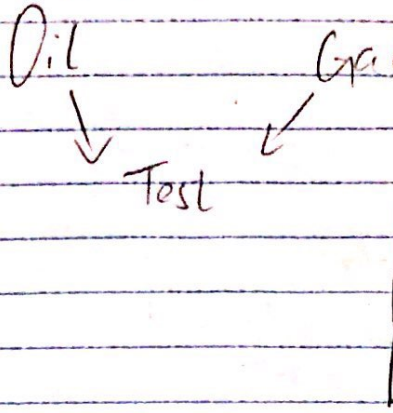
P(O) = 0.5 P(G) = 0.2

1(a)




| O | G | P(T) |
|---|---|---|
| + | + | 0 |
| + | - | 0.9 |
| - | + | 0.3 |
| - | - | 0.1 |

(b) $P(O|+) = \frac{P(+|O) \cdot P(O)}{P(+)} = \frac{0.9 \times 0.5}{P(+)}$

$= \frac{0.45}{P(+,O) + P(+,\neg O)}$

$= \frac{0.45}{0.9 \times 0.5 + 0.1 \times 0.5}$

$= \frac{9}{13} = 0.692$

2 (a) $Pr(A,B,C,D,E,F,G,H) = P(A) \cdot P(B) \cdot Pr(C|A) \cdot Pr(D|A,B) \cdot Pr(E|B) \cdot Pr(F|C,D) \cdot Pr(G|F) \cdot Pr(H|F,E)$

(b) $Pr(E,F,G,H) = \phi_1(E,B) \times \phi_2(F,C,D) \times \phi_3(G,F) \times \phi_4(H,E,F)$

(c) $Pr(a, \neg b, c, d, \neg e, f, \neg g, h) = 0.2 \cdot 0.3 \cdot Pr(c|a) \cdot 0.6 \cdot 0.1 \cdot Pr(f|c,a) \cdot Pr(\neg g|f) \cdot P(h|f, \neg e)$

$= 0.036 \, Pr(c|a) \cdot Pr(f|c,a) \, Pr(\neg g|f) \cdot Pr(h|f, \neg e)$

(d) $Pr(\neg a, b) = 0.8 \times 0.7 = 0.56$ due to independence.

$P(\neg e|a) = P(\neg e)$ due to independence

$= P(\neg e, b) + P(\neg e, \neg b)$

$= P(\neg e|b) \cdot P(b) + P(\neg e|\neg b) P(\neg b) = 0.9 \times 0.7 + 0.1 \times 0.3 = 0.66$

(e) {A} is independent to {B, E}
{B} is independent to {A, C}
{C} is ..... {D, B, E} given {A}
{D} is ..... {C, E} given {A, B}
{E} is ..... {A, C, D, F, G} given {B}
{F} is ..... {A, B, E} given {C, D}
{G} is ..... {A, B, C, D, E, H} given {F}
{H} is ..... {A, B, C, D, G} given {E, F}

(f) {A, B, C, F}

(g)

| A | B | D | E | $f_5(A, B, D, E)$ |
|---|---|---|---|---|
| T | T | T | T | 0.3 |
| T | T | T | F | 0.45 |
| T | T | F | T | 0.05 |
| T | T | F | F | 0.45 |
| T | F | T | T | 0.14 |
| T | F | T | F | 0.06 |
| T | F | F | T | 0.36 |
| T | F | F | F | 0.14 |
| F | T | T | T | 0.01 |
| F | T | T | F | 0.09 |
| F | T | F | T | 0.09 |
| F | T | F | F | 0.81 |
| F | F | T | T | 0.7 |
| F | F | T | F | 0.08 |
| F | F | F | T | 0.18 |
| F | F | F | F | 0.02 |

(h) $f_6(A, B, E) = f_5(A, B, d, E) + f_5(A, B, \neg d, E)$

⇒ continue next page

| A | B | E | $\phi_6(A, B, E)$ |
|---|---|---|---|
| T | T | T | 0.1 |
| T | T | F | 0.9 |
| T | F | T | 0.9 |
| T | F | F | 0.1 |
| F | T | T | 0.1 |
| F | T | F | 0.9 |
| F | F | T | 0.9 |
| F | F | F | 0.1 |