IEEE 754 – Floating Point Representation

* Each computer manufacturer had their own CPU chip design and agreed to use twos complement when working with integers on the computer. However, they all had different methods of approach when trying to represent floating point numbers, so different complex models would produce slightly different answers.
* Therefore, the IEEE (Institute of Electrical and Electronics Engineers) developed a standard for representing floating point numbers in 1985 and was called IEEE754. It addressed many of the other models had by being more reliable and portable and now most CPUs use this standard.
* Graphical user interface, text, application, email

  Description automatically generatedThe IEEE754 format is a 32-bit representation, and they are distributed as follows:
* There are, however, problems working with floating point numbers on computers. For example, there are some numbers that are just impossible to represent and so sometimes numbers that are quite close to the number you entered is converted into binary using this format. Other issues may include:  
    
  **-** Even before calculations, only an approximate value is being used for the data item.  
  **-** Safety critical codes don’t use floating point numbers  
  **-** Overflow / Underflow is possible and so computational science and engineering codes need to take account for this and monitor for errors.  
  **-** Mathematical operations may add round off errors.
* Using IEEE754 to go from decimal to binary:

Text, letter

Description automatically generated

* Text, letter

  Description automatically generatedUsing IEEE754 to go from binary to decimal: