
Floating Point

Problem Description

Computers use floating-point representation to store real numbers (such as 3.14159..., 1.06×10^{37} , -2.5) as fixed-length sequences of bits. The way that these bits are interpreted is known as the computer's floating-point format. Choosing a format involves trading off storage needed per number against the precision with which numbers can be represented, so a computer may support more than one format. Most modern computers use the two basic formats defined in IEEE Standard 754-1985, which are known as IEEE single-precision and IEEE double-precision respectively.

However, other floating-point formats have been in use since at least the early 1950s. One important set of formats is that introduced in 1964 with IBM's System/360 family of mainframes and used in the mainframe world ever since. System/360 also supports single- and double-precision formats, but naturally these are incompatible with the much later IEEE standard.

Task

You have been contracted to help a client migrate their IT operations from an IBM mainframe to a new desktop-based system. They have a large amount of numeric data on the mainframe which needs to be converted into a format the desktop boxes will understand. Your task is to produce a robust, carefully tested program which will read a file of IBM System/360-format floating point numbers and write them to a new file in IEEE standard format. Extracts from the documents which define the formats are attached.

Your program should prompt for input and output filenames, and the precision (single or double) of each file. Note that the two precision specifications are independent, so you will have to consider all four combinations. You may need to talk to the client about how to handle exceptional cases.

Relates to Objectives

1.2 1.4 2.2 2.5 2.7 2.8 3.1 3.5 4.3 4.4

(2 points, Group)