

Cambridge International AS & A Level



- 1** The lengths, X cm, of a sample of 100 insects of a certain type were summarised as follows.

$$n = 100 \qquad \Sigma x = 36.8 \qquad \Sigma x^2 = 17.34$$

- (a) Calculate unbiased estimates for the population mean and variance of X . [3]



- (b)** State a necessary condition for the estimates found in part **(a)** to be reliable. [1]

[illegible]

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- Use your answer to part (a) to comment on this claim.

[illegible]

- (a) Use a suitable approximating distribution to find the probability that at least 3 of the tickets sold by the agent are prize-winning tickets. [3]

- (b)** Justify the use of your approximating distribution in this context. [1]

[illegible]

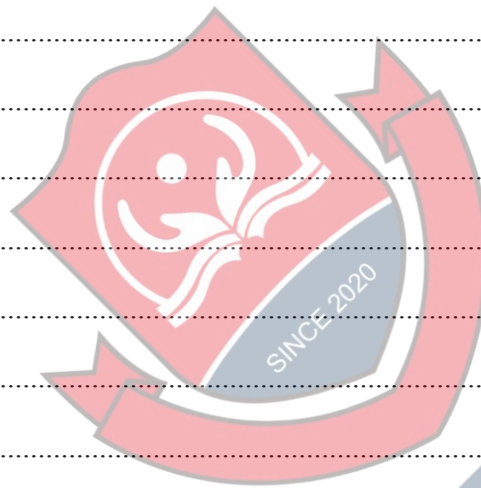
- (a) Find the probability that in a randomly chosen year the firm uses more gasoline than diesel fuel. [5]



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The costs per litre of gasoline and diesel fuel are \$0.80 and \$0.85 respectively.

- (b) Find the probability that the total cost of gasoline and diesel fuel in a randomly chosen year is between \$20 000 and \$22 000. [5]



- (a)** Find the probability that during a randomly chosen 2-day period no girls arrive late. [1]

[illegible]

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- [illegible]

Following a timetable change the teacher claims that on average more students arrive late than before the change. During a randomly chosen 5-day period a total of 4 students are late.

- (d) Test the teacher's claim at the 5% significance level.

[5]

- (a) Using only this information show that $P(X > -1) = \frac{245}{256}$. [2]

[illegible]

It is now given that, for x in a suitable domain,

$f(x) = k(12 + 4x - x^2)$, where k is a constant.

- (b)** Find the value of k . [3]



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- (c) A different random variable X has probability density function $g(x) = \frac{2}{9}(2+x-x^2)$. The domain of X is all values of x for which $g(x) \geq 0$.

Find $\text{Var}(X)$.

[5]



- 7 The heights, in centimetres, of adult females in Liania have mean μ and standard deviation σ . It is known that in 2004 the values of μ and σ were 163.21 and 6.95 respectively. The government claims that the value of μ this year is greater than it was in 2004. In order to test this claim a researcher plans to carry out a hypothesis test at the 1% significance level. He records the heights of a random sample of 300 adult females in Liania this year and finds the value of the sample mean.

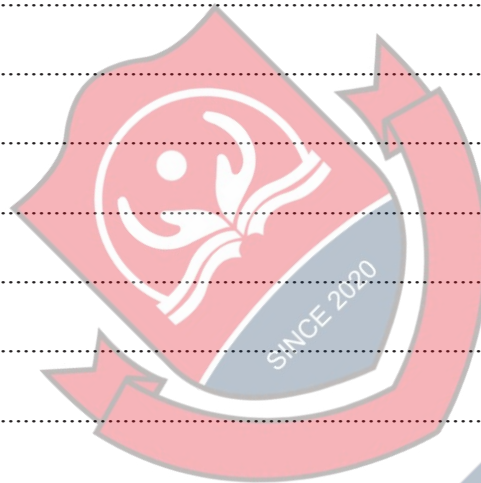
(a) State the probability of a Type I error.

[1]

You should assume that the value of σ after 2004 remains at 6.95.

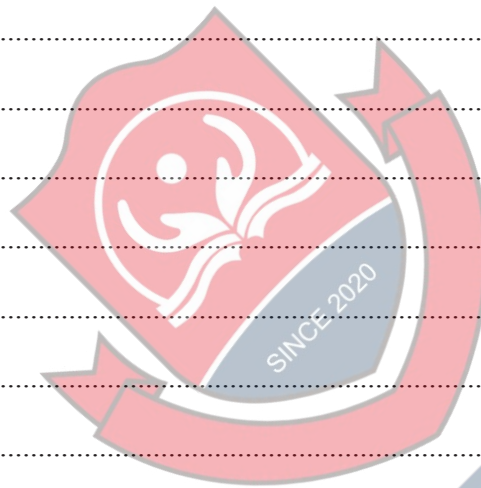
(b) Given that the value of μ this year is actually 164.91, find the probability of a Type II error.

[5]



Additional page

If you use the following page to complete the answer to any question, the question number must be clearly shown.



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