Variable Elimination (CE).

From the graph we have.

$$P(Sm, St, Pr, F, Pa) = P(Sm)P(St)P(Pr \mid Sm, St)\,P(F)\,P(Pa \mid Sm, Pr, F).$$

$$P(Pa) = \sum_{Sm, St, Pr, F} P(Sm, St, Pr, F, Pa).$$

$$= \sum_{Sm, St, Pr, F} P(Sm)\,P(St)\,P(Pr \mid Sm, St)\,\underbrace{P(F)\,P(Pa \mid Sm, Pr, F)}$$

$$f_F = \sum_F P(F)\,P(Pa \mid Sm, Pr, F)$$

where

f_F =

Sm	Pr	Pa.	$f_F(Sm, Pr, Pa)$
T	T	T	$0.9 \times 0.9 + 0.1 \times 0.1 = 0.82$
T	T	F	$0.9 \times 0.1 + 0.1 \times 0.9 = 0.18$
T	F	T	$0.9 \times 0.7 + 0.1 \times 0.1 = 0.64$
T	F	F	$0.9 \times 0.3 + 0.1 \times 0.9 = 0.36$
F	T	T	$0.9 \times 0.7 + 0.1 \times 0.1 = 0.64$
F	T	F	$0.9 \times 0.3 + 0.1 \times 0.9 = 0.36$
F	F	T	$0.9 \times 0.2 + 0.1 \times 0.1 = 0.19$
F	F	F	$0.9 \times 0.8 + 0.1 \times 0.9 = 0.81$

$$P(Pa) = \sum_{Sm, Pr, St} P(Sm)\,f_F(Sm, Pa, Pr)\,\underbrace{P(St)\,P(Pr \mid Sm, St)}$$

$$f_{St} = \sum_{St} P(St)\,P(Pr \mid Sm, St)$$

f_{St}

Sm	Pr	$f_{St}(Pr, Sm)$
T	T	$0.6 \times 0.9 + 0.4 \times 0.5 = 0.74$
T	F	$0.6 \times 0.1 + 0.4 \times 0.5 = 0.26$
F	T	$0.6 \times 0.7 + 0.4 \times 0.1 = 0.46$
F	F	$0.6 \times 0.3 + 0.4 \times 0.9 = 0.54$

$$P(Pa) = \sum_{Pr,Sm} P(Sm) f_F (Sm, Pa, Pr) f_{St} (Pr, Sm)$$

$$f_{Sm} = \sum_{Sm} P(Sm) f_F (Sm, Pa, Pr) f_{St} (Pr, Sm)$$

where

f_{Sm} =

Pr	Pa	$f_{Sm}(Pr, Pa)$
T	T	$0.8 \times 0.82 \times 0.74 + 0.2 \times 0.64 \times 0.46 = 0.5443$
T	F	$0.8 \times 0.18 \times 0.74 + 0.2 \times 0.36 \times 0.46 = 0.1396$
F	T	$0.8 \times 0.64 \times 0.26 + 0.2 \times 0.19 \times 0.54 = 0.1536$
F	F	$0.8 \times 0.36 \times 0.26 + 0.2 \times 0.81 \times 0.54 = 0.1623$

$$P(Pa) = \sum_{Pr} f_{Sm} (Pr, Pa)$$

Pa	P(Pa)
T	$0.5443 + 0.1536 = 0.6979$
F	$0.1396 + 0.1623 = 0.3016$

Probability that student will pass

$= 0.6979$