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3. A manufacturer produces plates. The proportion of plates that are flawed is 45%, with flawed plates occurring independently.

A random sample of 10 of these plates is selected.

(a) Find the probability that the sample contains

(i) fewer than 2 flawed plates,

(ii) at least 6 flawed plates.

(4)

George believes that the proportion of flawed plates is not 45%. To assess his belief George takes a random sample of 120 plates. The random variable F represents the number of flawed plates found in the sample.

(b) Using a normal approximation, find the maximum number of plates, c, and the minimum number of plates, d, such that

$$P(F \leqslant c) \leqslant 0.05 \text{ and } P(F \geqslant d) \leqslant 0.05$$

where $F \sim B(120, 0.45)$

(7)

The manufacturer claims that, after a change to the production process, the proportion of flawed plates has decreased. A random sample of 30 plates, taken after the change to the production process, contains 8 flawed plates.

(c) Use a suitable hypothesis test, at the 5% level of significance, to assess the manufacturer's claim. State your hypotheses clearly.

(4)

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Q3