Biostatistics – Assignment-1
For MSc12, IBAB

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1. An insurance agent meets individuals to persuade them to take an insurance policy. Based on large number of such meetings, it is estimated that only 10% of times he succeeds in selling a policy. How many people he should meet for selling 20 policies?

2. A regular deck of cards is shuffled and 2 cards are drawn.
(a) What is the probability that the first one is an ace and the second a king?
(b) What is the probability that one of them is an ace and other a king?

3. The nucleotides A,T,G,C are randomly chosen to construct a 6 nuclotide sequence.
How many sequences are possible with the fist 3 positions always as "ATG"

4. How many distinct 8 digit numbers can be formed by the digits 3,3,4,4,4,5,5,5 ?

5. If P(A) is 0.32 and P(B) is 0.41, what is P(A U B) if A and B are independent events? Can this problem be solved with the provided information, or what more information is needed to solve it?

6. Suppose that 5 men out of 100 and 25 women out of 10000 are color blind. A color blind person is chosen ar random. What is the probability that the randomly chosen person is a male? (Make any assumption required to solve this problem).

7. There are five bags each containing identical sets of ten distinct chocolates. One chocolate is randomly picked from each bag. Compute the the probability that at least two chocolates are identical. (Answer : 0.6976. Get this answer)

8. In the original cross breed experiment, Mendel cultivated the First generation plants and allowed self fertilization to take place. Among the seeds of Second generation he observed 4 types of seed phenotypes in the following numbers:

round, yellow	=	315
round, green	=	108
wrinkled, yellow	=	101
wrinkled, green	=	32
Total		556

(a) What is the ratio of round versus wrinkled?
(b) What is the ratio of yellow versus green?

(c) If we randomly pick a seed from this collection, what is the probability that it will be yellow?

(d) A seed that is randomly picked from this collection is found to be round. What is the probability that it will be green?

9. We define "A" as being the dominant normal allele and "a" as the recessive abnormal one that is responsible for a genetically inherited disease called cystic fibrosis. This disease only afflicts those who are homozygous recessive (aa).

As a carriers of this disease, let a husband and wife both be heterozygous (Aa).

(a) What is the chance that their child will have recessive disorder?

(b) What is the chance their child will be healthy carrier?

(c) What is the chance that the child is health and will not have recessive allele at all?

(d) If a carrier (Aa) for such a recessive disease mrries with someone who has it (aa), then what fraction of their children will have recessive disorder?

10. In a blind clinical trial, we have to randomly select 3 subjects from a group of 12 volunteers for administering some drug.

How many possible ways this can be done if

(1) it does not matter whether a person is selected first, second or third.

(2) the order of selection matters.

11. A female dog has 50% probability of giving birth to a male or female puppy.

(a) If the dog gives birth to 6 puppies, what is the probability that first 5 of them are female and sixth one is a male?

(b) If the dog gives birth to 6 puppies, what is the probability that 5 of them are male and 1 is female?. (ie.the order dosen't matter)

12. At a fair a vendor has 25 helium ballons on strings : ten balloons are yellow, seven are red and eight are green. A ballon is selected at random and sold.

(1) Given that the first ballon sold is yellow, what is the probability the second balloon selected at random will also be yellow?.

(2) Given that the first 2 balloons selected are yellow, what is the probability that the third balloon randomly selected is red?

13. Consider the following 10 numbers : 3,3,3,3,3,6,6,6,9,9

How many unique 10 digit numbers can be created out of these 10 numbers?

14. In a hospital, 35% of the patients have heart disease. It was also found that 86% of patients with heart disease are smokers. What is the probability that a randomly selected patient from this hospital will be a smoker and will have a heart disease.

15. In a group of 40 elderly people, 10 are healthy, 15 have high blood pressure, 25 have high cholesterol, 10 have both. How many of them have only one disease?

16. A committee of 5 people is to be formed randomly from a group of 10 women and 6 men. Find the probability that the committee has

a) 3 women and 2 men.

a) 4 women and 1 men.

c) 5 women.

d) at least 3 women.

17. A survey was conducted among a group of men and women for their left or right handedness.

Among the 52 men surveyed, 43 were right handed and 9 were left handed.
Among the 48 women surveyed, 44 were right handed and 4 were left handed.
Prepare a contingency table for this data to answer the following questions:

(a) If someone in this group is left handed, what is the probability that person is a male?
(b) What fraction of female in the group are right handed?
(c) What is the fraction of left handed people in the group?

18. It rains 20 days in a year in a district.
When it actually rains, the whether department forcasts correctly 80% of the time.
When it dosen't rain, they also incorrectly forcast 20% of the time.
The whether department has predicted that it will rain tomorrow in that town.
What is the probability that it will rain tomorrow?

The following two are freaky questions not related to statistics:

19. If m and n are integers and m-n is even, which of the following must always be even?
(a) $m^2 + n^2 + 3$ (b) $n(m-1)$ (c) $m^2 + n + 1$ (c) mn

20. A vehicle has a smaller from wheel and a larger back wheel. The circumference of the front wheel is 10 meters and the circumference of the back wheel is 12 meters. What is the distance traveled by the vehicle when the front wheel has done six more revolutions than the back wheel?
(a) 420 m (b) 320 m (c) 360 m (d) 840 m