Math Document Template

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Download all python codes from

svn co https://github.com/SiddharthPh/Summer2020/trunk/geometry/Probstat/codes

1 Probability Exercises

1.1 Exercise 1

1.1.1 Problem: Suppose you drop a die at random on the rectangular region shown in Fig.15.6.What is the probability that it will land inside the circle with diameter 1m?

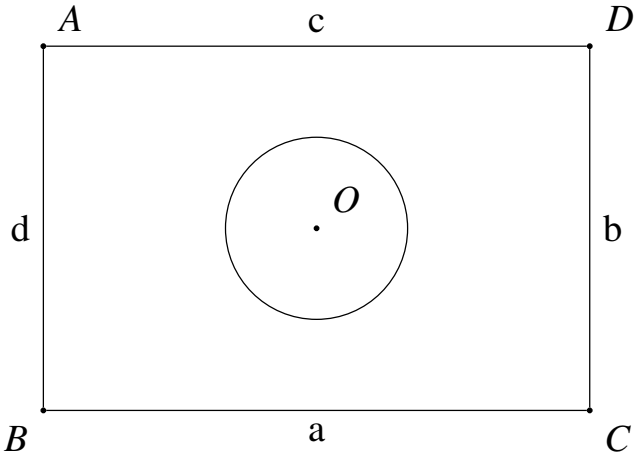

Fig. 0: Rectangle

1.1.2 Solution:

1. In the given question,
   The sample size = Total Area of the rectangle=

$$3x2 = 6m^2 \tag{1.1.2.1.1}$$

   Favourable outcome = Area of Circle=

$$\pi\left(\frac{1}{2}\right)^2 = \frac{\pi}{4}m^2 \tag{1.1.2.1.2}$$

   Probabilty(P) of the dice landing in the circle=$\frac{\pi}{24}$
   $\therefore$ P = 0.131
   The python code for the distribution.

prob/codes/prob1.py

shows the Bernouli distribution of data.
The Bernoulli Distribution of data is given below
Probability mass function(P(X))=$p^x\,(1-p)^{1-x}$

$$P(X=0) = 1-p \tag{1.1.2.1.3}$$

$$P(X=1) = p \tag{1.1.2.1.4}$$

where p=0.131 given by **??**

1.1.3 Understanding Graph:

1. From the graph (**??**),
   a) Values on X-axis represent the Bernoulli distribution of data.
   b) Values on Y-axis represent the density of frequency(Histogram estimator) of the data. To calculate the histogram estimator, we have to define the number of bins(Intervals) For the graph in the question,

$$bins = 10 \tag{1.1.3.1.1}$$

$$h(binwidth) = \frac{(1-0)}{10} \tag{1.1.3.1.2}$$

   For bin-width h, number of observations n, for bin j, proportion of observations is

$$p_j = \frac{y_j}{n} \tag{1.1.3.1.3}$$

   (Where y_j is the frequency of j$^t h$ bin.)

$$p_0 = \frac{869}{1000} = 0.869 \tag{1.1.3.1.4}$$

$$p_1 = \frac{131}{1000} = 0.131 \tag{1.1.3.1.5}$$

   The density estimate is

$$y(x) = \frac{p_j}{h} \tag{1.1.3.1.6}$$

$$y(0) = \frac{0.869}{0.1} = 8.69 \tag{1.1.3.1.7}$$

$$y(0) = \frac{0.131}{0.1} = 1.31 \tag{1.1.3.1.8}$$

   To draw the Gaussian Kernel Density curve, Calculate mean and standard deviation for the centre and bandwidth.