



Two digits. Countless uses.

Binary uses just two digits: 0 and 1.



$$8 + 0 + 2 + 1 = 11$$

Binary 1011 = decimal 11

TRY IT TODAY

Use cards worth 8, 4, 2 and 1 to make 11.

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? **Question:** How can a computer work with information using only zeros and ones?

🗣️ **Answer:** Binary is a number system with two digits: 0 and 1. A bit is a binary digit. Combinations of bits can represent numbers and, through agreed-upon codes, text, pictures, and sounds.

🕒 **History:** In 1703, Gottfried Wilhelm Leibniz wrote an explanation of binary arithmetic. The mathematics came long before the electronic computers that would put it to widespread use.

💡 **Example:** Our familiar place values grow by tens: 1, 10, 100. Binary place values grow by twos: 1, 2, 4, 8. In the binary number 1011, the 1s select 8, 2, and 1. Add them to get eleven.

🔍 **Insight:** A zero still matters. It holds a place and tells us that its value is not included. In 1011, the zero means we do not add the 4.

🔗 **Connection:** Understanding bits helps us see that digital technology follows rules we can investigate. The tools may be complex, but their foundations can be learned one step at a time.

🎯 **Challenge:** Label four cards 8, 4, 2, and 1 from left to right. Use a 1 for each selected value and a 0 for each unused value. Make eleven, then six and nine. Check after trying: six = 0110; nine = 1001. Explain one zero.