Venn Diagrams and Conditional Probability

New Terms:

Conditional Probability is the probability of an event occurring given that another event has occurred first.

$P(A|B)$ = probability of A, given B (has occurred)

$P(B|A)$ = probability of B, given A (has occurred)

To solve conditional probability problems:

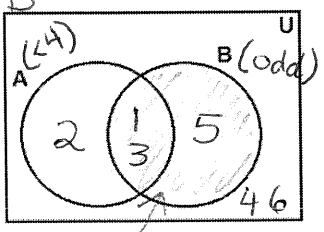
ONLY LOOK AT THE "GIVEN EVENT" to find your numerator (# of favorable events) and your denominator (total # of events)

Example 1: When you roll a six – sided die, if Event A is rolling a number less than 4, and Event B is rolling an odd number, what is P (A|B)?

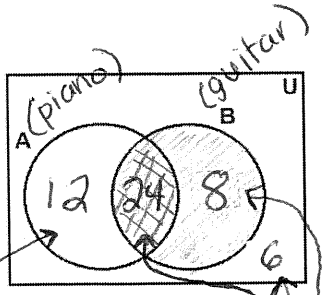
$P(A|B) = \frac{\#\text{ want}}{\text{total }\#}$ → how many A's in B

→ B b/c "Given"

$= \frac{2}{3}$



Given B



Example 2: At a music camp, we observe that 36 children play piano, 32 children play guitar, and 24 children play both the piano and guitar. There is a total of 50 children at this music camp. What is the probability that a child plays piano, given that the child plays guitar?

(*) Sometimes you need to use logic to figure out how many items go in each section.

1. 24 children play both
2. 36 children play piano
   $36 - 24 = 12$
3. 32 children play guitar
   $36 - 32 = 8$
4. total 50 children
   $50 - 12 - 24 - 8 = 6$
5. $P(\text{Piano}|\text{guitar})$ OR $P(A|B) = \frac{24}{24+8}$

$= \frac{24}{32}$

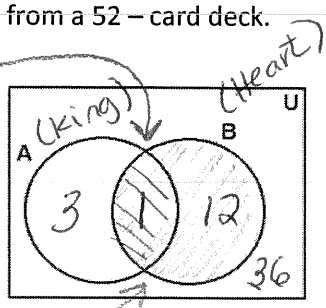
$= \frac{3}{4}$

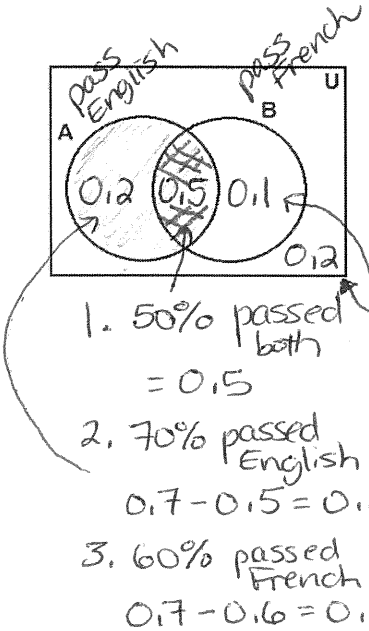
Example 3: Let Event A be drawing a King, and Event B be drawing a Heart from a 52 – card deck.

Find P (A|B).

$P(A|B) = \frac{1}{13}$ ← # WANT

Total # "given" B





Example 4: At Beaconsfield High School, 70% of the students passed their English exam, 60% of the students passed their French exam, and 50% of the students passed both their English and French exam. What is the probability that a student passes their French exam, given that the student passed their English exam?

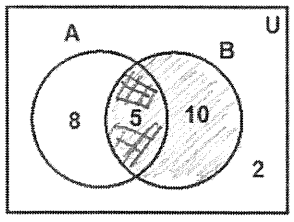
1. 50% passed both
   = 0.5
2. 70% passed English
   0.7 − 0.5 = 0.2
3. 60% passed French
   0.7 − 0.6 = 0.1
4. Total students = 100%
   100% − 50% − 20% − 10% = 20%
   = 0.2

$P(\text{French}|\text{English}) = P(B|A)$

$= \frac{0.5}{0.7}$

$= \frac{5}{7}$

Example 5: Given the Venn Diagram below, find P (A|B).



$P(A|B) = \frac{5}{15}$

$= \frac{1}{3}$