Par1

1 P(P=0,Y=0) = P(X) * P(Y|X)
= 0.3 x 0.3
=0.09 — use product rule

2 P(X=0,Y=1) = P(X) * P(Y|X)
= 0.3 x 0.7
= 0.21 — use product rule

3 P(X=1,Y=0) = P(X) * P(Y|X)
= P(X=1) * P(Y=0|X=1)
= 0.7 x 0.8
= 0.56 — use product rule

4 P(X=1,Y=1) = P(X) * P(Y|X)
= P(X=1) * P(Y=1|X=1)
= 0.7 x 0.2
= 0.14 — use product rule

2

X	Y	Z	P(X,Y,Z)
0	0	0	0.054
0	0	1	0.036
0	1	0	0.168
0	1	1	0.042
1	0	0	0.0336
1	0	1	0.224
1	1	0	0.112
1	1	1	0.028

Conditional independent rule:
X and *Z* are conditionally independent given *Y*
P(X|Z,Y)=P(X|Y)
P(Z|X,Y)=P(Z|Y)
P(X,Z|Y)=P(X|Y)*P(Z|Y)

P(X,Y,Z) = P(X,Z,Y)
=P(X|Z,Z|X,Y)
=P(X|Y)*P(Z|Y)
=P(X|Z,Y)*P(Z,Y) — conditional independent rule
=P(X,Y)*P(Z|Y) —Product rule
=P(X)*P(Y|X)*P(Z|Y)
The Formula I use is P(X)*P(Y|X)*P(Z|Y)
The rule I use Product rule and conditional independent rule

3
i)
sum rule : P(Z=0) = P(0,0,0) + P(0,1,0) + P(1,0,0) + P(1,1,0) = 0.67
ii)
If there are independent: P(Z|X) = Z when Z = 0.67. P(Z=0|X=0) = P(Z=0,X=0)/P(X) = 0,222/0.3=0.74
Therefore X and Z are not independent.

4
i) P(A,B,C) = P(C)*P(A,B|C) using chain rule

P(X=1,Y=0,X=1) = P(Z=1) * P(X=1,Y=0|Z=1)
P(X=1,Y=0|Z=1) = P(X=1,Y=0,Z=1)/P(Z=1)
P(X=1,Y=0|Z=1) = 0.224/0.33
= 0.679

ii) P(A,B,C) = P(C) * P(B|C) * P(A|B,C)
P(X=0,Y=0,Z=0)=P(Z=0) * P(Y=0|Z=0) * P(X=0|Y=0,Z=0)
P(X=0|Y=0,Z=0) = P(X=0, Y=0, Z=0) / P(Z=0) * P(Y=0|Z=0)
P(Y=0|Z=0)= P(X=0,Y=0,Z=0)+P(X=1,Y=0,Z=0)
= 0.054 + 0.336 = 0.39
P(X=0|Y=0,Z=0) = 0.054/ 0.67*0.39 = 0.207