Challenging Problem

Parvez Alam : AI21RESCH01005

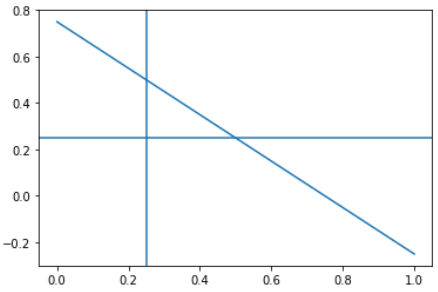
April 2021

1 Problem

Two points are chosen at random on a line of unit length. What is the probability that the three line segments so formed will have a length greater than 1/4 ?

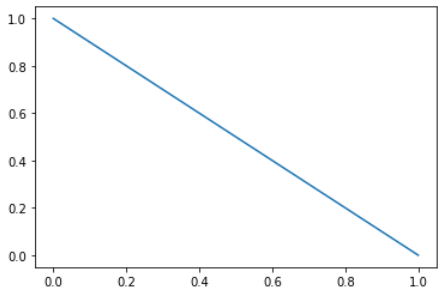
Solution: Let the line segment be PQ and the points be A, B.
let the length of PA be x, and length of AB be y then
length of BQ =1-(x+y)

$$x > 0.25$$
$$y > 0.25$$
$$x + y < 0.75$$



Favourable cases=area of the above triangle=$\frac{1}{32}$
Sample space will be represented by

$$x + y < 1$$



sample space = area of the above triangle=$\frac{1}{2}$

$$\begin{aligned} Probability &= \frac{\frac{1}{32}}{\frac{1}{2}} \\ &= \frac{1}{32} \times 2 \\ &= \frac{1}{16} \end{aligned}$$