Chapter 3.4 In a Two-Way Table

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Chapter 3 Conditional Probability

Two-way table

- It can be easier to think about, and compute conditional probabilities when they are found from observed counts in a two-way table.
- In the table on the next slide, high school athletes in 14 sports are classified with respect to their sport and their gender.
- These numbers are recorded in thousands, so the 454 entry in the Baseball/Softball – Male cell means that 454,000 males played baseball or softball this year.

The table

	Male	Female	TOTAL
Baseball/Softball	454	373	827
Basketball	541	456	997
Cross Country	192	163	355
Football	1048	1	1049
Gymnastics	2	21	23
Golf	163	62	225
Ice Hockey	35	7	42
Lacrosse	50	39	89
Soccer	345	301	646
Swimming	95	141	236
Tennis	145	163	308
Track and Field	550	462	1012
Volleyball	39	397	436
Wrestling	240	4	244
TOTAL	3899	2590	6489

Some events

Suppose one chooses a high school athlete at random. Consider several events

- F = athlete chosen is female
- S = athlete is a swimmer
- V = athlete plays volleyball

Computing some probabilities

- What is the probability that the athlete is female?
- Of the 6489 (thousand) athletes, 2590 were female, so the probability is

$P(F) = 2590/6489 = 0.3991$

- Likewise, the probability that the randomly chosen athlete is a swimmer is

$P(S) = 236/6489 = 0.0364.$

- The probability he or she plays volleyball is

$P(V) = 436/6489 = 0.0672.$

Some conditional probabilities

- What is the probability a volleyball player is female? We want to find

$$P(F \mid V).$$

- Restrict attention only to the volleyball players

	Male	Female	TOTAL
Volleyball	39	397	436

- Of the 436 (thousand) volleyball players, 397 are female, so

$$P(F \mid V) = 397/436 = 0.9106.$$

Another conditional probability

- What is the probability a woman athlete is a swimmer? We want to find $P(S \mid F)$
- One restricts attention to the "Female" column of counts. There are a total of 2590 (thousand) women who play one of these sports; of these, 141 are swimmers. So

$$P(S \mid F) = 141/2590 = 0.0544.$$

Independent events?

- Are events F and V independent?
- Above it was found that the probability a randomly chosen athlete is a volleyball player is $P(V) = 0.0672$.
- Next one finds the probability $P(V \mid F)$. Of the 2590 women, 397 are volleyball players, and so $P(V \mid F) = 397/2590 = 0.1533$,
- Note that the knowledge the athlete is female has increased one's probability that the athlete is a volleyball player. So the two events are not independent.