**1. According to a study, the daily average time spent by a user on a**

**social media website is 50 minutes. To test the claim of this study,**

**Ramesh, a researcher, takes a sample of 25 website users and finds**

**out that the mean time spent by the sample users is 60 minutes and**

**the sample standard deviation is 30 minutes.**

**Based on this information, the null and the alternative hypotheses**

**will be:**

**Ho = The average time spent by the users is 50 minutes**

**H1 = The average time spent by the users is not 50 minutes**

**Use a 5% significance level to test this hypothesis.**

**n=25**

**mean =60 minutes**

**daily average time spent=50 minutes**

**standard deviation =30**

**Z = ( x̅ – μ0 ) / (σ /√n)**

**10\*5/30**

**=5/3**

**=1.66**

**P value <0.05 is considered the null hypoyhesis to be true**

**Hence alternate hypothesis to be false.**

2. Height of 7 students (in cm) is given below. What is the median? 168

160,162,162,164,168,169,170

SOLUTION

Median =(n+1)th\2 observations

7+1\2 th observation

4 th observation

Median =164 cm

3.Below are the observations of the marks of a student. Find the value

of mode.

84 85 89 92 93 89 87 89 92

SOLUTION

mode=89

4. From the table given below, what is the mean of marks obtained by 20

students?

Marks Xi No. of students

fi

3 1

4 2

5 2

6 4

7 5

8 3

9 2

10 1

Total 20

SOLUTION

Mean=total marks obtained by the student\no of students

3+8+10+24+35+24+18+10/20

Mean=6.6

5.For a certain type of computer, the length of time between charges of

the battery is normally distributed with a mean of 50 hours and a

standard deviation of 15 hours. John owns one of these computers

and wants to know the probability that the length of time will be

between 50 and 70 hours.

SOLUTION

Let t be the variable that represents length of time.

So the battery has a mean of 50 and standard deviation of 15.

So we need to find the probability that t is between 50 and 70

So μ = 50 (mean) σ = 15 (standard deviation)

So P (50 < t < 70)

So in the standard form we have

Z = (t – μ) / σ

So for t = 50

Z = 50 – 50 / 15

Or Z = 0

So for t = 70

Z = 70 – 50 / 15

Z = 1.33

So P(50 < t < 70) = P(0 < z < 1.33)

So area to left of Z = 1.33 – area to the left of z = 0

0.9082 – 0.5

0.4082

6. Find the range of the following.

**g = [10, 23, 12, 21, 14, 17, 16, 11, 15, 19]**

**SOLUTION**

**Range=max value-min value**

**range=23-10**

**range=13**

**7. It is estimated that 50% of emails are spam emails. Some software**

**has been applied to filter these spam emails before they reach your**

**inbox. A certain brand of software claims that it can detect 99% of**

**spam emails, and the probability for a false positive (a non-spamemail detected as spam) is 5%. Now if an email is detected as spam,**

**then what is the probability that it is in fact a non-spam email?**

**SOLUTION**

**Let AA denote the event that an email is detected as spam and BB denote the event that an email is spam.**

**Given that 50% of the emails are spam, i.e., P(B)=0.5P(B)=0.5. Thus P(B′)=1−P(B)=0.50P(B′)=1−P(B)=0.50.**

**A certain brand of software claims that it can detect 99% of spam emails. That is P(A|B)=0.99P(A|B)=0.99.**

**And the probability for a false positive (a non-spam email detected as spam) is 5%. That is P(A|B′)=0.05P(A|B′)=0.05.**

**We need to find the probability that the email is non-spam given that it is detected as spam.**

**Using Bayes' Theorem, required probability is**

**P(B'\A)=P(A\B') P(B')/**

**P(A/B)P(B)+P(A/B')P(B')**

**=0.05\*0.5/**

**0.05\*0.5+0.99\*0.5**

**=0.025/0.52**

**=0.0481**

**8. Given the following distribution of returns, determine the lower**

**quartile:**

**{10 25 12 21 19 17 16 11 15 19}**

**LOWER QUARTILE=N+1\*1/4**

**=10+1/4**

**=2.75**

**9. For a Binomial distribution, the number of trials(n) is 25, and the**

**probability of success is 0.3. What’s the variability of the**

**distribution?**

Solution:-

The measure for variability is Variance The variance of the binomial

distribution is Var(X) =

n\*p\*q; where p is the probability of success and q is given as 1-p

So, as per question; n=25, p=0.3 q = 1-0.3 = 0.7.

Variance =N\*P\*Q

=25\*0.3\*0.7

=5.25

**10. Amy has two bags. Bag-I has 7 red and 2 blue balls and Bag-II has**

**5 red and 9 blue balls. Amy draws a ball at random and it turns out to**

**be red. Determine the probability that the ball was from the Bag-I**

**using the Bayes theorem.**

Solution: Let X and Y be the events that the ball is from the bag I and bag II, respectively. Assume A to be the event of drawing a red ball. We know that the probability of choosing a bag for drawing a ball is 1/2, that is,

P(X) = P(Y) = 1/2

Since there are 7 red balls out of a total of 11 balls in the bag I, therefore, P(drawing a red ball from the bag I) = P(A|X) = 7/11

Similarly, P(drawing a red ball from bag II) = P(A|Y) = 5/14

We need to determine the value of P(the ball drawn is from the bag I given that it is a red ball), that is, P(X|A). To determine this we will use Bayes Theorem. Using Bayes theorem, we have the following:

P(X/A )=P(A/X) P(x)

P(A/X) P(X)+P(A/Y) P(Y)

=[(7/11) (1/2)]/(7/11) (1/2) +(5/14) (1/2)]

=0.64

**11.Find the mean, mode and median of g = [10, 23, 12, 21, 14, 17, 16, 11,**

**15, 19, 12]**

**SOLUTION**

**MEAN=10+23+12+21+14+17+16+11+15+19+12**

11

=170

11

=15.45

MODE=12

MEDIAN=N+1/2 TH TERM

=6 TH TERM

=17

**12. The mean height of a random sample of 100 individuals from a**

**population is 160. The Standard deviation of the sample is 10. Would**

**it be reasonable to suppose that the mean height of the population is**

**165?**

**Solution**

**Sample size n=100**

**sample mean =165**

**population mean=160**

**population SD=10**

**Ho:U=165 CM**

**H1:U=165CM**

**TEST STASTICS=5**

**So it is right to be considered mean height to be 165cm**

**13.A study, physicians were asked what the odds of breast cancer**

**would be in a woman who was initially thought to have a 1% risk of**

**cancer but who ended up with a positive mammogram result (a**

**mammogram accurately classifies about 80% of cancerous tumors**

**and 90% of benign tumors.) 95 out of a hundred physicians estimated**

**the probability of cancer to be about 75%. Do you agree?**

Introduce the events:

+ = mammogram result is positive,

B = tumor is benign,

M = tumor is malignant.

Note that Bc = M. We are given P(M) = .01, so P(B) = 1 − P(M) = .99.

We are also given the conditional probabilities P(+ | M) = .80 and P(− | B) = .90, where

the event − is the complement of +, thus P(+ | B) = .10

Bayes’ formula in this case is

P(M | +) = P(+ | M)P(M)

(P(+ | M)P(M) + P(+ | B)P(B))

=

0.80 × 0.01

(0.80 × 0.01 + 0.10 × 0.99)

' 0.075

So the chance would be 7.5%. A far cry from a common estimate of 75

**14. Suppose we have 3 cards identical in form except that both sides**

**of the first card are colored red, both sides of the second card are**

**colored black, and one side of the third card is colored red and the**

**other side is colored black. The 3 cards are mixed up in a hat, and 1**

**card is randomly selected and put down on the ground. If the upper**

**side of the chosen card is colored red, what is the probability that the**

**other side is colored black?**

**Solution:**

RR     BB       RB

Probability of getting R card  up

= (1/3) .1    + (1/3) (1/2)

= 1/3  + 1/6

= 1/2

Probability of getting R card  up  = 1/3  when red both sides  ( other side = Red)

Probability of getting R card  up  = 1/6  when red one side and black other side ( other side = black)

upper side of the chosen card is colored red,

Hence probability that the other side is colored black =   (1/6) /( 1/2)

=  2/6

= 1/3

**1/3 is the probability that the other side is colored black**