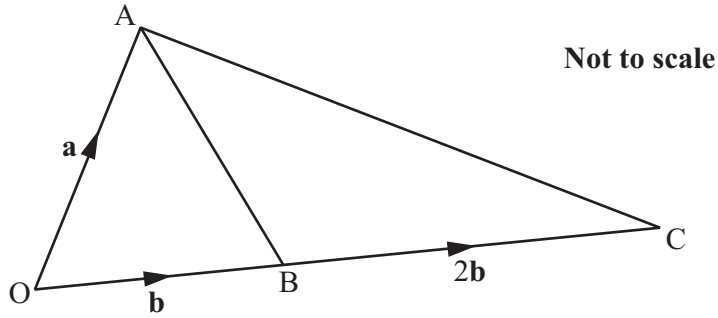
Not to scale

The diagram shows the cross-section of a tunnel.  
 It is a segment of a circle, centre O and radius 3.2 m.  
 It is bounded by the chord AB.  
 Angle AOB = 140°.

Calculate the area of the cross-section of the tunnel.

.....m<sup>2</sup> [5]

10



$\vec{OA} = \mathbf{a}$  and  $\vec{OB} = \mathbf{b}$ .

$\vec{BC} = 2\mathbf{b}$ .

(a) Find

(i)  $\vec{AB}$ ,

(a)(i) ..... [1]

(ii)  $\vec{AC}$ .

(ii) ..... [1]

(b) D is the point on AB produced such that  $\vec{BD} = 2\vec{AB}$ .

Use vectors to prove that OD and AC are **not** parallel.

.....

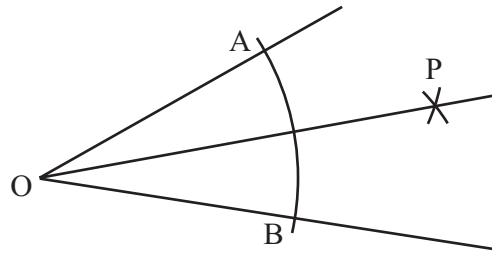
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.....

..... [2]

**TURN OVER FOR QUESTION 11**

11 The diagram shows a construction for bisecting an angle using a ruler and compasses.



Complete this proof to show why this construction works.

Statement	Reason
$OA = OB$	arcs drawn with same radius
$AP = BP$	.....
.....	.....
So triangles $OAP$ and $OBP$ are congruent	.....
So angle $AOP =$ angle $BOP$ as required	

[3]

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