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Centre Number						Candidate Number				
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**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GENERAL CERTIFICATE OF SECONDARY EDUCATION**

B294A

MATHEMATICS B (MEI)

**Paper 4 Section A
(Higher Tier)**

MONDAY 1 JUNE 2009: Morning

DURATION: 1 hour

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

Candidates answer on the question paper.

OCR SUPPLIED MATERIALS:

None

OTHER MATERIALS REQUIRED:

Geometrical instruments

Tracing paper (optional)

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

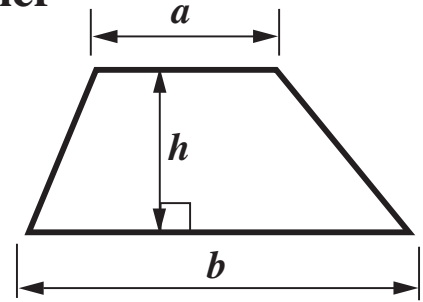
- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes on the first page.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Show your working. Marks may be given for a correct method even if the answer is incorrect.
- Answer ALL the questions.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.
- No calculator can be used for Section A of this paper.

INFORMATION FOR CANDIDATES

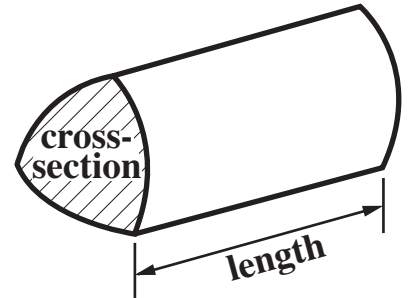
- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this Section is 50

Formulae Sheet: Higher Tier

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



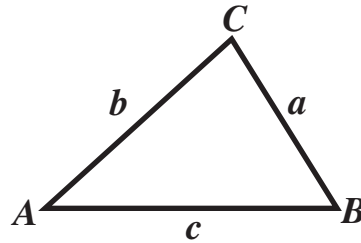
Volume of prism = (area of cross-section) \times length



In any triangle ABC

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

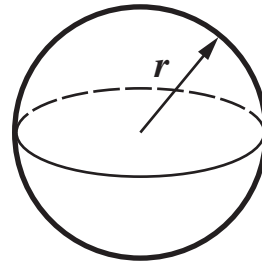
Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$



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

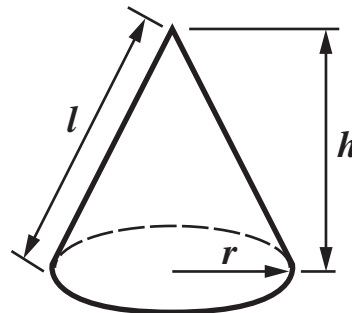
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

1 (a) **ESTIMATE** the value of

$$\frac{202 \times 59.7}{51.9 - 19.3}$$

[2 marks]

(a) _____

(b) **Karen and Jasmine have a job-share.
They share the hours in the ratio 3 : 1
One week they work a total of 36 hours.**

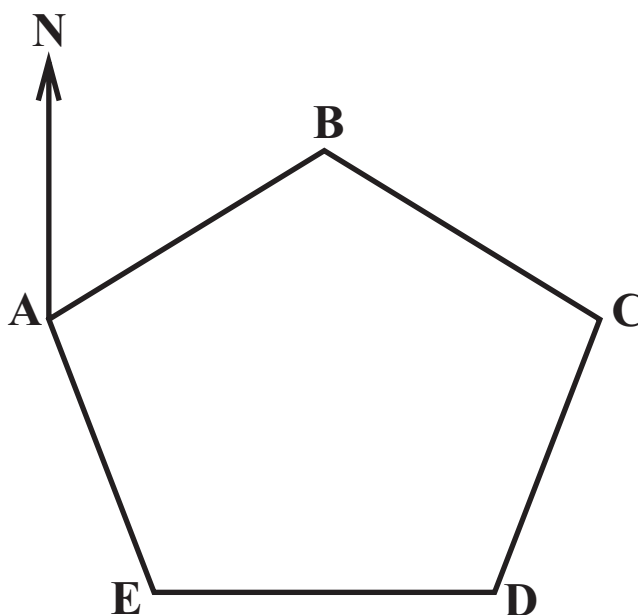
Calculate how many hours they each work. [2 marks]

(b) **Karen _____ hours**

Jasmine _____ hours

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



**The diagram shows the course for a yacht race.
ABCDE is a regular pentagon.**

- (a) Show that angle $ABC = 108^\circ$
[2 marks]**

(b) C is due east of A.

Find the bearing of

(i) B from A
[2 marks]

(b)(i) _____ °

(ii) E from A
[1 mark]

(ii) _____ °

3 (a) The n th term of a sequence is given by

$$\frac{n(n+1)}{2}.$$

(i) Find the first 4 terms of the sequence. [2 marks]

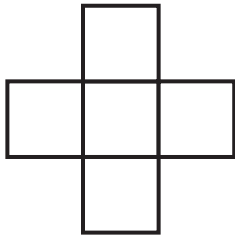
(a)(i) _____

(ii) What is the special name given to this sequence of numbers?

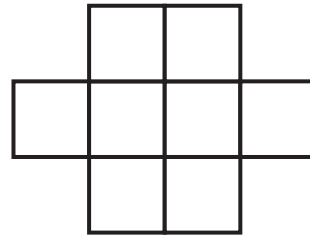
(ii) _____

(b) Look at the diagram below.

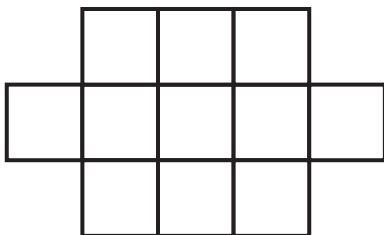
Pattern 1



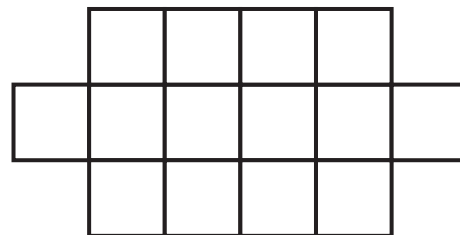
Pattern 2



Pattern 3



Pattern 4



The diagram shows a sequence of patterns made from squares.

(i) Find an expression for the number of squares in the n th pattern. [2 marks]

(b)(i) _____

(ii) Is there a pattern in this sequence with exactly 632 squares?

Explain your answer. [2 marks]

_____ because _____

- 4 Oliver has a large jar of coloured beads. He selected a bead at random, noted its colour and returned it to the jar. He repeated this 200 times.
His results are shown in the table below.

Red	White	Blue	Black
34	66	62	38

- (a) Use these figures to complete the table of relative frequencies below. [2 marks]

<u>COLOUR</u>	<u>RELATIVE FREQUENCY</u>
Red	
White	
Blue	
Black	

- (b) Give a reason why the figures in the table in part (a) give a good estimate of the probability of selecting each of the colours. [1 mark]
-

(c) There are 4000 beads in the jar.

Estimate the number of blue beads in the jar. [2 marks]

(c) _____

(d) Saleem chooses a bead at random from the same jar.

Calculate an estimate of the probability that Saleem's bead is black or white. [2 marks]

(d) _____

5 In 2005 the population of England was

$$5.04 \times 10^7$$

The population of Scotland was

$$5.09 \times 10^6$$

**(a) Work out the total population of England and Scotland.
Give your answer in standard form. [2 marks]**

(a) _____

(b) The area of Scotland is

7.79×10^4 square kilometres.

Amanda, Bishen, Caroline and Darren work out the population density of Scotland in people per square kilometre.

These are their answers.

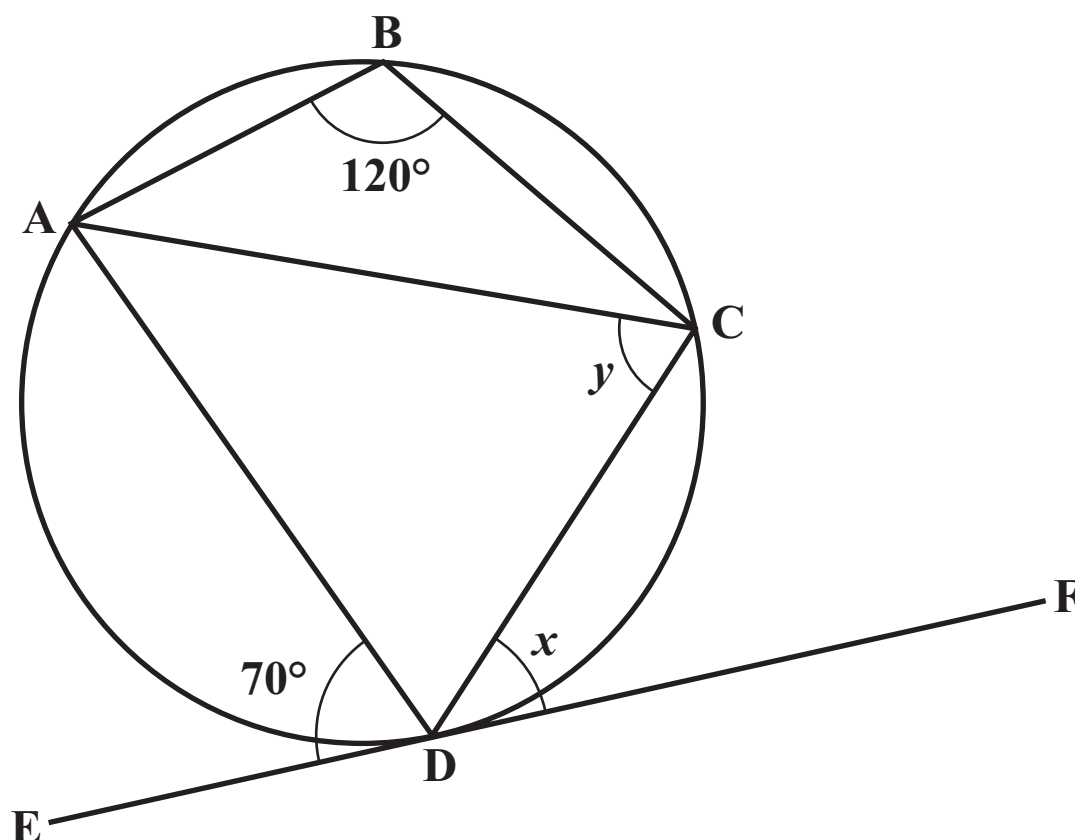
Amanda	Bishen	Caroline	Darren
6.53	0.015	65.3	3.97×10^{11}

One person is correct.

**USE ESTIMATION to decide which person is correct.
You must show your working. [3 marks]**

(b) _____

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



A, B, C and D are points on a circle.
EDF is a tangent to the circle.

Angle ABC = 120°

Angle ACD = y

Angle ADE = 70°

Angle CDF = x

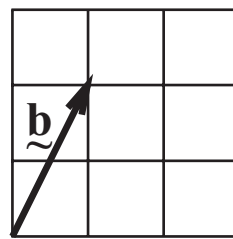
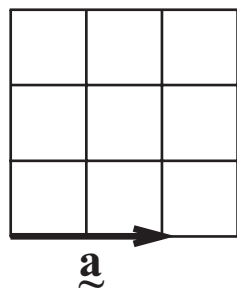
- (a) Calculate angle x . Give your reasons. [4 marks]

$x =$ _____ $^\circ$ because _____

(b) Write down angle y . Give your reason. [2 marks]

$y =$ _____[°] because _____

8 Look at the two grids below.
They show the vectors \mathbf{a} and \mathbf{b} .



(a) On the grid below, draw and label these vectors.

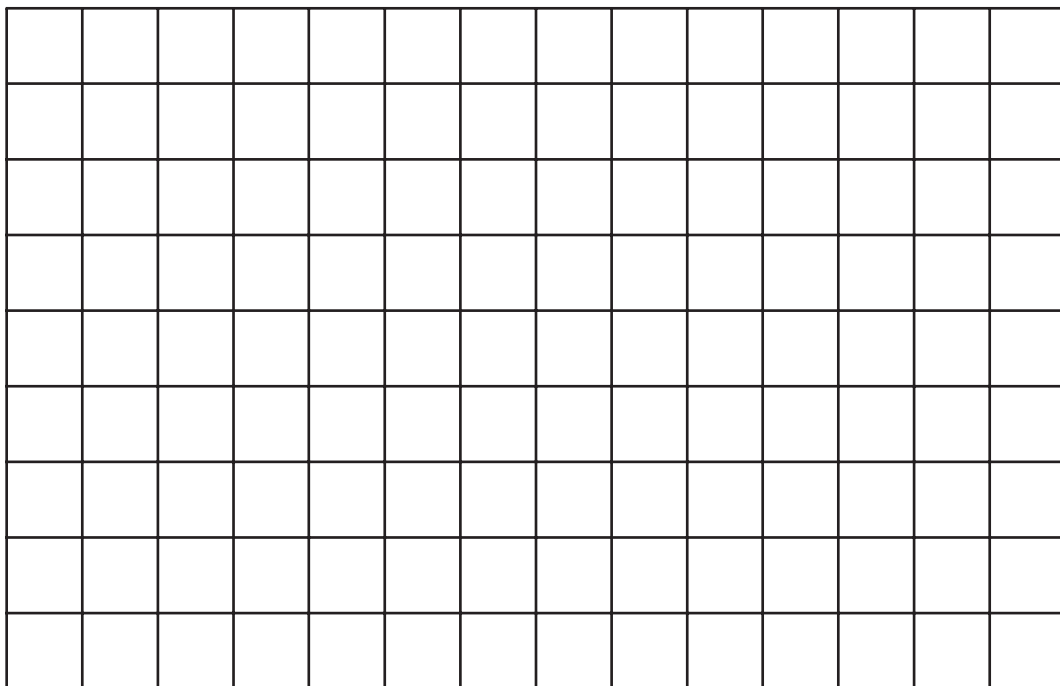
(i) $\overrightarrow{AB} = 3\mathbf{a}$
[1 mark]

(ii) $\overrightarrow{CD} = -2\mathbf{b}$ [1]

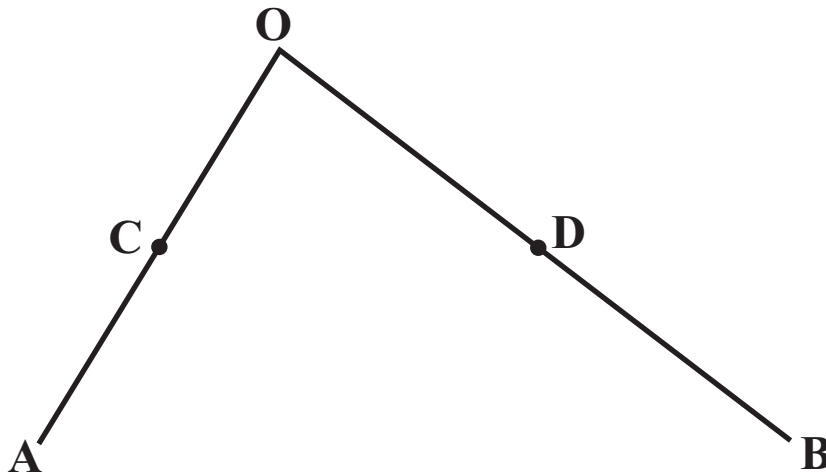
[1 mark]

(iii) $\overrightarrow{EF} = 2\mathbf{a} + \mathbf{b}$ [1]

[1 mark]



- (b) Look at the diagram below.
It is not to scale.



In this diagram $\vec{OA} = \underline{\underline{a}}$ and $\vec{OB} = \underline{\underline{b}}$.
C is the midpoint of OA and D is the midpoint of OB.

- (i) Use vectors to prove that

$$\vec{CD} = \frac{1}{2} \vec{AB}.$$

[3 marks]

- (ii) Hence state what you can conclude about the lines CD and AB. [2 marks]

9 $a = \sqrt{8}$

$b = \sqrt{18}$

Simplify, as far as possible, the following.

(a) $\frac{6}{a}$

[2 marks]

(a) _____

(b) ab^{-1}

[2 marks]

(b) _____



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