2. Luis makes and sells rugs. He knows that faults occur randomly in his rugs at a rate of 3 every $4\,m^2$

(a) Find the probability of there being exactly 5 faults in one of his rugs that is $4\,m^2$ in size.

(2)

(b) Find the probability that there are more than 5 faults in one of his rugs that is $6\,m^2$ in size.

(2)

Luis makes a rug that is $4\,m^2$ in size and finds it has exactly 5 faults in it.

(c) Write down the probability that the next rug that Luis makes, which is $4\,m^2$ in size, will have exactly 5 faults. Give a reason for your answer.

(2)

A small rug has dimensions 80 cm by 150 cm. Faults still occur randomly at a rate of 3 every $4\,m^2$
Luis makes a profit of £80 on each small rug he sells that contains no faults but a profit of £60 on any small rug he sells that contains faults.

Luis sells n small rugs and expects to make a profit of at least £4000

(d) Calculate the minimum value of n

(4)

Luis wishes to increase the productivity of his business and employs Rhiannon. Faults also occur randomly in Rhiannon's rugs and independently to faults made by Luis.
Luis randomly selects 10 small rugs made by Rhiannon and finds 13 faults.

(e) Test, at the 5% level of significance, whether or not there is evidence to support the suggestion that the rate at which faults occur is higher for Rhiannon than for Luis. State your hypotheses clearly.

(5)

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(Total for Question 2 is 15 marks)

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