1.a)

$$P(A,E) = P(E=1 \mid A=1)\, P(A)$$

$$P(E=1 \mid A=1) \cdot P(A=1) = P(A=1 \mid E=1)\, P(E=1)$$

$$P(E=1 \mid A=1) = \frac{P(A=1 \mid E=1)\, P(E=1)}{P(A)}$$

$$P(A=1 \mid E=1) = P(A=1 \mid E=1, B=0)\, P(B=0)$$
$$+ P(A=1 \mid E=1, B=1)\, P(B=1$$

$$P(A=1 \mid E=1) = 0{,}29066$$

$$P(A=1) = P(A=1 \mid E=0, B=0)\, P(E=0)\, P(B=0)$$
$$+ P(A=1 \mid E=1, B=0)\, P(E=1)\, P(B=0)$$
$$+ P(A=1 \mid E=0, B=1)\, P(E=0)\, P(B=1)$$
$$+ P(A=1 \mid E=1, B=1)\, P(E=1)\, P(B=1)$$
$$= 0{,}0025$$

(since $P(B)P(E) = P(B,E)$)

$$P(E=1 \mid A=1) = \frac{0{,}29066 \cdot 0{,}002}{0{,}0025} = 0{,}23$$

answer: 23 %

1 b) $$P(E=1 \mid A=1, B=0) = \frac{P(A=1, B=0 \mid E=1) \cdot P(E=1)}{P(A=1, B=0)}$$

$$= \frac{P(A=1 \mid B=0, E=1)\, P(B=0)\, P(E=1)}{P(A=1 \mid B=0)\, P(B=0)}$$

$$P(A=1 \mid B=0) = P(A=1 \mid B=0, E=0)\, P(B=0)\, P(E=0)$$
$$+ P(A=1 \mid B=0, E=1)\, P(B=0)\, P(E=1)$$

$$P(A=1 \mid B=0) = 0{,}001 \cdot 0{,}999 \cdot 0{,}998 + 0{,}94 \cdot 0{,}001 \cdot [illegible]$$

$$= 0{,}0019$$

$$P(E=1 \mid A=1, B=0) = \frac{P(A=1 \mid B=0, E=1)\, P(E=1)}{P(A=1 \mid B=0)} = \frac{0{,}94 \cdot 0{,}002}{0{,}00[illegible]}$$

answer: $\frac{94}{95}$

1c) $P(A=1 \mid M=1) = \dfrac{P(M=1 \mid A=1)\, P(A=1)}{P(M=1)}$

$P(M=1) = P(M=1 \mid A=1)\, P(A=1) + P(M=1 \mid A=0)\, P(A=0)$

$= 0{,}7 \cdot 0{,}0025 + 0{,}01(1-0{,}0025)$

$P(A=1 \mid M=1) = \dfrac{0{,}7 \cdot 0{,}0025}{0{,}0117}$

answer: 0,1496

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d) $P(A=1 \mid M=0, J=0) = \dfrac{P(M=1, J=0 \mid A=1)\, P(A=1)}{P(M=1, J=0)}$

$= \dfrac{P(M=1 \mid A=1)\, P(J=0 \mid A=1)\, P(A=1)}{P(M=1)\, P(J=0)}$

$P(M=1) = P(M=1 \mid A=1)\, P(A=1) + P(M=1 \mid A=0)\, P(A=0)$

$= 0{,}7(1-0{,}0025) + 0{,}01 \cdot 0{,}0025 = 0{,}698$

$P(J=0) = 1 - (0{,}9(1-0{,}0015) + 0{,}05 \cdot 0{,}0025) = 0{,}101$

$P(A=1 \mid M=0, J=0) = \dfrac{0{,}7 \cdot 0{,}05 \cdot 0{,}0025}{0{,}698 \cdot 0{,}101}$

answer: 0,0012

e)

$$P(A=1 \mid M=0) = \frac{P(M=0 \mid A=1)\, P(A=1)}{P(M=0)}$$

$$P(M=0 \mid A=1) = 1 - P(M=1 \mid A=1)$$

answer: 0,3

f) $$P(A=1 \mid B=1, M=0) = \frac{P(A=1, B=1 \mid M=0)}{P(B=1)}$$

$P(A$

2 a)

$$P(S_k = 1 \mid D = 0) = \frac{1}{2^k + (-1)^k}$$

$$P(D = 0 \mid S_1, \dots S_k) = \frac{P(S_1, \dots, S_k \mid D = 0) P(D = 0)}{P(S_1, \dots S_k)}$$

$$r_k = \frac{\frac{1}{2} \cdot \frac{1}{2^k + (-1)^k}}{\left(\frac{1}{2}\right)^k \cdot \frac{1}{2}} = \frac{1}{1 + \left(-\frac{1}{2}\right)^k}$$

The doctors diagnosis depends on the day in the way that it matters if the kith day is even or ~~o~~ odd. Is k ~~e~~ even/odd

b) It becomes less certain since the ratio converges ~~t~~ to 1.

~~...~~

6

a) $P(Z=1 \mid X=0, Y=0) = 1-(1-p_x)^0(1-p_y)^0 = 0$

$P(Z=1 \mid X=0, Y=1) = 1-(1-p_y) = p_y > 0$

$P(Z=1$

$\underline{<} P(Z=1 \mid X=0, Y=1)$

---

b) $P(Z=1 \mid X=1, Y=0) = 1-(1-p_x) = \underline{p_x}$

$P(Z=1 \mid X=0, Y=1) = p_y$

$p_x < p_y$

---

c) $P(Z=1 \mid X=1, Y=0) = p_x$

$P(Z=1 \mid X=1, Y=1) = 1-(1-p_x)(1-p_y) = p_y + p_x - p_x p_y$

$\cancel{p_x} < \cancel{p_x} + p_y - p_x p_y$

$p_x p_y < p_y$, true since $p_x < 1$

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d) $P(X=1) < P(X=1 \mid Z=1)$

---

f) $P(X=1 \mid Z=1) > P(X=1 \mid Y=1, Z=1)$

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g) $P(X=1) P(Y=1) P(Z=1) < P(X=1, Y=1, Z=1)$

2.3

1. F
2. T
3. T
4. F
5. T
6. T
7. F
8. T
9. T
10. F

4

a) F
b) T
c) F
d) F
e) F
f) F
g) T
h) F
i) T
j) T