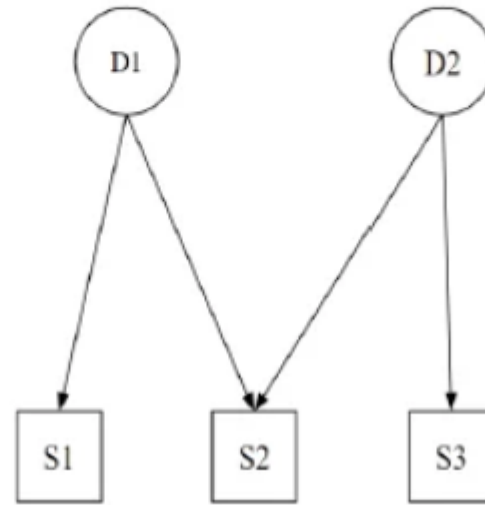A patient goes to a doctor with symptoms S1, S2 and S3. The doctor suspects disease D1and D2 and constructs a Bayesian network for the relation among the disease and symptoms as the following:

Suppose P(D1) = 0.4, P(D2) = 0.7 , P(SID1)=0.3 and P(S1| D1')= 0.6. Find P(S1)
a. 0.12
b. 0.48
c. 0.36
d. 0.60

$$P(S_1) = \sum_{D_1} P(S_1 \mid D_1) * P(D_1)$$

S_1	D_1	$P(S_1, D_1)$
T	T	0.3
T	F	0.6
F	T	0.7
F	F	0.4

$\times$

D_1	$P(D_1)$
T	0.4
F	0.6

S_1	D_1	
T	T	$0.3 * 0.4 = 0.12$
T	F	$0.6 * 0.6 = 0.36$
F	T	$0.7 * 0.4 = 0.28$
F	F	$0.4 * 0.6 = 0.24$

$\Downarrow$

S_1	$P(S_1)$
T	$0.12 + 0.36$
F	$0.28 + 24$

$\Downarrow$
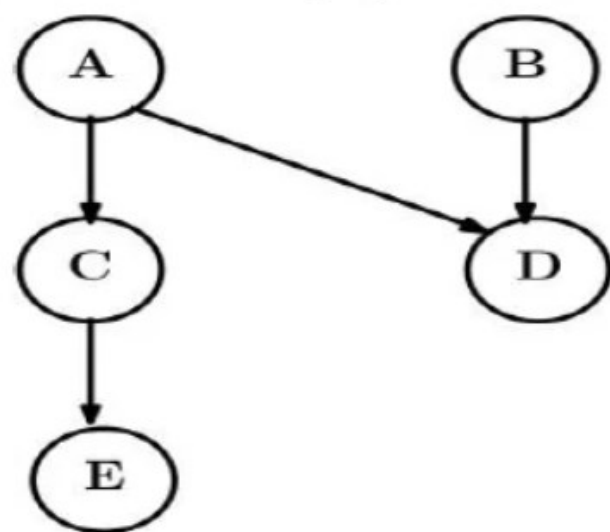
S_1	$P(S_1)$
T	0.48
F	0.52

Normalized

So $\boxed{P(S_1) = 0.48}$

Consider the following Bayesian network.

The values of the conditional probabilities are given below. Find $P(D)$.

Assume,

The values of the conditional probabilities are given below. Find $P(D)$

Assume,

$$P(A) = 0.3$$

$$P(B) = 0.6$$

$$P(C|A) = 0.8$$

$$P(C|\underline{A}) = 0.4$$

$$P(D|A, B) = 0.7$$

$$P(D|A, \underline{B}) = 0.8$$

$$P(D|\underline{A}, B) = 0.1$$

$$P(D|\underline{A}, \underline{B}) = 0.2$$

$$P(E|C) = 0.7$$

$$P(E|\underline{C}) = 0.2$$

a. 0.68
b. 0.32
c. 0.50
d. 0.70

$$P(D) = P(D|A,B)\, P(A) * P(B)$$

$$= \sum_A P(A) \sum_B P(D|A,B)\, P(B)$$

D	A	B	P(D|A,B)
T	T	T	0.7
T	T	F	0.8
T	F	T	0.1
T	F	F	0.2
F	T	T	0.3
F	T	F	0.2
F	F	T	0.9
F	F	F	0.8

$*$

	P(B)
T	0.6
F	0.4

P(A)

A	
T	0.3
F	0.7

D	A	P(D,A)
T	T	0.7*0.6 + 0.8*0.4
T	F	0.1*0.6 + 0.2*0.4
F	T	0.3*0.6 + 0.2*0.4
F	F	0.9*0.6 + 0.8*0.4

A	P(D)
T	0.3*.74 + .14*.7
F	0.3*.26 + .86*.7

D	A	P(BA)
T	T	0.74
T	F	0.14
F	T	0.26
F	F	0.86

	P(D)
T	0.32
F	0.68

Normalized