

1.9 Practice Programs

Each chapter will contain a set of 10 practice programs to help students reinforce the concepts in the chapter. These problem descriptions will not be as specific as a typical graded assignment for an introductory programming class. Rather, the goal of these problems is to give students simple ideas of programs to write and let the students fill in gaps in the problem description. Furthermore, instead of following the specifications in the problems exactly, one may and should make additional changes and/or additions to the problem description to create desired programs.

- 1) Write a program that prompts the user for the area of a circle and calculates the radius of that circle and prints it out.
- 2) Write a program that prompts the user to enter two points on the Cartesian plane with different x coordinates and calculate and output the slope between the two points. You may assume this slope is not undefined.
- 3) Write a program that asks the user for their hourly pay, the number of hours they work in a week, and the number of weeks they are working in the summer, as well as the cost of a single video game. Output the total number of video games they could buy, if they spent all of their earnings on video games, as well as the leftover money they would have. (The latter value must be strictly less than the cost of a game.) Assume all inputs are integers.
- 4) Write a program that asks the user for the price of gasoline per gallon, the number of gallons of gas currently in their car, the miles per gallon their car gets, and the length of their road trip in miles and calculates and prints out the amount the user will have to spend on extra gas to complete the road trip. (You may assume that the user will have to buy some gas to complete the trip.)
- 5) Write a program to guesstimate the total number of jelly beans in a right circular cylinder. In particular, the user must enter both the radius and the height of the cylinder, as well as the radius of the jellybean (we'll assume it's a sphere). For simplicity's sake, assume that the amount of volume a single jellybean takes up is simply the volume of the cube it would fit into. (Thus, if the radius of a jellybean is 2 units, then the total volume it takes up in the jar is 8 cubic units.) You should output a guess as to how many jellybeans are in the jar. Your guess need not be an integer. (If you want to enhance the program you may output the nearest integer to the actual value.)

6) Imagine a two-way straight railway and two trains approaching each other from opposite directions. You need to compute how long (in minutes) would it take for these trains to come side by side. You will also compute how many miles each train travels till then. Write a program to read in the distance (in miles), speeds of the trains (in miles per hour), and output the time to meet (in minutes) and the distance traveled by each train (in miles).

7) Write a program that calculates the cost of buying season football tickets. Ask the user for the number of upper bowl tickets (these are \$25 per game) and lower bowl tickets (these are \$50 per game) they desire, followed by the number of games in the season and the sales tax, entered as a percentage. Output the total cost of all the tickets, including tax.

8) Write a program that calculates the number of pictures that can be stored on a thumb drive. Ask the user to enter the number of gigabytes of data the thumb drive can store, as well as the length and width of each picture, in pixels. Assume that each pixel takes 3 bytes of storage. (This isn't really the case, since most pictures are stored in a compressed format.) Output your answer as a whole number.

9) Research how electoral votes are calculated, look up the most current census numbers and use this to write an electoral vote calculator. Your calculator should ask the user for the population of their state and output the number of electoral votes that state should receive. Since there are some slight exceptions in the actual process, compared to the straight mathematical theory behind it, your program will occasionally be off by 1 electoral vote compared to the actual allocation.

10) Write a program that prompts the user to enter the coefficients a , b and c from the quadratic equation $ax^2 + bx + c = 0$, and calculates the two real roots of the equation. You may assume that the user enters values of a , b and c that lead to the equation having two distinct real roots, namely, the user will enter values such that $b^2 > 4ac$, and a will not equal 0.