

Please write clearly in block capitals.	
Centre number	Candidate number
Surname	
Forename(s)	
Candidate signature	

# AS **MATHEMATICS**

Paper 2

Wednesday 22 May 2019

Morning

Time allowed: 1 hour 30 minutes

## **Materials**

- You must have the AQA Formulae for A-level Mathematics booklet.
- You should have a graphical or scientific calculator that meets the requirements of the specification.

### Instructions

- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer all questions.
- You must answer each question in the space provided for that question.
   If you require extra space, use an AQA supplementary answer book; do not use the space provided for a different question.
- Show all necessary working; otherwise marks for method may be lost.
- Do all rough work in this book. Cross through any work that you do not want to be marked.

# Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.

### Advice

- Unless stated otherwise, you may quote formulae, without proof, from the booklet.
- You do not necessarily need to use all the space provided.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
TOTAL	

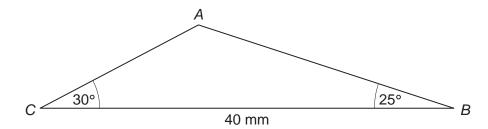


Section A					
	Answer all questions in the spaces provided.				
1	Find the gradient of the	$20 \text{ curve } y = a^{-3x} \text{ at}$	the point where it co	raccos than a axis	
•	Circle your answer.	ie curve $y = c$ at	ine point where it of	osses trie y-axis.	
	Circle your answer.			[1 mark]	
	-3	-1	1	3	
2	Find the centre of the	e circle $x^2 + y^2 + 4x -$	- 6 <i>y</i> = 12		
	Tick (✓) one box.				
	(-2, -3)			[1 mark]	
	(-2, 3)				
	(2, -3)				
	(2, 3)				



It is given that $\sin\theta = -0.1$ and $180^{\circ} < \theta < 270^{\circ}$	
Find the exact value of $\cos\theta$	[2 marks]
Show that, for $x > 0$	
$\log_{10} \frac{x^4}{100} + \log_{10} 9x - \log_{10} x^3 \equiv 2(-1 + \log_{10} 3x)$	
100 10910 109	[4 marks]
	·





Angle  $ABC=25^{\circ}$ 

Angle ACB = 30°

BC = 40 millimetres.

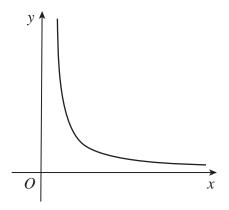
The length of the prism is 300 millimetres.

	[4 marks

Calculate the volume of the prism, giving your answer to three significant figures.




6 A curve has equation  $y = \frac{2}{x\sqrt{x}}$ 



The region enclosed between the curve, the x-axis and the lines x=1 and x=a has area 3 units.

Given that a > 1, find the value of a.

Fully justify your answer.	[5 marks]



Do	not	writ
ou	tside	the
	ho	<b>Y</b>

7	The points $A(a, 3)$ and $B(10, 6)$ lie on a circle.	
	AB is a diameter of the circle and passes through the point (2, 4)	
	The circle has equation	
	$(x-c)^2 + (y-d)^2 = e$	
	where $c$ , $d$ and $e$ are rational numbers.	
	Find the values of $a$ , $c$ , $d$ and $e$ .	[6 marks]



7

		Do not write outside the
		box
•		
	Turn over for the next question	



8

8	A curve has equation	
	$y = x^3 + px^2 + qx - 45$	
	The curve passes through point R (2, 3)	
	The gradient of the curve at R is 8	
8 (a)	Find the value of $p$ and the value of $q$ .	5 marks]



(b)	Calculate the area enclosed between the normal to the curve at ${\it R}$ and the coordinate axes.	Do no outsi b
	[5 marks]	



	A curve $C$ has equation $y = f(x)$ where
	$f(x) = (x-2)(x-3)^2$
(a)	Find the exact coordinates of the turning points of C.
	Determine the nature of each turning point.
	Fully justify your answer.
	[8 marks



		Do not writ
		box
	·	
9 (b)	State the coordinates of the turning points of the curve	
( )	y = f(x+1) - 4	
	y = 1(x + 1) - 4 [2 marks]	
	Turn over for the next question	



Do n	ot	write
outs	ide	the
	hav	,

As part of an experiment, Zena puts a bucket of hot water outside on a day when the outside temperature is 0°C.

She measures the temperature of the water after 10 minutes and after 20 minutes. Her results are shown below.

Time (minutes)	10	20
Temperature (degrees Celsius)	30	12

Zena models the relationship between  $\theta$ , the temperature of the water in °C, and t, the time in minutes, by

$$\theta = A \times 10^{-kt}$$

	$\theta = A \times 10^{-10}$	
	where $A$ and $k$ are constants.	
10 (a)	Using $t=0$ , explain how the value of $A$ relates to the experiment.	[1 mark]
10 (b)	Show that	
(2)	$\log_{10}\theta = \log_{10}A - kt$	[1 mark]
10 (c)	Using Zena's results, calculate the values of $A$ and $k$ .	[4 marks]

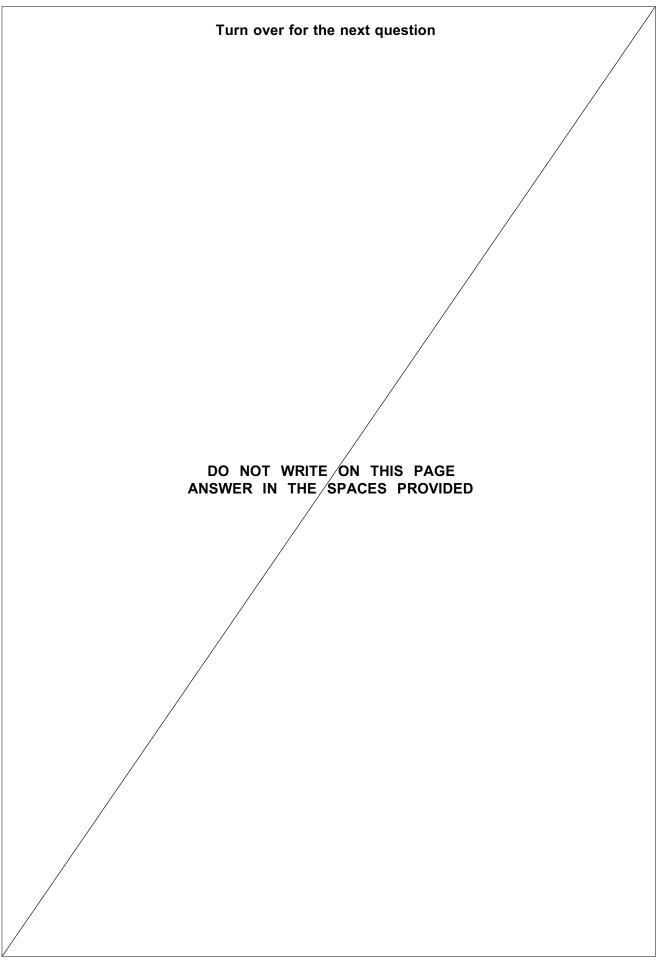


10 (d)	Zena states that the temperature of the water will be less than 1°C after 45 minutes.
	Determine whether the model supports this statement.  [3 marks]
10 (e)	Explain why Zena's model is unlikely to accurately give the value of $\theta$ after
	45 minutes. [1 mark]
	<del></del>



	Section B							
Answer <b>all</b> questions in the spaces provided.								
44	A companie un dentalien to fin	d aut the meet new		in I andan				
11	A survey is undertaken to fin  The first 1100 available peop			III LOIIGOII.				
			surveyeu.					
	Identify the name of this type	e or sampling.						
	Circle your answer.			[1 mark]				
	simple random	opportunity	stratified	quota				
12	Manny is studying the price a	and number of page	s of a random sar	mple of books.				
	He calculates the value of the price and number of pages in	=		ent between the				
	Which of the following best d	lescribes the value '	.05?					
	Tick (✓) one box.			[1 mark]				
	definitely correct			[Timenx]				
	probably correct							
	probably incorrect							
	definitely incorrect							







Do not write	
outside the	
box	

13	Denzel wants to buy a car with a propulsion type other than petrol or diesel.									
	He takes a sample, from the Large Data Set, of the CO <sub>2</sub> emissions, in g/km, of cars with one particular propulsion type.									
	The sample is as follows									
		82	13	96	49	96	92	70	81	
13 (a)	Using yo					Set, sta	ate which	n propul:	sion type	this sample [2 marks]
13 (b)	Calculat	e the m	ean of th	ne samp	le.					[1 mark]
13 (c)	Calculat	e the st	andard c	deviation	of the s	ample.				[1 mark]



13 (d)	Denzel claims that the value 13 is an outlier.
13 (d) (i)	Any value more than 2 standard deviations from the mean can be regarded as an outlier.
	Verify that Denzel's claim is correct.
	[1 mark]
13 (d) (ii)	State what effect, if any, removing the value 13 from the sample would have on the standard deviation.
	[1 mark]
	,
	Turn and for the west suggestion
	Turn over for the next question



Do not write
outside the
box

14	A probability distribution is given by	
	P(X = x) = c(4 - x), for $x = 0, 1, 2, 3$	
	where $c$ is a constant.	
14 (a)	Show that $c = \frac{1}{10}$	
( )	10	[2 marks]
		<del> </del>
14 (b)	Calculate $P(X \ge 1)$	[2 marks]
		<u></u>
		<del> </del>



15	Two independent events, $A$ and $B$ , are such that	
	P(A) = 0.2	
	$P(A \cup B) = 0.8$	
15 (a) (i)	Find P(B)	
	[4 1	narks]
15 (a) (ii)	Find $P(A \cap B)$	mark]
15 (b)	State, with a reason, whether or not the events $A$ and $B$ are mutually exclusive.	
	[1	mark]

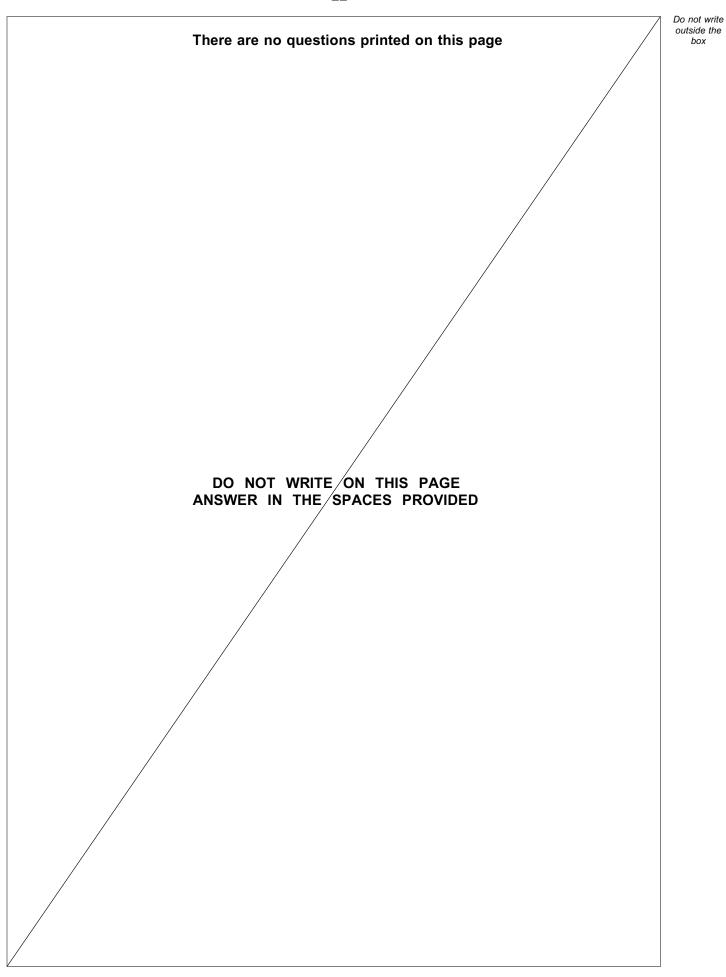


Andrea is the manager of a company which makes mobile pho	one chargers.
In the past, she had found that 12% of all chargers are faulty.	
Andrea decides to move the manufacture of chargers to a diff	erent factory.
Andrea tests 60 of the new chargers and finds that 4 chargers	s are faulty.
Investigate, at the 10% level of significance, whether the prop	ortion of faulty chargers
has reduced.	[7 marks]

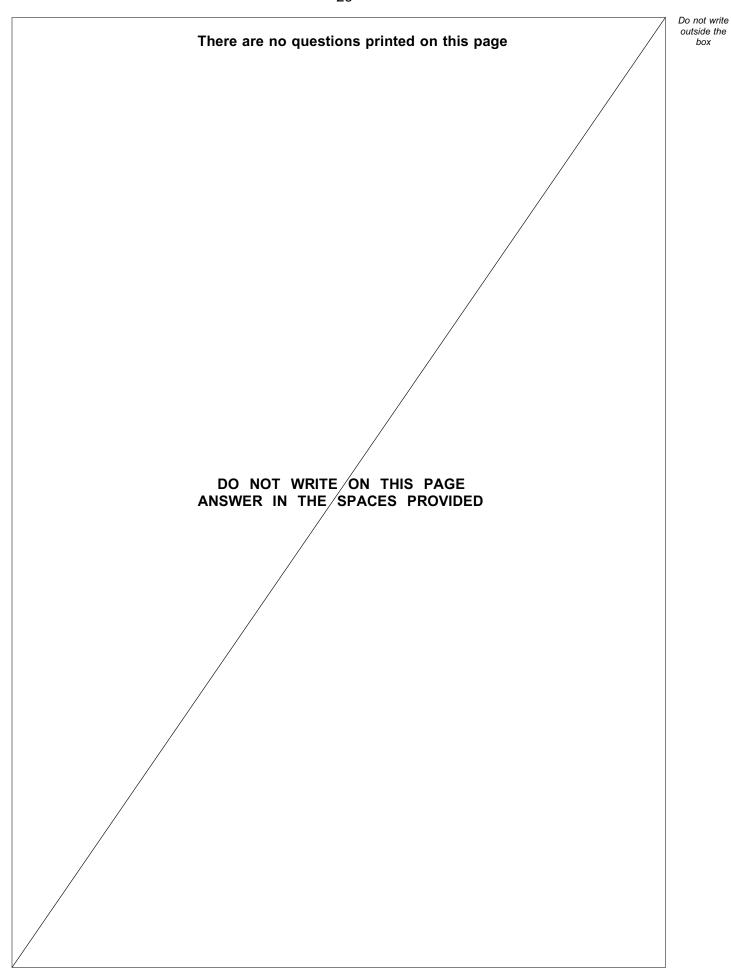


		Do not
16 (b)	State, in context, two assumptions that are necessary for the distribution that you	outside box
	have used in part (a) to be valid.	
	[2 marks]	
	END OF QUESTIONS	
		1











box

There are no questions printed on this page DO NOT WRITE ON THIS PAGE ANSWER IN THE SPACES PROVIDED Copyright information

For confidentiality purposes, from the November 2015 examination series, acknowledgements of third-party copyright material are published in a separate booklet rather than including them on the examination paper or support materials. This booklet is published after each examination series and is available for free download from www.aqa.org.uk after the live examination series.

Permission to reproduce all copyright material has been applied for. In some cases, efforts to contact copyright-holders may have been unsuccessful and AQA will be happy to rectify any omissions of acknowledgements. If you have any queries please contact the Copyright Team, AQA, Stag Hill House, Guildford, GU2 7XJ.

Copyright © 2019 AQA and its licensors. All rights reserved.



