H

OCR
RECOGNISING ACHIEVEMENT

GENERAL CERTIFICATE OF SECONDARY EDUCATION

MATHEMATICS B (MEI)
Paper 4 Section A
(Higher Tier)

B294A

Candidates answer on the question paper

OCR Supplied Materials:
None

Other Materials Required:
* Geometrical instruments
* Tracing paper (optional)

Monday 1 June 2009
Morning

Duration: 1 hour

B294A

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number					

MODIFIED LANGUAGE

INSTRUCTIONS TO CANDIDATES

* Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
* 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.
* Do **not** write in the bar codes.
* Write your answer to each question in the space provided. You may ask for more paper, if you need it.
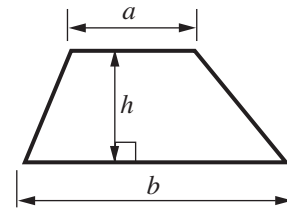
INFORMATION FOR CANDIDATES

* 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**.
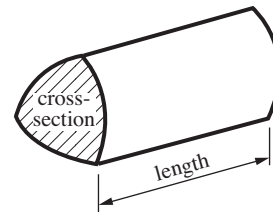* This document consists of **12** pages. Any blank pages are indicated.

WARNING

No calculator can be used for Section A of this paper

Turn over

Formulae Sheet: Higher Tier

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

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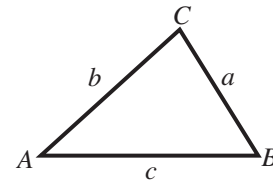

In any triangle ABC

Sine rule $\quad \dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$
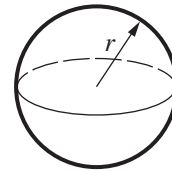
Cosine rule $\quad a^2 = b^2 + c^2 - 2bc \cos A$

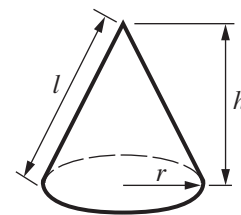**Area of triangle** $= \frac{1}{2}ab \sin C$

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

1   **(a)**   **Estimate** the value of $\dfrac{202 \times 59.7}{51.9 - 19.3}$.

(a) .... **[2]**

    (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.

(b) Karen .... hours

Jasmine .... hours **[2]**

        Turn over

2
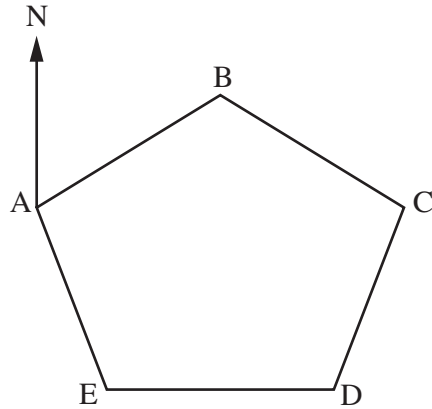
The diagram shows the course for a yacht race.
ABCDE is a regular pentagon.

(a) Show that angle ABC = 108°. **[2]**

(b) C is due east of A.

Find the bearing of

(i) B from A,

(b)(i) ....° **[2]**

(ii) E from A.

(ii) ....° **[1]**

3 **(a)** The nth term of a sequence is given by $\dfrac{n(n+1)}{2}$.

    (i) Find the first 4 terms of the sequence.

(a)(i) .... **[2]**

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

(ii) .... **[1]**

(b)
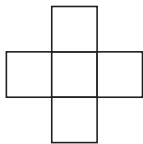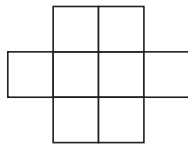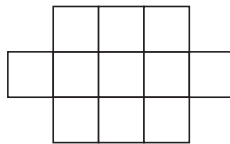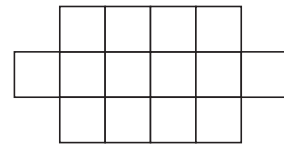
1   2   3   4

The diagram shows a sequence of patterns made from squares.

    (i) Find an expression for the number of squares in the nth pattern.

(b)(i) .... **[2]**

    (ii) Is there a pattern in this sequence with exactly 632 squares?
Explain your answer.

.... because ....

....

....**[2]**

Turn over

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 this table.

Red	White	Blue	Black
34	66	62	38

(a) Use these figures to complete the table of relative frequencies.

Colour	Red	White	Blue	Black
Relative Frequency				

[2]

(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]

(c) There are 4000 beads in the jar.

Estimate the number of blue beads in the jar.

(c) .... [2]

(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.

(d) .... [2]

5 In 2005 the population of England was 5.04×10^7.
The population of Scotland was 5.09×10^6.

(a) Work out the total population of England and Scotland.
Give your answer in standard form.

(a) .... [2]

(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.

(b) .... [3]

Turn over

6

Not to scale
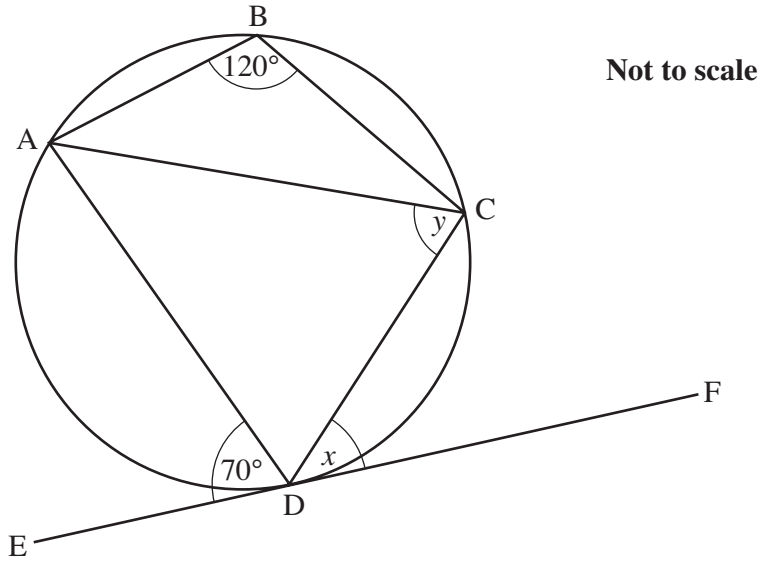
A, B, C and D are points on a circle.
EDF is a tangent to the circle.

(a) Calculate angle x. Give your reasons.

x = ...° because ....

....

.... **[4]**

(b) Write down angle y. Give your reason.

y = ...° because ....

.... **[2]**

7   Rushna is taking her driving test.
   The test is in two parts: Theory and Practical.
   She has to pass both parts of the test.

   The probability that Rushna will pass the Theory is 0.9.
   The probability that she will pass the Practical is 0.8.
   If she fails her Theory she cannot take the Practical.

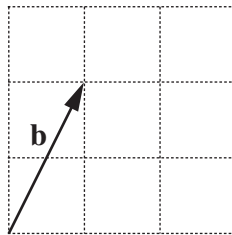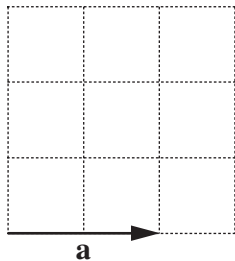   **(a)**   Complete this tree diagram.

Theory   Practical

0.9 — Pass
0.8 — Pass
Fail
....
.... — Fail
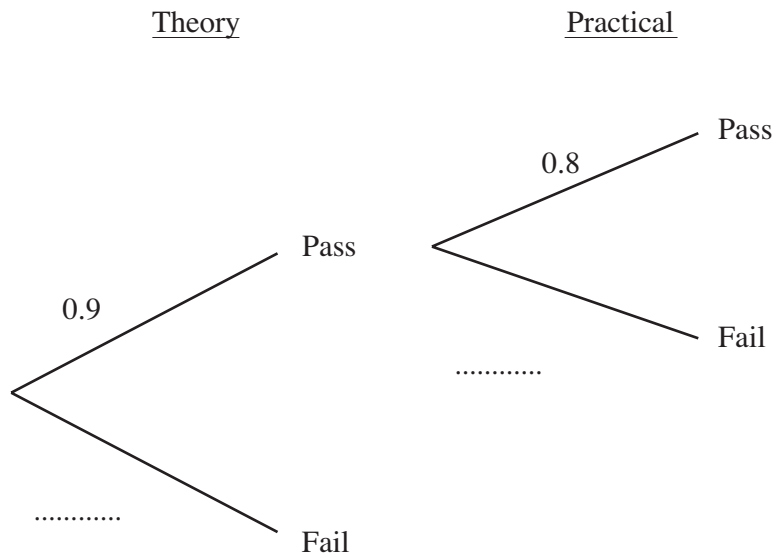
                                                                    [1]

   (b)   Calculate the probability that Rushna fails the driving test.

                                          (b) .... **[3]**

8

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

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

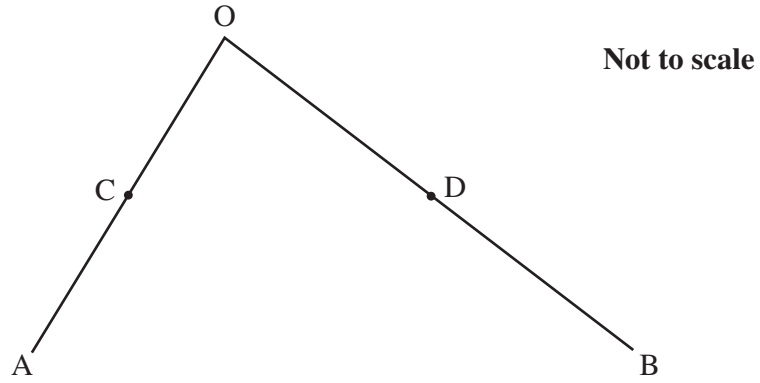   **(ii)** $\overrightarrow{CD} = -2\mathbf{b}$ **[1]**

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

(b)

O

Not to scale

C   D

A   B

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

(i) Use vectors to prove that

$$\overrightarrow{CD} = \tfrac{1}{2}\,\overrightarrow{AB}\ .$$

....

....

....

....

....

....**[3]**

(ii) Hence state what you can conclude about the lines CD and AB.

....

....**[2]**

TURN OVER FOR QUESTION 9

9 $a = \sqrt{8}$ $b = \sqrt{18}$

Simplify, as far as possible, the following.

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

(a) .... **[2]**

(b) ab^{-1}

(b) .... **[2]**