Tutorial 1

Exercise 1:
Specify the following sets by the rule method.
$A = \{1, 2, 3\}$, $B = \{8, 10, 12, 14\}$, $C = \{1, 3, 5, 7, ...\}$

Exercise 2:
State every subset of the set of letters $\{a, b, c, d\}$.

Exercise 3
Two sets are given by $A = \{-6, -4, -0.5, 0, 1.6, 8\}$ and $B = \{-0.5, 0, 1, 2, 4\}$. Find:

(*a*) $A - B$

(*b*) $B - A$

(*c*) $A \cup B$

(*d*) $A \cap B$

(*e*) $\overline{A} \cap B$

Exercise 4
Sketch a Venn diagram for three events where:
$A \cap B \neq \phi$, $B \cap C \neq \phi$, $C \cap A \neq \phi$ but $A \cap B \cap C = \phi$

Exercise 5
An experiment has a sample space with 10 equally likely elements $S = \{a_1, a_2, ... , a_{10}\}$. The events are defined as $A = \{a_1, a_5, a_9\}$, $B = \{a_1, a_2, a_6, a_9\}$ and $C = \{a_6, a_9\}$. Find the probability of:

(*a*) $A \cup C$

(*b*) $A - \overline{C}$

(*c*) $A \cap (B \cup C)$

(*d*) $\overline{A \cup B}$

(*e*) $(A \cup B) \cap C$

Exercise 6
An experiment consists of rolling a single die. Two events are defined as:
$A = \{$ 6 shows up $\}$ and $B = \{$ 2 or 5 shows up $\}$.
(*a*) Find $P(A)$ and $P(B)$.
(*b*) Define a third event C that $P(C) = 1 - P(A) - P(B)$

Exercise 7

In a box there are 500 colored balls: 75 black, 150 green, 175 red, 70 white and 30 blue.
What are the probabilities of selecting ball of each color?

Exercise 8

In three boxes there are capacitors as shown in the next Table. An experiment consist first randomly selecting a box, assuming each has the same likelihood of selection, and then selecting a capacitor from the chosen box.
(*a*) What is the probability of selecting a 0.01uF capacitor, given that box 2 is selected?
(*b*) If a 0.01uF capacitor is selected, what is the probability it came from box 3?

| | Number in Box | | | |
Value (uF)	1	2	3	Totals
0.01	20	95	25	140
0.1	55	35	75	165
1.0	70	80	145	295
Totals	145	210	245	600

Exercise 9

A missile can be accidentally launched if two relays A and B both have failed. The probabilities of A and B failing are known to be 0.01 and 0.03 respectively. It is also known that B is more likely to fail (probability 0.06) if A has failed.
(*a*) What is the probability of an accidental missile launch?
(*b*) What is the probability that A will fail if B has failed?
(*c*) Are the events "A fails" and "B fails" statistically independent?

Exercise 10

Given that two events A_1 and A_2 are statistically independent, show that:
(*a*) A_1 is independent of $\bar{A}_2$
(*b*) $\bar{A}_1$ is independent of A_2
(*c*) $\bar{A}_1$ is independent of $\bar{A}_2$