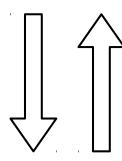
## **Probability Flowchart**

Use this flowchart to convert between different kinds of probabilities. In each example, the variables under consideration are A, B, C, D, and E.



Likelihood of a completely specified state of events Ex: P(ABCDE)

Joint probability is a special case of marginal probability



Marginal probability is a sum of joint probabilities:

$$= \sum_{d} \sum_{e} P(ABCDE)$$

Marginal probabilities

can factor if

variables are

/ independent: P(AB) = P(A) P(B)iff  $A \perp B$ 

## Marginal probability

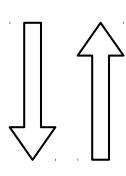
Likelihood of an incompletely specified state of events Ex: P(A), P(AB), P(BDE)

Marginal probability is a product of conditional probabilities (using the chain rule):

P(AB)

= P(B|A) P(A)

 $= P(A \mid B) P(B)$ 

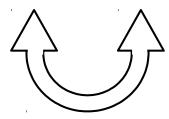


Conditional probability is a ratio of marginal probabilities:

$$P(A|BC) = \frac{P(ABC)}{P(BC)}$$



Likelihood of an event given some known information Ex: P(A|B), P(ABD|C), P(C|DE)



Conditional probability can be simplified using assumptions about conditional independence:

P(A|BC) = P(A|C) iff  $A \perp \!\!\! \perp B \mid C$ (That is, if and only if A and B are conditionally independent given C)  $P(V|\mathit{parents}(V))$