

Candidate forename		Candidate surname	
-----------------------	--	----------------------	--

Centre number						Candidate number				
------------------	--	--	--	--	--	---------------------	--	--	--	--

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GENERAL CERTIFICATE OF SECONDARY EDUCATION**

B294B

MATHEMATICS B (MEI)

Paper 4 Section B (Higher Tier)

FRIDAY 14 JANUARY 2011: Morning

DURATION: 1 hour

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

Candidates answer on the question paper.

OCR SUPPLIED MATERIALS:

None

OTHER MATERIALS REQUIRED:

Geometrical instruments

Scientific or graphical calculator

Tracing paper (optional)

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

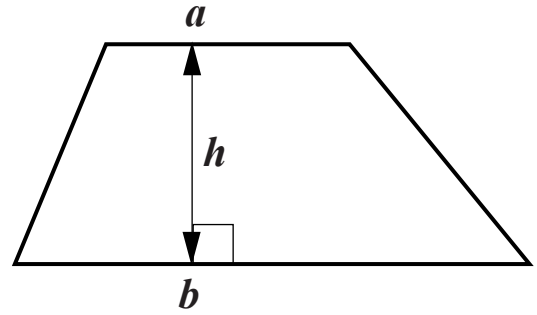
- Write your name, centre number and candidate number in the boxes on the first page. Please write clearly and in capital letters.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Show 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.

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 11.
- 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 50.

FORMULAE SHEET: HIGHER TIER

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



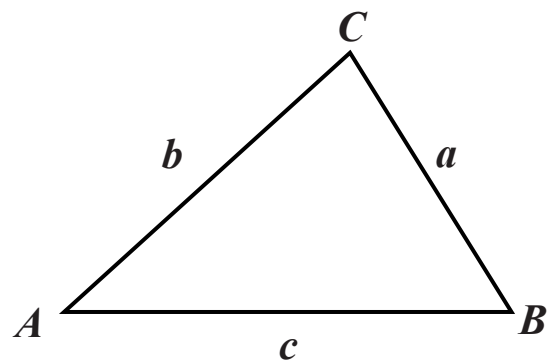
Volume of prism =
(area of cross-section) \times length

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 = $\frac{1}{2} ab \sin C$



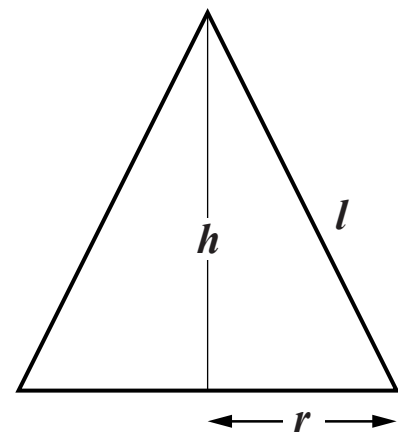
Volume of sphere = $\frac{4}{3} \pi r^3$

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

Where r is the radius.

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

Curved surface area of cone = πrl



The Quadratic Equation

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

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

- 11 The table below shows the average heights of children of different ages in a certain town.**

Age (years)	Height (cm)
2	86
3	95
4	102
6	116
8	128
10	139

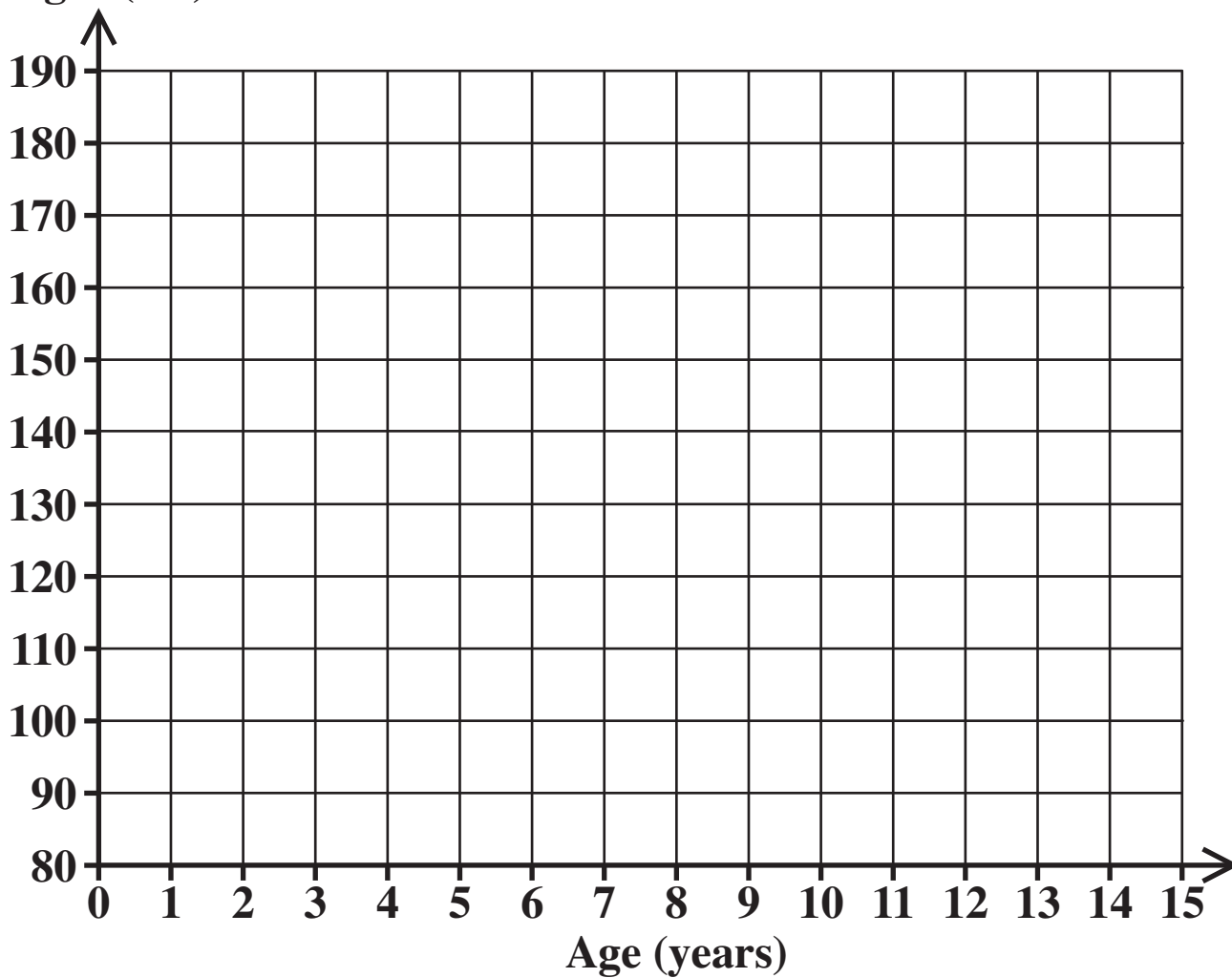
- (a) Plot the scatter diagram for these data. Use the grid on the page opposite. [2 marks]**
- (b) Draw a line of best fit. [1 mark]**
- (c) Use your line of best fit to estimate the average height of children from the town who are 7 years old. [1 mark]**

_____ cm

- (d) Would it be sensible to use your line of best fit to estimate the average height of children from the town who are 15 years old? Explain your answer. [1 mark]**

_____ because _____

Height (cm)



12 (a) Craig uses the formula

$$F = 2C + 30$$

to convert a temperature in degrees Celsius (C) to one in degrees Fahrenheit (F).

Use Craig's formula to find F when C = 75.

[1 mark]

(b) Craig's formula does not give exact conversions.

The formula which gives exact conversions is

$$F = 1.8C + 32.$$

(i) Complete the table below for

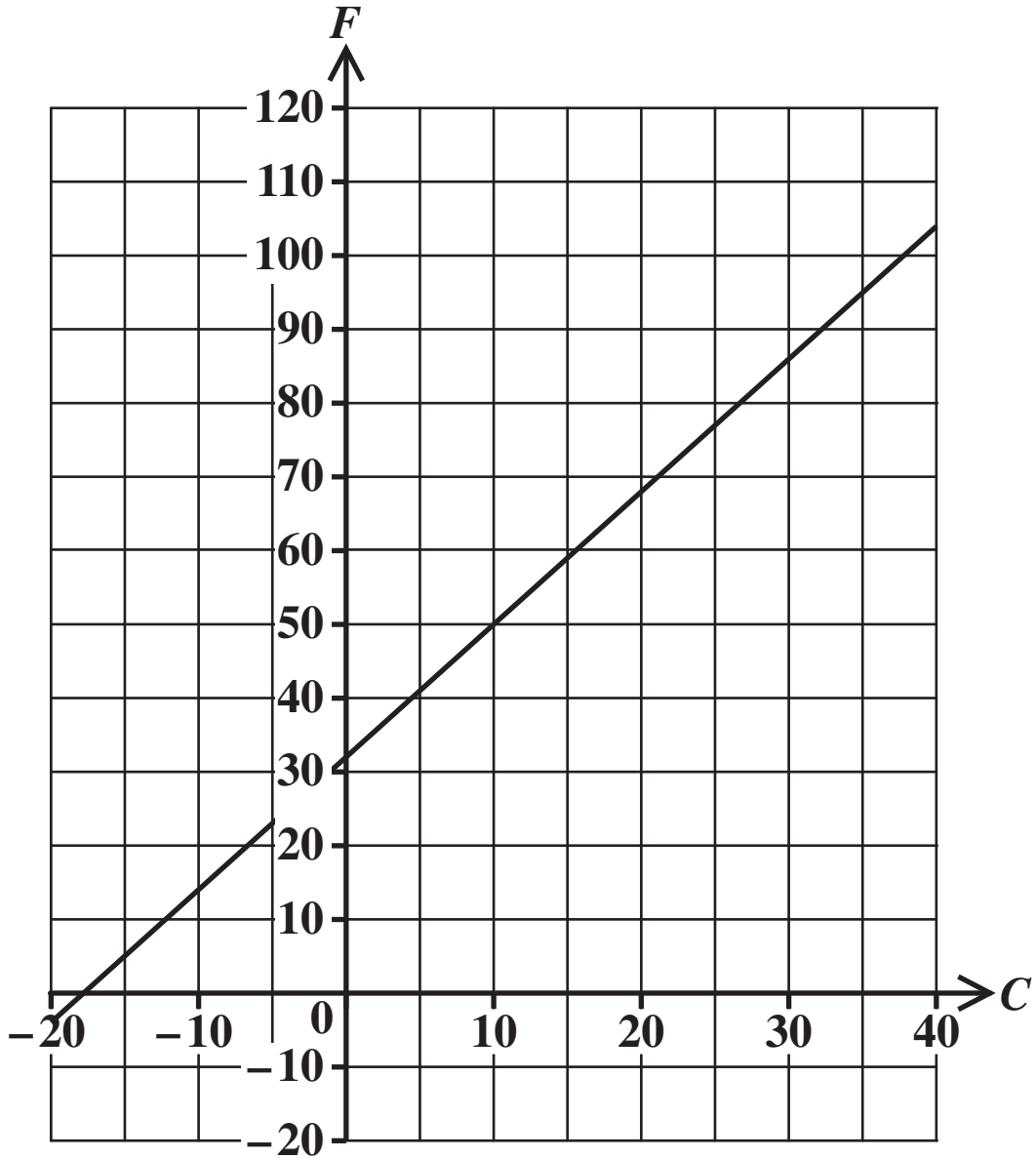
$$F = 1.8C + 32.$$

[1 mark]

C	-20	0	20	40
F			68	

The conversion graph for the exact conversion is shown on the grid opposite.

Graph of $F = 1.8C + 32$



- (ii) Complete the table and use the grid on the separate sheet to draw the graph of Craig's conversion $F = 2C + 30$
[3 marks]

13 (a) Solve
 $7x = 2x + 9$
[2 marks]

(b) Expand
 $3x(x^2 - 5)$
[2 marks]

BLANK PAGE

14 In 2008 the rate of Value Added Tax (VAT) was reduced from 17.5% to 15%

(a) A washing machine cost £320 PLUS VAT.

By how much was the selling price reduced? [3 marks]

£ _____

(b) After the change to 15% VAT, the new selling price of a television was £632.50

Calculate the selling price of the television before the change, when VAT was 17.5%
[5 marks]

£ _____

15 The first six terms of a sequence are shown below.

3 5 7 9 11 13

(a) Write down an expression for the n th term of the sequence. [2 marks]

(b) (i) Hence write down an expression for the n th term of the sequence below. [1 mark]

$\frac{1}{3}$ $\frac{1}{5}$ $\frac{1}{7}$ $\frac{1}{9}$ $\frac{1}{11}$ $\frac{1}{13}$ _____ _____

(ii) Explain why the $(n + 1)$ th term of the sequence in (b)(i) is

$$\frac{1}{2n + 3}$$

[1 mark]

(iii) Find as a single fraction, in its simplest form,

$$\frac{1}{2n+1} - \frac{1}{2n+3}$$

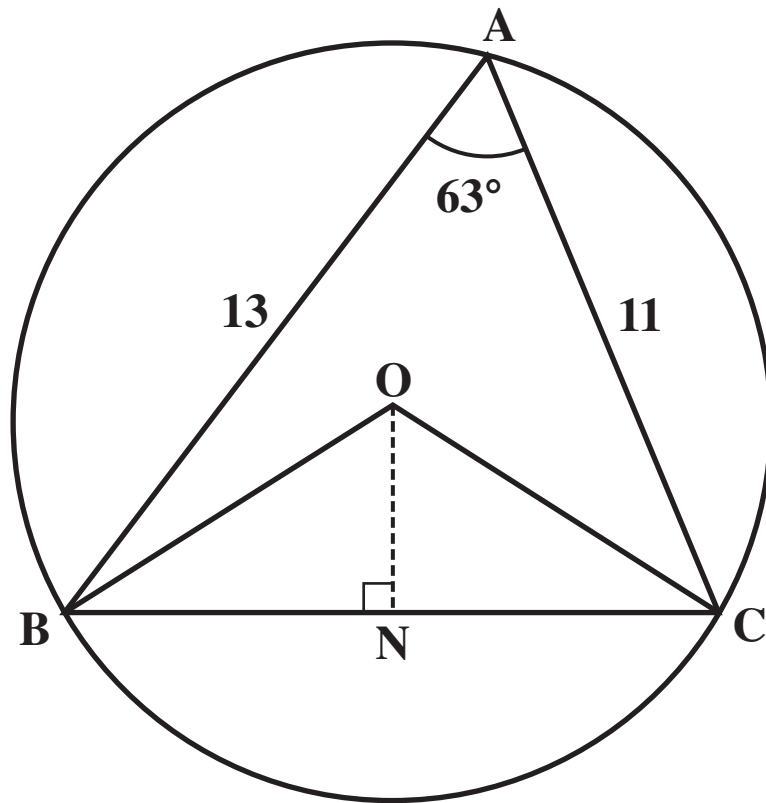
[3 marks]

(iv) Use your answer to part (b)(iii) to find the difference between the 25th and 26th term of the sequence

$$\frac{1}{3} \quad \frac{1}{5} \quad \frac{1}{7} \quad \frac{1}{9} \quad \frac{1}{11} \quad \frac{1}{13} \quad \text{---} \quad \text{---}$$

[1 mark]

- 16 Look at the diagram below.
It is not to scale.



A, B and C are points on the circle, centre O.
ON is perpendicular to BC.
AB = 13 cm
AC = 11 cm
angle BAC = 63°

- (a) Show that
BC = 12.66 cm correct to 2 decimal places. [2 marks]

(b) Explain why angle BON = 63°
[2 marks]

(c) Calculate OB, the radius of the circle. [4 marks]

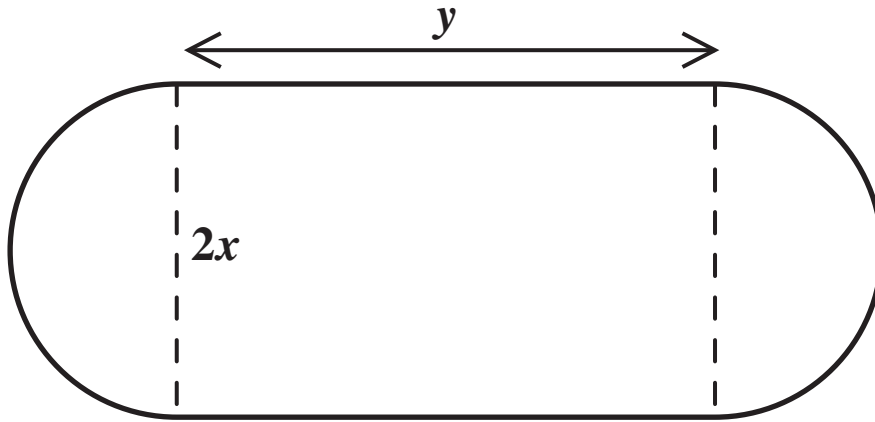
_____ **cm**

(d) Calculate the area of the SECTOR BOC. [3 marks]

_____ **cm²**

BLANK PAGE

**17 IN THIS QUESTION USE 3 AS AN APPROXIMATION TO π .
ALL THE LENGTHS ARE IN CENTIMETRES.
Look at the diagram below.**



**The shape is made up of a rectangle and two semicircles.
The radius of each semicircle is x and the length of the rectangle is y**

**The total area of the shape is 75 cm^2
This means that $3x^2 + 2xy = 75$**

(a) The perimeter of the shape is 34 cm.

**Show that $3x + y = 17$
[2 marks]**

- (b) Solve algebraically the equations $3x + y = 17$ and $3x^2 + 2xy = 75$ to find the radius x and the length y [7 marks]

$x =$ _____ cm

$y =$ _____ cm



Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.