1. A shop sells rods of nominal length 200 cm. The rods are bought from a manufacturer who uses a machine to cut rods of length L cm, where $L \sim N(\mu, 0.2^2)$

The value of μ is such that there is only a 5% chance that the rod, selected at random from those supplied to the shop, will have a length less than 200 cm.

(a) Find the value of μ to one decimal place.

(3)

A customer buys a random sample of 8 of these rods.

(b) Find the probability that at least 3 of these rods will have a length less than 200 cm.

(3)

Another customer buys a random sample of 60 of these rods.

(c) Using a suitable approximation, find the probability that more than 5 of these rods will have length less than 200 cm.

(3)

(Total for Question 1 is 9 marks)

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2. The random variable $X \sim B(10, p)$

(a) (i) Write down an expression for $P(X = 3)$ in terms of p

(ii) Find the value of p such that $P(X = 3)$ is 16 times the value of $P(X = 7)$

(4)

The random variable $Y \sim Po(\lambda)$

(b) Find the value of λ such that $P(Y = 3)$ is 5 times the value of $P(Y = 5)$

(3)

The random variable $W \sim B(n, 0.4)$

(c) Find the value of n and the value of α such that W can be approximated by the normal distribution, $N(32, \alpha)$

(3)

(Total for Question 2 is 10 marks)
