Business Analytics

BSMS2002

TA sessions
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https://github.com/utkarsh4tech/BSMS2002

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Method in which the previously calculated probabilities are revised with values of new probability is called _____

a. Revision theorem

b. Dependent theorem

c. Updation theorem

d. Bayes theorem

Select the all the correct options

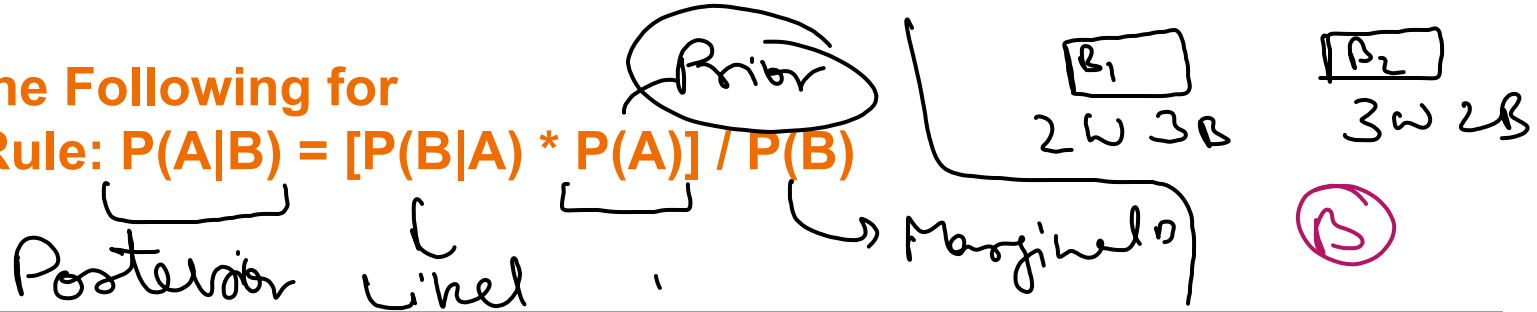
a. $P(A|B) = P(A) / P(B)$

b. $P(A|B) = P(B|A) * P(A) / P(B)$ [Bayes]

c. $P(A|B) = P(A \cup B) / P(B)$

d. $P(A|B) = P(A \cap B) / P(B)$ [Conditional]

Match the Following for Bayes Rule: P(A|B) = [P(B|A) * P(A)] / P(B)



TERM	REPRESENTATION IN FORMULA
Likelihood	P(B)
Posterior probability	P(B|A)
Prior probability	P(A)
Marginal probability	P(A|B)

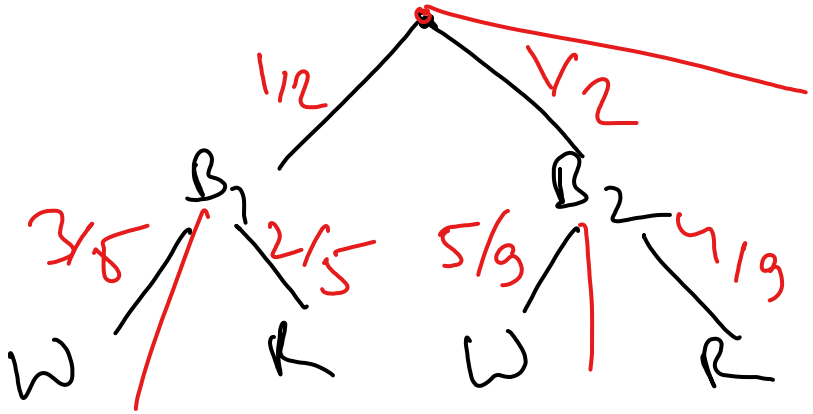
There are two boxes. The first box contains 3 white and 2 red balls whereas the second contains 5 white and 4 red balls. A ball is drawn at random from one of the two boxes and is found to be white. Find the probability that the ball was drawn from the second box?

a. 53/50

b. 50/104

c. 54/104

d. 54/44

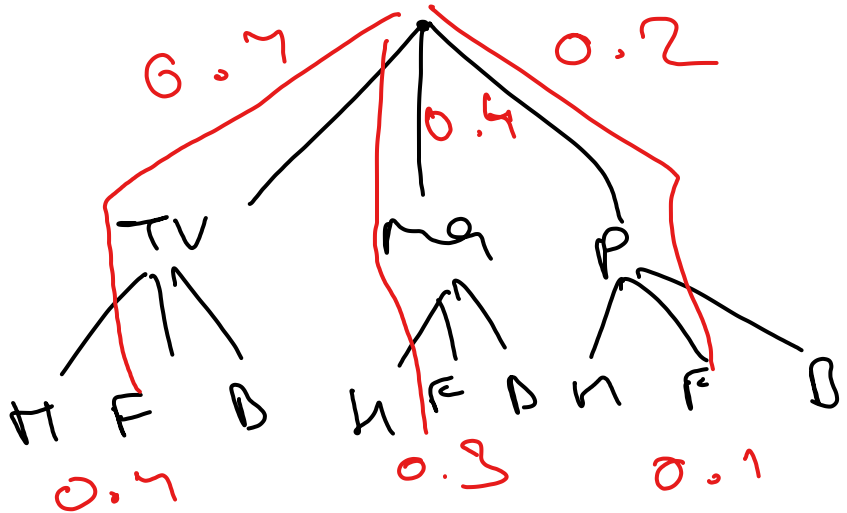


$$\frac{1/2 * 5/9}{3/5 \times 1/2 + 5/9 \times 1/2}$$

The application for the degree “Master in Being Useless (MBU)” has begun at “Star University (SU)”. The applicants to SU are from three professional categories namely “TV Watcher”, “Mobile Gamer” and “Procrastinator”. The previous year admissions indicate that 20% of the total applications are Procrastinators, 40% are Mobile Gamers and the rest are TV Watchers.

When examining past applications submitted by the three professional categories, it is seen that the applications are either “Fully Completed”, “Half Completed” or “Blank”. It is observed that among the “Mobile Gamer” applications that are received, 30% are “Fully Completed” and 60% is “Half Completed”. For TV Watcher applications that are received, 40% are “Half Completed” and 20% are “Blank”. Among all received Procrastinator applications, 50% have submitted “Blank” applications and 40% have submitted “Half Completed” applications.

a) What is the probability that an application for the coming application will be "Fully Completed"?



$P(F \cdot C)$

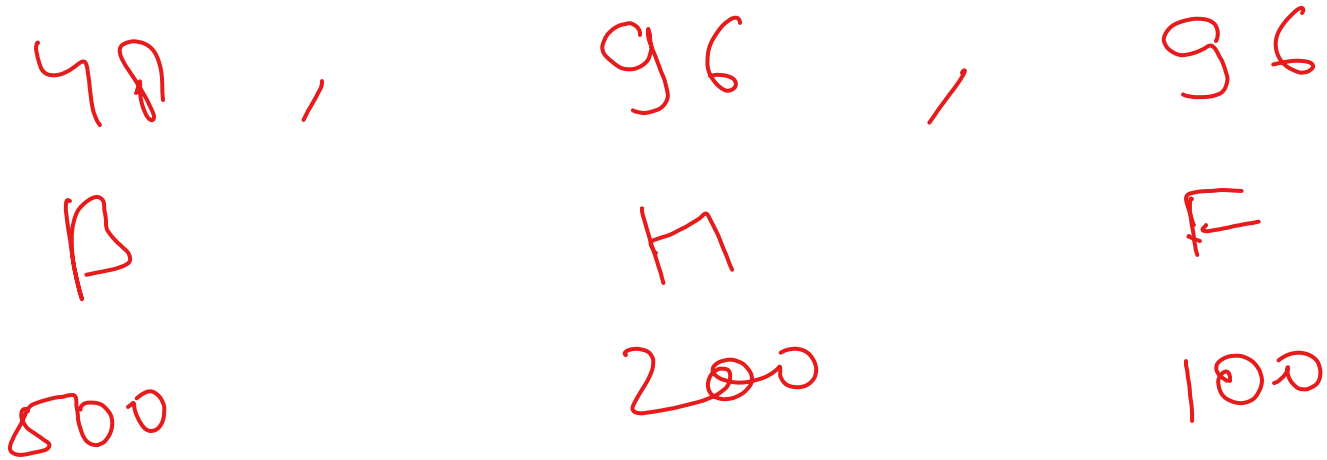
$0.4 \times 0.4 + 0.4 \times 3 + 0.2 \times 0.1$

b) If a total of 550 applications are expected to be received for the upcoming admission, then how many would you expect to be "Blank"?

$P(B) = ?$

$\text{Req. no} = 550 \times P(B)$

c) SU is planning to spend money on advertising to increase applications. Once the advertising is completed, a total of 600 applications are expected. Then, what is the expected revenue that can be generated from "TV Watcher" category if an application fee of Rs. 500 is charged for "Blank" applications, Rs. 200 is charged for "Half Completed" applications and Rs. 100 is for "Fully Completed" applications? (₹52000)



d) Recently, you saw a person applying to "SU". The person had submitted the application "Half Completed". Then which category would you suspect the person to belong to?

$$P(C \mid H.C) \rightarrow \begin{cases} P(G \mid H.C) \\ P(T \mid H.C) \\ P(Fr \mid H.C) \end{cases}$$

$$Pos \propto Lik \times Pri$$

$$P(MG \mid HC) = \frac{P(HC \mid MG)\, P(MG)}{P(HC)}$$

$$P(TV \mid HC) = \frac{\quad}{P(HC)}$$

$$P(H, C)$$

Table provides the data on the number of enrolments who complete the "Foundation", "Diploma", and "Degree" and the number of enrolments who "discontinue" the IITM BSc program for "Male" and "Female" gender students. Given this information, answer the subquestions.

	Foundation	Diploma	Degree	Discontinued
Male	30	40	30	23
Female	55	20	25	15

a) If the aim is to understand if the “Gender” categories and “Completion” categories (including completion of any degree and discontinuation) are independent of each other, then what is the value for the computed test statistic?

$$\chi^2 = \sum \frac{(E_i - O_i)^2}{E_i}$$

b) What is the number of degrees of freedom for the statistical test to be performed?

$$DOF = (\#R - 1) * (\#C - 1)$$

$$(2 - 1)(4 - 1)$$

$$1 \times 3 = 3 \checkmark$$

c) If a 20% significance level is considered, then which of the following statements is/are true for the performed statistical test (choose all that are applicable)

a. If the p-value for the test is 0.25, conclude that the course completions are independent of gender

b. If the p-value for the test is 0.15, conclude that the course completions are not independent of gender

c. If the p-value for the test is 0.25, conclude that the course completions are not independent of gender

d. If the p-value for the test is 0.15, conclude that the course completions are independent of gender

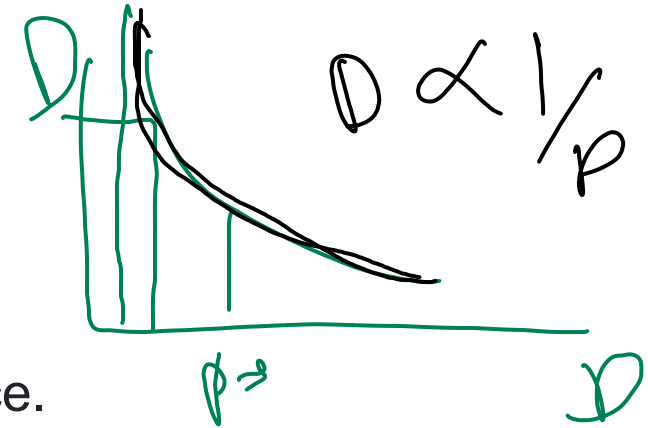
Latent demand can be captured by ?

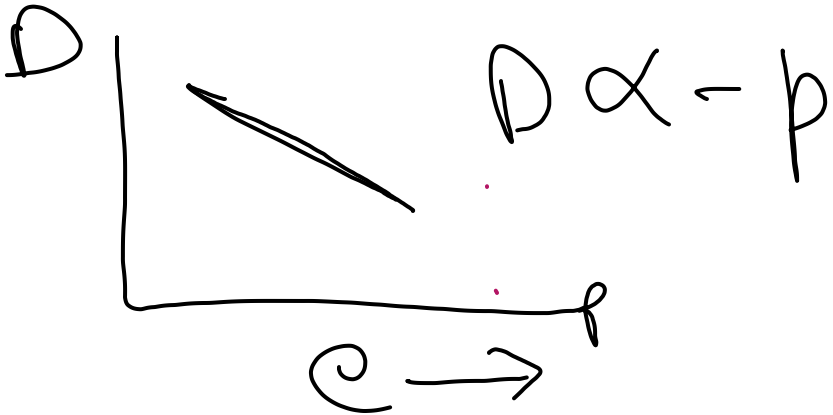
a. Increasing the price.

b. Decreasing the price.

c. By increasing the optimal price.

d. By setting the price to satiating price.





For a demand response curve which has constant elasticity, which of the following statements are true (choose all that are applicable)

a. If the curve is for an inelastic product, the revenue is increased only by setting price close to zero

b. If the curve is for an inelastic product, the revenue is increased by simply increasing the prices

c. If the curve is for an elastic product, the revenue is increased by simply increasing the prices

d. If the curve is for an elastic product, the revenue is increased only by setting price close to zero

$P_s = P_0/m$; $\epsilon = mP/D_0 - mP$

The linear demand response for product-A is modelled as a simple linear regression represented as D(P) = 1500 – 20*P, where D(P) is the demand at price-P. Then, answer the following two questions

$D(P) = D_0 - mP$

a) What is the elasticity of the demand response curve when the price is Rs.50?

b) What is the satiating price for the demand response curve?

(a) $\epsilon = \frac{m*P}{D_0 - mP} = \frac{20*50}{1500 - 20*50}$

(b) $P_s \Rightarrow P \epsilon D = 0$ $\quad 1500 - 20P_s = 0$

$P_s = 1500/20 = 75$

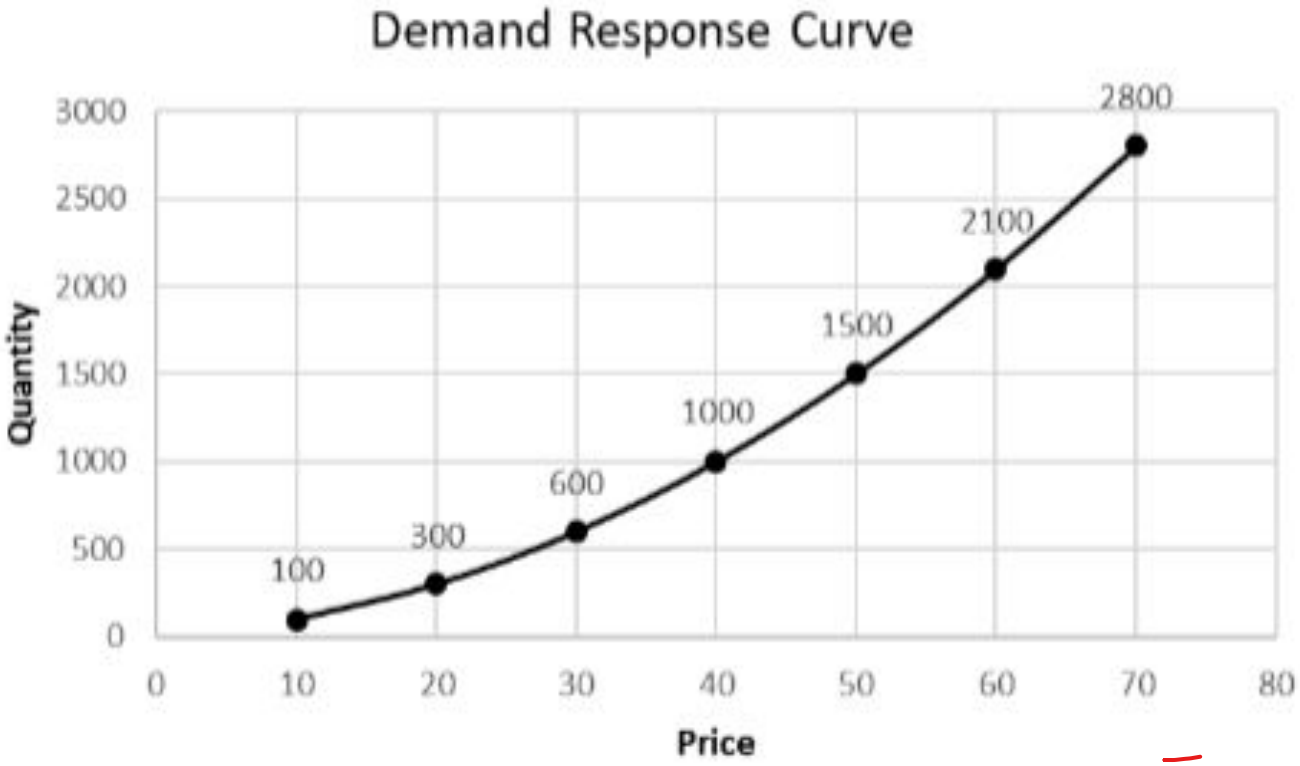
If the demand response curve for the data given in the following table is modelled by a constant elasticity curve, then answer the given subquestions

a) What is the demand when the price is Rs.1?

b) What is the price elasticity for the demand response curve?

DEMAND (# of Units)	PRICE (in INR)
1.00	10
0.50	20
0.33	30
0.25	40
0.20	50

Given the imaginary demand response curve in the below figure, answer the following three questions



a) **What is the elasticity between any two points of the given demand response curve (Note: Do NOT ASSUME that it is linear or a constant elasticity curve)?** $\varepsilon = \%\Delta Q / \%\Delta P$

b) **Based on the computed elasticity, what kind of demand is being exhibited by the product?**

a. Elastic demand ($\varepsilon > 1$)

b. Inelastic demand ($\varepsilon < 1$)

c. Demand for an inferior good

d. Demand for a normal good

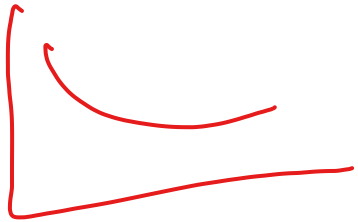
c) Which of the following statements are true? (choose all that is applicable).

a. As price increases, latent demand increases

b. As it is a linear curve, there is no impact of price on latent demand

c. As price increases, latent demand decreases

d. None of the above



H-W

A demand response curve is built using linear regression. The partial regression output is given in Figure-1 below. Given this information, answer the given subquestions.

a) What is the elasticity of D-R curve?
b) What is Market Size?
c) What is Satiating Prize?
d) Demand is ___ in nature, as e __ 1.
e) What % of total linear variability is Captured by this model of D-R curve.

ANOVA		
	df	*SS*
Regression		179700.8
Residual		
Total	18	200679.7
	Coefficients	*Standard Error*
Intercept	912.8670899	
Price	-3.836221412	

Find Value of X1, X2, X3, X4

$X_1 = 12$

$X_2 = 19493221.19$

SUMMARY OUTPUT	
Regression Statistics	
Multiple R	0.966016
R Square	0.933186
Adjusted R Square	0.926505
Standard Error	363.8778
Observations	**X1**

$F = \frac{MS(Reg)}{MS(Residual)}$

$MS = SS / df$

ANOVA				
	df	*SS*	*MS*	*F*
Regression	1	**X2**	x_2	**X4**
Residual	10	1324070.51	**X3**	
Total		19817291.7		

$= \frac{x_2}{x_3}$

1324070.057