Modern computation requires fast and correct operation for applications. The twin goals of performance and correctness are often at odds and require specialized algorithms and circuits for successful implementations. Come join us for an overview of representational systems, algorithmic techniques, and circuit designs. Representational methods include positional (place value system) notation in standard bases, redundant systems such as signed digit representation, and various specialized systems including irrational and logarithmic representations. Specialized algorithms for fast addition, multiplication and division have been developed for algorithmic operation. Extended internal systems can help to reduce errors. Many of these systems have found encodings in circuit designs for fast operation and correct computation.