

5. A machine puts liquid into bottles of medicine. The amount of liquid put into each bottle, D ml, follows a normal distribution with mean 28 ml.

Given that 5% of the bottles contain less than 27.29 ml,

- (a) find, to 2 decimal places, the value of k such that $P(27.29 < D < k) = 0.55$. (5)

A random sample of 200 bottles is taken.

- (b) Using a normal approximation, find the probability that fewer than half of these bottles contain between 27.29 ml and k ml. (3)

The machine is adjusted so that the standard deviation of the liquid put in the bottles is now 0.7 ml.

Following the adjustments, Hannah believes that the mean amount of liquid put in each bottle is less than 28 ml.

She takes a random sample of 20 bottles and finds the mean amount of liquid to be 27.72 ml.

- (c) Showing all your working, test Hannah's belief at the 5% level of significance. (5)

(Total for question 5 is 13 marks)