OCR
RECOGNISING ACHIEVEMENT

SPECIMEN

GENERAL CERTIFICATE OF SECONDARY EDUCATION

MATHEMATICS B
Higher Tier

H **B294/A**

TERMINAL PAPER – SECTION A

Specimen

Candidates answer on the question paper.
Additional Materials:
Geometrical instuments
Tracing paper

Time: 1 hour

Candidate Name

Centre Number | | | | | |

Candidate Number | | | | |

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above.
- Answer **all** the questions.
- Write your answers, in blue or black ink, in the spaces provided on the question paper. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Show all your working. Marks may be given for working which shows that you know how to solve the problem, even if you get the answer wrong.
- Do **not** write in the bar code.
- Do **not** write outside the box bordering each page.
- WRITE YOUR ANSWER TO EACH QUESTION IN THE SPACE PROVIDED. ANSWERS WRITTEN ELSEWHERE WILL NOT BE MARKED.

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 in this section is 50.

WARNING
You are not allowed to use a calculator in Section A of this paper.

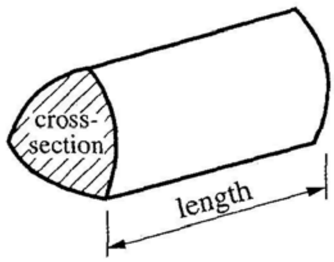
For Examiner's Use	
Section A	
Section B	
Total	

This document consists of **14** printed pages.

[Turn Over

FORMULAE SHEET

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

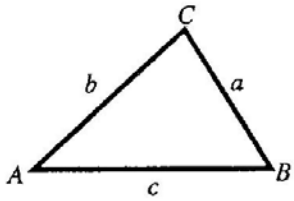


In any triangle *ABC*

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

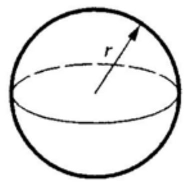
Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

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



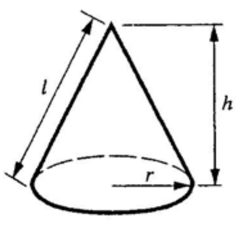
Volume of sphere $\dfrac{4}{3}\pi r^3$

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



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

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)** Philippa sat two exams whose marks are added together.
The sum of marks in the two examinations is 90 and they were scored in the ratio 2:1.

Work out the marks in each exam.

(a) …………… and …………..[2]

(b) Express 90 out of 200 as a percentage.

(b) ……………….…….. [2]

2 Alice cuts a cake into three portions. She has $\frac{1}{2}$ for herself and gives $\frac{1}{3}$ to Georgina.
How much cake is left for Elira?

..............................[3]

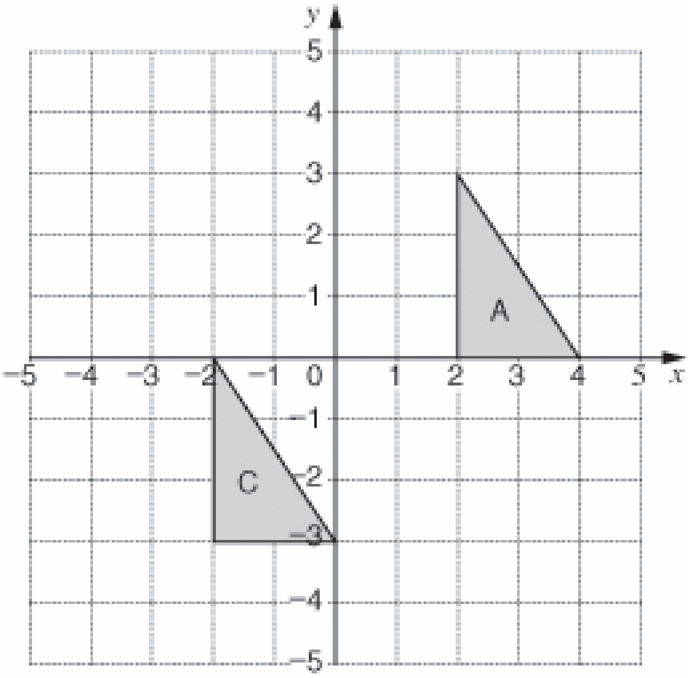
[Turn Over

3 Solve the following equation.

$$4x + 9 = 3(x + 2)$$

.................................[3]

4



(a) Rotate triangle A through 90° anticlockwise about the origin. Label the image B. [3]

(b) Describe the **single** transformation which maps triangle A onto triangle C.

....

.... [3]

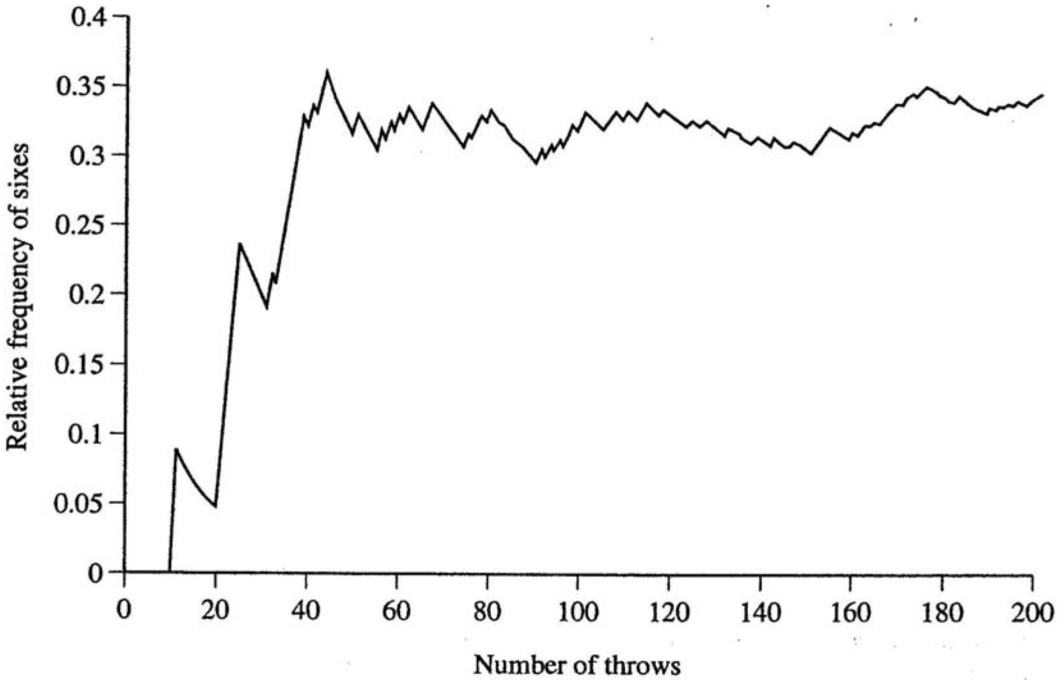
5 Sanjit threw a six-sided die numbered one to six 200 times and recorded the results on a spreadsheet.

He calculated the relative frequency of the number of sixes thrown.
The table shows his results.

Total number of throws	10	20	100	150	200
Total number of sixes	0	1	33	48	69
Relative frequency of sixes	0	0.05	0.33		0.345

(a) Complete the relative frequency row in the table.
Show how you obtained your answer. [2]

Sanjit then used the computer to draw this relative frequency graph of the number of sixes he threw.



(b) How does this graph indicate that Sanjit's die is biased?

....

.... [2]

[Turn Over

6 The notation $n!$, where n is a positive integer (called "n factorial") represents the product of all integers from 1 to n.
So, for instance, $4! = 4 \times 3 \times 2 \times 1 = 24$

(a) Show that $20 \times 19 \times 18 \times 17 \times 16$ is divisible by $5!$

[2]

(b) Prove that the product of any 5 consecutive integers is divisible by $5!$

[2]

(c) State a property for the product of any n consecutive integers.

…………………………………………………………………………………………….

……………………………………………………………………………………………. [1]

7 **(a)** Simplify the following.

$$b^2 \times b^4$$

(a) .... [1]

(b) Make t the subject of $s = \frac{1}{2}at^2$.

(b) .... [3]

(c) Solve these equations simultaneously.

$$3x + y = 4$$
$$2x + 4y = 1$$

(c) x = ...

y = ... [3]

[Turn Over

8 **(a)** Write down the value of the following.

(i) 9^0

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

(ii) $\left(\sqrt{5}\right)^4$

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

(iii) $9^{-\frac{1}{2}}$

(iii).............................[1]

(b) **(i)** Express $\frac{2}{9}$ as a recurring decimal.

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

(ii) Explain why $\frac{13}{625}$ is not a recurring decimal.

....

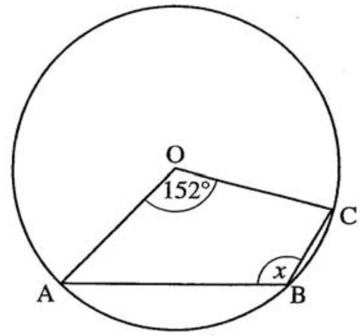
.... [1]

(c) Express $\left(3+\sqrt{5}\right)^2$ in the form $a+b\sqrt{5}$, where a and b are integers.

(c).....................................[2]

9 O is the centre of this circle.
A, B and C are on the circumference.

Work out angle x.



....° [3]

10 Jerry has collected the following data.

0 0 0 0 2 2 3 4 5 5 23

The mean of these data is 4.

For this set of data explain which of the averages - mean, mode or median - is the most appropriate to represent the data. Give your reasons, and explain why the other averages are not appropriate.

Most appropriate average: …………………………………………………………………..

Reasons: ………………………………………………………………………………….…

………………………………………………………………………………………….…… [3]

11 Find algebraically the coordinates of the two points where the line $y = x + 4$ intersects the curve $y = x^2 - 2x$.

(………. , ………..)

(………. , ………..) [5]

Oxford Cambridge and RSA Examinations

General Certificate of Secondary Education

MATHEMATICS B B294/A

TERMINAL PAPER – SECTION A

Specimen Mark Scheme

The maximum mark for this section is 50.

Section A					
1	**(a)**	Divide into 3 parts Gives 60 and 30	**M1** **A1**		Both
	(b)	$\frac{90}{200}=\frac{45}{100}=45\%$	**M1** **A1**	**4**	
2		$1-\frac{1}{2}-\frac{1}{3}=1-\frac{5}{6}$ $=\frac{1}{6}$	**M1** **A1** **A1**	**3**	Combining the fractions For 6 seen
3		$4x+9=3(x+2)$ $\Rightarrow 4x+9=3x+6$ $\Rightarrow x=-3$	**M1** **A1** **A1**	**3**	Expand brackets Collect terms
4	**(a)**	Correct triangle	**B1** **B1** **B1**		Rotation 90° anticlockwise Correct
	(b)	Translation "back 4" "down 3"	**B1** **B1** **B1**	**6**	Or B2 for $\begin{pmatrix}-4\\-3\end{pmatrix}$
5	**(a)**	$\frac{48}{150}$ $=0.32$	**M1** **A1**		
	(b)	Because the relative frequency seems to be settling at around 0.35 And it should be $\frac{1}{6}=0.17$	**B1** **B1**	**4**	
6	**(a)**	5 into 20, 4 into 16, etc	**B2**		
	(b)	In every set of 5 consecutive numbers, one of them will be a multiple of 5. Likewise one of them will be a multiple of 4, etc	**M1** **A1** **A1**		First statement Continues to completeness
	(c)	The product of any n consecutive integers is divisible by n!	**B1**	**5**	

7	(a)	b^6	B1		
	(b)	$s=\frac{1}{2}at^2 \Rightarrow t^2=\frac{2s}{a}$ $\Rightarrow t=\sqrt{\frac{2s}{a}}$	B1 B1 B1		Term in t^2 correct
	(c)	$3x+y=4$ (i) $2x+4y=1$ (ii) e.g. (i) $\times 4$: $12x+4y=16$ (iii)	M1		Any method to eliminate one variable.
		(iii) $-$ (ii): $10x=15 \Rightarrow x=1\frac{1}{2}$	A1		One of x or y
		Sub in (i): $y=4-4\frac{1}{2}=-\frac{1}{2}$ $\Rightarrow x=1\frac{1}{2},\quad y=-\frac{1}{2}$	A1	7	The other one
8	(a)(i)	1	B1		
	(ii)	25	B1		
	(iii)	$\frac{1}{3}$	B1		
	(b)(i)	$\frac{2}{9}=0.222.....$ or $0.\dot{2}$	B1		
	(ii)	Because 625 = 5^4 and any decimal with only 2s and 5s in the denominator terminates.	B1		
	(c)	$\left(3+\sqrt{5}\right)^2=9+2\times 3\times\sqrt{5}+5$	M1		Expand and collect
		$=14+6\sqrt{5}$	A1	7	
9		x is half the reflex angle at O which is 360 – 152 = 208 So x = 104	M1 A1 A1	3	Or any other valid method
10		The mode is not appropriate as 0 is the most frequent which is the smallest number.	B1		
		The mean is not appropriate as all values affect it and the largest is very much larger than the others.	B1		
		The median is the most appropriate because it is not sensitive to this large number (It is 2.)	B1	3	

11		Substitute for $y \Rightarrow x+4=x^2-2x$ $\Rightarrow x^2-3x-4=0$ $\Rightarrow (x-4)(x+1)=0$ $\Rightarrow x=4,-1$ $\Rightarrow y=8,3$ i.e. (4, 8) and (−1, 3)	**M1** **A1** **M1** **A1** **A1**	**5**	Any valid method Correct quadratic Solve quadratic Both values for *x* Both values for *y* and the correct pairing.

Section A Total 50

Assessment Objectives Grid

Question	AO2	AO3	AO4	Total
1	4			**4**
2	3			**3**
3	3			**3**
4		6		**6**
5			4	**4**
6	5			**5**
7	7			**7**
8		3		**3**
9	7			**7**
10			3	**3**
11	5			**5**
Totals	**34**	**9**	**7**	**50**

