

# Weekly medications

## Example 3

If a subject has an

- 80% chance of taking their medication this week,
- 70% chance of taking their medication next week, and
- 10% chance of not taking their medication either week,

$A^c \cap B^c$

then find the probability of them taking their medication exactly one of the two weeks.

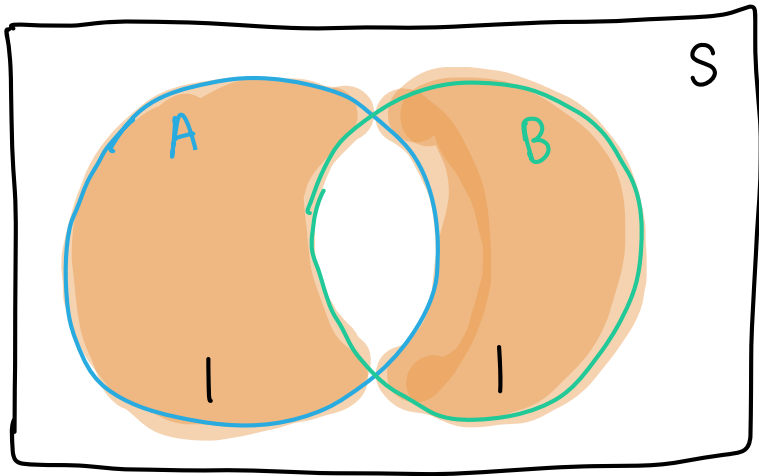
this week OR next week  
BUT not both

Hint: Draw a Venn diagram labelling each of the parts to find the probability.

GOAL:  $P(\text{take med this week or next week})$   
BUT not both weeks

- ① Translate words to notation & events
- ② Partition probabilities so we can reconstruct our probability goal
- ③ solve question w/ #'s

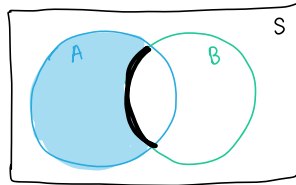
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- ① Let  $A = \text{take med this week (wk 1)}$   
 $B = \text{take med NEXT Week (wk 2)}$



goal Venn diagram ↗

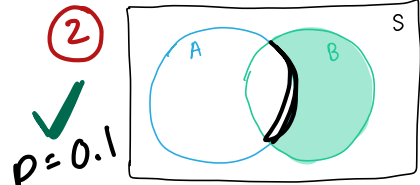
## 4 Partitions of sample space:

①



$P=0.2$  I take med this week BUT NOT next week

②

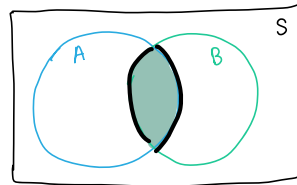


$P=0.1$  I take med next week BUT NOT this week

③

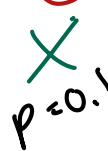


$P=0.6$

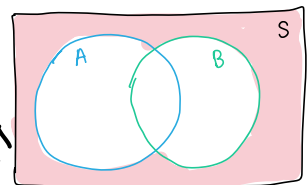


I take med this week AND next week

④



$P=0.1$



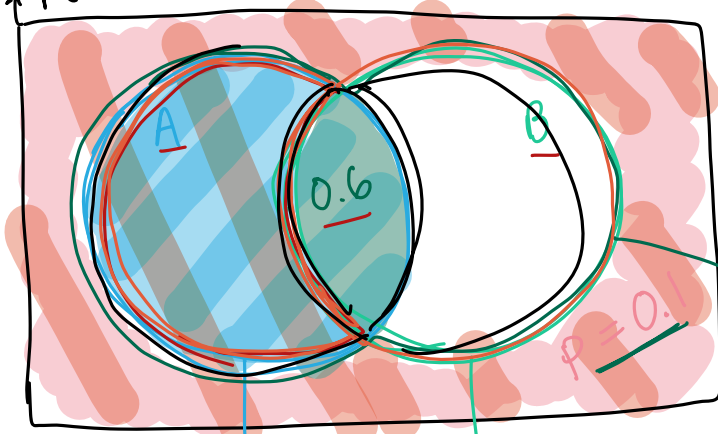
I do not take my med this week NOR next week

Union of ①-④ is the sample space

$$P(\textcircled{1} \cup \textcircled{2} \cup \textcircled{3} \cup \textcircled{4}) = P(S) = 1$$

AXIOM

$$P(S) = 1$$



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

A & B NOT necessarily independent (chp 3)

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

$$P(S) = P(A \cup B) + 0.1$$

$$P(A \cup B) = 1 - 0.1 = 0.9$$

$$P(A) = 0.8$$

$$P(B) = 0.7$$

$$A = \underbrace{(A \cap B^c)}_{\text{disjoint}} \cup \underbrace{(A \cap B)}$$

$$P(A) = P(A \cap B^c) + P(A \cap B)$$

$$0.8 = ? + 0.6$$

$$P(A \cap B^c) = 0.2$$

take med this week but not next

$$0.9 = 0.8 + 0.7 - P(A \cap B) + P(A \cap B) - 0.9$$

$$P(A \cap B) = 0.8 + 0.7 - 0.9 = 0.6$$

$$P(B) = P(B \cap A^c) + P(A \cap B) \rightarrow \text{double check you know this}$$

$$0.7 = ? + 0.6$$

$$P(B \cap A^c) = 0.1$$

take med next but not this week

$$P(\text{this week or next BUT NOT both}) =$$

$$= P(A \cap B^c) + P(B \cap A^c)$$

$$= 0.2 + 0.1 = \boxed{0.3}$$

The probability that they take their medication exactly 1 week is 0.3.