

# Re: Binary number digits <- > Decimal number digits

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*Source:* <http://sci.tech-archive.net/Archive/sci.math/2007-12/msg01827.html>

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- *From:* Jeremy Boden <[jeremy@xxxxxxxxxxxxxxxx](mailto:jeremy@xxxxxxxxxxxxxxxx)>
  - *Date:* Sun, 09 Dec 2007 16:50:37 -0000
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On Sun, 09 Dec 2007 16:58:11 +0100, Helmut Richter wrote:

On Sun, 9 Dec 2007, fc wrote:

For example, what calculus was made to arrive that a decimal number of 617 digits must have 2048 digits in binary? (Obviously, without make the conversion of the decimal number 999999...99999 [617 9 numbers] to binary) And: how to generalize for any decimal number of any length?

The number of digits of  $x$  in some base  $b$  is, not regarding rounding to integers, the logarithm of  $x$  with respect to base  $b$ , which is  $\log x / \log b$  (log to arbitrary base).

So the number of decimal digits of  $x$  is  $\log_2 x / \log_{10} x = 0.30103 \dots$

For a rough calculation,  $2^{10} = 1024$ ,  
So 10 bits is approximately 3 digits.

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Jeremy Boden  
"64 bits good, 32 bits bad"