

Question 20**(14 marks)**

A chocolate factory produces chocolates of which 80% are pink. Each box of chocolates contains exactly 30 pieces.

- (a) Identify the probability distribution of X = the number of pink chocolates in a single box and also give the mean and standard deviation. (3 marks)
- (b) Determine the probability, to three decimal places, that there are at least 27 pink chocolates in a randomly selected box. (3 marks)

Quality Control collects samples sizes of 20 boxes and counts the number of pink chocolates in total.

- (c) Determine a 95% confidence interval for the proportion of pink chocolates in a sample of 20 boxes, using the assumption that 80% of chocolates in the sample are pink. (2 marks)

- (d) Quality Control collects three samples and determines a 95% confidence interval each time. Determine the probability that only one of these intervals will **not** contain the true value 0.8 of the proportion of pink chocolates. (2 marks)
- (e) Using your 95% confidence interval in part (c), determine the range in which the expected number of pink chocolates in a sample of 20 boxes would lie. (2 marks)

Quality Control counted the number of pink chocolates in five samples as shown below.

Sample	1	2	3	4	5
Number of pink chocolates	433	463	482	473	566

(f) Decide which samples lie outside the 95% confidence interval, if any. Justify. (2 marks)