Combinational circuits are the simplest binary switching-circuits as they have no memorising ability. Because they occur in their own right, and are also used in all circuits which do have a memorising ability, they are basic to all applications and thus fundamentally important. Nevertheless, it took roughly one-hundred years from their advent in 1835, when the Scottish-American scientist J. Henry invented the electro-magnetic relay, to Shannon’s (1938) influential paper ‘A Symbolic Analysis of Relays and Switching Circuits’, the paper that founded switching algebra. From this late start onward, switching theory has remained technology driven. Even before Veitch (1952) and Karnaugh (1953) had put forth the so-called Karnaugh map for simplifying combinational circuits, the transistor had been invented (in 1948), and we were already working with the third computer generation (electro-magnetic relays, electronic radio valves, transistors). At this point in the development we still had no idea how to calculate simple memory devices, let alone general circuits with a memorising ability, so-called sequential circuits. All such circuits were developed intuitively.

The topics chosen for presentation in this division are a balanced extract of problems commonly encountered when working with combinational circuits. It is easy to list many further areas that are of basic interest, but being reticent therein allows us to focus our sights. The material of this division is taken from Vingron (2004) but much of it has been reworked quite basically, especially Chaps. 5, 6 and 8.