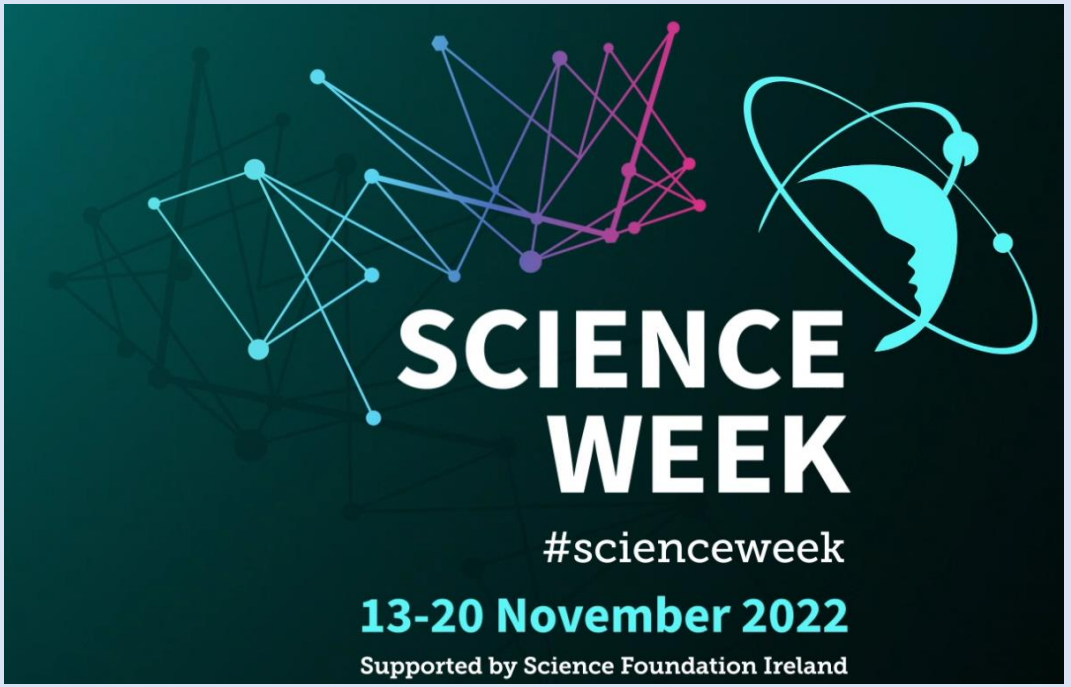
Computational Thinking Tasks for Science Week 2022

PACT team
Department of Computer Science
Maynooth University, Ireland



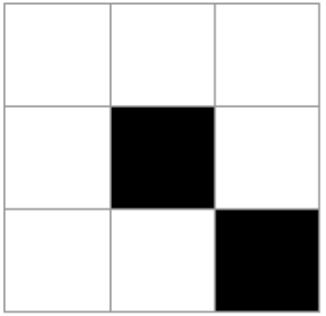
https://pact.cs.nuim.ie

QB code

Beavers want to encode numbers for keeping track of how many trees they have chewed down. Therefore, they developed the Quick Beaver code (QB code). This is a graphical code consisting of nine squares in a 3 × 3 arrangement. Each position means a different value. The squares are ordered row-by-row from bottom to top, and on each row from right to left. The next square has double the value of the square before. In the example, you see the values of the first five squares.

...	...	...
...	16	8
4	2	1

To encode a number, the beavers darken some squares. The number encoded is the sum of the values of the dark squares. For example, the number encoded in this QB code is 17:



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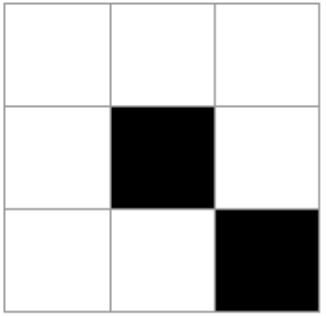

QUESTION

Which QB code encodes the largest number?

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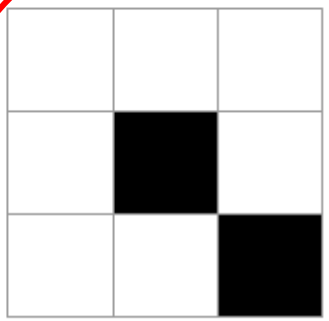

Why is this 17?

QB code

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...	...	...
...	16	8
4	2	1

Why is this 17?
16 + 1 = 17

To encode a number, the beavers darken some squares. The number encoded is the sum of the values of the dark squares. For example, the number encoded in this QB code is 17:

	16	
		1

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...	...	...
?	16	8
4	2	1

What values do the remaining positions have?

To encode a number, the beavers darken some squares. The number encoded is the sum of the values of the dark squares. For example, the number encoded in this QB code is 17:

	16	
		1

QB code

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...	...	?
32	16	8
4	2	1

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?	?	64
32	16	8
4	2	1

What values do the remaining positions have?

To encode a number, the beavers darken some squares. The number encoded is the sum of the values of the dark squares. For example, the number encoded in this QB code is 17:

	16	
		1

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256	128	64
32	16	8
4	2	1

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	16	
		1

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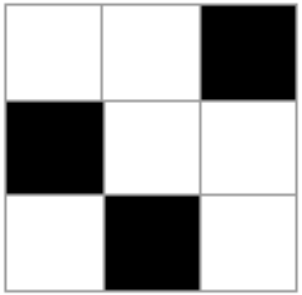
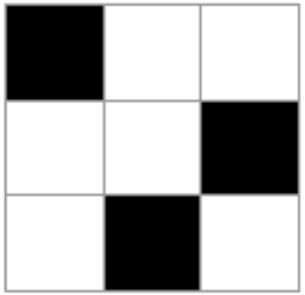
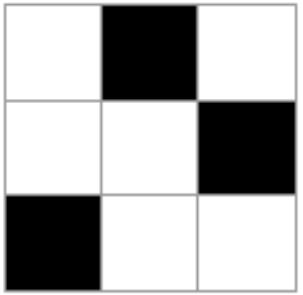


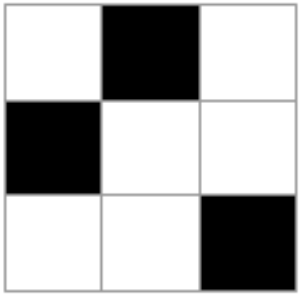
B.



C.



D.



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256	**128**	**64**
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What position has the largest value?

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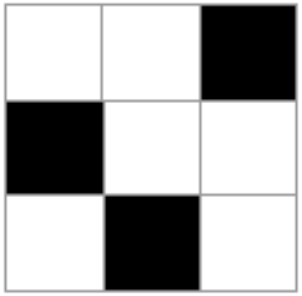
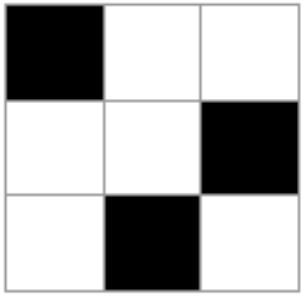


B.



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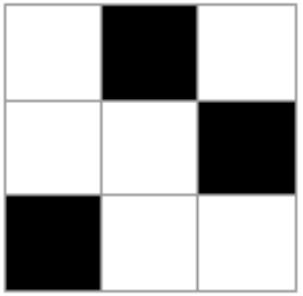
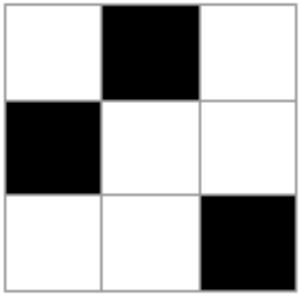


D.



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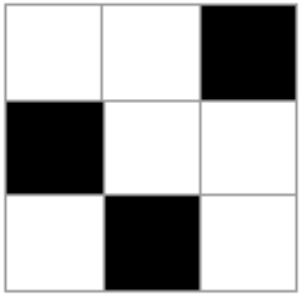

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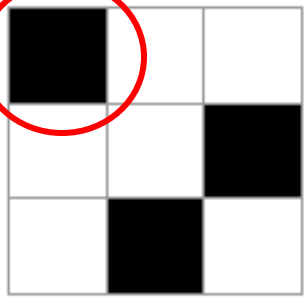

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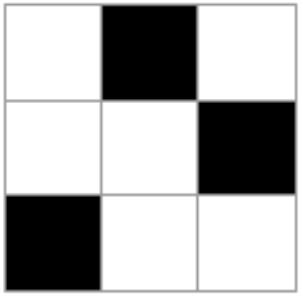

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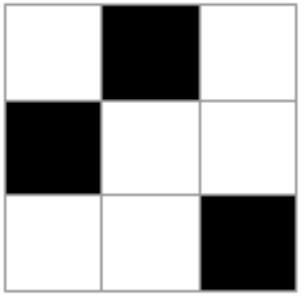

256	**128**	**64**
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Is B the correct answer or could another one be larger?

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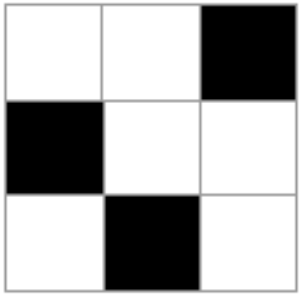

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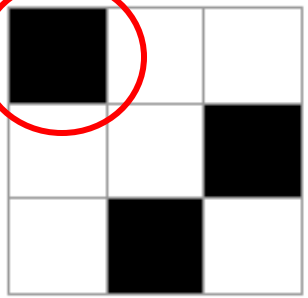

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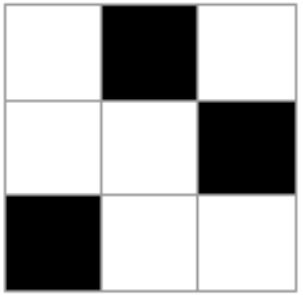

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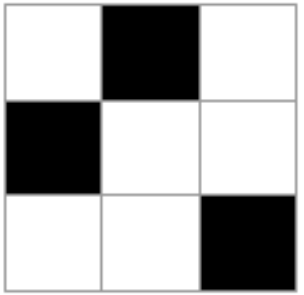

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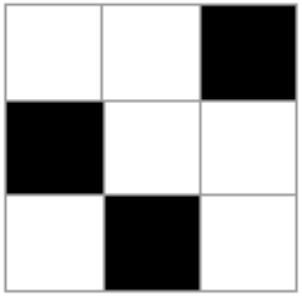

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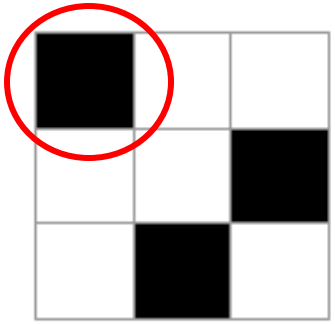

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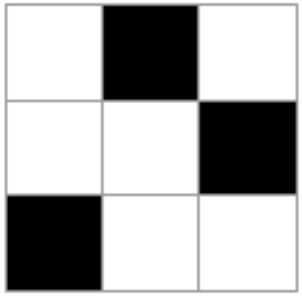

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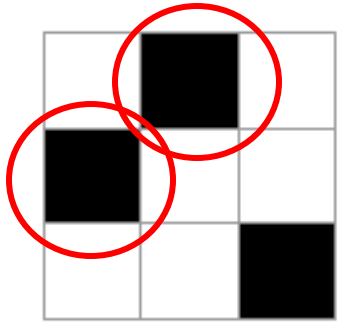

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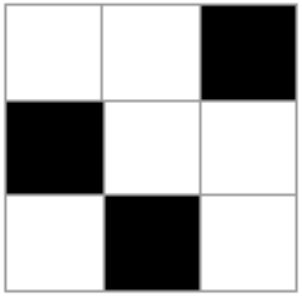

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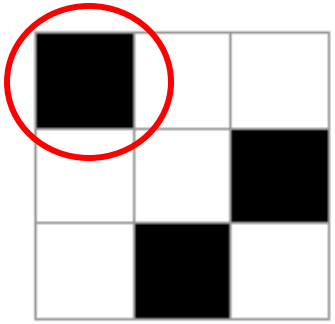

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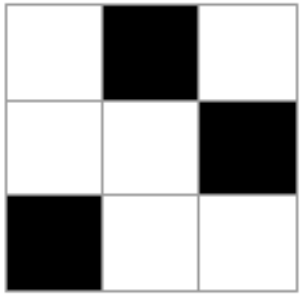

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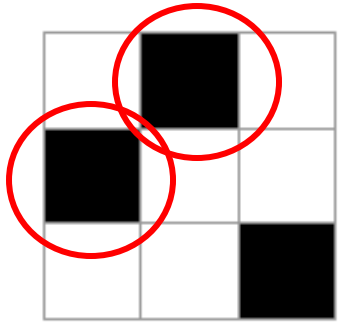

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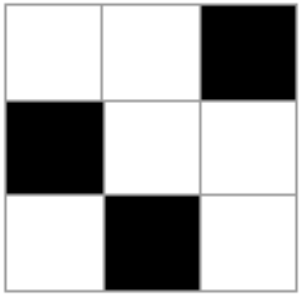

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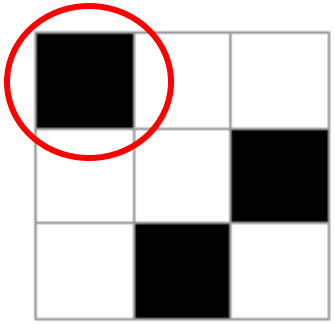
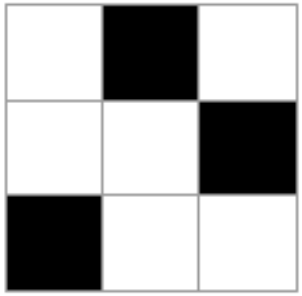


256 + 8 + 2 = 266

C.



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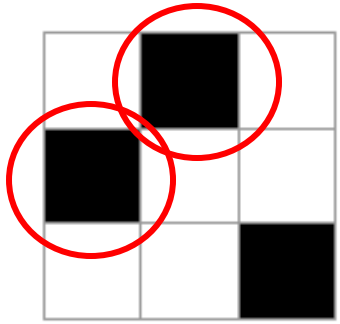

128 + 32 + 1 = 151

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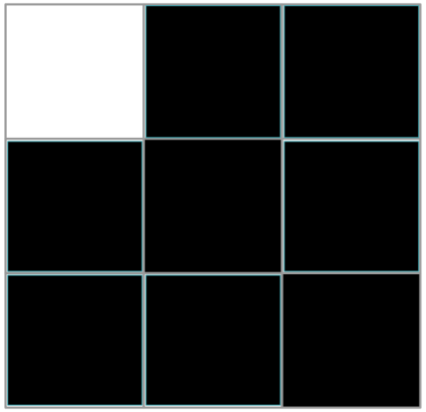
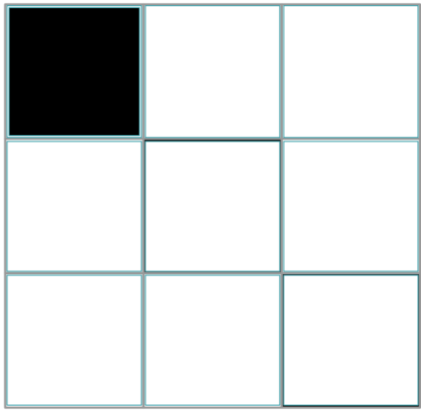
Which of these two is larger?

256	128	64
32	16	8
4	2	1





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Which of these two is larger?

256	**128**	**64**
32	16	8
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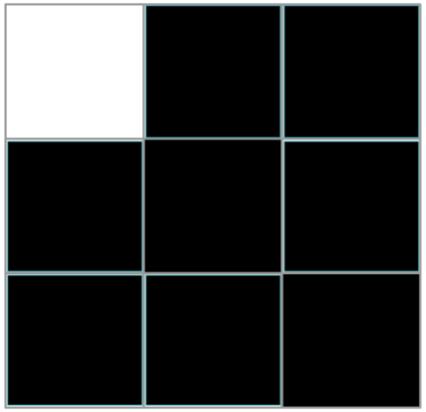

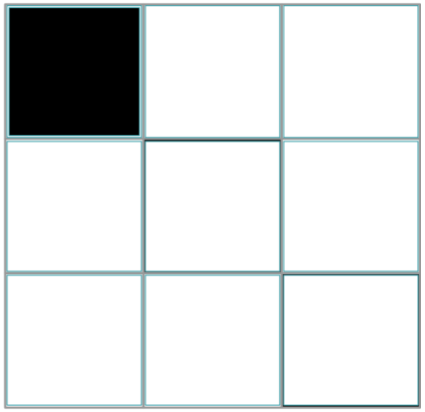

128 + 64 + 32 + 16 + 8 + 4 + 2 + 1 = 255

256

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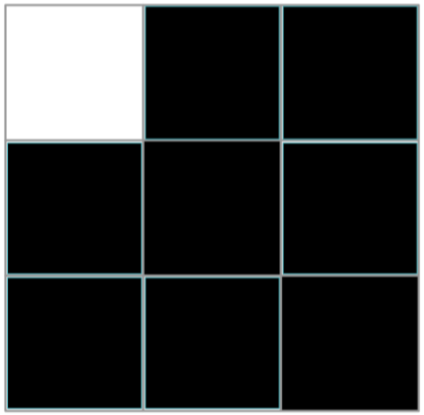
Analogy to Binary code



256	128	64
32	16	8
4	2	1

0	1	1	1	1	1	1	1	1

0 + 128 + 64 + 32 + 16 + 8 + 4 + 2 + 1 = 255

1	0	0	0	0	0	0	0	0

256 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 = 256

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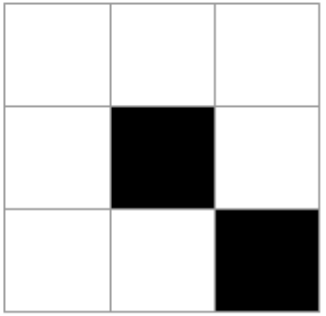

QUESTION

Which QB code encodes the largest number?

This task is an example of computational thinking topic **representation**.

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Questions / comments / discussion

See our website for more computational thinking tasks:

https://pact.cs.nuim.ie

Email: pact@mu.ie

To sign up for the Bebras Challenge
(taking place 7-25th November 2022):

https://bebras.techweek.ie

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