3.d.1

If the outlook is sunny is true and humidity is high is true, then not play tennis +1;

If the outlook is sunny is true and humidity is high is false, then play tennis+1;

If the outlook is sunny is false, is overcast is true, then play tennis+1;

If the outlook is sunny is false, is overcast is false, and wind is strong is true, then not play tennis+1;

If the outlook is sunny is false, is overcast is false, and wind is strong is false, then play tennis+1.

3.d.2

You can set an n-channel root to n-1 true and anther 1 false question;

4.

P(H|X) = P(X|H) *P(H)/P(X)

4.a

P (play = “yes”) = 9/14 = 0.643

P (play = “no”) = 5/14 = 0.357

4.b

For outlook:

P (O|yes) = 4/9 = 0.44

P (R|yes) = 3/9 = 0.33

P (S|yes) = 2/9 = 0.22

For temperature:

P (Hot|yes) = 2/9 = 0.22

P (Mild|yes) = 4/9 = 0.44

P (Cool|yes) = 3/9 = 0.33

For humidity:

P (High|yes) = 3/9 = 0.33

P (Normal|yes) = 6/9 = 0.67

For wind:

P (Strong|yes) = 3/9 = 0.33

P (Weak|yes) = 6/9 = 0.57

4.C

For outlook:

P (O|no) = 0/5 = 0

P (R|no) = 2/5 = 0.4

P (S|no) = 3/5 = 0.6

For temperature:

P (Hot|no) = 2/5 = 0.4

P (Mild|no) = 2/5 = 0.4

P (Cool|no) = 1/5 = 0.2

For humidity:

P (High|no) = 4/5 = 0.8

P (Normal|no) = 1/5 = 0.2

For wind:

P (Strong|no) = 3/5 = 0.6

P (Weak|no) = 2/5 = 0.4

4.d

For x1 = [overcast, hot, high, strong]:

P (x1|yes) = 0.44*0.22*0.33*0.33 = 0.01

p (x1|no) = 0

P (yes|x1) = 0.01*0.64 = 0.06

P (no|x1) = 0

X1 belongs to yes.

For x2 = [sunny, hot, normal, weak]:

P (x2|yes) = 0.22*0.22*0.67*0.67 = 0.022

p (x2|no) = 0.6*0.4*0.2*0.4 = 0.019

P (yes|x2) = 0.022*0.64 = 0.014

P (no|x2) = 0.019*0.36 = 0.007

X2 belongs to yes.

For x3 = [rain, mild, normal, strong]:

P (x3|yes) = 0.33*0.44*0.67*0.33 = 0.032

p (x3|no) = 0.4*0.4*0.2*0.6 = 0.019

P (yes|x3) = 0.032*0.64 = 0.020

P (no|x3) = 0.019*0.36 = 0.007

X3 belongs to yes.

For x4 = [overcast, cool, high, strong]:

P (x4|yes) = 0.44*0.33*0.33*0.33 = 0.015

p (x4|no) = 0

P (yes|x4) = 0.015*0.64 = 0.01

P (no|x4) = 0

X4 belongs to yes.

We can find the result are all “yes” for play tennis.

4.e

Confusion matrix:

Actual class/ predicted class	Play(predicted)	Not Play(predicted)
Play(actual)	2	0
Not Play(actual)	2	0

Precision = 2/ (2+2) = 0.5

Recall = 2/ (2+0) = 1

4.f

Decision Tree: Pros: Easy to understand Cons: Poor accuracy for unseen samples

Naïve Bayes: Pros: Easy to implement Cons: loss of accuracy