EdExcel Statistics 2

The Binomial and Poisson distributions

Section 1: The binomial distribution

Exercise

1. $X \sim B(8, 0.6)$. Find the following probabilities:
    (i) $P(X = 0)$
    (ii) $P(X = 3)$
    (iii) $P(X = 6)$

2. $X \sim B(10, 0.7)$. Find the following probabilities:
    (i) $P(X = 0)$
    (ii) $P(X = 1)$
    (iii) $P(X > 1)$
    (iv) $P(X < 3)$

3. $X \sim B(10, 0.3)$.
    Use binomial tables to find the following probabilities:
    (i) $P(X \leq 4)$
    (ii) $P(X \geq 7)$
    (iii) $P(5 \leq X \leq 8)$

4. $X \sim B(15, 0.6)$.
    Use binomial tables to find the following probabilities:
    (i) $P(X \leq 5)$
    (ii) $P(X \geq 8)$
    (iii) $P(10 \leq X \leq 12)$

5. A school estimates the probability that a student passes a Statistics module to be
    0.9. Only 5 students are taking the exam in January.
    (i)   What is the probability that all 5 students pass?
    (ii)   What is the probability that only 2 students pass?
    (iii) What is the probability that at least 3 students pass?
    (iv) What is the most likely number of students who pass?

6. An online store claims that 75% of orders are dispatched on the next working day.
    I use this online store regularly, and only 4 of my last 10 orders were dispatched
    on the next working day.
        (i)   What is the probability using the store's figures that exactly 4 out of 10
                   orders are dispatched on the next working day?
        (ii)   What is the probability using the store's figures that under 4 out of 10
                   orders are dispatched on the next working day?

7. $X \sim B(12, 0.4)$.
    (i)   Find the expectation.
    (ii)   What is the most likely outcome for X?

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8. $X \sim B(8, 0.4)$.
    (i) Find the expectation.
    (ii) What is the most likely outcome for X?

9. A box contains a large number of bulbs. 20% of the bulbs are white, the rest are red. Bulbs are selected at random.
    How many bulbs must be selected so that the probability that there is at least one white bulb is greater than 0.95?

10. Using recent data provided by the low-cost airline Sleezyjet, the probability that a passenger loses his suitcase on a flight is estimated to be 0.15.
    Each week I make six different flights with Sleezyjet.
    (i) In a particular week, find the probability that
        (a) I arrive with my suitcase on all flights,
        (b) I lose my suitcase exactly once,
        (c) I lose my suitcase more than once,
        (d) I lose my suitcase exactly three times.
    (ii) What is the expected number of times I will lose my suitcase per week?
    (iii) If I fly for four weeks with six flights each week, what is the probability that I arrive with my suitcase on all flights for three weeks out of the four?

11. A supermarket buys bottles from a supplier in boxes of 16. The supermarket manager is concerned at the number of bottles which are broken on arrival. A random sample of 100 boxes is checked, and the number of broken bottles per box is as follows:

Number of broken bottles	0	1	2	3+
Number of boxes	70	28	2	0

    (i) Calculate the mean number of broken bottles per box.
    (ii) Estimate the probability of a particular bottle being broken.
    (iii) Using this figure calculate the probability that a chosen box will contain exactly 2 broken bottles.