Week-3: STATISTICAL MODELLING

Assignment- Solution

1. c
2. b
3. a
4. a
5. b
6. d
7. a
8. a
9. b
10. d
11. b
12. b
13. a
14. a
15. c
16. d
17. a
18. c
19. b
20. d
21. a
22. b

Solutions: -

1. $\frac{55+32}{107} = \frac{87}{107}$

2. $\frac{(55/107)}{(55+32)/107} = \frac{55}{87}$

3. $\frac{(55/107)}{(55+17)/107} = \frac{55}{72}$

4. $E(2X + 3Y) = E(2X) + E(3Y) = 2(0) + 3(10) = 30$

5. $\sigma^2_{2X+3Y} = 4\sigma^2_X + 9\sigma^2_Y = 4(5) + 9(9) = 101$

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6. We will stop tossing the coin when we get heads in the 5th toss. This will remain fixed and the probability for this is $^1/_2$

   ****H

   We still need to get 2 heads in the 4 first four tosses
   If n is the no. of trial (n=4) and k is the total no. of desired output (k=2), then
   Probability of 2 heads in 4 tosses= $n_{C_k}(p)^k(1-p)^{n-k}$

   $= 4_{C_2}(\frac{1}{2})^2(1-\frac{1}{2})^{4-2}$

   $=\frac{3}{8}$

   Therefore, probability that the coin is tossed exactly five times is= $\frac{3}{8} * \frac{1}{2} = \frac{3}{16}$

7.
```
> mileage<-read.csv("Mileage.csv")
> summary(mil)
     Mileage
 Min.   :11.57
 1st Qu.:15.47
 Median :17.06
 Mean   :17.55
 3rd Qu.:19.60
 Max.   :25.10
```

8. Maximum-minimum
9. From summary

10.
```
> sd(mileage$Mileage)
[1] 2.905042
```

11. From summary

12.
```
> visualize.norm(stat=c(-1,1),mu=0,sd=1,section = "tails")
> pnorm(-1,0,1,lower.tail = T)+pnorm(1,0,1,lower.tail = F)
[1] 0.3173105
```

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13.
```
> qnorm(p = 0.05,mean = 0,sd = 1,lower.tail = T)
[1] -1.644854
```

14.
```
> pnorm(q = 2.5,mean = 0,sd = 1,lower.tail = T)
[1] 0.9937903
```

15.
```
> dbinom(x = 10,size = 10,prob = 0.8)
[1] 0.1073742
```

16.
```
> lamda=8*0.02
> lamda
[1] 0.16
> ppois(q = 0,lambda = lamda,lower.tail = T)
[1] 0.8521438
```

17.
```
> alpha=0.01
> alpha
[1] 0.01
> n=20
> n
[1] 20
> qt(p = 1-alpha,df = n-1)
[1] 2.539483
```

18. Correlation is between -1 to +1

19.
```
> cor(anscombe$x3,anscombe$y3)
[1] 0.8162867
```

20. We need to check if average protein in X and Y are equal. Hence two sample t test for mean.

Degrees of freedom=n1+n2-2; where n1 and n2 are the sample sizes of the brands X and Y respectively.

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21. $t = \frac{153.7-146.3}{17.2/sqrt(21)} = 1.97$

22. $\bar{x} - To\ be\ calculated\ from\ given\ data - corresponds\ to\ avg\ weight\ of\ ten\ students$

$\bar{x} = 66$

Var: -

$$\frac{1}{n-1}\sum_{i=1}^{n}(x_i - \bar{x})^2 = \frac{90}{9} = 10$$

$$t = \frac{66-64}{\sqrt{\frac{10}{10}}} = 2$$