Probability & Statistics (MA2670), Term 1 - 4th Tutorial

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- For a discrete r.v, X, the probability mass function (pmf) is

$$\Pr(X = x) \equiv p(x) = x/15, \quad x = 1, 2, 3, 4, 5$$

$$p(x) = 0 \quad \text{otherwise.}$$

Find $\mathbb{E}(X(6 - X))$.

- Using the result:

$$\sum_{x=1}^{\infty} 1/x^2 = \pi^2/6,$$

(*) show that the pmf of the discrete r.v. $X \in \mathbb{N}$ is

$$p(x) = 6/(\pi x)^2, x = 1, 2, 3, \ldots.$$

(*) show that $\mathbb{E}(x)$ does not exist.

- Let the expectation of a r.v. X be $\mathbb{E}(X) = 2$, and $\mathbb{E}[X(X - 4)] = 5$. Find the variance and standard deviation of $12 - 4X$.

- The annual rainfall (in cm) in a given geographical location is a r.v. X with the cdf

$$F_X(x) = 0 \quad x < 5;$$

$$F_X(x) = 1 - (5/x^2) \quad x \geq 5.$$

What is the probability that in the coming year, it will rain
(*) at least 6cm;
(*) at most 9cm;
(*) at least 2 and at most 7cm?

- A restaurant serves 8 main courses of fish, 12 of beef, and 10 of chicken. If customers select from these courses randomly, what is the probability that 2 of the next 4 customers order fish courses?

- A town of 100,000 residents is exposed to an infectious disease. If the probability that a person gets infected is 0.04, what is the expectation of the number of people who become infected?