

Convert the following decimal numbers into octal and hexadecimal

1. $165_{10} \rightarrow N_8$

Solution:

Successive/Repeated Division by Powers of Base (n) Method

	Quotient (Q)	Remainder (R)
165/64	2	37
37/8	4	5
5/1	5	0

8^3	8^2	8^1	8^0
512	64	8	1
0	2	4	5

Final answer is 245_8

Successive/Repeated Division by Base (n) Method

	Quotient (Q)	Remainder (R)
165/8	20	5
20/8	2	4
2/8 → Cannot be		2

Final answer is 245_8

2. $165_{10} \rightarrow N_{16}$

Solution:

Successive/Repeated Division by Powers of Base (n) Method

	Quotient (Q)	Remainder (R)
165/16	10 = A	5
5/1	5	0

16^2	16^1	16^0
256	16	1
0	10=A	5

Final answer is $A5_{16}$

Successive/Repeated Division by Base (n) Method

	Quotient (Q)	Remainder (R)
165/16	10 = A	5
10/16 → Cannot be		A

Final answer is $A5_{16}$

Convert the following octal and hexadecimal numbers to decimal number

1. $126_8 \rightarrow N_{10}$

Solution:

Multiply and Add Method:	Positional Value Method :															
<p>Start with the leftmost digit</p> <ul style="list-style-type: none">• $1 * 8 = 8$• $8 + 2 = 10$• $10 * 8 = 80$• $80 + 6 = 86_{10}$ <p>Final answer is 86_{10}</p>	<p>Start with the rightmost digit</p> <table><tr><th></th><th>Step 1</th><th>Step 2</th></tr><tr><td>1</td><td>$6 * 8^0 =$</td><td>$6 * 1 =$ 6</td></tr><tr><td>2</td><td>$2 * 8^1 =$</td><td>$2 * 8 =$ 16</td></tr><tr><td>6</td><td>$1 * 8^2 =$</td><td>$1 * 64 =$ 64</td></tr><tr><td></td><td></td><td>86</td></tr></table> <p>Final answer is 86_{10}</p>		Step 1	Step 2	1	$6 * 8^0 =$	$6 * 1 =$ 6	2	$2 * 8^1 =$	$2 * 8 =$ 16	6	$1 * 8^2 =$	$1 * 64 =$ 64			86
	Step 1	Step 2														
1	$6 * 8^0 =$	$6 * 1 =$ 6														
2	$2 * 8^1 =$	$2 * 8 =$ 16														
6	$1 * 8^2 =$	$1 * 64 =$ 64														
		86														

2. $A34_{16} \rightarrow N_{10}$

Solution:

Multiply and Add Method:	Positional Value Method :															
<i>Start with the leftmost digit</i>	<i>Start with the rightmost digit</i>															
<ul style="list-style-type: none">$A * 16 = 160$$160 + 3 = 163$$163 * 16 = 2608$$2608 + 4 = \mathbf{2612_{10}}$	<table><tr><th></th><th>Step 1</th><th>Step 2</th></tr><tr><td>A</td><td>$4 * 16^0 =$</td><td>$4 * 1 =$</td></tr><tr><td>3</td><td>$3 * 16^1 =$</td><td>$3 * 16 =$</td></tr><tr><td>4</td><td>$A = 10 * 16^2 =$</td><td>$A = 10 * 256 =$</td></tr><tr><td></td><td></td><td>$\mathbf{4}$ $\mathbf{48}$ <u>$\mathbf{2560}$</u> $\mathbf{2612}$</td></tr></table>		Step 1	Step 2	A	$4 * 16^0 =$	$4 * 1 =$	3	$3 * 16^1 =$	$3 * 16 =$	4	$A = 10 * 16^2 =$	$A = 10 * 256 =$			$\mathbf{4}$ $\mathbf{48}$ <u>$\mathbf{2560}$</u> $\mathbf{2612}$
	Step 1	Step 2														
A	$4 * 16^0 =$	$4 * 1 =$														
3	$3 * 16^1 =$	$3 * 16 =$														
4	$A = 10 * 16^2 =$	$A = 10 * 256 =$														
		$\mathbf{4}$ $\mathbf{48}$ <u>$\mathbf{2560}$</u> $\mathbf{2612}$														
Final answer is 2612_{10}	Final answer is 2612_{10}															

Convert the following binary numbers into octal and hexadecimal

1. $111000000001110_2 \rightarrow N_8$

Solution:

Group the bits into three's starting from the right hand side

Octal form

Group 5	Group 4	Group 3	Group 2	Group 1
111	000	000	001	110
421	421	421	421	421
4+2+1 = 7	0	0	1	4+2 = 6

Final answer is **70016₈**

2. $1111101011001110_2 \rightarrow N_{16}$

Solution:

Group the bits into four's starting from the right hand side

Hexadecimal form

Group 4	Group 3	Group 2	Group 1
1111	1010	1100	1110
8421	8421	8421	8421
8+4+2+1 = 15 = F	8+2 = 10 = A	8+4 = 12 = C	8+4+2 = 14 = E

Final answer is **FACE₁₆**

Convert the following octal and hexadecimal numbers into binary

1. $765432_8 \rightarrow N_2$

Solution:

Step 1	7	6	5	4	3	2
	421	421	421	421	421	421
Step 2	111	110	101	100	011	010
Step 3	111110101100011010₂					

Final Answer

2. $FACADE_{16} \rightarrow N_2$

Solution:

Step 1	F	A	C	A	D	E
	8421	8421	8421	8421	8421	8421
Step 2	1111	1010	1100	1010	1101	1110
Step 3	111110101100101011011110₂					

Final Answer

Convert the following into the specified base notation

1. $0.386_{10} \rightarrow N_2$

Solution:

			Product	
		Integer Part		Fractional Part
Step 1	$0.386 * 2 =$	0		. 772
Step 2	$0.772 * 2 =$	1		. 544
	$0.544 * 2 =$	1		. 088
	$0.088 * 2 =$	0		. 176
	$0.176 * 2 =$	0		. 352
	$0.352 * 2 =$	0		. 704
			Repeat Detected	

Final answer is $0.11000..._2$ (approximately)

2. $0.386_{10} \rightarrow N_8$

			Product	
		Integer Part		Fractional Part
Step 1	$0.386 * 8 =$	3		. 088
Step 2	$0.088 * 8 =$	0		. 704
	$0.704 * 8 =$	5		. 632
	$0.632 * 8 =$	5		. 056
			Repeat Detected	

Final answer is $0.3055..._8$ (approximately)

3. $0.386_{10} \rightarrow N_{16}$

			Product	
		Integer Part		Fractional Part
Step 1	$0.386 * 16 =$	6		. 176
Step 2	$0.176 * 16 =$	2		. 816
	$0.816 * 16 =$	13=D		. 056
	$0.056 * 16 =$	0		. 896
			Repeat Detected	

Final answer is $0.62D0..._{16}$ (approximately)

4. $0.765_{10} \rightarrow N_2$

Solution:

			Product	
		Integer Part		Fractional Part
Step 1	$0.765 * 2 =$	1		. 53
Step 2	$0.53 * 2 =$	1		. 06
	$0.06 * 2 =$	0		. 12
	$0.12 * 2 =$	0		. 24
	$0.24 * 2 =$	0		. 48
	$0.48 * 2 =$	0		. 96
	$0.96 * 2 =$	1		. 92
			Repeat Detected	

Final answer is $0.1100001..._2$ (approximately)

5. $0.765_{10} \rightarrow N_8$

			Product	
		Integer Part		Fractional Part
Step 1	$0.765 * 8 =$	6		. 12
Step 2	$0.12 * 8 =$	0		. 96
	$0.96 * 8 =$	7		. 68
	$0.68 * 8 =$	5		. 44
	$0.44 * 8 =$	3		. 52
	$0.52 * 8 =$	4		. 16
			Repeat Detected	

Final answer is **0.607534...₈** (approximately)

6. $0.765_{10} \rightarrow N_{16}$

			Product	
		Integer Part		Fractional Part
Step 1	$0.765 * 16 =$	12 = C		. 24
Step 2	$0.24 * 16 =$	3		. 84
	$0.84 * 16 =$	13 = D		. 44
	$0.44 * 16 =$	7		. 04
	$0.04 * 16 =$	0		. 64
	$0.64 * 16 =$	10 = A		. 24
			Repeat Detected	

Final answer is **0.C3D70A...₁₆** (approximately)

Convert the following fractional part into base 10 notation

1. $0.1100111_2 \rightarrow N_{10}$

0 . 1 1 0 0 1 1 1	$1 * 2^{-1} =$	$1 * 1/2^1 =$	$1 * 1/2 =$	$1/2$
	$1 * 2^{-2} =$	$1 * 1/2^2 =$	$1 * 1/4 =$	$1/4$
	$0 * 2^{-3} =$	$0 * 1/2^3 =$	$0 * 1/8 =$	0
	$0 * 2^{-4} =$	$0 * 1/2^4 =$	$0 * 1/16 =$	0
	$1 * 2^{-5} =$	$1 * 1/2^5 =$	$1 * 1/32 =$	$1/32$
	$1 * 2^{-6} =$	$1 * 1/2^6 =$	$1 * 1/64 =$	$1/64$
	$1 * 2^{-7} =$	$1 * 1/2^7 =$	$1 * 1/128 =$	$1/128$
				<u>103/128</u>

Final answer is $103/128 = 0.8046875_{10}$

2. $0.475_8 \rightarrow N_{10}$

0 . 4 7 5	$4 * 8^{-1} =$	$4 * 1/8^1 =$	$4 * 1/8 =$	$4/8 = 1/2$
	$7 * 8^{-2} =$	$7 * 1/8^2 =$	$7 * 1/64 =$	$7/64$
	$5 * 8^{-3} =$	$5 * 1/8^3 =$	$5 * 1/512 =$	$5/512$
				<u>317/512</u>

Final answer is $317/512 = 0.619140625_{10}$

3. $0.A9F_{16} \rightarrow N_{10}$

0 . A 9 F	$A=10 * 16^{-1} =$	$A=10 * 1/16^1 =$	$A=10 * 1/16 =$	$10/16$
	$9 * 16^{-2} =$	$9 * 1/16^2 =$	$9 * 1/256 =$	$9/256$
	$F=15 * 16^{-3} =$	$F=15 * 1/16^3 =$	$F=15 * 1/4096 =$	$15/4096$
				<u>2719/4096</u>

Final answer is $2719/4096 = 0.663818359375_{10}$