Problem 1:
Info(A)
-(7/16)*llog$_2$(7/16)-(9/16)*log_2(9/16) = 0.989 bits

RAIN:
(4/16)(-(¾)*log$_2$(¾)-(¼)*log$_2$(¼)(12/16)(-(4/12)*log$_2$(4/12)-(8/12)&log$_2$(8/12))
= (0.25)(-(0.75)*(-0.415)-(0.25)*(-2))+(0.75)(-(0.333)*(-1.586)-(0.667)*(-0.584)) = 0.057 bits
Gain(Rain): = 0.989 - 0,057 = 0.932 bits

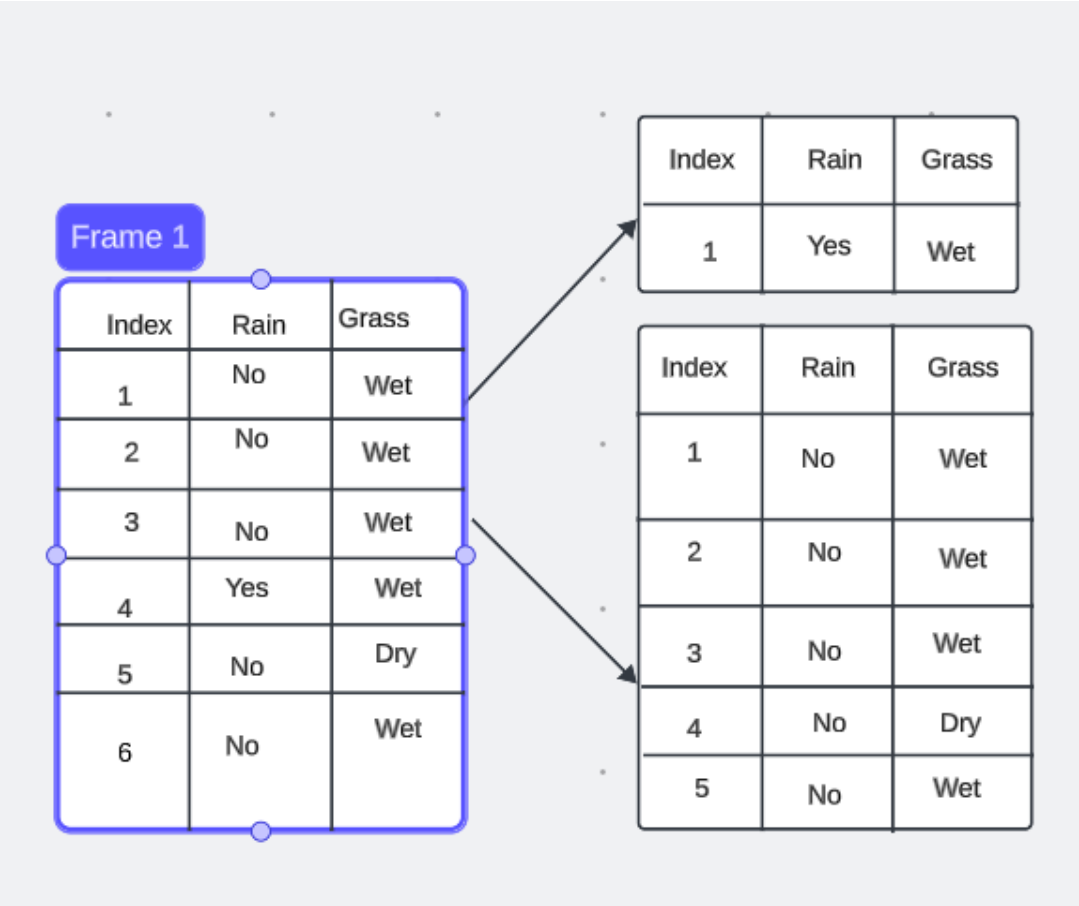
SPRINKLER:
(6/16)(-(⅝)*log$_2$(⅝)-(⅛)*log$_2$(⅛))+(10/16)(-(2/10)*log$_2$(2/10)-(8/10)*log$_2$(8/10))
= (0.375)(-0.833)*(-0.264)-(0.167)*(-2.582))+(0.625)(-(0.2)*(02.322)-(0.8)*(-0.322))
= 0.05 bits
Gain(Sprinkler): 0.989 - 0.05 = 0.939 bits

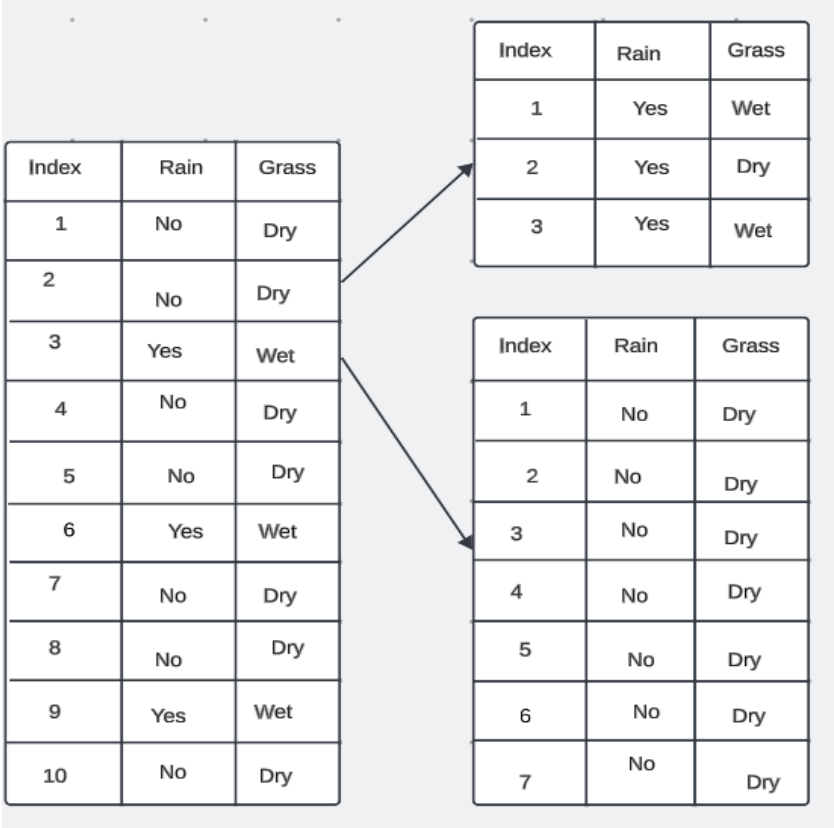
INDEX	RAIN	GRASS
1	No	Wet
2	No	Wet
3	No	Wet
4	Yes	Wet
5	No	Dry
6	No	Wet

Index	Rain	Grass
1	No	Dry
2	No	Dry
3	Yes	Wet
4	No	Dry
5	No	Dry
6	Yes	Wet
7	No	Dry

8	No	Dry
9	Yes	Wet
10	No	Dry

Split the tuples



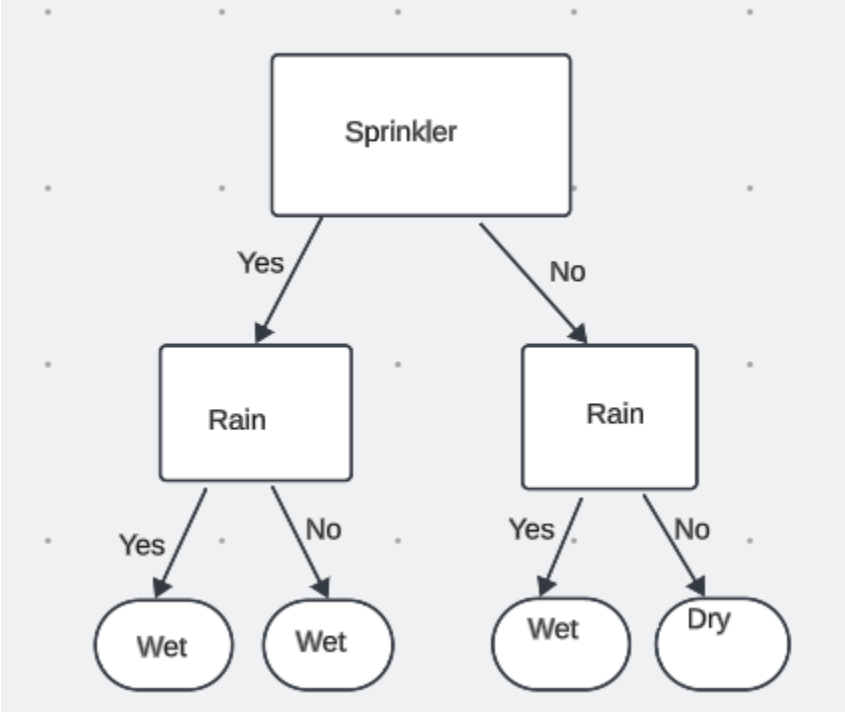


Index	Rain	Grass
1	No	Dry
2	No	Dry
3	Yes	Wet
4	No	Dry
5	No	Dry
6	Yes	Wet
7	No	Dry
8	No	Dry
9	Yes	Wet
10	No	Dry

Index	Rain	Grass
1	Yes	Wet
2	Yes	Dry
3	Yes	Wet

Index	Rain	Grass
1	No	Dry
2	No	Dry
3	No	Dry
4	No	Dry
5	No	Dry
6	No	Dry
7	No	Dry

Final Decision Tree



Problem 2:

Class	Wet	Dry	Total	Recognition
Grass = wet	TP = 4	FN = 1	5	80%
Grass = Dry	FP = 2	TN = 3	5	60%
	Total = 6	Total = 4	10	70%

- Classification Accuracy: (TP + TN) / (P + N) = 7/10 = 70%
- Error Rate: (FP + FN) / (P + N) = 3/10 = 30%
- Sensitivity: TN / P = ⅘ = 80%
- Specificity: TN / N = ⅗ = 60%
- Precision: TP / (TP + FP) = 4/6 = 66.67%
- Recall: TP / (TP + FN) = ⅘ = 80%
- F-score: (2 * 4/6 * ⅘) / (4/6 + ⅘) = 8/11 = 72.73%

Problem 3:
P(Grass = Wet) = 7/16 = 0.438
P(Grass = Dry) = 9/16 = 0.563

P(Rain = “No”| Grass = “Wet”) = (4/16)*(7/16) = 4/7 = 0.571
P(Rain = “No”| Grass = “Dry”) = (8/16) * ((9/16) = 8/9 = 0.889

P(Sprinkler = “yes”| Grass = “Wet”) = (5/16) / (7/16) = 0.714
P(Sprinkler = “yes”| Grass = “Dry”) = (1/16) / (9/16) = 0.111

P(X | Grass = “Wet”) = P(Rain = “No”| Grass = “Wet”) * P(Sprinkler = “yes”| Grass = “Wet”)
→ 0.571 * 0.714 = 0.408
P(X | Grass = “Dry”) = P(Rain = “No”| Grass = “Dry”) * P(Sprinkler = “yes”| Grass = “Dry”)
→ 0.889 * 0.111 = 0.099

P(X | Grass = “Wet”) * P(Grass = “Wet”) → 0.408 * 0.438 = 0.179
P(X | Grass = “Dry”) * P(Grass = “Dry”) → 0.099 * 0.563 = 0.056

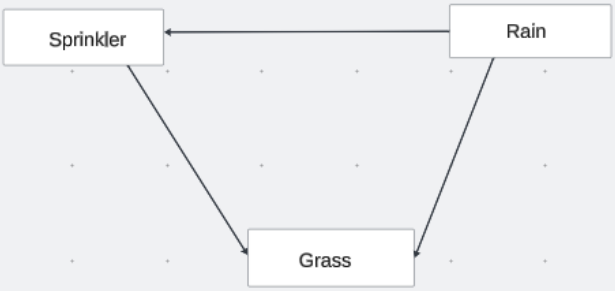
Since P(X | Grass = “Wet”) , P(Grass = “Wet”) is maximum, the fourth record (Rain = “No”, Sprinkler = “yes” and Grass = Wet) is predicted as Wet by the naïve Bayesian classifier.

Problem 4:
RAIN:
P(Rain = Yes) = 4/16 = 0.25
P(Rain = No) = 12/16 = 0.75

SPRINKLER:
P(Sprinkler = yes | Rain = Yes) = P(Sprinkler = yes , Rain = Yes) / P(Rain = Yes)
→ (1/16) / (4/16) = ¼ = 0.25
P(Sprinkler = No | Rain = Yes) = P(Sprinkler = No , Rain = Yes) / P(Rain = Yes)
→ (3/16) / (4/16) = ¾ = 0.75
P(Sprinkler = yes | Rain = No) = P(Sprinkler = yes , Rain = No) / P(Rain = No)
→ (5/16) / (12/16) = 5/12 = 0.42
P(Sprinkler = No | Rain = No) = P(Sprinkler = No , Rain = No) / P(Rain = No)
→ (7/16) / (12/16) = 0.58

GRASS:
P(Grass = Wet | Sprinkler = Yes, Rain = Yes)
→ (1/16) / (1/16) = 1
P(Grass = Wet | Sprinkler = Yes, Rain = No)
→ (2/16) / (3/16) = ⅔ = 0.67
P(Grass = Wet | Sprinkler = No, Rain = Yes)
→ (4/16) / (5/16) = ⅘ = 0.80
P(Grass = Wet | Sprinkler = No, Rain = No)
→ (0/16) / (7/16) = 0
P(Grass = Dry | Sprinkler = Yes, Rain = Yes)
→ (0/16) / (1/16) = 0
P(Grass = Dry | Sprinkler = Yes, Rain = No)
→ (1/16) / (3/16) = ⅓ = 0.33
P(Grass = Dry | Sprinkler = No, Rain = Yes)
→ (1/16) / (5/16) = ⅕ = 0.20
P(Grass = Dry | Sprinkler = No, Rain = No)
→ (7/16) / (7/16) = 1

	P(SPrinkler)	
Rain	Yes	No
Yes	0.25	0.75
No	0.42	0.58



	P(Rain)
Yes	0.25
No	0.75

		P(Grass)	
Sprinkler	Rain	Wet	Dry
Yes	Yes	1	0
Yes	No	0.67	0.33
No	Yes	0.80	0.20
No	No	0	1