

## Selection of Appropriate Data Type

### 2.1 Objectives

- 1 To convert specification into C programs (Specification → Flowchart → Program).
- 2 To understand data types and select them wisely while writing computer programs in C.
- 3 To learn data formatting using `printf()/scanf()` and perform arithmetic calculations.

Time-span: One lab day (2 hrs)

### 2.2 Problems

*Note:* You need to justify the selection of data types in each of the following problems. Mention your justifications as comments in the program code.

- 1 You are given two circuit diagrams below, *fig.-1* and *fig.-2*. You are going to write two programs, one for each circuitry. Your programs should calculate and display the current  $I$  flowing in the circuit using Ohm's law ( $V = IR$ ). Note that Voltage is measure in terms of Volts( $V$ ), Resistance in ohms( $\Omega$ ) and Current in Amperes( $A$ ). Assume that our virtual workshop only has  $\{5V, 20V\}$  batteries. Similarly we only have  $\{100\Omega, 1K\Omega\}$  resistors to choose from. [Note:  $1K = 1000$ ]
  - a. Run the program with  $V_1 = 5V, R_1 = 10\Omega, R_2 = 100\Omega$ .
  - b. Run the program with  $V_1 = 20V, R_1 = 100\Omega, R_2 = 1K\Omega$ .

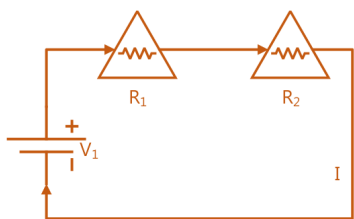


Fig. 1

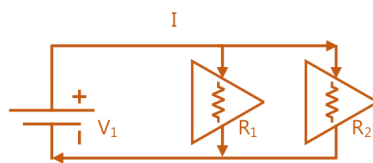


Fig. 2

- 2 (a) Newton's law of universal gravitation states that every object in the universe attracts every other object with a force proportional to the product of their masses and inversely proportional to the square of the distance between them.

I. Write a program to calculate the force given: Mass of Object<sub>1</sub> = 10kg, Mass of Object<sub>2</sub> = 20kg and Distance = 2m.

II. Write another program to calculate the force of attraction between the Earth and the Moon. Mass of Moon =  $7.34 \times 10^{22} \text{kg}$ , Mass of the Earth =  $5.97 \times 10^{24} \text{kg}$  and Distance = 384400km.

For the job (I), Store the gravitational constant  $G$  as  $0.00000000006674 \text{ N(m/kg)}^2$ . For the job (II) store  $G$  as  $6.674 \times 10^{-11} \text{ N(m/kg)}^2$ . Note: Mass is measured in Kilogram (kg), Distance in Meter (m) and Force is measured in Newton (N). Change the measurement units as and when required.

(b) Modify part (a) and read the mass of the two objects and the distance between them from the user. Think about how to read very large (or small) numbers in exponential notation.

- 3 Jaikishan has  $X_1$  number of Rs 1000/-,  $X_2$  number of Rs 500/-,  $X_3$  number of Rs 100/- and  $X_4$  number of Rs 50/-,  $X_5$  number of Rs 25/-,  $X_6$  number of Rs 10/- and  $X_7$  number of Rs 5/- notes. Write a C program to calculate the total amount in rupees that Jaikishan owns. Take input  $X_1, X_2 \dots X_7$  from the user. [Note: Flowchart required]