BT 307: Quiz 1.
Marks: 10 (15 scaled to 10)

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Put your final answers on the designated places in the back side of the paper. Q1-Q5: one mark each; Q6 to Q10: 2 marks each

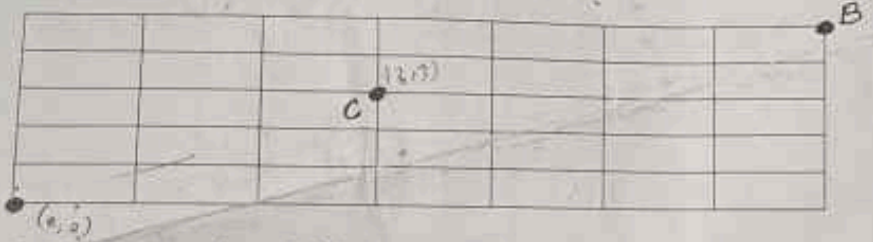
1. Z has a standard normal distribution. What is $P(0 \leq Z^2 \leq 1)$?

2. The genome of a newly discovered species of bacterium has equal distribution of A, T, G and C. If a hexanucleotide sequence from the genome is chosen at random, what will be the probability that it would be an EcoRI restriction site which is GAATTC?

3. An unfair coin has 60 percent probability of showing heads. This coin is tossed three times. What is the probability that the first or second toss are heads?

4. A tall pea plant (genotype **Tt**) is crossed with a dwarf pea plant (**tt**). Here **T** is the dominant allele and **t** is the reccessive allele. 5 of the resulting seeds are picked at random and sowed. What is the probability that 3 of them will yield dwarf plants and 2 of them will yield tall plants?

5. The figure below shows the roads (indicated by straight lines) and junctions of a city. One is allowed to travel only in south to north and ~~east~~ to ~~west~~ direction. In how many different ways can one travel from point A to point B, via point C.



6. A box contains a 5 fair dice and 15 unfair dice. The probability of getting "6" for the unfair dice is 0.3 (all other outcomes being equally probable). A person picks up one dice at random and rolls it five times with the following outcomes- "1", "6", "4", "6", "6". What is the probability that the person picked up a fair dice?

8. Clinical data on the effectiveness of a newly developed analgesic pill shows that- it reduces pain in 60% of the patients, produces no effect on 20% of the patients, and increases pain in 20% of the patients. A doctor administered this analgesic to 7 patients with pain. What is the probability that the pill will reduce pain, will not have any effect, and increase the pain in **2, 2 and 3** patients respectively?

9. A DNA synthesizer makes single stranded DNA molecules by polymerizing nucleotides (A, T, G, and C) picked up at random from a mixture of nucleotides. The proportion of the nucleotides in the mixture is 0.5:1:2:0.5. The machine is programmed in such a way that the synthesizer stops once a C is added.
a) What is the probability that on a particular run, the machine ends up making an octamer (ie a DNA strand with 8 nucleotides)?
b) If the machine is run over and over again, what will be the average length of DNA strands generated by this machine?

10. Consider the following probability mass function of X

X	-1	0	1	2	3
P(X)	0.2	0.4	0.2	0.1	0.1

Find- a) the mean of X, and b) the standard deviation of X.