





Binary	Symbol
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00	
01	
10	
11	

Using this key or this encoding system, how would you represent this symbol in binary?



**Answer: 00**

Using this key system how would you represent this line?














**Answer: 0110100011**

### Challenge Question

Using the key above, what does the following binary represent?

100001

- a.   
- b.   
- c.   
- d.   

Answer: d

Binary can represent whatever we determine a key for. With this in mind, how might we represent things like letters or other characters in binary?

## ASCII Table

In a similar way, letters can be represented with binary with the help of a table or key to tell the computer which symbol goes with which binary sequence. This is where a tool called the [ASCII Table](#) comes into play.

Symbol	Binary	Symbol	Binary	Symbol	Binary
A	0100 0001	a	0110 0001	.	0010 1110
B	0100 0010	b	0110 0010	,	0010 0111
C	0100 0011	c	0110 0011	:	0011 1010
D	0100 0100	d	0110 0100	;	0011 1011

E	0100 0101	e	0110 0101	?	0011 1111
F	0100 0110	f	0110 0110	!	0010 0001
G	0100 0111	g	0110 0111	'	0010 1100
H	0100 1000	h	0110 1000	"	0010 0010
I	0100 1001	i	0110 1001	(	0010 1000
J	0100 1010	j	0110 1010	)	0010 1001
K	0100 1011	k	0110 1011	<b>space</b>	0010 0000
L	0100 1100	l	0110 1100		
M	0100 1101	m	0110 1101		
N	0100 1110	n	0110 1110		
O	0100 1111	o	0110 1111		
P	0101 0000	p	0111 0000		
Q	0101 0001	q	0111 0001		
R	0101 0010	r	0111 0010		
S	0101 0011	s	0111 0011		
T	0101 0100	t	0111 0100		
U	0101 0101	u	0111 0101		
V	0101 0110	v	0111 0110		
W	0101 0111	w	0111 0111		
X	0101 1000	x	0111 1000		
Y	0101 1001	y	0111 1001		
Z	0101 1010	z	0111 1010		

With the help of the table, letters, words, and phrases can be represented using the series of 1s and 0s.

Here is the phrase "Hello World!" in binary.

01001000 01100101 01101100 01101100

01101111 00100000 01010111 01101111

01110010 01101100 01100100 00100001

Did you notice that uppercase letters and lowercase letters have different binary values? And did you find binary for the exclamation point?

You might wonder how numbers and ASCII values can be differentiated? There are even ASCII values for numbers that can be used for text files.

**Question:**

How to say "sun" in binary?

**Answer:** 01010011 01010101 01001110

**Challenge:**

How to say "I love to code!" in binary?

## Unicode



Some of you might already be thinking beyond the [ASCII table](#). What about other characters that show up in other languages? Like the Spanish word for kid:

niño

Or the French word for school:

l'école

What about the languages that have many characters like chinese or korean?

"Welcome to class" looks like this in Chinese:

"Welcome to class" looks like this in Korean:

수업에 오신 것을 환영합니다

"Welcome to class looks like this in Arabic:

مرحبا بكم في الدرجة

Clearly the [ASCII table](#) won't work for these kinds of languages. The ASCII table was invented in the 1960s and as time goes on it has become less and less useful. We live in an increasingly global society where all different languages use the same programs. A different approach was needed, which led to the invention of Unicode.

The [Unicode](#) system accounts for every symbol that is used in any language. That way people from anywhere can use the same programs. The key is more complicated than the ASCII table, so we won't explain it here, but it would be a good topic to research further if you are interested.

The [Unicode](#) system accounts for the ASCII system as well--so code written in the past that understands ASCII will continue to work and will also be able to represent other languages. The first part of the unicode system *is* the ASCII table.

## ACTIVITY: BINARY ART PROJECT

Binary is just a pattern that represents if there is electricity or not. 0 means no electricity and 1 means there is electricity.

Are there other ways we can represent binary code? Think outside the box. Come up with an art project where you can artistically send a secret hidden message in binary.

Ideas:

- Colors of beads on a string where one color represents 1 and another color represents 0.
- Lines of poetry where a line with many syllables represents 1 and a line with few syllables represents 0.
- Create a movie of a skateboarder where a push represent a 0 and a jump represents a 1.
- A song where high notes represent 1 and low notes represent 0.
- Bands of color on a snake where one color represents 1 and another color represents 0.
- Color a picture of flamingos where a flamingo with their head up high represents a 1 and a flamingo with their head in the water represents a 0.

Be creative! Think of unique ways you can send hidden messages with binary.

## Abstraction

Abstraction is representing something complex with something simple. Rather than asking users to work with groupings of zeroes and ones, we work with letters, numbers, color, and more. Bits and bytes are grouped to create abstractions.

The same sequence of bits may represent different types of data in different contexts. It depends on what key the grouping of bytes is using.

## Summary

You can represent anything with binary as long as you provide a key as to what the binary combinations mean. The key for converting binary to text has been the [ASCII table](#). With the world communicating across more languages, a more sophisticated key called Unicode came into play. With [Unicode](#), we can represent any language character with binary.

## Questions (6)

### 1. Which table is best used for different spoken languages?

MULTIPLE CHOICE

Choose the correct answer:

- A. ASCII Table
- B. Unicode
- C. Universal Translation Table
- D. ABD Table

### 2. True or False: You can represent pretty much anything in binary as long as you provide a key.

MULTIPLE CHOICE

Choose the correct answer:

- A. True
- B. False

### 3. True or False: Uppercase and Lowercase letters have different binary values

MULTIPLE CHOICE

Choose the correct answer:

- A. True
- B. False

### 4. True or False: Systems that use the Unicode system won't be able to read the ASCII table.

MULTIPLE CHOICE

Choose the correct answer:

- A. True
- B. False

### 5. What is abstraction in the context of representing data in binary?

MULTIPLE CHOICE

Choose the correct answer:

- A. Passages written using the Unicode table.
- B. Representing emojis with letters.
- C. Representing complex groupings of 0's and 1's with a letter.
- D. Writing poetry with characters from the ASCII table.

**6. True or False: The same grouping of 0's and 1's can represent different things, depending on the key it's using.**

MULTIPLE CHOICE

**Choose the correct answer:**

- A. True
- B. False

## Answer Keys & Solutions

### Questions

#### 1. Which table is best used for different spoken languages?

MULTIPLE CHOICE

Correct Answer:

- A. ASCII Table ✗ Incorrect
- B. Unicode ✓ Correct
- C. Universal Translation Table ✗ Incorrect
- D. ABD Table ✗ Incorrect

#### Explanation:

This was a new kind of code that is more useful than the ASCII table

#### 2. True or False: You can represent pretty much anything in binary as long as you provide a key.

MULTIPLE CHOICE

Correct Answer:

- A. True ✓ Correct
- B. False ✗ Incorrect

#### Explanation:

Binary carries value as far as a key shows

#### 3. True or False: Uppercase and Lowercase letters have different binary values

MULTIPLE CHOICE

Correct Answer:

- A. True ✓ Correct
- B. False ✗ Incorrect



**Explanation:**

Each character needs a unique code so that it will display correctly.

**4. True or False: Systems that use the Unicode system won't be able to read the ASCII table.**

MULTIPLE CHOICE

**Correct Answer:**

- A. True ✗ Incorrect
- B. False ✓ Correct

**Explanation:**

The first part of the unicode system is the ASCII table.

**5. What is abstraction in the context of representing data in binary?**

MULTIPLE CHOICE

**Correct Answer:**

- A. Passages written using the Unicode table. ✗ Incorrect
- B. Representing emojis with letters. ✗ Incorrect
- C. Representing complex groupings of 0's and 1's with a letter. ✓ Correct
- D. Writing poetry with characters from the ASCII table. ✗ Incorrect

**Explanation:**

Instead of showing all the 0's and 1's, showing letters and words is simpler to understand.

**6. True of False: The same grouping of 0's and 1's can represent different things, depending on the key it's using.**

MULTIPLE CHOICE

**Correct Answer:**

- A. True ✓ Correct

B. False

✖ Incorrect

**Explanation:**

Since different keys can be used, the same grouping of 0's and 1's can mean something different.