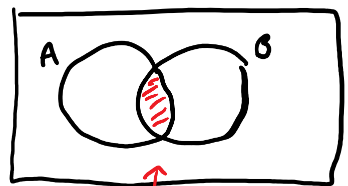
Section 2.2: cont'd

Thursday, January 18, 2018 12:31 PM

addition rule:

$$n(A \text{ or } B) = n(A) + n(B) - n(AB)$$

$$P(A \text{ or } B) = P(A) + P(B) - P(AB)$$



if we just add $n(A) + n(B)$, we double-count the overlap

note: elsewhere, you may see this written as

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

in set notation, $\cup$ = union and $\cap$ = intersection (overlap)

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example: How many 4-digit PINs

a) start with a 9?
b) end in a 4?
c) start with a 9 or end in a 4?
d) start with a 9 or a 4?

a) $\underline{9}\ \underline{\quad}\ \underline{\quad}\ \underline{\quad} \qquad = 1 \cdot 10 \cdot 10 \cdot 10 = 10^3$

choices = 1

10 choices 0-9

b) same, 10^3

c) start with 9 <u>and</u> end in 4 : ___ ___ ___ ___

1 choice, 10 choices, 1 choice

$= 10^2$

n(start 9 <u>or</u> end 4) = n(start 9) + n(end 4) − n(both)

$= 10^3 + 10^3 - 10^2$

$= 1900$

d) n(start 9 or start 4) = n(start 9) + n(start 4) − n(both)

n(both) = 0 ← can only have one digit to begin with

n(start 9 or 4) = 1000 + 1000 − 0

<u>or</u> $\underline{2}$ ___ ___ ___

9 or 4, 10 possibilities

note: the multiplication rule can only be used if the number of choices for each step is independent, so that the number of choices for the first slot does not depend on your choices for any other slot