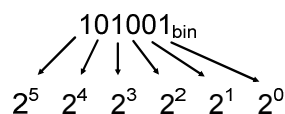


1. Log in
2. Open Netbeans and Moodle
3. Did you finish Unit 1 WS 04?
4. Did you enter your answers online?

Sep 28-7:21 AM

Review Binary = base 2 numbers

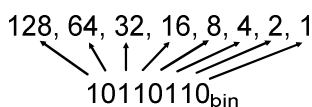
Binary digits basically tell you how many of each 2^x existRemember:
Start on the
right side

$$(1)2^5 + (0)2^4 + (1)2^3 + (0)2^2 + (0)2^1 + (1)2^0$$

$$(1)32 + (0)16 + (1)8 + (0)4 + (0)2 + (1)1 = 41_{\text{dec}}$$

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In other words, remember ...

Remember:
Start on the
right side

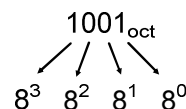
$$(1)2^7 + (0)2^6 + (1)2^5 + (1)2^4 + (0)2^3 + (1)2^2 + (1)2^1 + (0)2^0$$

$$128 + \dots + 32 + 16 + \dots + 4 + 2 + \dots$$

$$= 182_{\text{dec}}$$

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Now Octal Numbers = Base 8 numbers

Remember:
Start on the
right side

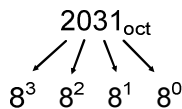
Octal digits basically tell you how many of each 8^x exist
 --- Now $8^0 = 1$, so we now can use the digits 0-7 for base 8 (we used 0-1 for base 2)
 --- So the numbers are 512, 64, 8, 1

$$(1)8^3 + (0)8^2 + (0)8^1 + (1)8^0$$

$$(1)512 + (0)64 + (0)8 + (1)1 = 513_{\text{dec}}$$

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Remember, base 8 can use 0-7

Remember:
Start on the
right side

Octal digits basically tell you how many of each 8^x exist
 --- Now $8^0 = 1$, so we now can use the digits 0-7 for base 8 (we used 0-1 for base 2)
 --- So the numbers are 512, 64, 8, 1

$$(2)8^3 + (0)8^2 + (3)8^1 + (1)8^0$$

$$(2)512 + (0)64 + (3)8 + (1)1 = 1049_{\text{dec}}$$

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Try one or two on your own ...

Do you notice that you
don't need as many bits
to create larger numbers?

$$1233_{\text{oct}} = 667_{\text{dec}}$$

$$0147_{\text{oct}} = 103_{\text{dec}}$$

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One more - Hexadecimal Numbers (base 16)

$$\begin{array}{c}
 101_{\text{hex}} \\
 \swarrow \quad \downarrow \quad \searrow \\
 16^2 \quad 16^1 \quad 16^0
 \end{array}$$

Hexadecimal digits basically tell you how many of each 16^n exist

--- Now $16^0 = 1$, so we now can use the digits 0-15 for base 16 (but, 15 is 2-digits = go letters)

--- Uses 0-9, A, B, C, D, E, F

--- 0-9, A=10, B=11, C=12, D=13, E=14, F=15

$$(1)16^2 + (0)16^1 + (1)16^0$$

$$(1)256 + (0)16 + (1)1 = 257_{\text{dec}}$$

Remember:
Start on the
right side

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One more - Hexadecimal Numbers (base 16)

$$\begin{array}{c}
 2AD_{\text{hex}} \\
 \swarrow \quad \downarrow \quad \searrow \\
 16^2 \quad 16^1 \quad 16^0
 \end{array}$$

0-9, A=10, B=11, C=12, D=13, E=14, F=15

$$(2)16^2 + (10)16^1 + (13)16^0$$

$$(2)256 + (10)16 + (13)1 = 685_{\text{dec}}$$

Remember:
Start on the
right side

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Now Decimal to Octal ...

$$283_{\text{dec}} \rightarrow ?_{\text{oct}}$$

$$\begin{array}{r}
 283 \\
 35 \quad 3 \\
 4 \quad 3 \\
 0 \quad 4
 \end{array}
 \begin{array}{c}
 \uparrow \\
 \uparrow \\
 \uparrow
 \end{array}$$

433_{oct}

Remember:
Divide by 8, track
the remainders until
you get division
answer 0 and
remainder 0-7

Oct 2-1:54 PM

Review Decimal to Binary ...

$$283_{\text{dec}} \rightarrow ?_{\text{bin}}$$

$$\begin{array}{r}
 283 \\
 141 \quad 1 \\
 70 \quad 1 \\
 35 \quad 0 \\
 17 \quad 1 \\
 8 \quad 1 \\
 4 \quad 0 \\
 2 \quad 0 \\
 1 \quad 0 \\
 0 \quad 1
 \end{array}
 \begin{array}{c}
 \uparrow \\
 \uparrow \\
 \uparrow \\
 \uparrow \\
 \uparrow \\
 \uparrow \\
 \uparrow \\
 \uparrow \\
 \uparrow \\
 \uparrow
 \end{array}$$

100011011_{bin}

Remember:
Divide by 2, track
the remainders until
you get division
answer 0 and
remainder 1 or 0

Oct 2-1:54 PM

Now Decimal to Octal ...

$$278_{\text{dec}} \rightarrow ?_{\text{oct}}$$

$$\begin{array}{r}
 278 \\
 34 \quad 6 \\
 4 \quad 2 \\
 0 \quad 4
 \end{array}
 \begin{array}{c}
 \uparrow \\
 \uparrow \\
 \uparrow
 \end{array}$$

426_{oct}

Remember:
Divide by 8, track
the remainders until
you get division
answer 0 and
remainder 1 or 0

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Now Decimal to Octal ...

$$721_{\text{dec}} \rightarrow ?_{\text{oct}}$$

$$\begin{array}{r}
 721 \\
 90 \quad 1 \\
 11 \quad 2 \\
 1 \quad 3 \\
 0 \quad 1
 \end{array}
 \begin{array}{c}
 \uparrow \\
 \uparrow \\
 \uparrow \\
 \uparrow
 \end{array}$$

1321_{oct}

Remember:
Divide by 8, track
the remainders until
you get division
answer 0 and
remainder 1 or 0

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NOW decimal to Hexadecimal!!!

 $721_{\text{dec}} \rightarrow ?_{\text{hex}}$

721	
45	1
2	13
0	2

	↑

0-9, A=10, B=11, C=12, D=13, E=14, F=15

 $2D1_{\text{hex}}$

Remember:
Divide by 16, track
the remainders until
you get division
answer 0 and
remainder 1 or 0

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NOW decimal to Hexadecimal!!!

 $3410_{\text{dec}} \rightarrow ?_{\text{hex}}$

3419	
213	11
13	5
16	13

	↑

0-9, A=10, B=11, C=12, D=13, E=14, F=15

 $D5B_{\text{hex}}$

Remember:
Divide by 16, track
the remainders until
you get division
answer 0 and
remainder 1 or 0

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What if we want Hex -> Binary?

 $A3F_{\text{hex}} \rightarrow ?_{\text{bin}}$ WAY #1

$$A3F_{\text{hex}} = (10)16^2 + (3)16^1 + (15)16^0 = 2623$$

2623	
1311	1
655	1
327	1
163	1
81	1
40	1
20	0
10	0
5	0
2	1
1	0
0	1

 $1010\ 0011\ 1111_{\text{bin}}$

0-9, A=10, B=11, C=12, D=13, E=14, F=15

Two ways:
1) To dec first
2) Convert each digit
to four bits

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What if we want Hex -> Binary?

 $A3F_{\text{hex}} \rightarrow ?_{\text{bin}}$ WAY #2 $A3F_{\text{hex}}$

A	3	F
↓	↓	↓
10	3	15
↓	↓	↓
1010	0011	1111

 $1010\ 0011\ 1111_{\text{bin}}$

0-9, A=10, B=11, C=12, D=13, E=14, F=15

Two ways:
1) To dec first
2) Convert each digit
to four bits

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What if we want Oct -> Binary?

 $721_{\text{oct}} \rightarrow ?_{\text{bin}}$

$$(7)8^2 + (2)8^1 + (1)8^0$$

$$448 + 16 + 1 = 465_{\text{dec}}$$

465	
232	1
116	0
58	0
29	0
14	1
7	0
3	1
1	1
0	1

 $0001\ 1111\ 0001_{\text{bin}}$

0-9, A=10, B=11, C=12, D=13, E=14, F=15

Just go to
decimal first

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Checklist for today ...

- ☐ Understand today's lesson
- ☐ Complete Unit 1 Worksheet 05
- ☐ Enter Worksheet Answers in Moodle (counts as a grade, retake once)
- ☐ Review documents for converting can be found on course website

Sep 28-9:44 AM