

## Conditional Probability

Name KEY

1. Age and marital status of women (thousands)

	Age			Total
	18-29	30-64	65 and over	
Married	7842	43808	8270	59920
Never Married	13930	7184	751	21865
Widowed	36	2523	8385	10944
Divorced	704	9174	1263	11141
Total	22512	62689	18669	103870

Find the following probabilities:

a.  $P(18-29) = \frac{22512}{103870}$

b.  $P(18-29 \text{ and married}) = \frac{7842}{103870}$

c.  $P(\text{married}|18-29) = \frac{7842}{22512}$

d.  $P(\text{widowed}|18-29) = \frac{36}{22512}$

Are you surprised that the probability for answer d is so much smaller than the answer for answer c? Why or why not?

*NB - NOT MANY PAIRS THAT GO TO DIE*

e.  $P(\text{at least 65}) = \frac{18669}{103870}$

f.  $P(\text{widowed and at least 65}) = \frac{8385}{103870}$

g.  $P(\text{widowed}|\text{at least 65}) = \frac{8385}{18669}$

Conditional Probability

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2. Slim is a professional poker player. He stares at the dealer, who prepares to deal. What is the probability that the card dealt to Slim is an ace? 4/52  
 This calculation assumes that Slim knows nothing about any cards already dealt. Suppose now that he is looking at 4 cards already in his hand, and that 1 of them is an ace. Slim's probability of being dealt an ace, given what he knows, is 3/48. *IF HE HAS ONLY 4 CARDS FROM THE DECK*  
 Find these additional probabilities for Slim:

- a.  $P(1^{\text{st}} \text{ card is a diamond}) = 13/52$   
 b.  $P(2^{\text{nd}} \text{ card is a diamond} | 1^{\text{st}} \text{ card is a diamond}) = 12/51$   
 c.  $P(\text{both cards are diamonds}) = \frac{13}{52} \cdot \frac{12}{51} =$

3. The numbers of Nobel Prize laureates in selected sciences, 1901 to 1998, are shown in the table below:

Country	Physics	Chemistry	Physiology/medicine	
United States	70	46	82	198
United Kingdom	21	26	24	71
Germany	61	17	29	107
France	25	11	7	43
Soviet Union	10	7	1	18
Japan	4	3	1	8
	191	110	144	445

If a laureate is selected at random, what is the probability that

- a. his or her award was in chemistry? 110/445  
 b. the award was won by someone from the United States? 198/445  
 c. the awardee was from the United States, given that the award was for physiology/medicine? 82/144  
 d. the award was for physiology/medicine, given that the awardee was from the United States? 82/198

(Use percents when giving the above probabilities)  
*AND DECIMALS*