

Geometric Distribution Questions (with Year 2 Content) (From OCR 4723)

Q1, (Jun 2007, Q9)

(i) A random variable X has the distribution $\text{Geo}(\frac{1}{5})$. Find

- (a) $E(X)$, [2]
- (b) $P(X = 4)$, [2]
- (c) $P(X > 4)$. [2]

(ii) A random variable Y has the distribution $\text{Geo}(p)$, and $q = 1 - p$.

- (a) Show that $P(Y \text{ is odd}) = p + q^2p + q^4p + \dots$. [1]
- (b) Use the formula for the sum to infinity of a geometric progression to show that

$$P(Y \text{ is odd}) = \frac{1}{1 + q}. \quad [4]$$

Q2, (Jan 2010, Q9)

R and S are independent random variables each having the distribution $\text{Geo}(p)$.

- (i) Find $P(R = 1 \text{ and } S = 1)$ in terms of p . [1]
- (ii) Show that $P(R = 3 \text{ and } S = 3) = p^2q^4$, where $q = 1 - p$. [1]
- (iii) Use the formula for the sum to infinity of a geometric series to show that

$$P(R = S) = \frac{p}{2 - p}. \quad [5]$$
