

# Probability Concepts

1. Suppose you and a friend each toss a coin. Let H and T denote Heads and Tails respectively.

Match the following with the associated probability concept.

(Event, Sample Space, Experiment, Complement of getting heads at least once)

- Tossing two coins – (\_\_\_\_\_)
- Obtaining two heads – (\_\_\_\_\_)
- {HH, HT, TH, TT} – (\_\_\_\_\_)
- {TT} – (\_\_\_\_\_)

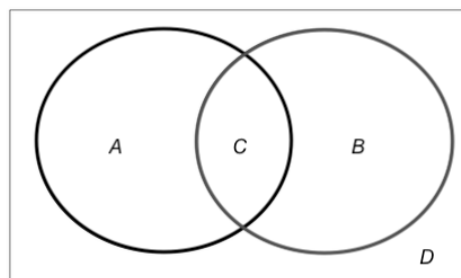
2. Which approach to probability do the following scenarios use?

(Subjective, Priori or Classical, Empirical or Relative Frequency)

- You do a survey and find that 90% of the population aged 15-30 owns a mobile phone. (\_\_\_\_\_)
- The probability of choosing a red ball from a bag containing 3 blue balls and 2 red balls is  $\frac{2}{5}$ . - (\_\_\_\_\_)
- A political scientist has a hunch that the current government has a 40% chance of winning the next election. - (\_\_\_\_\_)
- A study of the rainfall data for April reveals the probability of rain on any given day in April is 35%. - (\_\_\_\_\_)

3. Consider a sample of 10 students. 3 of them like only Maths and 2 like only Science. 2 of them like both Maths and Science. See the Venn diagram below: the black circle (on the left) corresponds to the set of students who like Maths and the grey circle (on the right) corresponds to the set of students who like Science.

Match the number of students to the corresponding areas A, B, C, and D.



4. Let us go back to the previous example where out of 10 students: 5 students liked Maths (3 liked only Maths and 2 liked both Maths and Science) and 4 students liked Science and 2 students liked both Maths and Science.

What is the probability that a student chosen randomly likes Maths, given that he also likes Science?

5. You calculated the probability that a student likes maths (event A), given that he likes science (event B) as 0.5.

Which of the following statements about A and B is correct?

- A and B are not independent.
- A and B are mutually exclusive
- A and B are mutually exhaustive
- A and B are independent

6. Consider the following contingency table based on a sample of 15 individuals.

Contingency Table

	Right-Handed	Left-Handed
Male	6	2
Female	3	4

Find the following events to the correct probabilities.

- $P(\text{Male})$
- $P(\text{Right handed AND Female})$
- $P(\text{Left handed})$

7. Suppose we have two events A and B. The calculation of  $P(A \cup B)$  requires subtracting  $P(A \cap B)$  because  $P(A)$  and  $P(B)$  both include  $P(A \cap B)$ .

☐ True

☐ False

8. 10% of patients entering a clinic have liver disease.

Among those patients diagnosed with liver disease, 14% are alcoholics. Among patients not diagnosed with liver disease, 7% are alcoholics.

What is the probability of a patient having liver disease given that they are an alcoholic?  
(give the answer rounded to two decimal places)

9. How many 3 digit numbers can be formed using the digits 1,2,3,4, and 5? (Assume that the digits cannot be repeated)

10. How many ways can you give 4 textbooks to 8 students?