

## Section 2.5: Event Relations and

Monday, January 21, 2019

10:17 AM

## Probability Rules

consider the following events  $A$  and  $B$ .

definitions:

the event "A or B" is called the union of these two events and is denoted by

$$A \cup B$$

the event "A and B" is called the intersection of these two events and is denoted by

$$A \cap B$$

(I just say  $AB$ )

the complement of event  $A$  is the event in which  $A$  does not occur

$$A^c \leftarrow \text{book}$$

$$\bar{A} \leftarrow \text{I use}$$

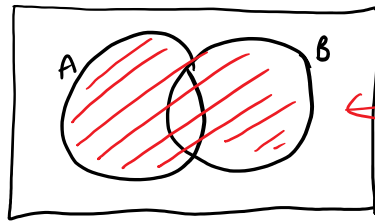
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the addition rule:

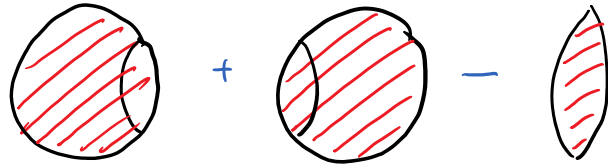
$$n(A \text{ or } B) = n(A) + n(B) - n(AB)$$

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

} same rule, different notation



shaded region is "A or B"



similarly:

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

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



if A and B are mutually exclusive, this term is zero

example: How many 4-digit PINs

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

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

b) same

$$c) \quad n(\text{start with 9 and end in 4}) = \underline{1} \quad \underline{10} \quad \underline{10} \quad \underline{1} = 100$$

$$n(\text{start with 9 or end in 4}) = n(\text{start 9}) + n(\text{end 4})$$

$$- n(\text{both})$$

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

$$= 1900$$

$$d) \quad n(\text{both}) = 0, \quad \text{so} \quad n(\text{start w 9 or 4}) = 2000$$

$$\underline{\underline{\text{or}}} \quad \underline{2} \quad \underline{10} \quad \underline{10} \quad \underline{10} = 2000 \quad (\text{multiplication rule})$$