



















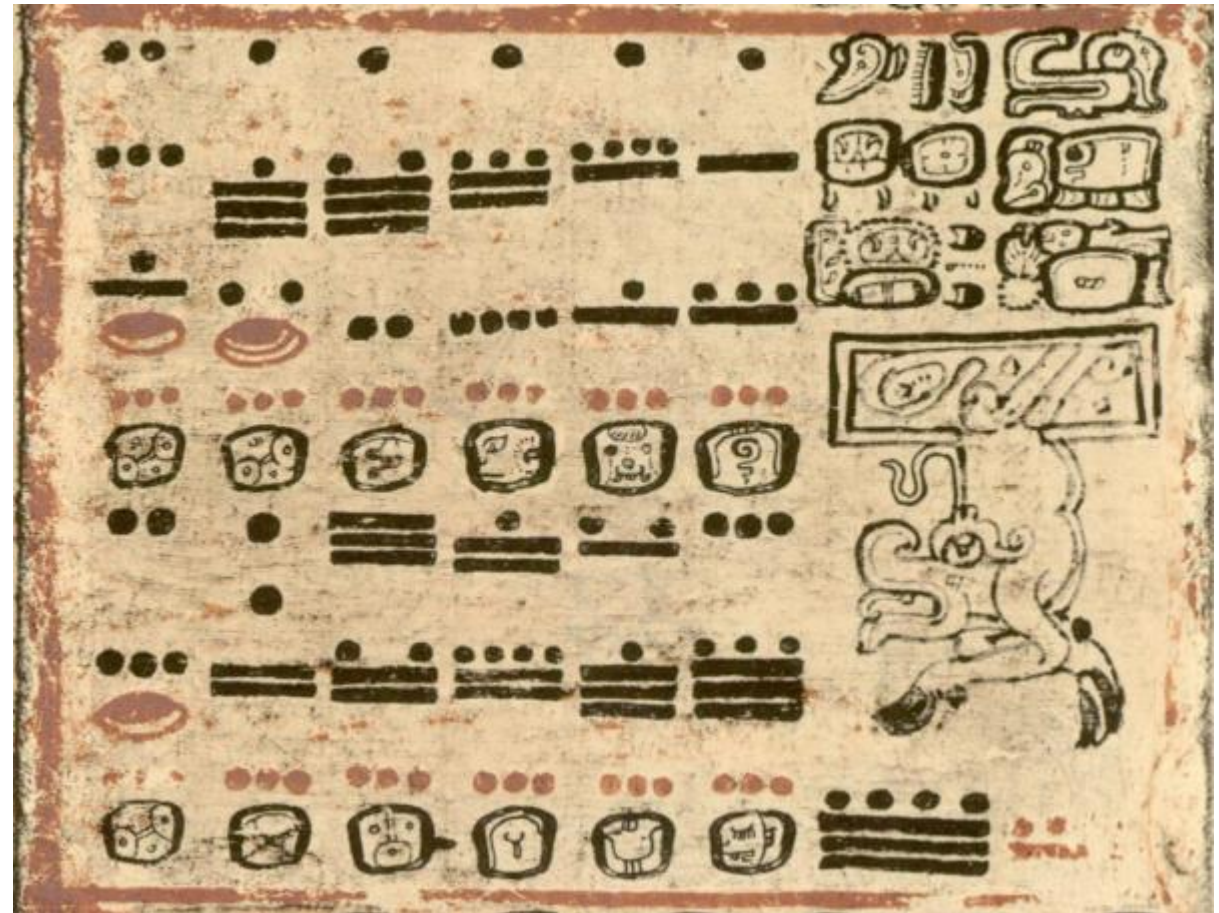


Hexadecimal

Base 16 numbers

 0	 1	 2	 3	 4
 5	 6	 7	 8	 9
 10	 11	 12	 13	 14
 15	 16	 17	 18	 19



1	𐎧	11	𐎧𐎠	21	𐎧𐎠𐎧	31	𐎧𐎠𐎧𐎠	41	𐎧𐎠𐎧𐎠𐎧	51	𐎧𐎠𐎧𐎠𐎧𐎠
2	𐎧𐎧	12	𐎧𐎠𐎧𐎧	22	𐎧𐎠𐎧𐎧𐎧	32	𐎧𐎠𐎧𐎧𐎧𐎧	42	𐎧𐎠𐎧𐎧𐎧𐎠𐎧	52	𐎧𐎠𐎧𐎧𐎧𐎠𐎧𐎧
3	𐎧𐎧𐎧	13	𐎧𐎠𐎧𐎧𐎧	23	𐎧𐎠𐎧𐎧𐎧𐎧	33	𐎧𐎠𐎧𐎧𐎧𐎧𐎧	43	𐎧𐎠𐎧𐎧𐎧𐎧𐎠𐎧	53	𐎧𐎠𐎧𐎧𐎧𐎧𐎠𐎧𐎧
4	𐎧𐎧𐎧𐎧	14	𐎧𐎠𐎧𐎧𐎧𐎧	24	𐎧𐎠𐎧𐎧𐎧𐎧𐎧	34	𐎧𐎠𐎧𐎧𐎧𐎧𐎧𐎧	44	𐎧𐎠𐎧𐎧𐎧𐎧𐎧𐎠𐎧	54	𐎧𐎠𐎧𐎧𐎧𐎧𐎧𐎠𐎧𐎧
5	𐎧𐎧𐎧𐎧𐎧	15	𐎧𐎠𐎧𐎧𐎧𐎧𐎧	25	𐎧𐎠𐎧𐎧𐎧𐎧𐎧𐎧	35	𐎧𐎠𐎧𐎧𐎧𐎧𐎧𐎧𐎧	45	𐎧𐎠𐎧𐎧𐎧𐎧𐎧𐎧𐎠𐎧	55	𐎧𐎠𐎧𐎧𐎧𐎧𐎧𐎧𐎠𐎧𐎧
6	𐎧𐎧𐎧𐎧𐎧𐎧	16	𐎧𐎠𐎧𐎧𐎧𐎧𐎧𐎧	26	𐎧𐎠𐎧𐎧𐎧𐎧𐎧𐎧𐎧	36	𐎧𐎠𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧	46	𐎧𐎠𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎠𐎧	56	𐎧𐎠𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎠𐎧𐎧
7	𐎧𐎧𐎧𐎧𐎧𐎧𐎧	17	𐎧𐎠𐎧𐎧𐎧𐎧𐎧𐎧𐎧	27	𐎧𐎠𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧	37	𐎧𐎠𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧	47	𐎧𐎠𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎠𐎧	57	𐎧𐎠𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎠𐎧𐎧
8	𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧	18	𐎧𐎠𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧	28	𐎧𐎠𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧	38	𐎧𐎠𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧	48	𐎧𐎠𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎠𐎧	58	𐎧𐎠𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎠𐎧𐎧
9	𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧	19	𐎧𐎠𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧	29	𐎧𐎠𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧	39	𐎧𐎠𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧	49	𐎧𐎠𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎠𐎧	59	𐎧𐎠𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎠𐎧𐎧
10	𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧	20	𐎧𐎠𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧	30	𐎧𐎠𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧	40	𐎧𐎠𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧	50	𐎧𐎠𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧𐎧		



Name	Base	Digits	Columns	Uses
Decimal	10			

Name	Base	Digits	Columns	Uses
Decimal	10	0, 1, 2, 3, 4, 5, 6, 7, 8, 9		

Name	Base	Digits	Columns	Uses
Decimal	10	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	1000, 100, 10, 1	

Name	Base	Digits	Columns	Uses
Decimal	10	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	1000, 100, 10, 1	Humans use it to do math. It comes from our ten fingers.

Name	Base	Digits	Columns	Uses
Decimal	10	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	1000, 100, 10, 1	Humans use it to do math. It comes from our ten fingers.
Binary	2			

Name	Base	Digits	Columns	Uses
Decimal	10	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	1000, 100, 10, 1	Humans use it to do math. It comes from our ten fingers.
Binary	2	0, 1		

Name	Base	Digits	Columns	Uses
Decimal	10	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	1000, 100, 10, 1	Humans use it to do math. It comes from our ten fingers.
Binary	2	0, 1	32, 16, 8, 4, 2, 1	

Name	Base	Digits	Columns	Uses
Decimal	10	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	1000, 100, 10, 1	Humans use it to do math. It comes from our ten fingers.
Binary	2	0, 1	32, 16, 8, 4, 2, 1	Computers store all information in binary.

Name	Base	Digits	Columns	Uses
Decimal	10	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	1000, 100, 10, 1	Humans use it to do math. It comes from our ten fingers.
Binary	2	0, 1	32, 16, 8, 4, 2, 1	Computers store all information in binary.
Hexadecimal	16			

Name	Base	Digits	Columns	Uses
Decimal	10	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	1000, 100, 10, 1	Humans use it to do math. It comes from our ten fingers.
Binary	2	0, 1	32, 16, 8, 4, 2, 1	Computers store all information in binary.
Hexadecimal	16	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F		

Name	Base	Digits	Columns	Uses
Decimal	10	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	1000, 100, 10, 1	Humans use it to do math. It comes from our ten fingers.
Binary	2	0, 1	32, 16, 8, 4, 2, 1	Computers store all information in binary.
Hexadecimal	16	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F	4096, 256, 16, 1	

Name	Base	Digits	Columns	Uses
Decimal	10	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	1000, 100, 10, 1	Humans use it to do math. It comes from our ten fingers.
Binary	2	0, 1	32, 16, 8, 4, 2, 1	Computers store all information in binary.
Hexadecimal	16	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F	4096, 256, 16, 1	It is a short form of binary that is easier for humans to follow.

Name	Base	Digits	Columns	Uses
Decimal	10	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	1000, 100, 10, 1	Humans use it to do math. It comes from our ten fingers.
Binary	2	0, 1	32, 16, 8, 4, 2, 1	Computers store all information in binary.
Hexadecimal	16	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F	4096, 256, 16, 1	It is a short form of binary that is easier for humans to follow.
-	n	0 – [n-1] (using letters if needed)	Powers of n	

The final 6 digits in **hexadecimal** are letters.

$$A = 10$$

$$B = 11$$

$$C = 12$$

$$D = 13$$

$$E = 14$$

$$F = 15$$

Hexadecimal to Decimal

Multiplication

Translate C8D from hexadecimal into decimal.

C8D_{HEX}

Translate C8D from hexadecimal into decimal.

C8D_{HEX}

256	16	1
C (12)	8	D (13)

Figure out the columns.
Start at the RIGHT

Translate the letters into their
corresponding numbers.

Translate C8D from hexadecimal into decimal.

C8D_{HEX}

256	16	1
C (12)	8	D (13)

C (12) X 256

8 X 16

D (13) X 1

Multiply each digit with its column value.

Translate C8D from hexadecimal into decimal.

C8D_{HEX}

256	16	1
C (12)	8	D (13)

$$C (12) \times 256 = 3072$$

$$8 \times 16 = 128$$

$$D (13) \times 1 = 13$$

Then, add up the answers.

Translate C8D from hexadecimal into decimal.

C8D_{HEX}

256	16	1
C (12)	8	D (13)

$$C (12) \times 256 = 3072$$

$$8 \times 16 = 128$$

$$D (13) \times 1 = 13$$

3213

That value is the decimal number.

Thus, C8D_{HEX} = 3212_{DEC}

Hexadecimal to Binary

It's an easy translation. Take 4 digits at a time.

$$2^4 = 16^1$$

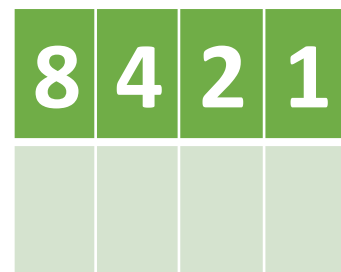
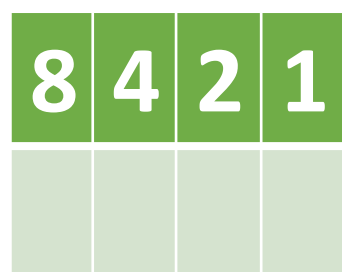
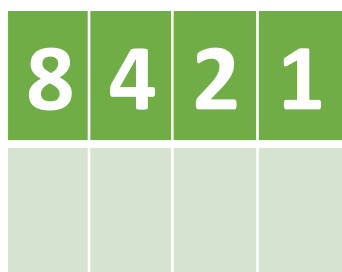
A7D5

A

7

D

5



A7D5

A

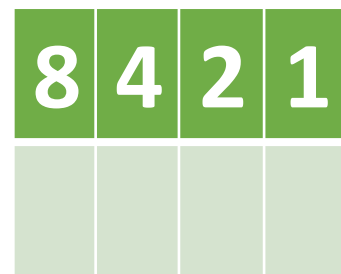
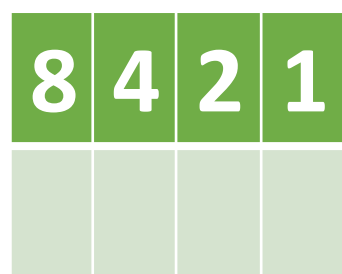
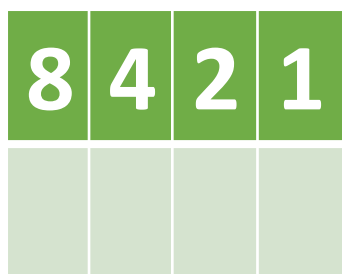
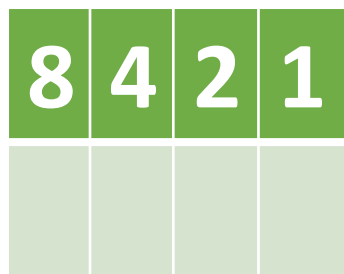
7

D

5

10

13



A7D5

A

7

D

5

10

13

8	4	2	1
1	0	1	0

8	4	2	1

8	4	2	1

8	4	2	1

A7D5

A

7

D

5

10

13

8	4	2	1
1	0	1	0

8	4	2	1
0	1	1	1

8	4	2	1

8	4	2	1

A7D5

A

7

D

5

10

13

8	4	2	1
1	0	1	0

8	4	2	1
0	1	1	1

8	4	2	1
1	1	0	1

8	4	2	1

A7D5

A

7

D

5

10

13

8	4	2	1
1	0	1	0

8	4	2	1
0	1	1	1

8	4	2	1
1	1	0	1

8	4	2	1
0	1	0	1

A7D5

A	7	D	5																																
10		13																																	
<table><thead><tr><th>8</th><th>4</th><th>2</th><th>1</th></tr></thead><tbody><tr><td>1</td><td>0</td><td>1</td><td>0</td></tr></tbody></table>	8	4	2	1	1	0	1	0	<table><thead><tr><th>8</th><th>4</th><th>2</th><th>1</th></tr></thead><tbody><tr><td>0</td><td>1</td><td>1</td><td>1</td></tr></tbody></table>	8	4	2	1	0	1	1	1	<table><thead><tr><th>8</th><th>4</th><th>2</th><th>1</th></tr></thead><tbody><tr><td>1</td><td>1</td><td>0</td><td>1</td></tr></tbody></table>	8	4	2	1	1	1	0	1	<table><thead><tr><th>8</th><th>4</th><th>2</th><th>1</th></tr></thead><tbody><tr><td>0</td><td>1</td><td>0</td><td>1</td></tr></tbody></table>	8	4	2	1	0	1	0	1
8	4	2	1																																
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1	1	0	1																																
8	4	2	1																																
0	1	0	1																																

In Binary: 1010 0111 1101 0101



Don't loose the leading zeros!

Binary to Hexadecimal

It's **still** an easy translation. Take 4 digits at a time.

$$2^4 = 16^1$$

In Binary: 10101100001001

8	4	2	1

8	4	2	1

8	4	2	1

8	4	2	1



Start on the right side to make bunches of 4.

In Binary: 10 1011 0000 1001

8	4	2	1

8	4	2	1

8	4	2	1

8	4	2	1



Start on the right side to make bunches of 4.

In Binary: 10 1011 0000 1001

8	4	2	1
		1	0

8	4	2	1
1	0	1	1

8	4	2	1
0	0	0	0

8	4	2	1
1	0	0	1

In Binary: 10 1011 0000 1001

8	4	2	1
		1	0

8	4	2	1
1	0	1	1

8	4	2	1
0	0	0	0

8	4	2	1
1	0	0	1

2

11

0

9

In Binary: 10 1011 0000 1001

8	4	2	1
		1	0

8	4	2	1
1	0	1	1

8	4	2	1
0	0	0	0

8	4	2	1
1	0	0	1

11

2

B

0

9

In Binary: 10 1011 0000 1001

8	4	2	1
		1	0

8	4	2	1
1	0	1	1

8	4	2	1
0	0	0	0

8	4	2	1
1	0	0	1

11

2

B

0

9

2B09

Decimal to Hexadecimal

Go via Binary

In Decimal: 2002

First: Convert to Binary

In Decimal: 2002

First: Convert to Binary

1024	512	256	128	64	32	16	8	4	2	1
1	1	1	1	1	0	1	0	0	1	0

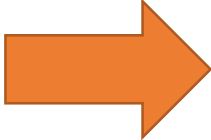
Second: Bunches of 4

In Decimal: 2002

First: Convert to Binary

1024	512	256	128	64	32	16	8	4	2	1
1	1	1	1	1	0	1	0	0	1	0

Second: Bunches of 4

11111010010  111 1101 0010

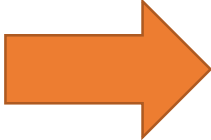
Third: Translate Binary to Hex

In Decimal: 2002

First: Convert to Binary

1024	512	256	128	64	32	16	8	4	2	1
1	1	1	1	1	0	1	0	0	1	0

Second: Bunches of 4

11111010010  111 1101 0010

Third: Translate Binary to Hex


8	4	2	1	8	4	2	1	8	4	2	1
	1	1	1	1	1	0	1	0	0	1	0

In Decimal: 2002

First: Convert to Binary

1024	512	256	128	64	32	16	8	4	2	1
1	1	1	1	1	0	1	0	0	1	0

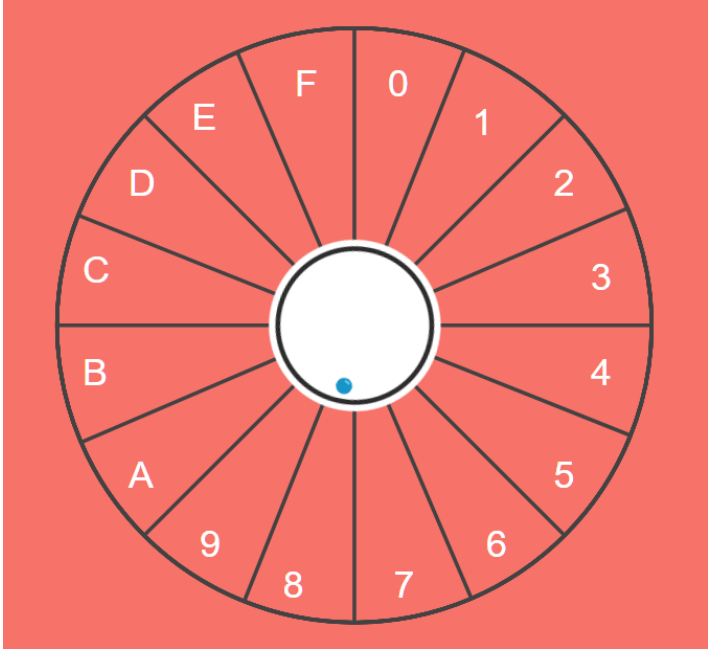
Second: Bunches of 4

11111010010  111 1101 0010

Third: Translate Binary to Hex

8	4	2	1	8	4	2	1	8	4	2	1
	1	1	1	1	1	0	1	0	0	1	0
7				13 (D)				2			

In Hex: 7D2



AROUND TOWN
GETTING CREATIVE IN THE CLASSROOM
STUDENTS RECREATING SCENE FROM "THE MARTIAN"

23abc
KERO · BAKERSFIELD
6:21 61°



Hexadecimal

- Base 16 numbers.
- They use the columns based on 16: 4096, 256, 16, 1
- They use the digits 0-9 and also A=10, B=11, C=12, D=13, E=14, F=15
- Computers do NOT use them. Their only purpose is as a short form of binary code for HUMANS.
- Because $2^4=16^1$, four binary digits can be condensed into one hexadecimal digit.

Decimal to Hexadecimal

Division and Remainders

Translate 5964 from decimal into hexadecimal.

	16^4	16^3	16^2	16^1	16^0
Columns	65,536	4,096	256	16	1
Largest divisor					
Remainder					

Write out the columns. Find the largest one you need.

Divide the number by the column.

Translate 5964 from decimal into hexadecimal.

	16^4	16^3	16^2	16^1	16^0
Columns	65,536	4,096	256	16	1
Largest divisor		1			
Remainder					

Find the remainder.

Translate 5964 from decimal into hexadecimal.

	16^4	16^3	16^2	16^1	16^0
Columns	65,536	4,096	256	16	1
Largest divisor		1			
Remainder		r 1868			

Take the remainder and divide it by the next column.

Translate 5964 from decimal into hexadecimal.

	16^4	16^3	16^2	16^1	16^0
Columns	65,536	4,096	256	16	1
Largest divisor		1	7		
Remainder		r 1868			

Find the remainder.

Translate 5964 from decimal into hexadecimal.

	16^4	16^3	16^2	16^1	16^0
Columns	65,536	4,096	256	16	1
Largest divisor		1	7		
Remainder		r 1868		r 76	

Take the remainder and divide it by the next column.

Translate 5964 from decimal into hexadecimal.

	16^4	16^3	16^2	16^1	16^0
Columns	65,536	4,096	256	16	1
Largest divisor		1	7	4	
Remainder		r 1868		r 76	

Find the remainder.

Translate 5964 from decimal into hexadecimal.

	16^4	16^3	16^2	16^1	16^0
Columns	65,536	4,096	256	16	1
Largest divisor		1	7	4	
Remainder		r 1868	r 76	r 12	

Take the remainder and divide it by the next column – in this case, it's only 1, so that's easy.

Translate 5964 from decimal into hexadecimal.

	16^4	16^3	16^2	16^1	16^0
Columns	65,536	4,096	256	16	1
Largest divisor		1	7	4	12 = C
Remainder		r 1868	r 76	r 12	

In the largest divisor row, translate all numbers over 10 to a letter

Translate 5964 from decimal into hexadecimal.

	16^4	16^3	16^2	16^1	16^0
Columns	65,536	4,096	256	16	1
Largest divisor		1	7	4	12 = C
Remainder		r 1868	r 76	r 12	

The largest divisor row is your answer.

Thus, $5964_{\text{DEC}} = 174C_{\text{HEX}}$