adamjee maths

A-LEVEL MATHS / EDEXCEL / FREE RESOURCES

Normal distribution

Question paper

2 questions

Exam questions and marking instructions remain credited to their board.

Contents

1 June 2024 - Paper 3 Statistics - Q5

2 October 2020 - Paper 3 Statistics - Q5

5. The records for a school athletics club show that the height, H metres, achieved by students in the high jump is normally distributed with mean 1.4 metres and standard deviation 0.15 metres.

(a) Find the proportion of these students achieving a height of more than 1.6 metres.

(1)

The records also show that the time, T seconds, to run 1500 metres is normally distributed with mean 330 seconds and standard deviation 26 seconds.

The school's Head would like to use these distributions to estimate the proportion of students from the school athletics club who can jump higher than 1.6 metres **and** can run 1500 metres in less than 5 minutes.

(b) State a necessary assumption about H and T for the Head to calculate an estimate of this proportion.

(1)

(c) Find the Head's estimate of this proportion.

(3)

Students in the school athletics club also throw the discus.

The random variable $D \sim \mathrm{N}\left(\mu, \sigma^2\right)$ represents the distance, in metres, that a student can throw the discus.

Given that $\mathrm{P}(D < 16.3) = 0.30$ and $\mathrm{P}(D > 29.0) = 0.10$

(d) calculate the value of μ and the value of σ

(5)

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Question 5 continued

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5. A health centre claims that the time a doctor spends with a patient can be modelled by a normal distribution with a mean of 10 minutes and a standard deviation of 4 minutes.

(a) Using this model, find the probability that the time spent with a randomly selected patient is more than 15 minutes.

(1)

Some patients complain that the mean time the doctor spends with a patient is more than 10 minutes.

The receptionist takes a random sample of 20 patients and finds that the mean time the doctor spends with a patient is 11.5 minutes.

(b) Stating your hypotheses clearly and using a 5% significance level, test whether or not there is evidence to support the patients' complaint.

(4)

The health centre also claims that the time a dentist spends with a patient during a routine appointment, T minutes, can be modelled by the normal distribution where $T \sim \mathrm{N}(5, 3.5^2)$

(c) Using this model,

(i) find the probability that a routine appointment with the dentist takes less than 2 minutes

(1)

(ii) find $\mathrm{P}(T < 2 \mid T > 0)$

(3)

(iii) hence explain why this normal distribution may not be a good model for T.

(1)

The dentist believes that she cannot complete a routine appointment in less than 2 minutes.

She suggests that the health centre should use a refined model only including values of $T > 2$

(d) Find the median time for a routine appointment using this new model, giving your answer correct to one decimal place.

(5)

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TOTAL FOR STATISTICS IS 50 MARKS

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