(a) The belief network representing the causal links can be drawn as follows:

Copy code

f v

\ /

\ /

\ /

a

/ \

/ \

c t

(b) One example of an independence assumption that is implicit in this network is that the occurrence of vandalism is independent of the occurrence of fire.

(c) The 10 conditional probabilities that need to be specified are:

P(f)

P(v)

P(a|f,v)

P(a|~f,v)

P(c|a)

P(c|~a)

P(t|a)

P(t|~a)

P(c|a,t)

P(c|~a,~t)

To calculate the probability of a fire given that there is a crowd but no fire truck arrives, we can use Bayes' theorem:

P(f|c,~t) = P(c,~t|f) \* P(f) / P(c,~t)

where

P(c,~t|f) = P(a|f,v) \* P(c|a,f) \* P(~t|a) is the probability of there being a crowd and no fire truck arriving given that there is a fire

P(f) is the prior probability of a fire

P(c,~t) = [P(a|f,v) \* P(c|a,f) \* P(t|a) + P(a|~f,v) \* P(c|~a) \* P(t|~a)] \* P(f) + [P(a|f,v) \* P(c|a,t) \* P(~t|a) + P(a|~f,v) \* P(c|~a,~t) \* P(~t|~a)] \* P(~f) is the probability of there being a crowd and no fire truck arriving

P(~f) = 1 - P(f) is the probability of no fire

Plugging in the probabilities given in the problem, we get:

P(f|c,~t) = (0.9 \* 0.7 \* 0.1 \* 0.01) / [(0.9 \* 0.7 \* 0.1 \* 0.01 + 0.1 \* 0.05 \* 0.9) \* 0.02 + (0.9 \* 0.3 \* 0.9 \* 0.01 + 0.1 \* 0.95 \* 0.1)]

= 0.2053

Therefore, the chance that there is a fire given that there is a crowd but no fire truck arrives is approximately 0.2053.