

## 1 Probability

Use the probability table to calculate the following values:

$X_1$	$X_2$	$X_3$	$P(X_1, X_2, X_3)$
0	0	0	0.05
1	0	0	0.1
0	1	0	0.4
1	1	0	0.1
0	0	1	0.1
1	0	1	0.05
0	1	1	0.2
1	1	1	0.0

1.  $P(X_1 = 1, X_2 = 0)$

2.  $P(X_3 = 0)$

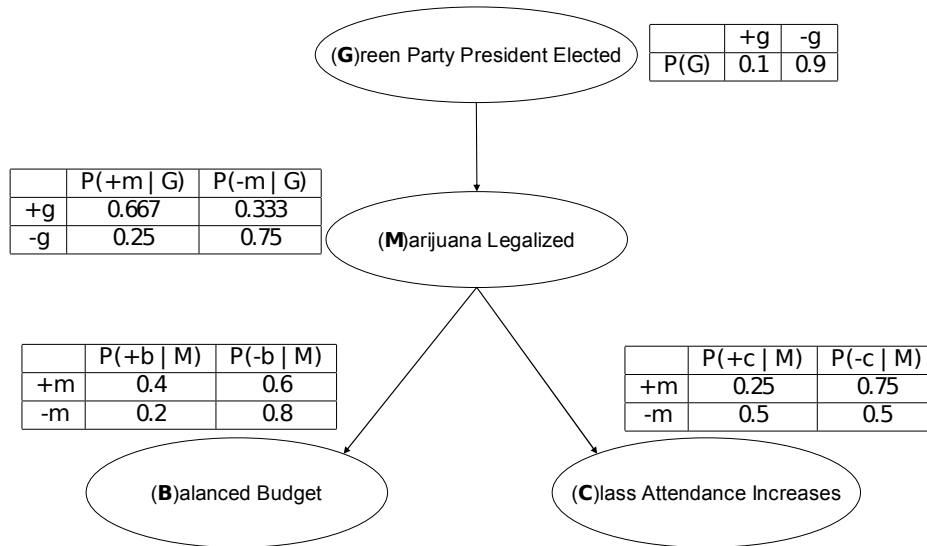
3.  $P(X_2 = 1 | X_3 = 1)$

4.  $P(X_1 = 0 | X_2 = 1, X_3 = 1)$

5.  $P(X_1 = 0, X_2 = 1 | X_3 = 1)$

## Q2. Bayes Nets: Green Party President

In a parallel universe the Green Party is running for presidency. Whether a Green Party President is elected ( $G$ ) will have an effect on whether marijuana is legalized ( $M$ ), which then influences whether the budget is balanced ( $B$ ), and whether class attendance increases ( $C$ ). Armed with the power of probability, the analysts model the situation with the Bayes Net below.



- The full joint distribution is given below. Fill in the missing values.

$G$	$M$	$B$	$C$	$P(G, M, B, C)$	$G$	$M$	$B$	$C$	$P(G, M, B, C)$
+	+	+	+	1/150	-	+	+	+	
+	+	+	-		-	+	+	-	27/400
+	+	-	+	1/100	-	+	-	+	
+	+	-	-		-	+	-	-	81/800
+	-	+	+	1/300	-	-	+	+	27/400
+	-	+	-	1/300	-	-	+	-	27/400
+	-	-	+		-	-	-	+	
+	-	-	-	1/75	-	-	-	-	27/100

- Now, add a node  $S$  to the Bayes net that reflects the possibility that a new scientific study could influence the probability that marijuana is legalized. Assume that the study does not directly influence  $B$  or  $C$ . Draw the new Bayes net below. Which CPT or CPT's need to be modified?