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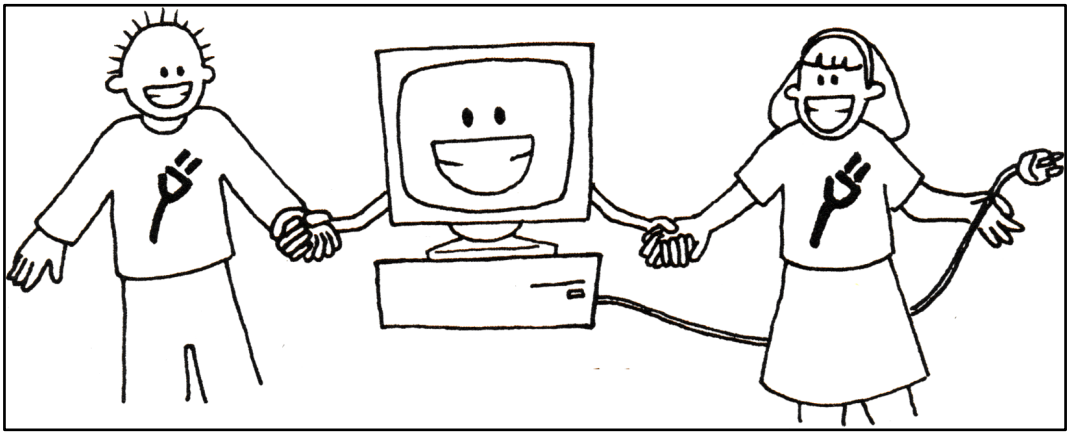
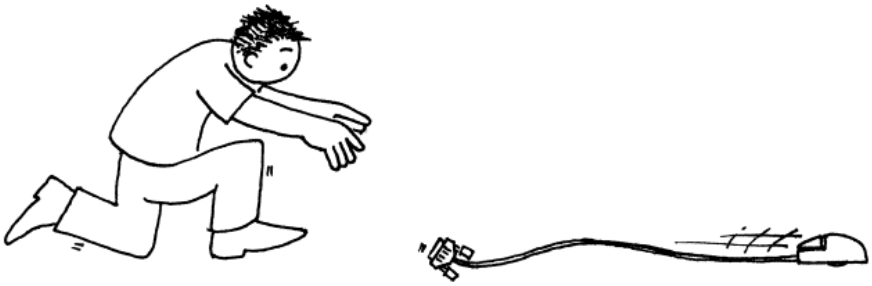


An enrichment and extension programme for primary-aged students



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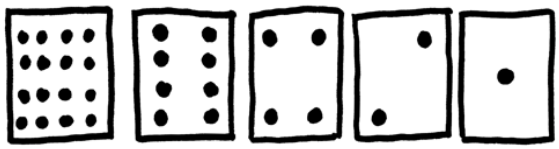
2015 Revision by Sam Jarman

Binary Numbers

Introduction

Before giving out the worksheet on page 6, it can be helpful to demonstrate the principles to the whole group.

For this activity, you will need a set of five cards, as shown below, with dots on one side and nothing on the other. Choose five students to hold the demonstration cards at the front of the class. The cards should be in the following order:



Discussion

As you give out the cards (from right to left), see if the students can guess how many dots are on the next card. What do you notice about the number of dots on the cards? (Each card has twice as many as the card to its right.)

How many dots would the next card have if we carried on to the left? (32) The next...? (64)

We can use these cards to make numbers by turning some of them face down and adding up the dots that are showing. Ask the students to show 6 dots (4-dot and 2-dot cards), then 15 (8-, 4-, 2- and 1-dot cards), then 21 (16, 4 and 1)... The only rule is that a card has to be completely visible, or completely hidden.

What is the smallest number of dots possible? (They may answer one, but it's zero).

Now try counting from zero onwards.

The rest of the class needs to look closely at how the cards change to see if they can see a pattern in how the cards flip (each card flips half as often as the one to its right). You may like to try this with more than one group.

When a binary number card is **not** showing, it is represented by a zero. When it **is** showing, it is represented by a one. This is the binary number system.

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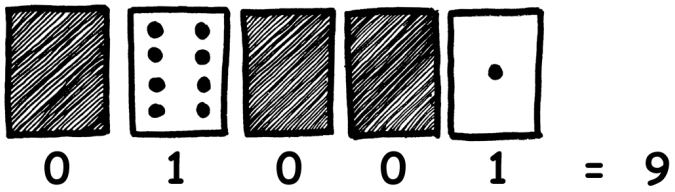

Ask the students to make 01001. What number is this in decimal? (9) What would 17 be in binary? (10001)

Try a few more until they understand the concept.

There are five optional follow-up extension activities, to be used for reinforcement. The students should do as many of them as they can.

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Worksheet Activity: Binary Numbers

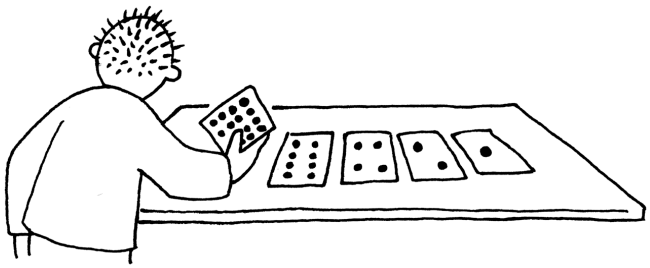
Learning how to count

So, you thought you knew how to count? Well, here is a new way to do it!

Did you know that computers use only zero and one? Everything that you see or hear on the computer—words, pictures, numbers, movies and even sound is stored using just those two numbers! These activities will teach you how to send secret messages to your friends using exactly the same method as a computer.

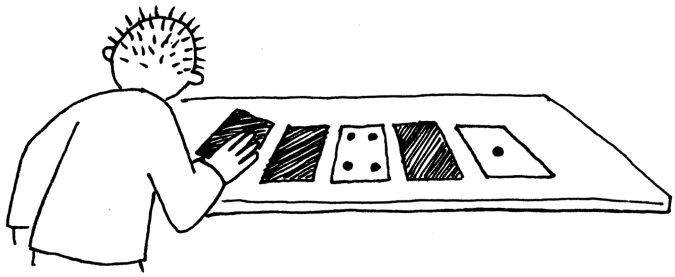
Instructions

Cut out the cards on your sheet and lay them out with the 16-dot card on the left as shown here:



Make sure the cards are placed in exactly the same order.

Now flip the cards so exactly 5 dots show—keep your cards in the same order!



Find out how to get 3, 12, 19. Is there more than one way to get any number? What is the biggest number you can make? What is the smallest? Is there any number you can't make between the smallest and biggest numbers?

Extra for Experts: Try making the numbers 1, 2, 3, 4 in order. Can you work out a logical and reliable method of flipping the cards to increase any number by one?

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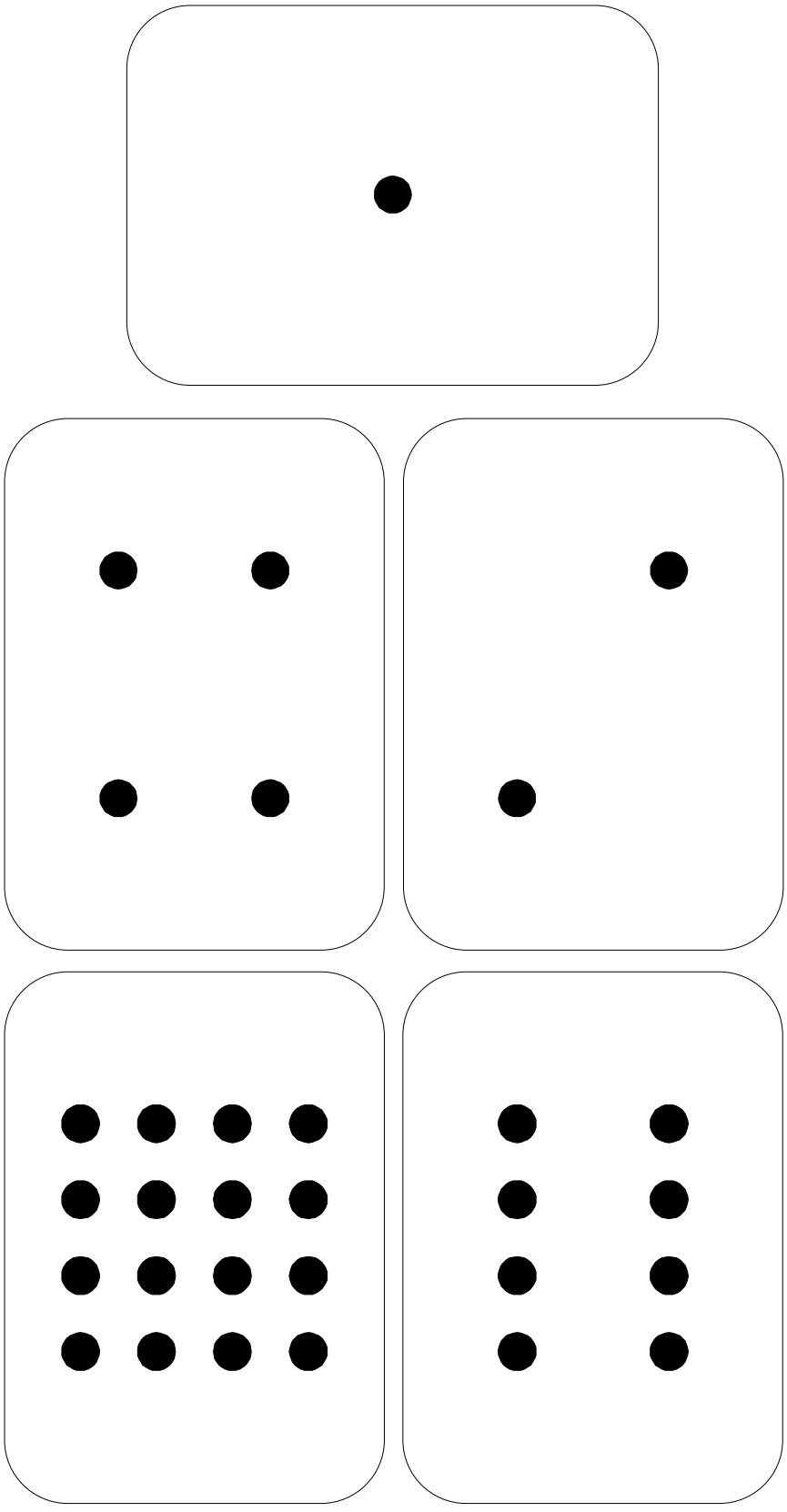
Photocopy Master: Binary Numbers



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