

# Decimal Fractions to Binary Fractions (Attempt 2)

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# Contents

<b>1</b>	<b>Abstract</b>	<b>1</b>
<b>2</b>	<b>A Brief Explanation of the Problem</b>	<b>2</b>
<b>3</b>	<b>Algorithms</b>	<b>3</b>
3.1	From Decimal to Binary . . . . .	3
3.2	Decimal Fraction . . . . .	3
3.3	Binary Fractions . . . . .	3
3.4	A Simplistic (if Slow) Approach . . . . .	3
3.5	Exploiting Powers of Two . . . . .	3

# 1 Abstract

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## 2 A Brief Explanation of the Problem

## 3 Algorithms

### 3.1 From Decimal to Binary

### 3.2 Decimal Fraction

### 3.3 Binary Fractions

### 3.4 A Simplistic (if Slow) Approach

### 3.5 Exploiting Powers of Two

Times 2 table

Value of Product	Append	Subtract from Decimal
(0, 1)	'0'	$0 \times 2^0$
[1, 2)	'1'	$1 \times 2^0$

Times 4 table

Value of Product	Append	Subtract from Decimal
(0, 1)	'00'	$0 \times 2^1 + 0 \times 2^0$
[1, 2)	'01'	$0 \times 2^1 + 1 \times 2^0$
[2, 3)	'10'	$1 \times 2^1 + 0 \times 2^0$
[3, 4)	'11'	$1 \times 2^1 + 1 \times 2^0$

Times 8 table

Value of Product	Append	Subtract from Decimal
(0, 1)	'000'	$0 \times 2^2 + 0 \times 2^1 + 0 \times 2^0$
[1, 2)	'001'	$0 \times 2^2 + 0 \times 2^1 + 1 \times 2^0$
[2, 3)	'010'	$0 \times 2^2 + 1 \times 2^1 + 0 \times 2^0$
[3, 4)	'011'	$0 \times 2^2 + 1 \times 2^1 + 1 \times 2^0$
[4, 5)	'100'	$1 \times 2^2 + 0 \times 2^1 + 0 \times 2^0$
[5, 6)	'101'	$1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0$
[6, 7)	'110'	$1 \times 2^2 + 1 \times 2^1 + 0 \times 2^0$
[7, 8)	'111'	$1 \times 2^2 + 1 \times 2^1 + 1 \times 2^0$

Times 16 table

Value of Product	Append	Subtract from Decimal
(0, 1)	'0000'	$0 \times 2^3 + 0 \times 2^2 + 0 \times 2^1 + 0 \times 2^0$
[1, 2)	'0001'	$0 \times 2^3 + 0 \times 2^2 + 0 \times 2^1 + 1 \times 2^0$
[2, 3)	'0010'	$0 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 0 \times 2^0$
[3, 4)	'0011'	$0 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 1 \times 2^0$
[4, 5)	'0100'	$0 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 0 \times 2^0$
[5, 6)	'0101'	$0 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0$
[6, 7)	'0110'	$0 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 0 \times 2^0$
[7, 8)	'0111'	$0 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 1 \times 2^0$
[8, 9)	'1000'	$1 \times 2^3 + 0 \times 2^2 + 0 \times 2^1 + 0 \times 2^0$
[9, 10)	'1001'	$1 \times 2^3 + 0 \times 2^2 + 0 \times 2^1 + 1 \times 2^0$
[10, 11)	'1010'	$1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 0 \times 2^0$
[11, 12)	'1011'	$1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 1 \times 2^0$
[12, 13)	'1100'	$1 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 0 \times 2^0$
[13, 14)	'1101'	$1 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0$
[14, 15)	'1110'	$1 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 0 \times 2^0$
[15, 16)	'1111'	$1 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 1 \times 2^0$