The central limit theorem

Answers

Further Maths topic practice

This topic online

Q	Answer	Marks
1	**a)** $\bar{X} \approx N(4.5, 0.075)$ **b)** X is Poisson, not normal; because n = 60 is large the central limit theorem says $\bar{X}$ is approximately normally distributed	3
2	0.1103	4
3	0.1193	4
4	0.1508	5
5	0.0690	6
6	0.1729	6
7	**a)** k = 5.03 **b)** S is discrete uniform, not normal; since n = 50 is large, the CLT gives that the mean score is approximately normal, which allowed the normal distribution to be used	7
8	**a)** 10k = 1 so k = 1/10 **b)** E(X) = 3, Var(X) = 1 **c)** 0.0548	7
9	136	6
10	**a)** a = 0.15, b = 0.3 **b)** $E(X^2) = 5.35$, so $Var(X) = 5.35 - 2.05^2 = 1.1475$ **c)** 0.0934 **d)** 446	9
11	**a)** $\bar{X} > 5.58$ **b)** Do not reject H0: insufficient evidence that the mean number of colonies per 10 ml is greater than 5 **c)** 0.860 **d)** Power increases: $Var(\bar{X}) = \lambda/n$ gets smaller, so when $\lambda = 6$ the sample mean is more likely to fall in the critical region	10
12	**a)** p = 0.4, r = 4 **b)** 0.0786 **c)** The 30 trainees act independently (and all have the same p), so they form a random sample from NB(4, 0.4)	10

Full worked solutions, written out by hand, are on the solutions sheet for this topic.

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