

10 Binary Numbers

Binary numbers are a way to express numbers, letters, characters like exclamation marks, commas etc., using only 1s and 0s. They are used A LOT in computing.

YOUR CHALLENGE: Can you work out what the binary number is for each letter of the alphabet? A step by step guide to help you is on the next page.

	16	8	4	2	1		16	8	4	2	1		16	8	4	2	1
A=1	0	0	0	0	1	J=10	0	1	0	1	0	S=19	1	0	0	1	1
B=2						K=11						T=20					
C=3						L=12						U=21					
D=4						M=13						V=22					
E=5						N=14						W=23					
F=6						O=15						X=24					
G=7						P=16						Y=25					
H=8						Q=17						Z=26					
I=9						R=18											

You now need to use your binary numbers to work out what Professor Yulia Timofeeva, Head of the Department of Computer Science at the university, said about computer science. That computer science ...

10011	01000	00001	10000	00101	10011
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 the _____

00110	10101	10100	10101	10010	00101
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 of _____

10100	00101	00011	01000	01110	01111	01100	01111	00111	11001
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 , _____

01001	01110	00100	10101	10011	10100	10010	11001
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 and _____

10011	01111	00011	01001	00101	10100	11001
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Khalil works in the Department of Computer Science and his research focuses on computer security, artificial intelligence (AI), and computer science education.

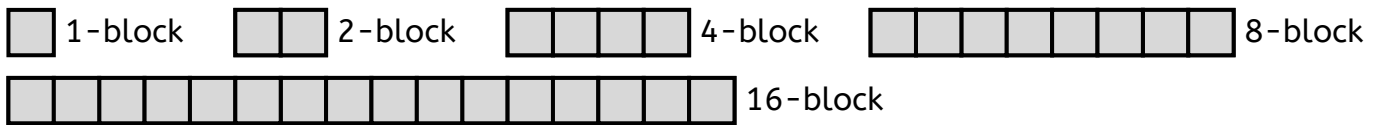
By understanding more about this topic Khalil can help develop more secure computer systems and improve the education of future UK and worldwide computer scientists.



How to Work Out Binary Numbers



Imagine you have some building blocks (you know the ones we mean!). You have a set of five, made up of the blocks shown below. You only have one of each, and these are the ONLY ones you are allowed to use.



As an example, let's work out the binary number for the letter J.

J is the 10th letter of the alphabet, so we want to work out a binary number that represents 10. Let's picture J in the same way as our blocks above, a set of squares grouped together, so for J we need 10 (it's the 10th letter). Let's call this J-block.



To work out how to fill it (and find the binary number) we're going to follow a process, a step-by-step guide, in the form of questions. And we always start with the biggest block – the 16-block.

1 Will the 16-block fit in the J-block? → **No** → There's no room for the 16-block in the J-block, so in our binary table we write '0' under 16 →

16	8	4	2	1
0				

2 Will the 8-block fit in the J-block? → **Yes** → The 8-block will fit in the J-block, so this time we write '1' under 8 in the binary table. →

16	8	4	2	1
0	1			

Because it fits, the 8-block now stays in the J-block!



3 Will the 4-block fit in the J-block? → **No** → There's no room for the 4-block, so in the binary table we write '0' under 4 →

16	8	4	2	1
0	1	0		

4 Will the 2-block fit in the J-block? → **Yes** → The 2-block will fit in the J-block, so this time we write '1' under 2 in the binary table. →

16	8	4	2	1
0	1	0	1	

Because it fits, the 2-block now stays in the J-block!



5 Will the 1-block fit in the J-block? → **No** → There's no room for the 1-block, so in the binary table we write '0' under 1 →

16	8	4	2	1
0	1	0	1	0

And now we have our binary number for the letter J - 01010