	$HHHH$	$\mathcal{M}$
fair	cell $= P(\text{fair}) \cdot P(HHHH\mid\text{fair})$ row $= P(HHHH\mid\text{fair})$ col $= P(\text{fair}\mid HHHH)$	$4/5$
bias	cell $= P(\text{bias}) \cdot P(HHHH\mid \text{bias})$ row $= P(HHHH\mid\text{bias})$ col $= P(\text{bias}\mid HHHH)$	$1/5$

Law of total probability $\Big\{$
$$P(HHHH) = \begin{array}{c} P(\text{fair}) \cdot P(HHHH\mid\text{fair}) \\ + \\ P(\text{bias}) \cdot P(HHHH\mid\text{bias}) \end{array}$$

Bayes Rule:

$$P(\text{bias}\mid HHHH) = \frac{P(\text{bias}) \cdot P(HHHH\mid\text{bias})}{P(HHHH)}$$

$$P(bias | HHHH) = \frac{P(bias) \cdot P(HHHH | bias)}{P(HHHH)}$$

$$P(bias) = \cancel{\frac{1}{8}} \; 1/5$$

$$P(HHHH | bias) \implies P(H) = 0.75$$
$$P(HHHH) = 0.75^4 = 0.3164$$

$$P(HHHH) = P(fair) \cdot P(HHHH | fair) +$$
$$P(bias) \cdot P(HHHH | bias)$$

$$P(fair) = 4/5$$
$$P(HHHH | fair) \implies P(H) = 0.5 \to 0.5^4 = 0.0625$$

$$4/5 \cdot 0.0625 + 1/5 \cdot 0.3164 = 0.11328$$

$$P(bias | HHHH) = \frac{1/5 \cdot 0.3164}{0.11328} = \boxed{0.5586}$$