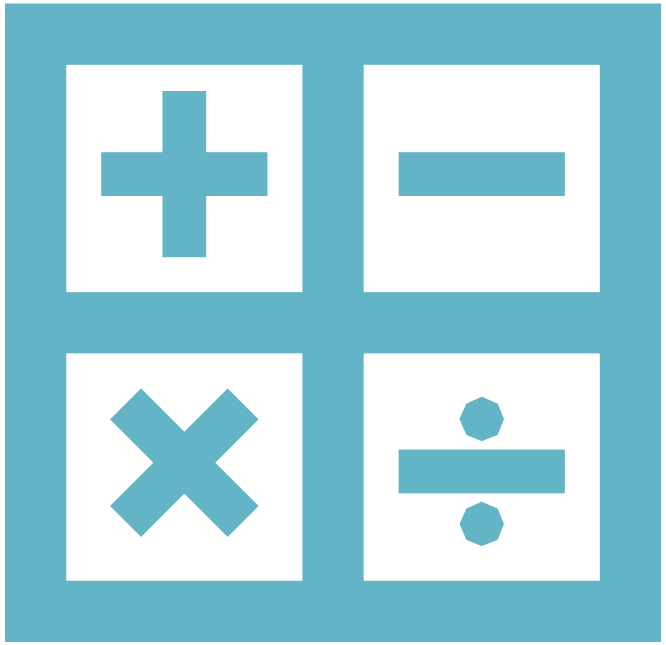
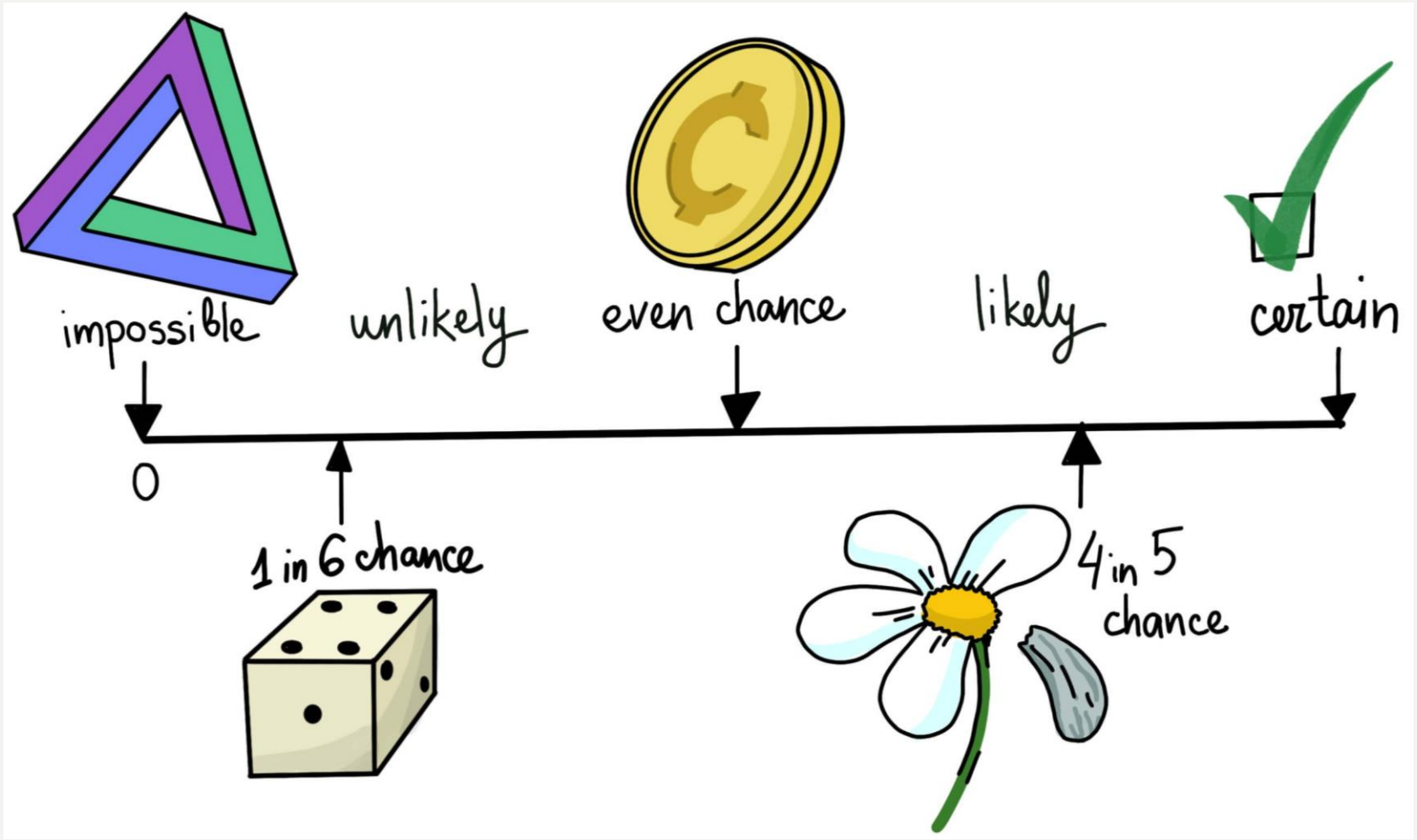
MATHEMATICS FOR COMPUTING



WEEK 4


impossible
unlikely
even chance
likely
certain
0
1 in 6 chance
4 in 5 chance

THEORETICAL PROBABILITY

- So far we've dealt with rigorous data. We assumed we have certain knowledge.
  - We could evaluate if a proposition is True of False
- But is it always the case?

Consider the following

  - It will be a sunny day tomorrow
  - We have tested the program in all possible ways therefore it doesn't have bugs


A
A


IN
JAIL
JUST
VISITING

THEORETICAL PROBABILITY

$$Probability = \frac{Number\ of\ favourable\ outcomes}{Number\ of\ all\ possible\ outcomes}$$

COMPLIMENTARY EVENTS

- When there are only two outcomes
  - It rains or it doesn't rain
  - You get a job or you don't
  - You pass the exam or you don't
- For any complimentary events,

$$P(A) + P(B) = 1$$

INDEPENDENT EVENTS

- What if we have two events that are not related to each other?
- What is the probability of an unbiased die thrown twice?
- What is the probability of a die scoring "4" and a coin giving Head?

If events A and B are independent then the probability of A and B is calculated as

$$P(A \text{ and } B) = P(A) \times P(B)$$

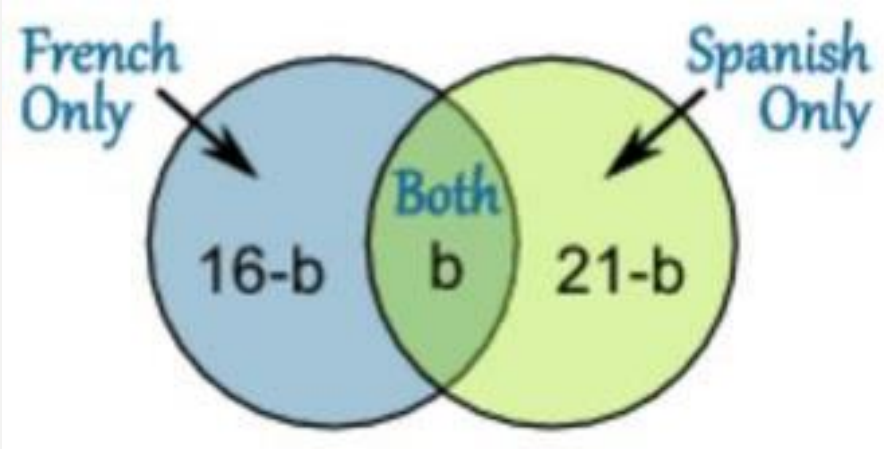
MUTUALLY EXCLUSIVE

- If events A and B are mutually exclusive, then either
  - A can happen
  - B can happen
  - But both cannot happen at the same time

$$P(A) \cap P(B) = 0$$

- If events A and B are not mutually exclusive, then A and B can happen at the same time. $P(A) + P(B) \neq 1$

16 people study French, 21 study Spanish, and there are 30 students altogether



BRAIN FOOD

Find the following:

P(French)

P(Spanish)

P(French only)

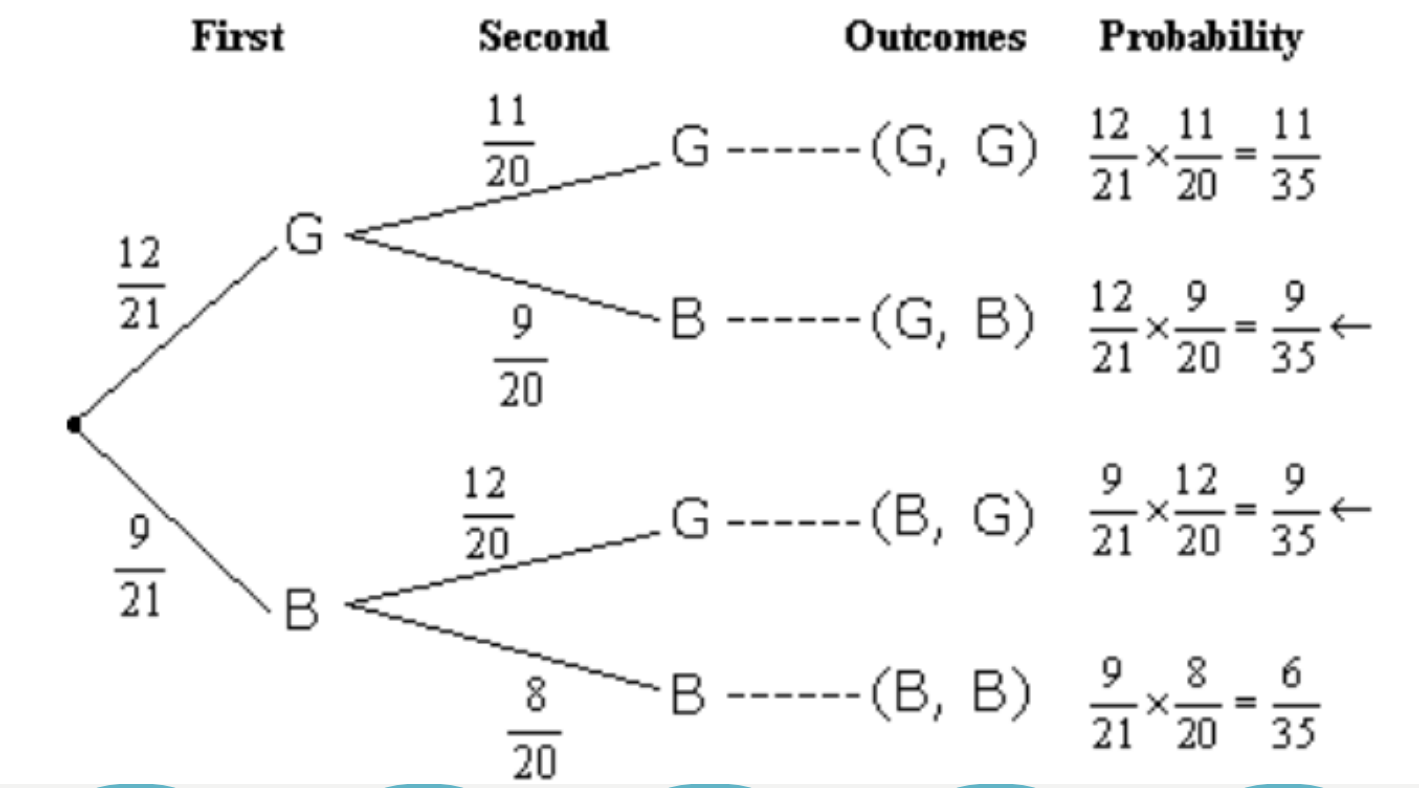
P(Spanish only)

P(French or Spanish)

P(French and Spanish)

DEPENDENT EVENTS

Outcome depends on something that has already happened



CONDITIONAL PROBABILITY

- These are the probabilities calculated on the basis that something has already happened
  - The probability that my students will turn up to a tutorial on Thursday given that that the Coursework for Programming is due on Friday
- If these two events are A and B then they are <u>not</u> INDEPENDENT

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

TEST YOUR KNOWLEDGE

1. A coin is thrown 3 times. What is the probability that at least one head is obtained?
2. There are 5 green 7 red balls. Two balls are selected one by one without replacement. Find the probability that first is green and second is red.
3. What is the probability of getting a sum of 7 when two dice are thrown?

QUESTIONS?

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