Practice Problems

Problems on Probability

1) A multinational farm conducted a job satisfaction survey on a sample of its employees. The table below summarizes the result of the survey. Assuming that the sample drawn is a random sample from its entire employee population, the HR would like to know the probability of the following events.

   a) What proportion of employees is satisfied?
   b) What proportion of employees is at a risk of attrition? (Assume a dissatisfied employee will attrite eventually.)
   c) If a dissatisfied employee attrite with probability 0.4 within a year, what is the probability of an employee to attrite in a year?
   d) If an employee is chosen randomly, what is the probability that he/she at least a high school graduate?
   e) What is the satisfaction rate among employees who are college graduate or more?
   f) Among the employees who have at least some college education, what proportion is not dissatisfied?
   g) Among the employees who are not satisfied, what proportion are college graduate or more?
   h) Among the employees who have not had any college education, what proportion are not highly dissatisfied?

Education Level	Job Satisfaction				
	Satisfied	Neutral	Dissatisfied	Highly Dissatisfied	Total
Did not complete high school	10	20	30	40	100
High school graduate	20	30	25	50	125
Some college	30	60	35	25	150
College Graduate	120	40	30	10	200
Post-graduate	60	15	0	0	75
Total	240	165	120	125	650

2) A multinational bank is concerned about the waiting time of its customers before they use the ATM for their transactions. A study of a random sample of 500 customers reveals the following probability distribution.

Waiting time (in minutes)	Probability
0	0.2
1	0.18
2	0.16
3	0.12
4	0.1
5	0.09
6	0.08
7	0.04
8	0.03

a) What is the probability that a customer will wait for more than 5 minutes?
b) What proportion of the customers do not have to wait at all?
c) What is the expected waiting time for a customer?

Problems on Binomial and Normal Distributions

The trick is to identify which problem can be solved by applying binomial rule. For binomial application you need to check if there are **n** trials, each trial results in a **success** or a **failure** and **probability of success is constant** for each trial.

1) In an inspection of automobiles 60% of all automobiles had emissions that do not meet the pollution requirement. For a random sample of 15 automobiles, compute the following
    a) Probability that all 15 fails the inspection
    b) Exactly 8 fails the inspection
    c) Seven or less passes the inspection
    d) Expected number of automobiles to pass the inspection and its variance.

2) Over a long period of time in a large multinomial corporation, 10% of all sales trainees are rated as outstanding, 75% are rated as excellent, 10% are rated as satisfactory and 5% are considered unsatisfactory. Find the following probabilities for a sample of 10 trainees selected at random
    a) Two are rated as outstanding
    b) Two or more are rated as outstanding
    c) Eight of the ten are rated either outstanding or excellent

      d) None of the trainees are rated as unsatisfactory

3) A labor union's examining board for the selection of trainees has a record of admitting 70% of all applicants who meet a basic set of criteria. Five members of a minority group recently came before the board and four of five were rejected. Find the probability that one or fewer would be accepted if the record is really 0.7. Did the board apply a lower probability of acceptance when reviewing the five members of the minority group?

4) According to the Telecommunication Industry the average monthly cell phone bill is Rs. 850 with a standard deviation of Rs. 150.

      a) What is the probability that a randomly selected cell phone bill is more than Rs 1200?

      b) What is the probability that a randomly selected cell phone bill is between Rs 750 and Rs 1200?

      c) What is the probability that a randomly selected cell phone bill is no more than Rs 650?

      d) What is the amount above which lies top 15% of cell phone bills?

      e) What is the amount below which lies bottom 25% of cell phone bills?

5) For on-campus recruitment Ms. Z has sat for tests by Company A and Company B. For both tests her score is 50. It is known that for Company A, scores have a normal distribution with mean 40 and standard deviation 15 whereas for Company B, scores have a normal distribution with mean 45 and standard deviation 10. Relatively speaking in which test has Ms. Z done better?

Problems on Central Limit Theorem

1) On an average Make My Trip gets 5000 queries a day with a standard deviation of 500.
      a) Assuming a month contains 30 days, on what proportion of days a month will there be more than 5250 queries?
      b) Assuming a month contains 30 days, data is collected on 25 months and an average of 25 months is computed. What is the probability that average of 25 months is more than 5250?

2) A survey was conducted with graduates from the top 30 MBA programs. On the basis of the survey assume that the mean annual salary for male and female graduates 10 years after graduation is US$168,000 and US$117,000 respectively. Assume the standard deviation for the male graduates is US$40,000 and for the female graduates US$25,000.

a) What is the probability that a random sample of 40 male graduates will provide a sample mean within US$10,000 of the population mean?
b) What is the probability that a random sample of 40 female graduates will provide a sample mean within US$10,000 of the population mean?
c) In which of the preceding two cases, do we have a higher probability of obtaining a sample estimate within US$10,000 of the population mean? Why?
d) What is the probability that a sample of 100 male graduates will provide a sample mean more than US$4000 below the population mean?