

Exercise # 1 :
ASCII to Decimal to Binary conversions

<http://schoolscience.rice.edu/duker/robots/binarynumber.html>

1. **How does the computer know how to add and subtract, and how can its memory remember the answers it computes?**

A computer knows how to add and subtract

2. **Approximately, how many switches are in a computer?**

There are two switches in a computer and those are On and off switch.

3. **What are these switches used for?**

These switches are used to represent the binary digits.

4. **What do 1's and 0's represent in a computer?**

1's represents On and 0's represents off in a computer.

5. **Illustrate the previous question using a diagram?**

Converting 16 to binary

Divided by 2	Remainder
16/2=8	0
8/2=4	0
4/2=2	0
2/2=1	0
1/2=0	1

http://www.cut-the-knot.org/do_you_know/BinaryHistory.shtml

6. **According to this article, what was the first electronic computer?**

First electronic computer was ENIAC which stood for Electronic Numerical Integrator and Calculator

7. **How old is the binary number system?**

The binary system is 3 centuries old.

8. **Who "discovered" binary?**

Gottfried Wilhelm Leibniz discovered binary system.

9. **How does one read $(1101)_2$?**

One determines $(1101)_2$ is a binary as it has 2 as its transcript.

$$2^0 + 2^1 + 2^2 + 2^3$$

$$1+4+8$$

$$13$$

http://en.wikipedia.org/wiki/Binary_numeral_system

10. **In point form, document the people responsible for the development of binary according to this article.**

The people responsible for the development of binary according to this article are Thomas Harriot, Juan Caramuel y Leibowitz, and Gottfried Leibniz.

11. **How do you express a number as a binary number? How do you express a number as a decimal number? For example, 100?**

To express a number as a binary number you use the subscript of 2 as that is the base of all binary number. To express a number as a decimal number you use the subscript of 10 as that is the base of decimal numbers. For example, the binary subscript for 100 would be 100_2 and the decimal subscript for 100 would be 100_{10}

12. For the following decimal numbers, indicate the place value for each digit

- a. **165**
 $5 \cdot 1 + 6 \cdot 10 + 1 \cdot 100$
- b. **23**
 $3 \cdot 1 + 2 \cdot 10$
- c. **8221**
 $1 \cdot 1 + 2 \cdot 10 + 2 \cdot 100 + 8 \cdot 1000$
- d. **10001**
 $1 \cdot 1 + 0 \cdot 10 + 0 \cdot 100 + 0 \cdot 1000 + 1 \cdot 10000$

13. For the following decimal numbers, indicate the place value for each digit as a base 10.

- a. **12**
 $2 \cdot 1 + 1 \cdot 10$
 12_{10}
- b. **765**
 $5 \cdot 1 + 6 \cdot 10 + 7 \cdot 100$
 765_{10}
- c. **3453**
 $3 \cdot 1 + 5 \cdot 10 + 4 \cdot 100 + 3 \cdot 1000$
 3453_{10}
- d. **54764**
 $4 \cdot 1 + 6 \cdot 10 + 7 \cdot 100 + 4 \cdot 1000 + 5 \cdot 10000$
 54764_{10}

14. For the following binary numbers, indicate the place value for each digit.

- a. **10110101**
 $1 + 4 + 16 + 32 + 128$
 181
- b. **1000101**
 $1 + 4 + 64$
 69
- c. **10010101**
 $1 + 4 + 16 + 128$
 149
- d. **111101**
 $1 + 4 + 8 + 16 + 32 + 64$
 125

15. For the following binary numbers, indicate the place value for each digit as a base 2.

- a. **101**
 $1 + 4$
 5_2
- b. **100101**
 $1 + 4 + 32$
 37_2
- c. **1001010**
 $2 + 8 + 64$
 74_2
- d. **11111111**
 $1 + 2 + 4 + 8 + 16 + 32 + 64 + 128$
 125_2

16. Given the bases for the place value of binary and decimal numbers, guess what the base would be for the following number system:

- a. Octal- 8
- b. Hexadecimal-6

17. Convert the following binary numbers to decimals.

- a. 0000 0000
0
- b. 0000 0010
2
- c. 0000 1010
2+8
10
- d. 1001 0010
2+16+128
146
- e. 0110 0111
1+2+4+32+64
103
- f. 1111 1111
1+2+4+8+16+32+64+128
255

18. Convert the following decimal numbers to binary.

a. 0

Divided by 2	Remainder
0/2=0	0

0

b. 1

Divided by 2	Remainder
1/2=0	1

1

c. 63

Divided by 2	Remainder
63/2=31	1
31/2=15	1
15/2=7	1
7/2=3	1
3/2=1	1
1/2=0	1

111111

d. 64

Divided by 2	Remainder
64/2=32	0
32/2=16	0
16/2=8	0
8/2=4	0
4/2=2	0
2/2=1	0
1/2=0	1

0000001

e. 127

Divided by 2	Remainder
$127/2=63$	1
$63/2=31$	1
$31/2=15$	1
$15/2=7$	1
$7/2=3$	1
$3/2=1$	1
$1/2=0$	1

1111111

f. 128

Divided by 2	Remainder
$128/2=64$	0
$64/2=32$	0
$32/2=16$	0
$16/2=8$	0
$8/2=4$	0
$4/2=2$	0
$2/2=1$	0
$1/2=0$	1

00000001

g. 245

Divided by 2	Remainder
$245/2=122$	1
$122/2=61$	0
$61/2=30$	1
$30/2=15$	0
$15/2=7$	1
$7/2=3$	1
$3/2=1$	1
$1/2=0$	1

10101111

h. 244

Divided by 2	Remainder
$244/2=122$	0
$122/2=61$	0
$61/2=30$	1
$30/2=15$	0
$15/2=7$	1
$7/2=3$	1
$3/2=1$	1
$1/2=0$	1

00101111