

STEP 3, 2009 - Notes (1 page; 8/6/18)

See separate documents for Sol'ns.

1	2	3	4	5	6	7	8
Sol'n			Sol'n		Sol'n	Sol'n	Sol'n

9	10	11		12	13	14
		Sol'n		N		

Q12 (i) $E(X_1) = \frac{k}{2}$ [Binomial np]

$$E(X_2) = \sum_{r=1}^k E(X_2|X_1 = r)P(X_1 = r) = \sum_{r=1}^k \frac{r}{2} P(X_1 = r)$$

$$= \frac{1}{2} E(X_1) = \frac{k}{4}$$

$$E(X_3) = \sum_{r=1}^k E(X_3|X_2 = r)P(X_2 = r) = \sum_{r=1}^k \frac{r}{2} P(X_2 = r)$$

$$= \frac{1}{2} E(X_2) = \frac{k}{8} \text{ etc}$$

$$\text{Thus } \sum_{r=1}^{\infty} E(X_r) = \frac{k}{2} \left(1 + \frac{1}{2} + \frac{1}{4} + \dots \right) = \frac{k}{2} \left(\frac{1}{1-\frac{1}{2}} \right) = k$$