SECTION 8.4 CONDITIONAL PROBABILITY
CONDITIONAL PROBABILITY RULE and MULTIPLICATION RULE

IF : CONDITIONAL PROBABILITY

Probability that event A occurs IF (given that) we know that outcome B has occurred

P(A|B) = Probability that event A occurs **if** we know that outcome B has occurred

P(A|B) = Probability that event A occurs **"given that"** outcome B has occurred

The vertical line means "if" ; we can also say "given that"

- The event we are interested in comes appears before (to the left of) the "if line"
- The condition is the outcome we know about; it appears after (to the right of) the "if line".

The condition reduces the sample space to be smaller by eliminating outcomes that did not occur.

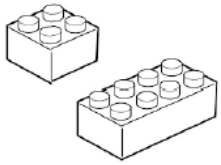
EXAMPLE 14: Two coins are tossed.

Each coin is a fair coin and has equal probability of landing on Head (H) or Tail (T).
Sample space S = { HH, HT, TH, TT}

Find the probability of getting "**two heads**".

Find the probability of getting "**two heads**" given that **"at least one head"** is obtained.

EXAMPLE 15: A box of 25 Lego blocks contains:



2 yellow square blocks	3 yellow rectangular blocks
4 blue square blocks	8 blue rectangular blocks
4 green square blocks	4 green rectangular blocks

Y: yellow
B: blue
G: green
S: square
R: rectangle

A child randomly selects one block at random.

Find P(B)

Find P(B|S)

Find P(S|B)

Find P(Y)

Find P(Y|S)

EXAMPLE 16: A large car dealership examined a sample of vehicles sold or leased in the past year. Data is classified by type (**car, SUV, van, truck**) and by whether they were a sale of a **new** or **used** vehicle or whether the vehicle was **leased**.

	Car (C)	SUV (S)	Van (V)	Truck(T)	Total
New vehicle sale (N)	86	25	21	38	170
Used vehicle sale (U)	39	13	4	22	78
Vehicle Lease (L)	34	12	6	0	52
Total	159	50	31	60	300

Suppose a vehicle in the sample is randomly selected to review its sales or lease papers.

Find the probability that a vehicle was a Car IF (GIVEN THAT) it was Leased.

Find the probability that the vehicle was Leased IF (GIVEN THAT) it was a Car.

A contingency table displays data for two variables. This table shows the number of individuals or items in each category. We can use the data in the table to find probabilities.

All probabilities <u>EXCEPT conditional probabilities</u> have the grand total in the denominator

<u>Conditional Probabilities</u>: The condition limits you to a particular row or column in the table. Condition says "IF" we look only at a particular row or column, find the probability
The **denominator will be the total for the row or column** in the table that corresponds to the condition