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10/20/2021

CS 440

1.
   a. 0.18
   b. 0.4
   c. 0.52
   d. $\frac{P(win=true \wedge weather=clear)}{P(weather=clear)} = \frac{0.26}{0.4} = 0.65$
   e. $\frac{P(win=true \wedge (weather=cloudy \vee weather=rainy))}{P(weather=cloudy \vee weather=rainy)} = \frac{0.32}{0.6} = 0.53$

2. $P(practice = ture \wedge healthy = true \wedge win = true) =$
   $P(practice = true \wedge healthy = true|win = true) * P(win = true) = 0.8 * 0.7 = 0.56$
   P(win = false) = 0.3
   $P(practice = true \wedge healthy = true \wedge win = false)$
   $\qquad = P(practice = true \wedge heathly = true \,|win = false) * P(win = false)$
   $\qquad = 0.4 * 0.3 = 0.12$
   $P(healthy = true \wedge practice = true) = P(practice = ture \wedge healthy = true \wedge win =$
   $true) + P(practice = true \wedge healthy = true \wedge win = false) = 0.56 + 0.12 = 0.68$
   $P(Win = true \,| healthy = true \wedge practice = true)$
   $\qquad = P(practice = ture \wedge healthy = true \wedge win = true)/P(healthy$
   $\qquad = true \wedge practice = true) = 0.56/0.68 = 0.82$
   $P(Win = false \,| healthy = true \wedge practice = true)$
   $\qquad = P(practice = ture \wedge healthy = true \wedge win = false)/P(healthy$
   $\qquad = true \wedge practice = true) = 0.12/0.68 = 0.17$
   $P(Win \,|Healthy = true \wedge practice = true) = P(Win = true \,| healthy = true \wedge practice$
   $\qquad = true) + P(Win = false \,| healthy = true \wedge practice = true)$
   $\qquad = 0.82 + 0.17 = 0.99$

3.
   a. $breeze: \sim b_{1,1} \wedge b_{1,2} \wedge b_{2,1}$
   $known: k_{1,1} \wedge k_{1,2} \wedge k_{2,1} \wedge k_{3,1}$
   Pit: $p_{3,1} \wedge \sim p_{1,1} \wedge \sim p_{1,2} \wedge \sim p_{2,1}$
   Frontier: $f_{1,3}$
   Other: (3,2), (3,3), (2,3)
   b. $P(Pit_{2,2}|breeze, known) = \frac{P(Pit_{2,2} \wedge breeze \wedge known)}{P(breeze \wedge known)} = \propto P(Pit_{2,2} \wedge breeze \wedge$
   $known) = \propto \sum_{unknown} P(pit_{2,2}, breeze, known, unknown) = \propto$
   $\sum_{frontier} \sum_{other} \sum_{pit} \quad P(pit_{2,2}, breeze, known, unknown, frontier, other, pit) =$
   $\propto \sum_f \sum_o \sum_p P(breeze \,|pit_{2,2}, known, frontier) * P(pit_{2,2}, known, f, o) = \propto$
   $P(known) * P(Pit_{2,2}) \sum_f P(f) \sum_O P(breeze|Pit_{2,2}, known, f)P(o) = \propto P(known) *$
   $P(Pit_{2,2}) \sum_f P(f)P(breeze|Pit_{2,2}, known, f) \sum_O P(breeze|Pit_{2,2}, known, f)P(o) =$
   $\propto P(known) * P(Pit_{2,2}) \sum_f P(f)P(breeze|Pit_{2,2}, known, f) =$

$\propto' P(pit_{2,2}) \sum_f P(f) P(breeze|Pit_{2,2}, known, f) = \propto' (.2 * (0.2 + 0.8), 0.8(0.2 * 0.8)) \approx [0.2, \ 0.8]$

$P(pit_{2.2}) = [0.2, 0.8]$