



QUESTION WORKBOOK

Geometric and negative binomial distributions

Further Statistics 1 · Year FM

7 questions · 24 marks

NAVY SCREEN EDITION

SECTION A · Warm-up

A1 State how the geometric distribution differs from the binomial in what it counts.

[2]

A2 X follows a geometric distribution with $p = 0.3$. Find $P(X = 4)$ and the mean.

[3]

SECTION B · Standard

B1 X follows a geometric distribution with $p = 0.3$. Find $P(X \geq 5)$ and explain why no summation is required.

[3]

- B2** A component passes inspection with probability 0.25. Find the probability that the second pass occurs on the sixth inspection, and the mean number of inspections needed for two passes. [4]

- B3** Explain why the combination in the negative binomial formula is ${}^{x-1}C_{r-1}$ rather than xC_r . [3]

- B4** Show that the negative binomial distribution with $r = 1$ reduces to the geometric distribution, in probability, mean and variance. [3]

SECTION C · Stretch

- C1** The random variable X follows a negative binomial distribution with parameters r and p , and has mean 12 and variance 24. Find the values of p and r . Hence find $P(X = 5)$ and the probability that at least 6 trials are needed, each as an exact fraction. [6]