

**Translating decimal numbers to binary**

1. *Decimal integers*: count to 10 in binary - use the binary converter online to find the binary equivalents to the numbers from 0 to 10, and enter them in the Binary number row.

Decimal number	0	1	2	3	4	5	6	7	8	9	10
Binary number											

How many bits were needed to represent the number 10 as a binary number?

2. *Decimal floating point numbers*: express the following as floating point numbers. In each case the significant digits are 4321. A floating point number expresses the significant digits as a whole number, multiplied by an exponent. The first is done for you as an example.

$$4321 = 4321 \times 10^0$$

$$0.004321 =$$

$$432100 =$$

$$4.321 =$$

$$43.21 =$$

3. *Floating point weirdness*. Follow the instructions online to produce the examples of weird results from floating point calculations.

a. What happened when you made a series in Excel starting at 0.01 and dropping by 0.0001 in each cell (that is, when you got to 0 what did Excel display instead)?

b. Give an example of a calculation that would not be strongly affected by this problem, and one that would be catastrophically wrong.

c. What is responsible for Excel's failure to do this simple subtraction operation? Is this a programming bug in Excel, or is it a problem with all floating point calculations on a digital computer?

## Representing text using ASCII codes

4. a. Translate the following ASCII codes to binary numbers, and then into letters. Use the binary to decimal converter in the instructions web page to get the binary numbers. Use the ASCII table linked on the web page to get the letters.

ASCII code	66	105	111	108	111	103	121	33
Binary number								
Letter								

b. Look at the ASCII table again – is the ASCII code for the number 0 the same as the binary number that is equivalent to 0? What does this tell you about the importance of letting the computer know what kind of data you are using?

c. Spell your first name in ASCII - each letter should be an 8-bit binary number. Don't forget to capitalize!

Write the letters:

Write the ASCII codes:

Translate into binary digits:

d. What base 10 number is the hexadecimal number 2A? What does the 2 represent, and what does the A represent?

e. What character is represented by the HTML numeric code &#40;?

f. If you had the sentence `<p>The quick brown fox jumped over the lazy old dog</p>` in a file that you opened both in a web browser and in a text editor, which one would show you the tags? Which would use the tags to format the sentence, but not display them on the page?