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QUESTION WORKBOOK

# The Poisson distribution

Further Statistics 1 · Year FM

6 questions · 24 marks

PRINT EDITION

**SECTION A** · Warm-up

- A1** State the conditions under which a count can be modelled by a Poisson distribution, and name its one parameter. [3]

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- A2**  $X \sim \text{Po}(4)$ . Find  $P(X = 3)$  and  $P(X \leq 2)$ , each to 4 decimal places. [3]

**SECTION B** · Standard

- B1** Calls arrive at a switchboard at a mean rate of 2.5 per minute, at random. Find the probability of no calls in a two-minute period, and state the variance of the count over that period. [4]

- B2**  $X \sim \text{Po}(6)$ . Find  $P(X \geq 8)$  to 4 decimal places. [2]

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- B3** A component fails with probability 0.01, independently. In a batch of 200, use a Poisson approximation to estimate the probability of at most one failure, and compare with the exact binomial value. [5]

### SECTION C · Stretch

- C1** Two independent sources of faults occur at rates following  $Po(1.5)$  and  $Po(2)$  per hour. State the distribution of the total number of faults in a three-hour shift, explain why its mean and variance are equal, and find the probability that the shift produces at most 8 faults. [7]