4. A company claims that 20% of the electrical components sent to them are faulty.

To test this claim the company takes a random sample of 30 electrical components and records the number that are faulty.

(a) State, in context, **two** conditions necessary for a binomial distribution to be a suitable model for the number of faulty electrical components in the sample.

(2)

(b) Using a 5% significance level, find the critical region for a two-tailed test of the hypothesis that the probability of an electrical component being faulty is 0.2
The probability of rejection in each tail should be as close as possible to 0.025

(3)

(c) Find the actual significance level of this test based on your critical region from part (b)

(1)

In this sample 4 electrical components were found to be faulty.

(d) Comment on the company's claim with reference to your answer to part (b)
You must justify your answer.

(2)

To try to reduce the number of faulty electrical components being received, the company changes supplier.

After the change of supplier, the company takes a random sample of 25 electrical components and 2 were found to be faulty.

(e) Test, at the 10% level of significance, whether or not the probability of a faulty electrical component has decreased.
State your hypotheses clearly.

(4)

(Total for Question 4 is 12 marks)