The JETS Challenge

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Challenge 87 — The Binary Challenge

Problem:

Computers convert the base-10 numbers we use into binary numbers. We can mimic this process by dividing a given number by the largest power of 2^n and continuing the process down to $2^0 = 1$. For example, suppose you want to convert Pi to three places without the decimal point (i.e., 314) to binary:

314 – 256 = 58	$1 \bullet 2^8$	(2^8 =256)
	$+ 0 \bullet 2^7$	(2^7 =128)
	$+ 0 \bullet 2^6$	(2^6 =64)
58 – 32 = 26	$+ 1 \bullet 2^5$	(2^5 =32)
26 – 16 = 10	$+ 1 \bullet 2^4$	(2^4 =16)
10 – 8 = 2	$+ 1 \bullet 2^3$	(2^3 = 8)
	$+ 0 \bullet 2^2$	(2^2 = 4)
2 – 2 = 0	$+ 1 \bullet 2^1$	(2^1 = 2)
	$\underline{+ 0 \bullet 2^0}$	(2^0 = 1)

Thus, 314 = 100111010

Convert 31416 (Pi to 5 decimal places without the decimal) in binary.

Solution:

31,416 – 16,384 = 15,032 $1 \bullet 2^{14}$ (2^{14}= 16,384)

15,032 – 8,192 = 6,840 $+1 \bullet 2^{13}$ (2^{13}= 8,192)

6,840 – 4,096 = 2,744 $+1 \bullet 2^{12}$ (2^{12}= 4,096)

2,744 – 2,048 = 696 $+1 \bullet 2^{11}$ (2^{11}=2,048)
$+0 \bullet 2^{10}$ (2^{10}= 1,024)

696 – 512 = 184 $+1 \bullet 2^{9}$ (2^{9}= 512)
$+0 \bullet 2^{8}$ (2^{8}= 256)

184 – 128 = 56 $+1 \bullet 2^{7}$ (2^{8}= 128)
$+0 \bullet 2^{6}$ (2^{6}= 64)

56 – 32 = 24 $+1 \bullet 2^{5}$ (2^{5}= 32)

24 – 16 = 8 $+1 \bullet 2^{4}$ (2^{4}= 16)

8 – 8 = 0 $+1 \bullet 2^{3}$ (2^{3}= 8)
$+0 \bullet 2^{2}$ (2^{2}= 4)
$+0 \bullet 2^{1}$ (2^{1}= 2)
$+0 \bullet 2^{0}$ (2^{0}= 0)

Answer: 111 101 010 111 000