

## Conditional Probability

**$P(B|A)$  represents the probability of event  $B$  occurring after it is assumed that event  $A$  has already occurred (read  $B|A$  as “ $B$  given  $A$ .”)**

$$P(B|A) = \frac{P(A \cap B)}{P(A)}$$

↑  
given that

A survey of middle school students asked: What is your favorite winter sport? The results are summarized below:



Favorite Winter Sport

Grade	Snowboarding	Skiing	Ice Skating	TOTAL
6th	68	41	46	155
7th	84	56	70	210
8th	59	74	47	180
<b>TOTAL</b>	211	171	163	545

P(7th grader, given ice skating)

$$P(\underset{B}{7^{\text{th}} \text{ gr.}} \mid \underset{A}{\text{ice skating}}) = \frac{P(A \cap B)}{P(A)} = \frac{\frac{70}{545}}{\frac{163}{545}} = \frac{70}{163}$$

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Favorite Winter Sport

Grade	Snowboarding	Skiing	Ice Skating	TOTAL
6th	68	41	46	155
7th	84	56	70	210
8th	59	74	47	180
<b>TOTAL</b>	211	171	163	545

$$P(\text{ice skating, given a 7th grader}) = \frac{70}{210} = \frac{70}{545} = \frac{70}{210} = \frac{1}{3}$$

A survey of middle school students asked: What is your favorite winter sport? The results are summarized below:



Favorite Winter Sport

Grade	Snowboarding	Skiing	Ice Skating	TOTAL
6th	68	41	46	155
7th	84	56	70	210
8th	59	74	47	180
TOTAL	211	171	163	545

P(snowboarding, given an 8th grader)

$$\frac{59}{180}$$

A survey of middle school students asked: What is your favorite winter sport? The results are summarized below:



Favorite Winter Sport

Grade	Snowboarding	Skiing	Ice Skating	TOTAL
6th	68	41	46	155
7th	84	56	70	210
8th	59	74	47	180
TOTAL	211	171	163	545

P(skiing, given a 6th grader)

$$\frac{41}{155}$$

A survey of middle school students asked: What is your favorite winter sport? The results are summarized below:



Favorite Winter Sport

Grade	Snowboarding	Skiing	Ice Skating	TOTAL
6th	68	41	46	155
7th	84	56	70	210
8th	59	74	47	180
<b>TOTAL</b>	211	171	163	545

P(6th grader, given skiing)

$$\frac{41}{545}$$

$$\frac{41}{171}$$

A survey of middle school students asked: What is your favorite winter sport? The results are summarized below:

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

Favorite Winter Sport



Grade	Snowboarding	Skiing	Ice Skating	TOTAL
6th	68	41	46	155
7th	84	56	70	210
8th	59	74	47	180
<b>TOTAL</b>	211	171	163	545

$$P(\text{6th grader OR skiing}) = \frac{155}{545} + \frac{171}{545} - \frac{41}{545}$$

$$P(\text{7th and skiing}) = \frac{56}{545}$$

$$\frac{285}{545}$$



## Day 10

22 If events  $A$  and  $B$  are independent,  $P(A) = 0.62$ , and  $P(B | A) = 0.93$ , what is  $P(B)$ ?

(A) 0.93

(C) 0.67

(B) 0.58

(D) 0.41

Independent

$$P(A \cap B) = P(A) \cdot P(B)$$

$$P(A|B) = \frac{P(A \cap B)}{P(A)}$$

$$.93 = \frac{\cancel{P(A)} \cdot P(B)}{\cancel{P(A)}}$$

25 If  $P(A) = 0.43$  and  $P(B | A) = 0.89$ , find  $P(A \text{ and } B)$ .

(A) 0.51

(C) 0.11

(B) 0.48

(D) 0.38

$$P(B|A) = \frac{P(A \cap B)}{P(A)}$$

$$.89 = \frac{P(A \cap B)}{.43}$$

20. A box contains three blue marbles, five red marbles, and four white marbles. If one marble is drawn at random, find:

a)  $P(\text{blue} | \text{not white})$

b)  $P(\text{red} | \text{not blue})$

$$a.) \frac{3}{8}$$

$$b.) \frac{5}{9}$$

9. A number is selected, at random, from the set 12345678. Find:

a)  $P(\text{odd}) = \frac{1}{2}$

b)  $P(\text{prime} | \text{odd}) = \frac{3}{4}$