MTH 102: Probability and Statistics

Quiz 3

01/04/2020

Sanjit K. Kaul

I. Question 1

Runners Tom and Jerry have running speeds that belong to the set $\{1, 1.25, 1.5\}$ strides per second. Let the speed of runner A be given by the random variable X and that of B be given by Y. Do the following.

(a) Provide an example marginal distribution each for the speeds of Tom and Jerry. It is known that their distributions are non-identical and not uniform. Also, all probabilities are in the open interval $(0, 1)$.

(b) We are also interested in their speeds when they run together. Provide three example unique joint distributions corresponding to your choice of marginal distributions. At least one of the joint distributions must correspond to when the running speeds are independent. All probabilities must be in the open interval $(0, 1)$.

(c) From the three joint distributions you crafted above, choose one that corresponds to running speeds being dependent. Mention your choice clearly.

(d) For the chosen joint distribution, calculate

(1) All possible conditional distributions of X given Y.

(2) $P[X = Y]$,

(3) $P[X > Y|Y = 1]$,

(4) Var$[X - Y]$.