

Representing Numbers with Binary

Textbook

Representing Numbers with Binary



All information we see on a computer is actually represented with a series of ones and zeroes. In other words, the presence of electricity or not.

Converting from Numbers to Binary

Let's do a few more examples of how to convert numbers we are familiar with into [binary](#) numbers.

How would we do the number 12?

Fourth Place (8)	Third Place (4)	Second Place (2)	First Place (1)
1	1	0	0

Remember, we only have the option to do a 0 or a 1 in each place, so in order to get up to 12, we need to use the fourth place.

$$8 + 4 + 0 + 0 = 12$$

[Show answer/example](#)

Fourth Place (8)	Third Place (4)	Second Place (2)	First Place (1)
1	0	0	1

$$8 + 0 + 0 + 1 = 9$$

[Show answer/example](#)

How about the number 1?

Fourth Place (8)	Third Place (4)	Second Place (2)	First Place (1)
0	0	0	1

[Show answer/example](#)

(Remember that a rule of math is that anything to the power of 0 is equal to 1)

Converting from Binary to Numbers

Let's try to do it backwards. **What is the decimal number for the binary value 0101?**

(When we ask for a decimal number, we are looking for the number in the everyday system we are used to using.)

Fourth Place (8)	Third Place (4)	Second Place (2)	First Place (1)
0	1	0	1

$$4 + 1 = 5$$

[Show answer/example](#)

What is the decimal number for the binary value 1100?

Fourth Place (8)	Third Place (4)	Second Place (2)	First Place (1)
1	1	0	0

$$8 + 4 + 0 + 0 = 12$$

[Show answer/example](#)

Bigger Numbers

What about converting a bigger decimal number like 50 into binary?

You simply add more columns to the left and increase the value of each column by a power of 2.

Sixth Place (32)	Fifth Place (16)	Fourth Place (8)	Third Place (4)	Second Place (2)	First Place (1)
1	1	0	0	1	0

$$32 + 16 + 0 + 0 + 2 + 0 = 50$$

[Show answer/example](#)

Let's do the number 57.

Sixth Place (32)	Fifth Place (16)	Fourth Place (8)	Third Place (4)	Second Place (2)	First Place (1)
1	1	1	0	0	1

$$32 + 16 + 8 + 0 + 0 + 1 = 57$$

[Show answer/example](#)

Challenge

Can you do it on your own without the help of the chart? You can either draw out the chart on a piece of scratch paper or come up with your own method of remembering how to translate into binary.

Stretch Challenge: Try and put the following binary numbers in order from least to greatest.

- A. 0010
- B. 0110
- C. 0001
- D. 0101

[Show answer/example](#)

Summary

[Binary](#) is organized into a series of zeroes and ones. These zeroes and ones represent numbers that increase by the power of two. A zero means there is no amount of that value and a one means there is an amount of that value. Adding the value of all the ones together gives you your decimal number.

Questions (10)

1. From what we have learned in this lesson, how would you represent the number 3 using only zeroes and ones?

MULTIPLE CHOICE

Choose the correct answer:

- A. 0011
- B. 1100
- C. 0001
- D. 1110

2. From what we have learned in this lesson, how would you represent the number 15 using only zeroes and ones?

MULTIPLE CHOICE

Choose the correct answer:

- A. 1111
- B. 0000
- C. 1100
- D. 0011

3. From what we have learned in this lesson, how would you represent the number 5 using only zeroes and ones?

MULTIPLE CHOICE

Choose the correct answer:

- A. 0101
- B. 1010
- C. 1001
- D. 0110

4. From what we have learned in this lesson, how would you represent the number 8 using only zeroes and ones?

MULTIPLE CHOICE

Choose the correct answer:

- A. 1010
- B. 0001
- C. 0101
- D. 1000

5. From what we have learned in this lesson, what decimal number is this? 0100

MULTIPLE CHOICE

Choose the correct answer:

- A. 2
- B. 4
- C. 5
- D. 10

6. From what we have learned in this lesson, what decimal number is this? 1100

MULTIPLE CHOICE

Choose the correct answer:

- A. 12
- B. 13
- C. 5
- D. 8

7. From what we have learned in this lesson, what decimal number is this? 0110

MULTIPLE CHOICE

Choose the correct answer:

- A. 6
- B. 4
- C. 5
- D. 9

MULTIPLE CHOICE

8. What is the decimal equivalent of the binary number 1001?

Choose the correct answer:

- A. 8
- B. 9
- C. 10
- D. 12

MULTIPLE CHOICE

9. What is the binary representation of the decimal number 9?

Choose the correct answer:

- A. 1001
- B. 1100
- C. 1111
- D. 10001

MULTIPLE CHOICE

10. At its most basic level, how is information represented on a computer?

Choose the correct answer:

- A. Alphabetical characters.
- B. Numeric digits.
- C. Series of ones and zeroes (binary).
- D. Combination of letters and numbers.

Answer Keys & Solutions

Questions

1. From what we have learned in this lesson, how would you represent the number 3 using only zeroes and ones?

MULTIPLE CHOICE

Correct Answer:

- | | |
|---------|-------------|
| A. 0011 | ✓ Correct |
| B. 1100 | ✗ Incorrect |
| C. 0001 | ✗ Incorrect |
| D. 1110 | ✗ Incorrect |

Explanation:

The last place is the one's place. The second to last place is the two's place. $1 + 2 = 3$

2. From what we have learned in this lesson, how would you represent the number 15 using only zeroes and ones?

MULTIPLE CHOICE

Correct Answer:

- | | |
|---------|-------------|
| A. 1111 | ✓ Correct |
| B. 0000 | ✗ Incorrect |
| C. 1100 | ✗ Incorrect |
| D. 0011 | ✗ Incorrect |

Explanation:

$8 + 4 + 2 + 1 = ?$

3. From what we have learned in this lesson, how would you represent the number 5 using only zeroes and ones?

MULTIPLE CHOICE

Correct Answer:

A. 0101 ✓ Correct

B. 1010 ✗ Incorrect

C. 1001 ✗ Incorrect

D. 0110 ✗ Incorrect

Explanation:

$$0 + 4 + 0 + 1 = ?$$

4. From what we have learned in this lesson, how would you represent the number 8 using only zeroes and ones?

MULTIPLE CHOICE

Correct Answer:

A. 1010 ✗ Incorrect

B. 0001 ✗ Incorrect

C. 0101 ✗ Incorrect

D. 1000 ✓ Correct

Explanation:

$$8 + 0 + 0 + 0 = ?$$

5. From what we have learned in this lesson, what decimal number is this?
0100

MULTIPLE CHOICE

Correct Answer:

A. 2 ✗ Incorrect

B. 4 ✓ Correct

C. 5 ✗ Incorrect

D. 10

✗ Incorrect

Explanation:

$$0 + 4 + 0 + 0 = ?$$

6. From what we have learned in this lesson, what decimal number is this?
1100

MULTIPLE CHOICE

Correct Answer:

A. 12

✓ Correct

B. 13

✗ Incorrect

C. 5

✗ Incorrect

D. 8

✗ Incorrect

Explanation:

$$8 + 4 + 0 + 0 = ?$$

7. From what we have learned in this lesson, what decimal number is this?
0110

MULTIPLE CHOICE

Correct Answer:

A. 6

✓ Correct

B. 4

✗ Incorrect

C. 5

✗ Incorrect

D. 9

✗ Incorrect

Explanation:

$$0 + 4 + 2 + 0 = ?$$

MULTIPLE CHOICE

8. What is the decimal equivalent of the binary number 1001?

Correct Answer:

- A. 8 ✗ Incorrect
- B. 9 ✓ Correct
- C. 10 ✗ Incorrect
- D. 12 ✗ Incorrect

Explanation:

8 plus 1 is 9

9. What is the binary representation of the decimal number 9?

MULTIPLE CHOICE

Correct Answer:

- A. 1001 ✓ Correct
- B. 1100 ✗ Incorrect
- C. 1111 ✗ Incorrect
- D. 10001 ✗ Incorrect

Explanation:

$8 + 0 + 0 + 1 = ?$

10. At its most basic level, how is information represented on a computer?

MULTIPLE CHOICE

Correct Answer:

- A. Alphabetical characters. ✗ Incorrect
- B. Numeric digits. ✗ Incorrect
- C. Series of ones and zeroes (binary). ✓ Correct
- D. Combination of letters and numbers. ✗ Incorrect

Explanation:

The ones and zeroes of binary can be converted into other, more complex information.