Assignment Week 3: Bayes Classifier

1. In a multiclass classification problem, Bayes classifier assigns an instance to the class corresponding to: **(1 Mark)**

A. Maximum aposteriori probability

B. Maximum apriori probability

C. Lowest aposteriori probability

D. Lowest apriori probability

Ans: A

Explanation: Bayes classifier is also known as MAP (Maximum Aposteriori Probability.)

2. Which of the following is incorrect about Naive Bayes: **(1 mark)**

A. Attributes can be nominal or numeric

B. Attributes are statistically dependent on one another given the class value.

C. Attributes are equally likely.

D. All of the above.

Ans: B

Explanation: Attributes are statistically independent of one another given the class value.

3. A fair coin is tossed n times. The probability that the difference between the number of heads and tails is (n-3) is: **(1 mark)**

A. 2^{-n}

B. 0

C. $C(n,n-3)*2^{-n}$

D. 2^{-n+3}

Ans: B

Explanation: Let the number of heads = h then the number of tails will be n-h. The difference between them is n-3 so it is

$h – (n - h) = n-3$

$h = (2n-3)/2 = n – 3/2$ which is not an integer value, therefore, the probability of the event is 0.

4. Three companies supply bulbs. The percentage of bulbs supplied by them and the probability of them being defective is given below:

Company	% of bulbs supplied	Probability of defective
A	60	0.01
B	30	0.02
C	10	0.03

Given that the bulb is defective probability that it is supplied by B is: **(2 marks)**

A. 0.1

B. 0.2

C. 0.3

D. 0.4

Ans: D

<u>Explanation:</u> P(B|D) = (P(D|B)*P(B))/P(D)

P(D|B) * P(B) = 0.02 * 0.3 = 0.006

P(D) = P(D|A) * P(A) + P(D|B) * P(B) + P(D|C) * P(C) = 0.01*0.6 + 0.02*0.3 + 0.03*0.10 = 0.015

P(B|D) = 0.006/0.015 = 0.4

5. If P(Z∩X) = 0.2, P(X) = 0.3, P(Y) = 1 then P(Z|X∩Y) is: **(1 mark)**

A. 0

B. 2/3

C. Not enough data.

D. None of the above.

<u>Ans:</u> B

<u>Explanation:</u> P(Z|X∩Y) = P(Z|X) since P(Y) = 1. Therefore, P(Z|X∩Y) = P(Z∩X)/P(X) = 0.2/0.3= 2/3

For questions 6-7, consider the following hypothetical data regarding the hiring of a person.

GPA	Effort	Confidence	Hire
Low	Some	Yes	No
Low	Lots	Yes	Yes
High	Lots	No	No
High	Some	No	Yes
High	Lots	Yes	Yes

6. Using Naïve Bayes determine whether a person with GPA=High, Effort=Some, and Confidence=Yes be hired: (**2 marks**)

A. Yes

B. No

C. The example cannot be classified.

D. Both classes are equally likely

Ans: **A**

Explanation:

P(Hire=Yes|High, Some, Yes) = P(High, Some, Yes|Hire=Yes)P(Hire=Yes) = 4/45

P(Hire=No|High, Some, Yes) = P(High, Some, Yes|Hire=No)P(Hire=No) = 1/20

P(Hire=Yes|High, Some, Yes)> P(Hire=No|High, Some, Yes)

7. Using Naïve Bayes determine whether a person with Effort=lots, and Confidence=No be hired: (**2 marks**)

A. Yes

B. No

C. The example cannot be classified

D. Both classes are equally likely

Ans: A

Explanation: P(Hire=Yes|Lots, No) = P(Lots, No|Hire=Yes)P(Hire=Yes) = 0.133

P(Hire=No|Lots, No) = P(Lots, No|Hire=No)P(Hire=No) = 0.1

P(Hire=Yes|Lots, No)> P(Hire=No|Lots, No)