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Theoretical Exercises

**Exercise 5.1: (Theoretical) Calculating with probabilities A**

Let  $P(A \cap B) = 0.2$ ,  $P(B) = 0.5$  and  $P(A) = 0.2$  be given, compute

- a)  $P(\overline{A})$
- b)  $P(A \setminus B)$
- c)  $P(\overline{A} \cup B)$

**Exercise 5.2: (Theoretical) Calculating with probabilities B**

Let  $P(A) = 0.5$ ,  $P(B) = 0.2$ ,  $P(C) = 0.4$ ,  $P(A \cap B) = 0.1$ ,  $P(A \cap C) = 0.2$ ,  $P(B \cap C) = 0.04$ .

- a) Compute  $P(A|B)$ ,  $P(\overline{A}|B)$ ,  $P(A|\overline{B})$  and  $P(\overline{A}|\overline{B})$
- b) Which pairs of events are stochastically independent?  $A$  &  $B$ ,  $B$  &  $C$  or  $A$  &  $C$

**Exercise 5.3: (Theoretical) Mississippi**

How many 11-letter combinations can you make from the word “MISSISSIPPI”?

**Exercise 5.4: (Theoretical) Twin births in Europe**

We investigate twin births in Europe. The following is known:

- The probability of identical twins is  $\frac{1}{4}$
- The probability among fraternal twins that they are of the same sex is  $\frac{1}{2}$

What is the probability that twins are the same sex?

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**Excercise 5.5: (Theoretical) Smoking behaviour**

In a study on smoking behavior in a country, only people over the age of 15 should be considered.

- It is known that 29.8% of 15-35 year olds, 32.4% of 36-55 year olds, 20.5% of 56-75 year olds and 5.2% of over 75 year olds smoke.
- It is also known that 25.1% of the considered population is between 15-35 years old, 32.7% of the considered population is between 36-55 years old and 29.5% of the considered population is between 56-75 years old.

Answer the following questions:

- a) What percentage of the total population are non-smokers?
- b) It is known that a person smokes. What is the probability that he is 15-35 years old?