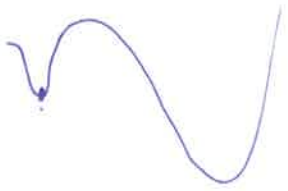
$$P(Day_2 = W) = P(Day_1 = W, Day_2 = W) +$$
$$P(Day_1 = C, Day_2 = W) \quad \text{[sum rule]}$$

$$= P(Day_1 = W)\, P(Day_2 = W \mid Day_1 = W) +$$
$$P(Day_1 = C)\, P(Day_2 = W \mid Day_1 = C)$$

[product



$$= 0.5 \times 0.6 +$$
$$0.5 \times 0.3$$

$$= 0.3 + 0.15 = 0.45$$

$$P(A|B) = \frac{P(B|A)P(A)}{P(B)}$$

$$P(B|A) = 0.99 \qquad P(A) = \frac{1}{10000}$$

A: home disease.

B_1: test 1 positive

B_2: test 2 positive.

$$P(A|B_1, B_2) = \frac{P(B_1, B_2|A)P(A)}{P(B_1, B_2)}$$

$$= \frac{P(B_1|A) \times P(B_2|A) \times P(A)}{P(B_1) \times P(B_2)}$$

$$= \frac{0.99 \times 0.99 \times 0.0001}{0.010001 \times 0.010001}$$

$$P(B_1) = P(B_1, A) + P(B_1, \neg A) \qquad P(B_2)$$

$$= P(B_1|A)P(A) + P(B_1|\neg A)P(\neg A)$$

$$= 99\% \times \frac{1}{10000} + 0.01 \times \frac{9999}{10000}$$