



Cambridge International AS & A Level

CANDIDATE NAME				
CENTRE NUMBER		CANDIDATE NUMBER		

MATHEMATICS 9709/63

Paper 6 Probability & Statistics 2

May/June 2024

1 hour 15 minutes

You must answer on the question paper.

You will need: List of formulae (MF19)

INSTRUCTIONS

- Answer all questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do not write on any bar codes.
- If additional space is needed, you should use the lined page at the end of this booklet; the question number or numbers must be clearly shown.
- You should use a calculator where appropriate.
- You must show all necessary working clearly; no marks will be given for unsupported answers from a
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.

INFORMATION

- The total mark for this paper is 50.
- The number of marks for each question or part question is shown in brackets [].

This document has 12 pages.



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Use a suitable approximating distribution to find $P(2 \le X \le 5)$.	
ustify your approximating distribution in this case.	

(a)

* 0019655001503 *

The widths, w cm, of a random sample of 150 leaves of a certain kind were measured. The sample mean of w was found to be 3.12 cm.

3

Using this sample, an approximate 95% confidence interval for the population mean of the widths in centimetres was found to be [3.01, 3.23].

Explain whether it was necessary to use the Central Limit theorem in your answer to part (a).

The masses in kilograms of large and small bags of cement have the independent distributions N(50, 2.4) and N(26, 1.8) respectively.

Find the probability that the total mass of 5 randomly chosen large bags of cement is greatotal mass of 10 randomly chosen small bags of cement.				
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In this question you should **not** use an approximating distribution.

At an election in Menham last year, 24% of voters supported the Today Party. A student wishes to test whether support for the Today Party has decreased since last year. He chooses a random sample of 25 voters in Menham and finds that exactly 2 of them say that they support the Today Party.

Test at the 5% significance level whether support for the Today Party has decreased.	[5]
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A random variable X has probability density function f given by

$$f(x) = \begin{cases} ax - x^3 & 0 \le x \le \sqrt{2}, \\ 0 & \text{otherwise,} \end{cases}$$

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where a is a constant.

(a)	Show that $a = 2$.	[3]
(b)	Find the median of X .	[4]

* 0019655001607 *

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(c)	Find the exact value of $E(X)$.	[3]
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6 The numbers of green sweets in 200 randomly chosen packets of Frutos are summarised in the table.

Number of green sweets	0	1	2	3	> 3
Number of packets	32	50	97	21	0

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nufacturers of Fr	utos claim th	at the mean	number of g	reen sweets in	a packet is 1.65	5.
lieves that the tri	ie value of t	he mean 11	is less than	1.65 She us	es the results fr	om the
ly chosen packets	s to test the r	nanufacture	rs' claim.	1100 1 2110 00	100000000000000000000000000000000000000	
te suitable null a	nd alternativ	e hypothese	es for the test			
	lieves that the tru	lieves that the true value of t	lieves that the true value of the mean, μ ly chosen packets to test the manufacture	lieves that the true value of the mean, μ , is less than ly chosen packets to test the manufacturers' claim.	lieves that the true value of the mean, μ , is less than 1.65. She us ly chosen packets to test the manufacturers' claim.	

* 0019655001609 *

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(c)	Show that the result of Anji's test is significant at the 5% level but not at the 1% level. [4]
(d)	It is given that Anji made a Type I error.
	Explain how this shows that the significance level that Anji used in her test was not 1%. [1]

(a)	Find $P(X+Y < 4)$.	[3]
(b)	Find the probability that $V = 2$ given that $V + V = 4$	
(D)	Find the probability that $X = 2$ given that $X + Y < 4$.	[4]



(c) A sample of 60 randomly chosen pairs of values of X and Y is taken, and the value of X+Y is calculated for each pair. The sample mean of these 60 values is found.

Find the probability that the sample mean of $X+Y$ is less than 4.0.	[6]
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Additional page

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