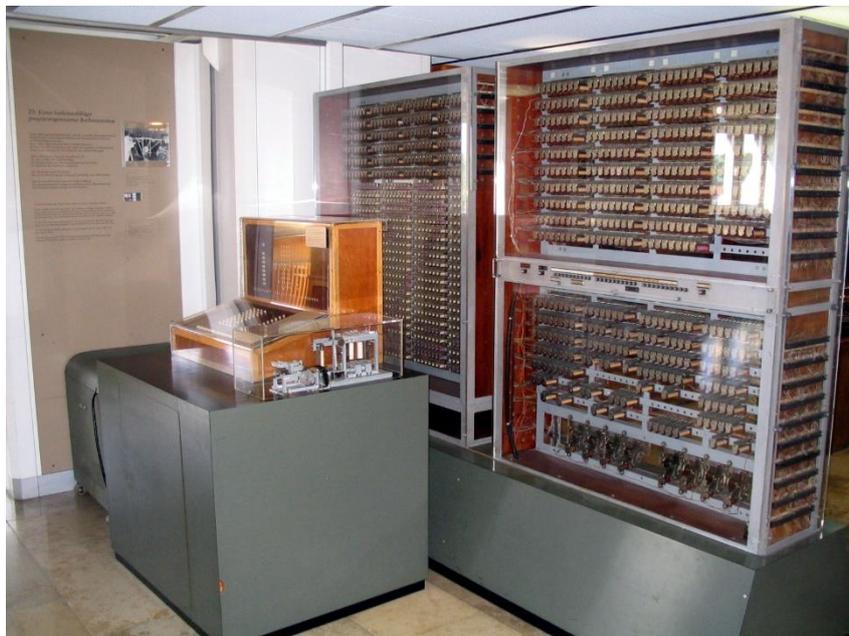


How do computers think?

In this week's Pop-Up Science edition, we are dealing with computers and how we have to speak to them to understand us.

Did you know that the world's first computer was introduced in 1941?

Konrad Zuse built the calculating machine Z3, which was as big as a living room cupboard! The machine weighed three tons and could solve a simple calculation in three seconds. This is what the machine looked like:



Venusianer, CC BY-SA 3.0, <https://commons.wikimedia.org/w/index.php?curid=3632073>

In the meantime, there has been a lot of progress. Computers are much smaller than a living room cupboard and can do much more than just calculating!

A. Read the following text and underline the most important pieces of information!

You have probably wondered how a computer works and what it is built of. If you would open up a computer, you would see different components:

The processor is the ‘heart’ of the computer. He does the computing work. The working memory is its ‘short-term memory’. It stores contains the data that the computer is using at a certain moment in time. The hard drive, on the other hand, is the computer’s ‘long-term memory’. All data you will need again later are stored here. Lastly, the graphic card tells the computer what to display on the screen. Altogether, a computer’s building blocks are called ‘hardware’.

A computer is a machine—to be more exact, a calculating machine; it calculates or processes data. This happens through programs called ‘software’, which humans have written. This process is called programming.

A program is a series of commands that the machine executes one after the other. The machine only works correctly if the commands are executed in the right order—just like when you are baking a cake and have to exactly follow the single steps of a recipe: first, you weigh the ingredients, then you pour them into a bowl, you mix them, put them in a cake pan, and only then put the pan in the hot oven. Imagine mixing the ingredients after baking them in the oven! Baking the cake this way simply wouldn’t work.

It is not as easy to speak with a computer as it is to speak with humans. Machines only understand a special ‘language, the so-called binary code. The only two ‘letters’, or rather ‘digits’ of this code are zeros (0) and ones (1).

When a program is written, the commands are translated into this code. For example, the letter ‘A’ has the sequence 1000001; the letter ‘a’ has the sequence 1100001. When programming, you should not make any mistakes when entering a code, otherwise, the program does not work properly! When mistakes happen, they are called ‘bugs’. Did you know that the German word for ‘bug’ is ‘Käfer’? Translated back to English, this means ‘beetle’!

B. Connect the terms on the left with the correct description on the right!

program

processor

hard drive

binary code

graphic card

bug

working memory

1000001

calculating machine

binary code for the letter 'A'

language for computers, which only uses zeros and ones

the 'short-term memory' of a computer

another word for computer

the 'heart' of a computer

a series of commands

the 'long-term memory' of a computer

tells the computer what to display on the screen

a mistake in the code

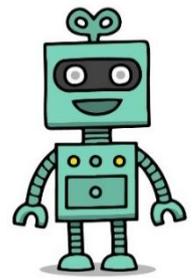
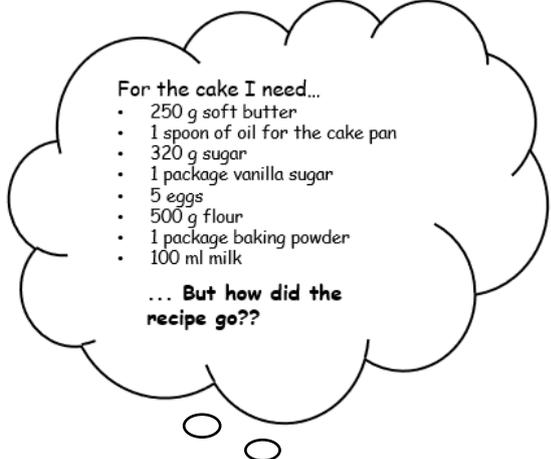
C. Do you speak the language of computers?

Programming is like baking a cake!

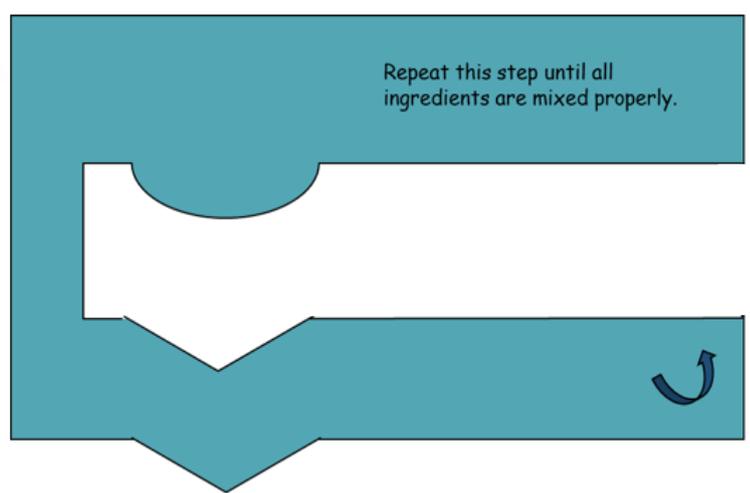
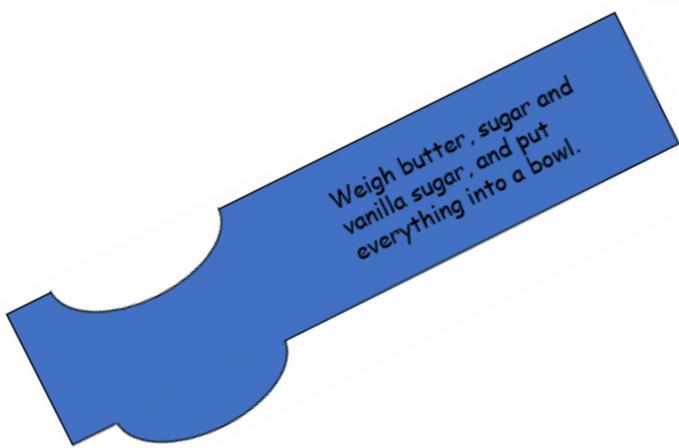
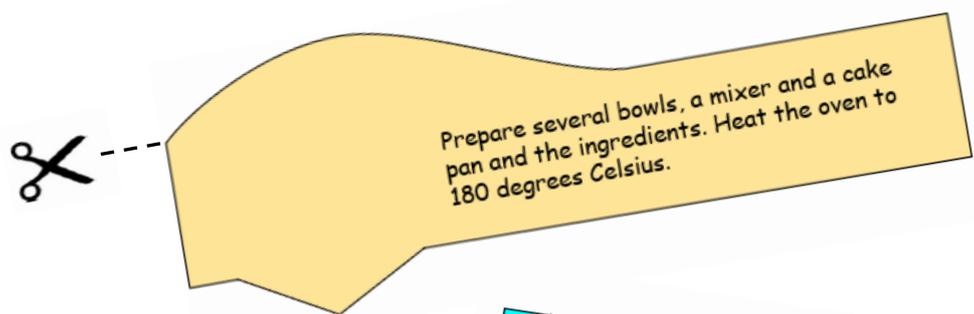
A computer can only work correctly if it gets commands in the right order.

Can you help the baking robot?

Cut out the commands and bring them in the right order!



Created by freepik; www.freepik.com



Mix flour and baking powder.

Flip the cake pan over to get the cake out of the pan and sprinkle some sugar on the cake.

Mix butter, sugar and vanilla sugar with the mixer until it is foamy.

Fill the dough into the cake pan.

Coat the cake pan with oil and pour flour on it to avoid the cake from sticking to the pan after baking.

Put the cake out of the oven and let it cool down. Caution, hot!

Mix the eggs to the butter-sugar-mixture.

Bake the cake for approximately 60 minutes in the oven.

That was fun?

Learn more about the language of computers on the websites <https://code.org> or <https://scratch.mit.edu>. You can also start your first programming attempts!

D. Word search

Can you discover all the hidden words in our word search this time?

PROGRAM

WORKING MEMORY

COMPUTER

CALCULATING MACHINE

GRAPHIC CARD

BINARY CODE

PROCESSOR

LANGUAGE

BUGS

HARD DRIVE

ROBOT

LAPTOP

Circle each word. Good luck!

M	J	C	L	G	M	Z	G	N	K	U	W	W	F	L	Q	U	U	T	Y
L	A	H	A	R	D	D	R	I	V	E	G	D	O	L	A	W	C	R	B
D	W	I	N	L	P	I	R	E	E	C	Y	H	H	Z	U	A	K	B	U
R	W	B	G	D	C	R	O	W	A	P	Q	O	C	A	B	H	B	N	G
B	B	R	U	I	S	U	O	K	R	N	Q	B	O	H	T	X	S	A	S
W	B	Q	A	F	H	R	L	C	P	O	Z	Y	M	C	I	R	C	Z	T
Q	O	S	G	F	L	B	G	A	E	Z	B	A	P	T	I	T	U	H	R
D	E	U	E	I	A	B	X	X	T	S	K	O	U	A	G	V	Q	P	Y
N	Y	Y	D	C	P	Y	A	N	E	I	S	R	T	Z	R	Q	M	Q	B
O	N	D	G	G	T	W	D	A	H	P	N	O	E	Y	A	B	I	F	I
D	Z	H	P	R	O	G	R	A	M	Q	S	G	R	P	P	J	T	F	N
A	C	U	F	T	P	G	D	N	I	A	V	L	M	J	H	Z	P	I	A
E	O	B	J	S	D	S	X	T	R	A	U	E	M	A	I	X	C	O	R
S	G	U	C	R	T	J	R	X	Y	E	M	Q	J	D	C	S	L	E	Y
O	A	N	F	B	I	P	Y	L	I	V	I	G	K	W	C	H	W	P	C
K	N	W	N	O	X	C	I	Z	O	W	Q	A	A	A	A	R	I	J	O
O	X	T	U	A	K	G	K	T	W	X	S	Y	E	D	R	I	T	N	D
E	N	Y	I	X	O	P	Z	D	T	V	D	E	E	H	D	D	L	F	E
X	V	L	A	F	N	O	X	L	U	N	U	W	Y	L	X	U	D	K	N
B	W	O	R	K	I	N	G	M	E	M	O	R	Y	W	O	W	B	I	S

E. Color the pictures! Afterwards, you can cut them out. To put them upright, fold the lower part of the picture to the back. Have fun!

