From the definition of conditional probability

$$\Pr\left\{A \mid B\right\} = \frac{\Pr\left\{A \cap B\right\}}{\Pr\left\{B\right\}} \qquad \Pr\left\{B \mid A\right\} = \frac{\Pr\left\{A \cap B\right\}}{\Pr\left\{A\right\}}$$

This can be written as

$$\Pr\left\{A \cap B\right\} = \Pr\left\{A \mid B\right\}\Pr\left\{B\right\} \qquad \Pr\left\{A \cap B\right\} = \Pr\left\{B \mid A\right\}\Pr\left\{A\right\}$$

That is

$$\Pr\left\{A \mid B\right\}\Pr\left\{B\right\} = \Pr\left\{B \mid A\right\}\Pr\left\{A\right\}$$

Rearranging this we have

$$\Pr\left\{A \mid B\right\} = \frac{\Pr\left\{A\right\}}{\Pr\left\{B\right\}} \times \Pr\left\{B \mid A\right\} \quad \Leftarrow$$ Bayes' Theorem