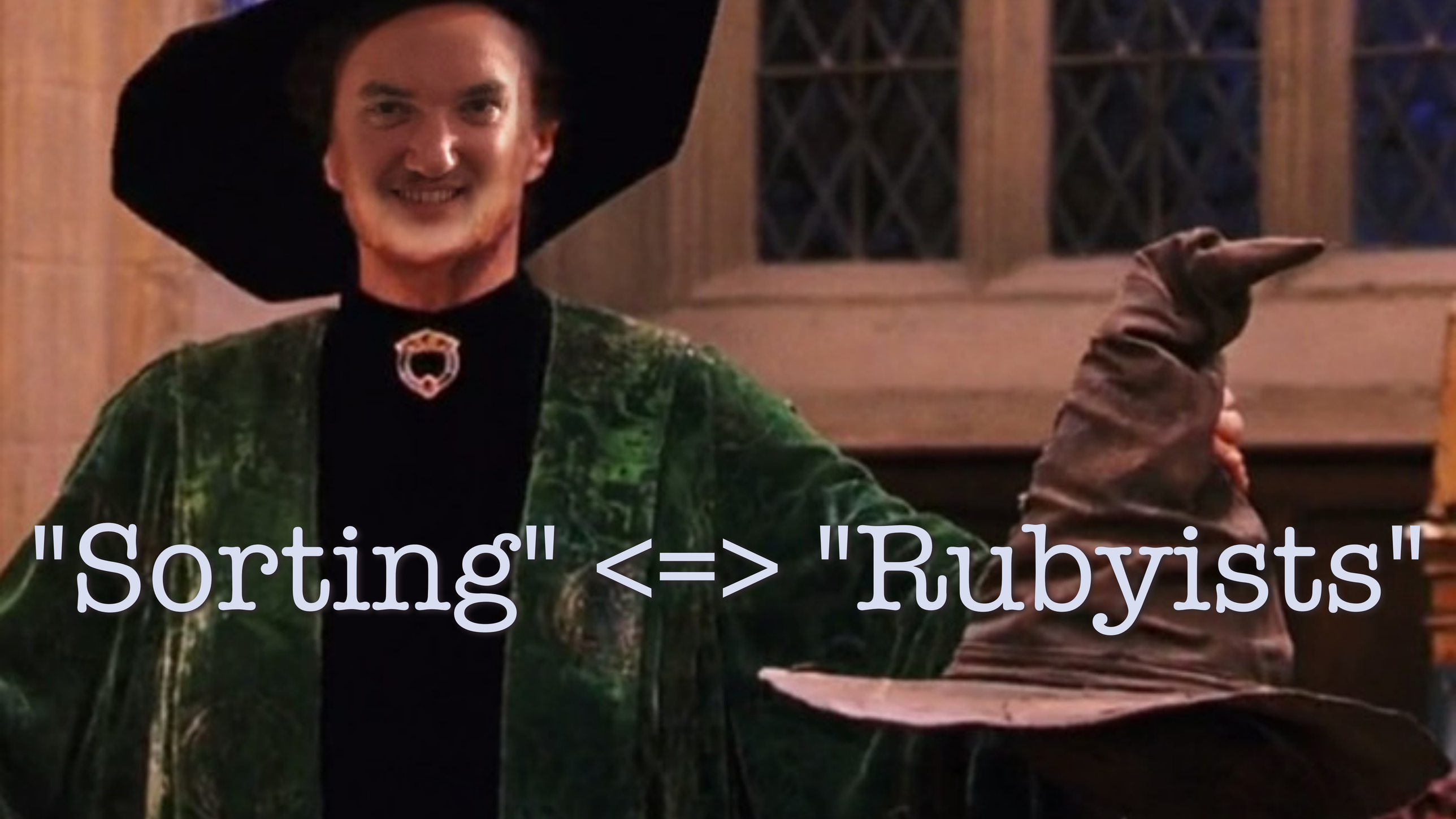
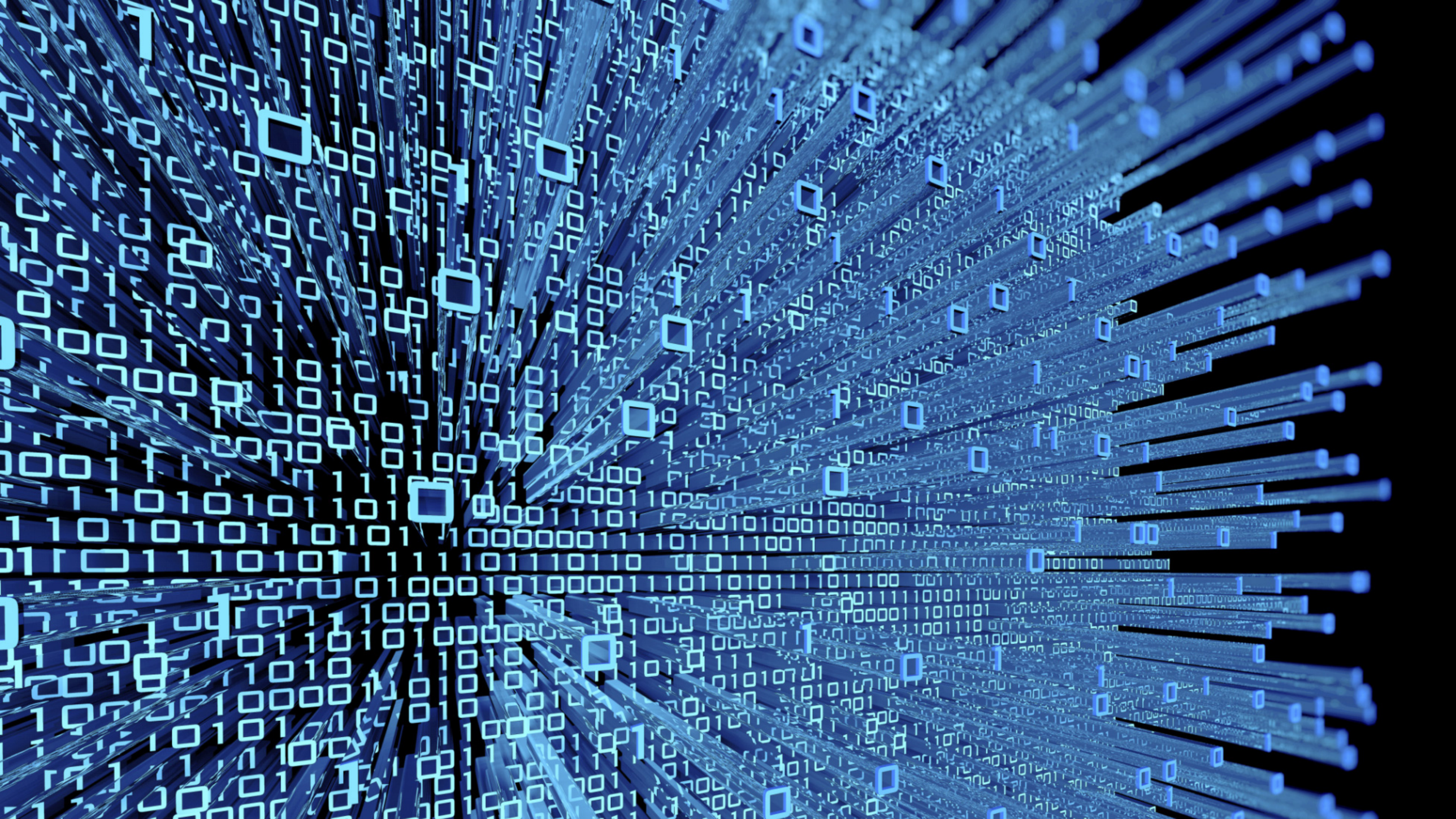
THE GOBBLING GLUTTONS

ONCE UPON A TIME, WALDO EMBARKED UPON A FANTASTIC JOURNEY. FIRST, AMONG A THRONG OF GOBBLING GLUTTONS, HE MET WIZARD WHITEBEARD, WHO COMMANDED HIM TO FIND A SCROLL AND THEN TO FIND ANOTHER AT EVERY STAGE OF HIS JOURNEY. FOR WHEN HE HAD FOUND 12 SCROLLS, HE WOULD UNDERSTAND THE TRUTH ABOUT HIMSELF.

IN EVERY PICTURE FIND WALDO, WOOF (BUT ALL YOU CAN SEE IS HIS TAIL), WENDA, WIZARD WHITEBEARD, ODLAW, AND THE SCROLL. THEN FIND WALDO'S KEY, WOOF'S BONE (IN THIS SCENE IT'S THE BONE THAT'S NEAREST TO HIS TAIL), WENDA'S CAMERA, AND ODLAW'S BINOCULARS.

THERE ARE ALSO 25 WALDO-WATCHERS, EACH OF WHOM APPEARS ONLY ONCE SOMEWHERE IN THE FOLLOWING 12 PICTURES. AND ONE MORE THING! CAN YOU FIND ANOTHER CHARACTER, NOT SHOWN BELOW, WHO APPEARS ONCE IN EVERY PICTURE EXCEPT THE LAST?


"Sorting" <=> "Rubyists"



```
/*
 *  call-seq:
 *     ary.sort!                    -> ary
 *     ary.sort! { |a, b| block }  -> ary
 *
 *  Sorts +self+ in place.
 *
 *  Comparisons for the sort will be done using the <code><=></code> operator
 *  or using an optional code block.
 *
 *  The block must implement a comparison between +a+ and +b+ and return
 *  an integer less than 0 when +b+ follows +a+, +0+ when +a+ and +b+
 *  are equivalent, or an integer greater than 0 when +a+ follows +b+.
 *
 *  The result is not guaranteed to be stable.  When the comparison of two
 *  elements returns +0+, the order of the elements is unpredictable.
 *
 *     a = [ "d", "a", "e", "c", "b" ]
 *     a.sort!                    #=> ["a", "b", "c", "d", "e"]
 *     a.sort! { |x,y| y <=> x }  #=> ["e", "d", "c", "b", "a"]
 *
 *  See also Enumerable#sort_by.
 */

VALUE
```

```
/*
 *  call-seq:
 *     ary.sort!                    -> ary
 *     ary.sort! { |a, b| block }  -> ary
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 *  The result is not guaranteed to be stable.  When the comparison of two
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 *     a = [ "d", "a", "e", "c", "b" ]
 *     a.sort!                    #=> ["a", "b", "c", "d", "e"]
 *     a.sort! { |x,y| y <=> x }  #=> ["e", "d", "c", "b", "a"]
 *
 *  See also Enumerable#sort_by.
 */

VALUE
```
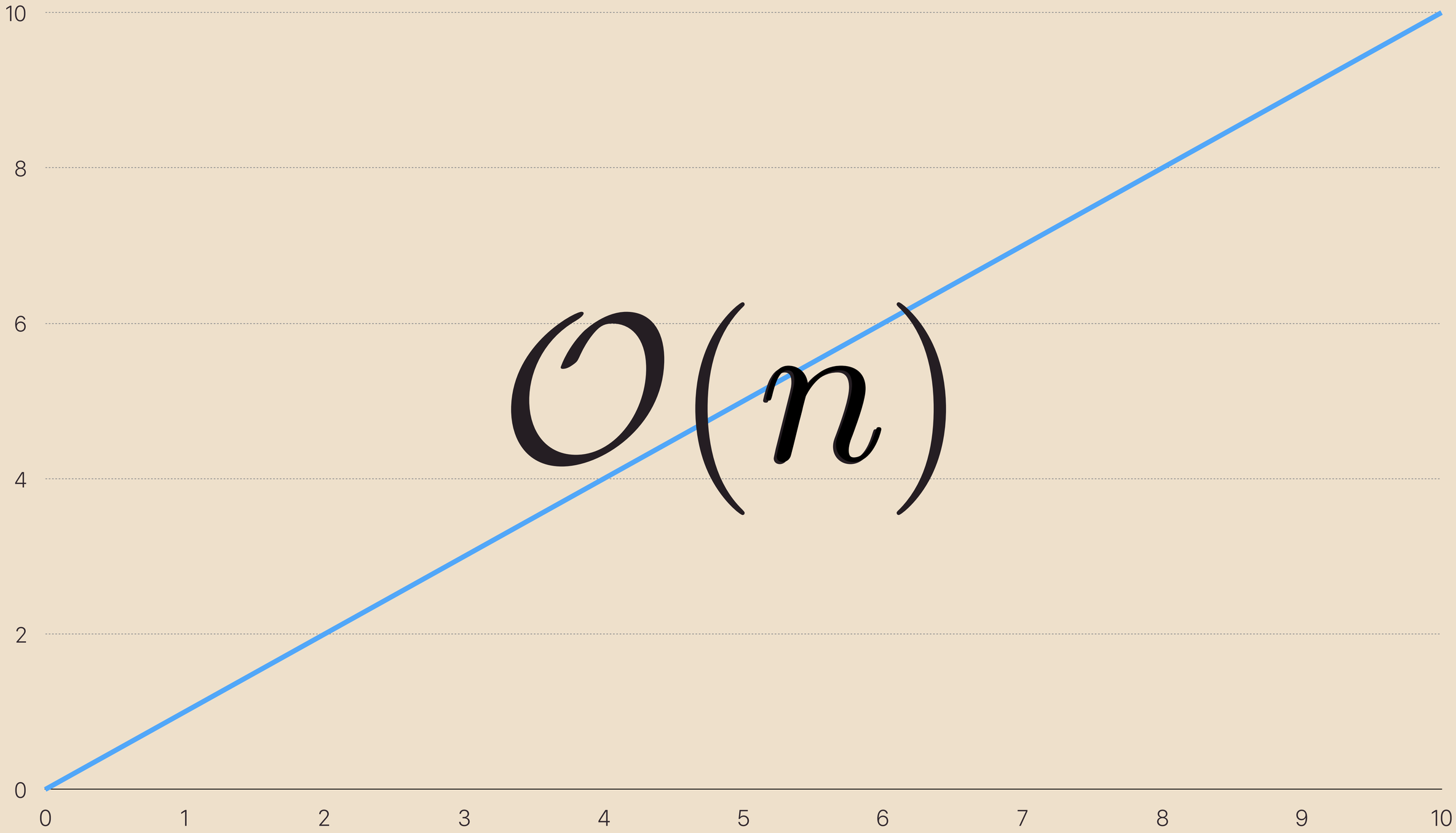
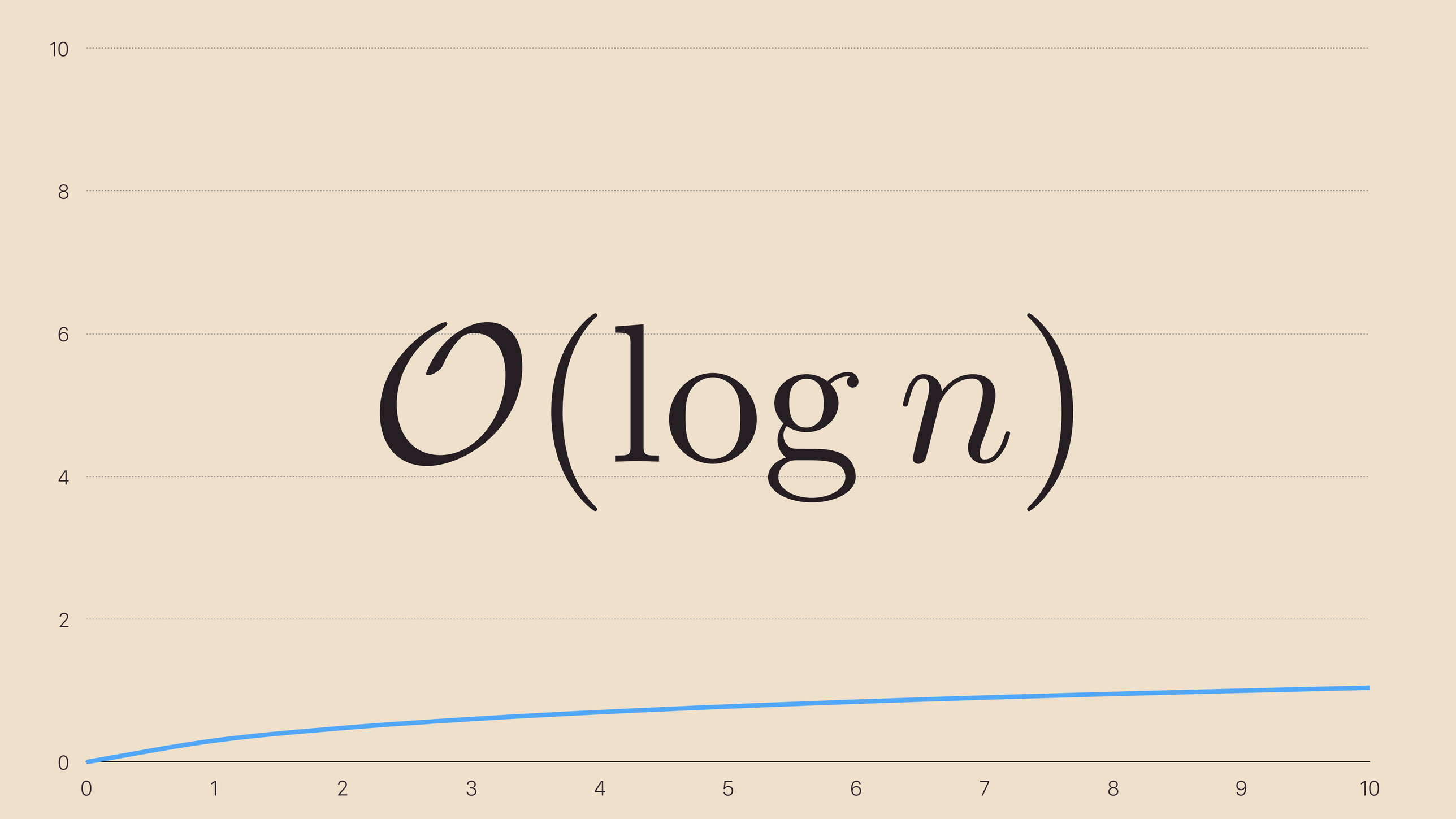
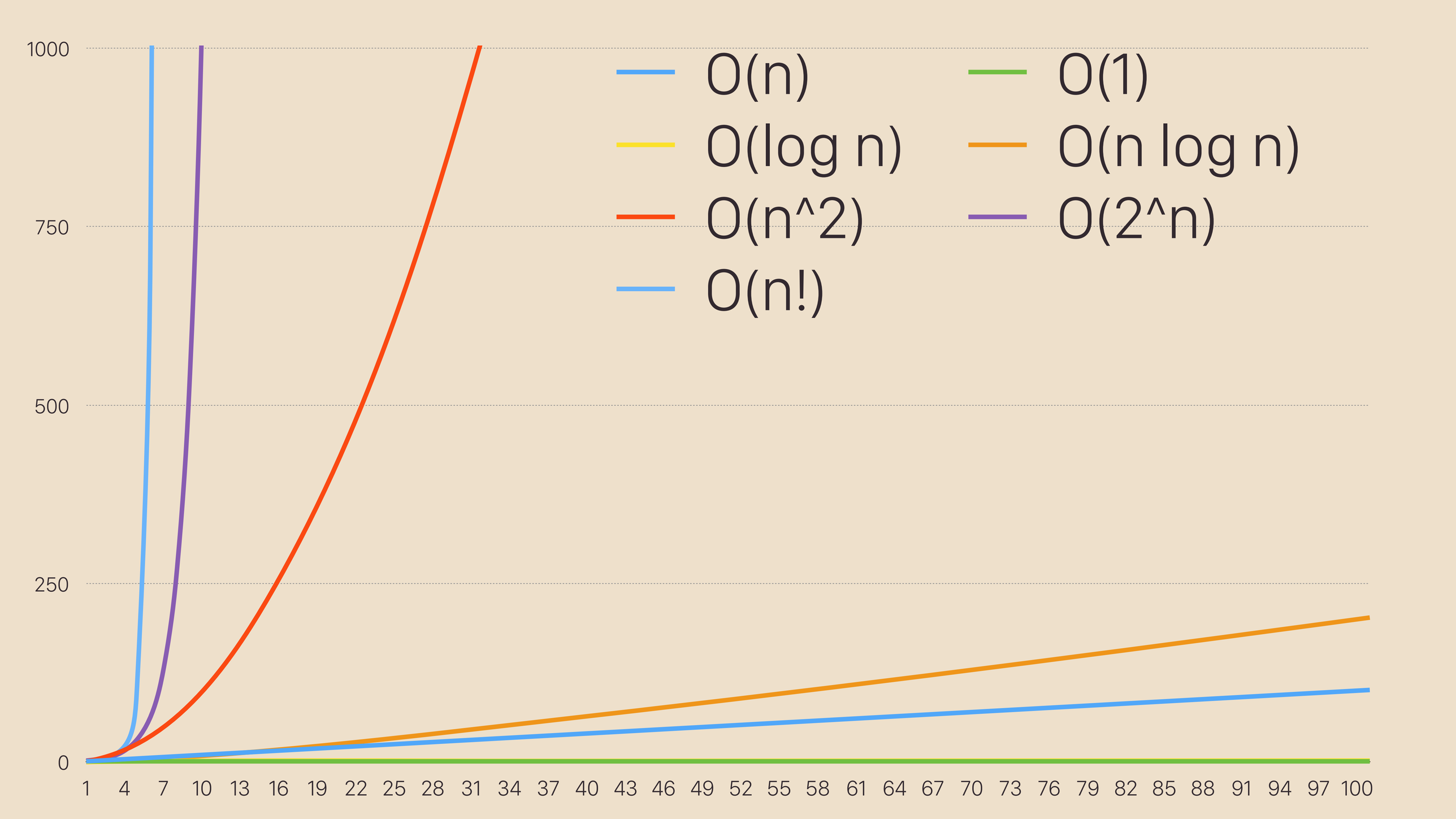

Algorithms

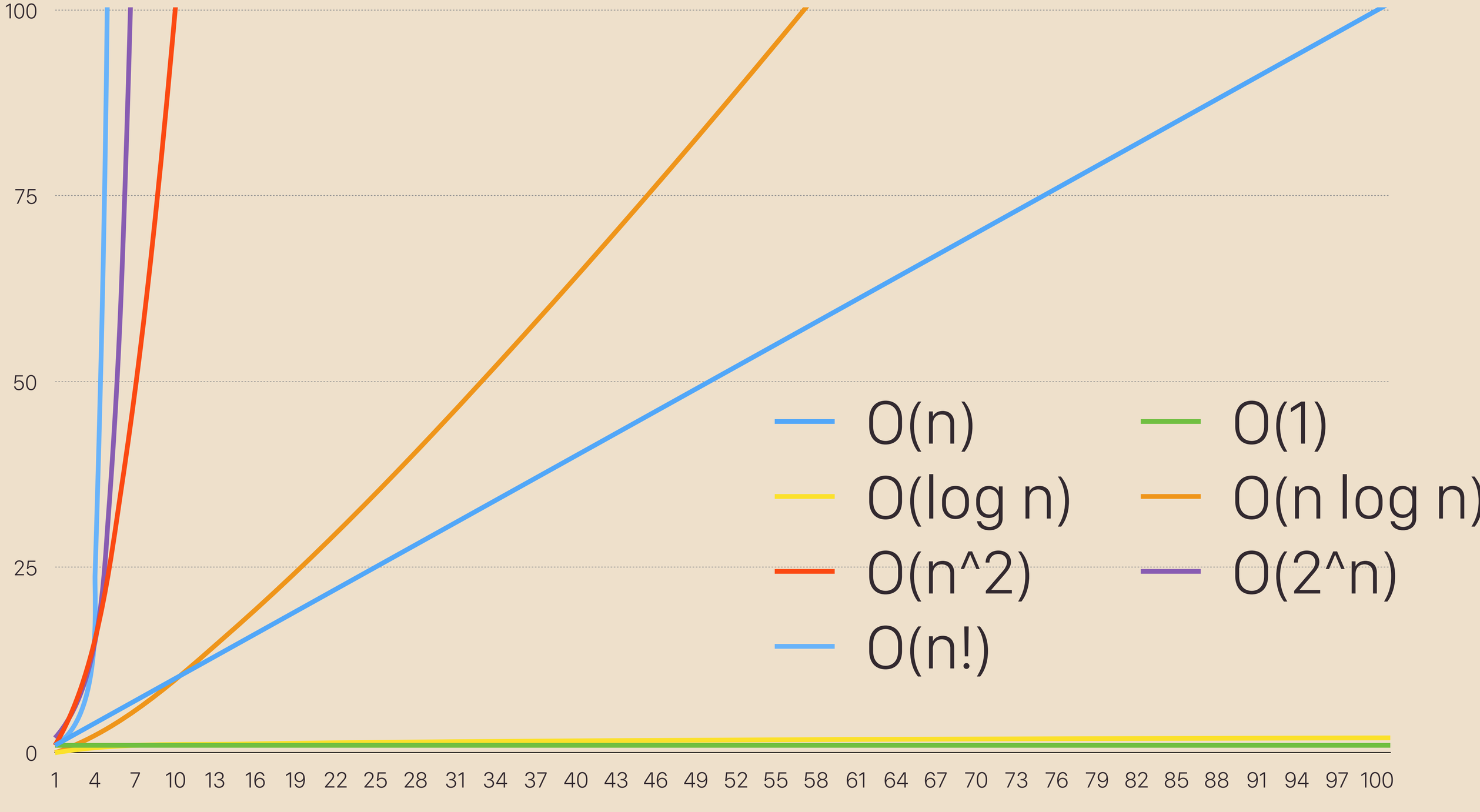
A series of step-by-step instructions

Big O


10
8
6
4
2
0
0
1
2
3
4
5
6
7
8
9
10
$O(n)$


10
8
6
4
2
0
0
1
2
3
4
5
6
7
8
9
10
$\mathcal{O}(\log n)$


1000
750
500
250
0
1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55 58 61 64 67 70 73 76 79 82 85 88 91 94 97 100
O(n)
O(log n)
O(n^2)
O(n!)
O(1)
O(n log n)
O(2^n)


100
75
50
25
0
1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55 58 61 64 67 70 73 76 79 82 85 88 91 94 97 100
O(n)
O(log n)
O(n^2)
O(n!)
O(1)
O(n log n)
O(2^n)

When do you update a user record?

When do you update a user record?

$$\mathcal{O}(n \log n)$$

If you understood everything

If you understood
everything

I'm really $\mathcal{O}(n)$ it today

How do you debug an app?

How do you debug an app?

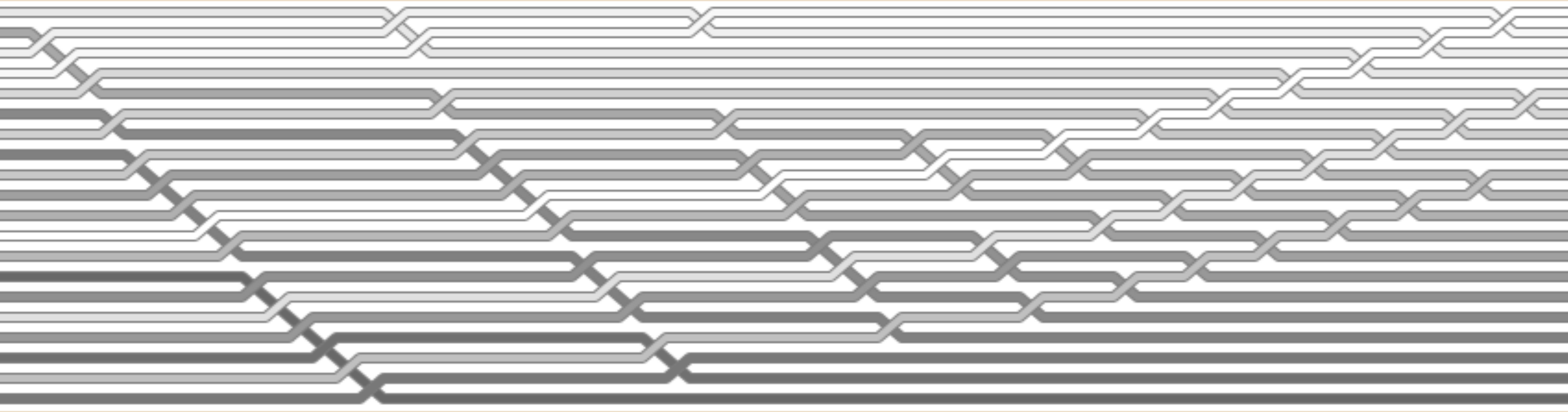
Start $\mathcal{O}(\log n)$

What happens when you buy something?

What happens when you buy something?

You $\mathcal{O}(n)$ it

Big Ω



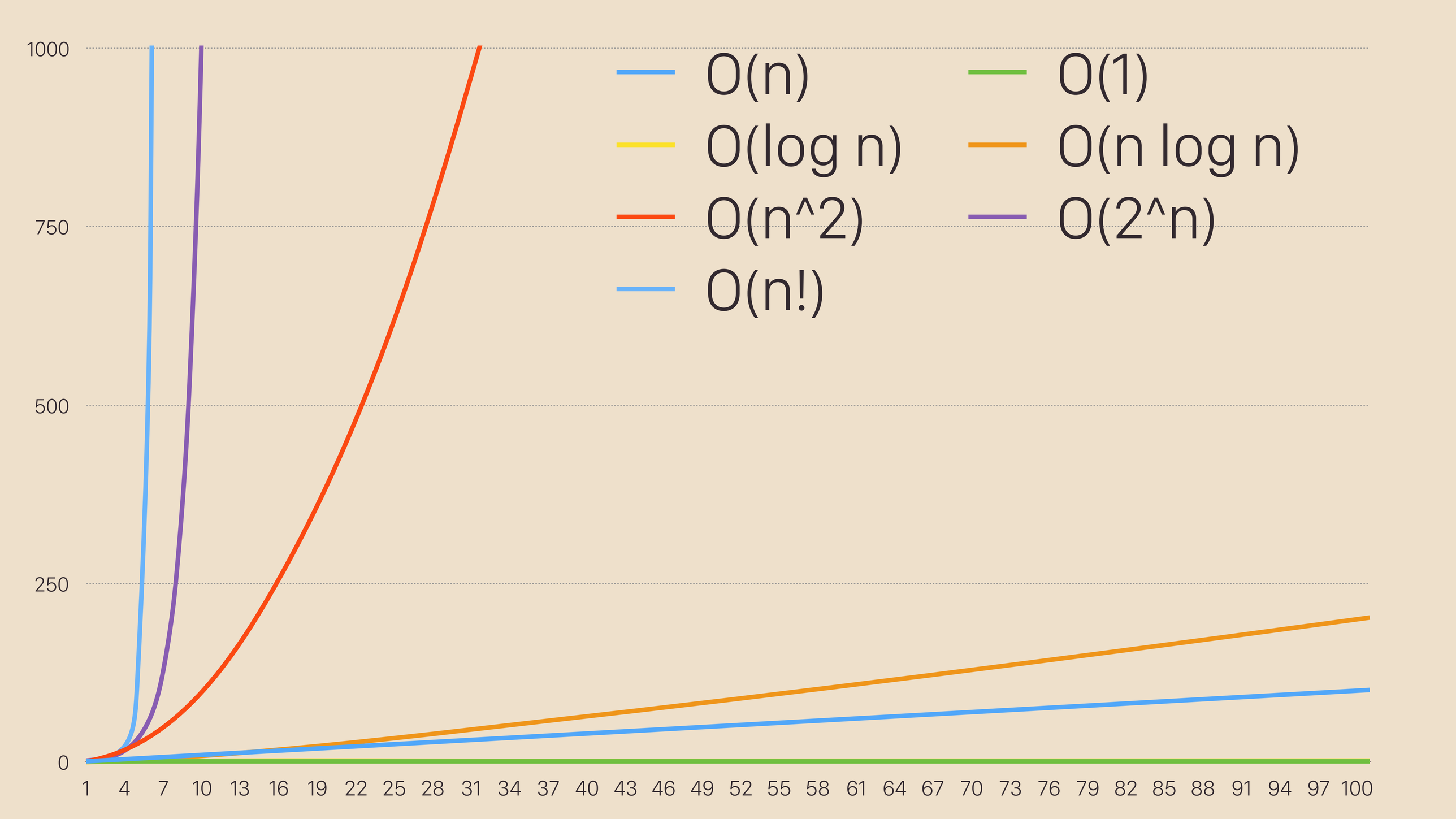
Bubble Sort

$$O(n^2)$$

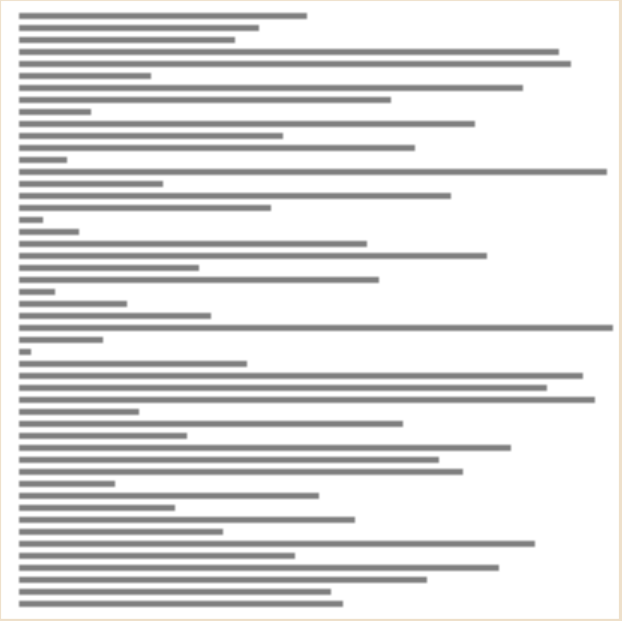
$$\mathcal{O}(\texttt{set.length}^2)$$

$$O(n^2)$$

$$\Omega(n)$$

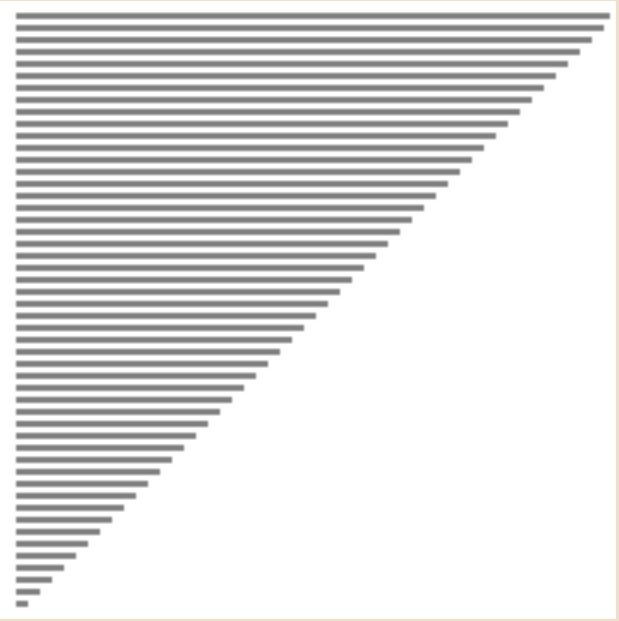

1000
750
500
250
0
1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55 58 61 64 67 70 73 76 79 82 85 88 91 94 97 100
O(n)
O(log n)
O(n^2)
O(n!)
O(1)
O(n log n)
O(2^n)

Random



Nearly Sorted

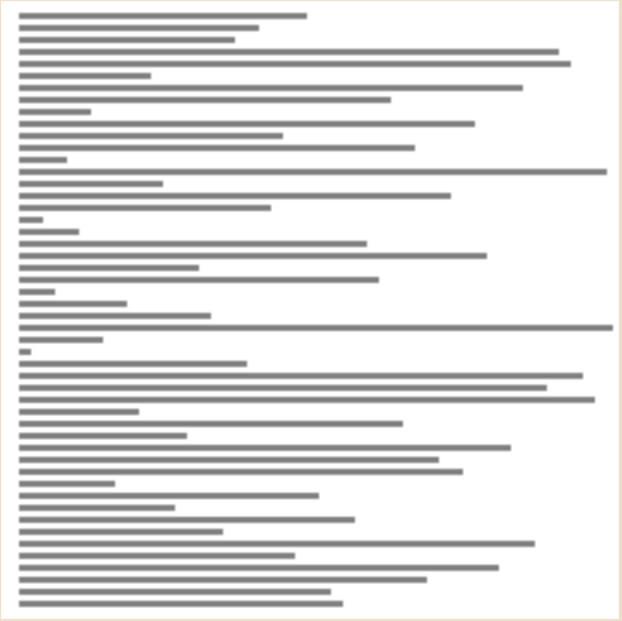
Reversed



Few Unique

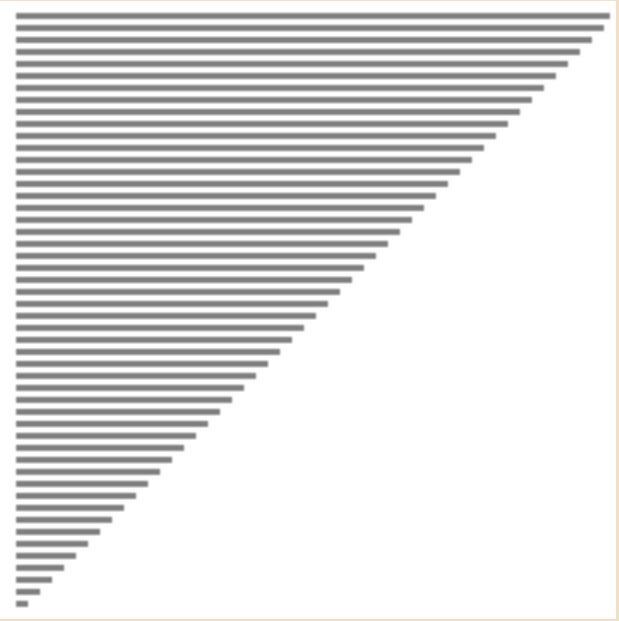
https://www.toptal.com/developers/sorting-algorithms/bubble-sort

Random



Nearly Sorted

Reversed



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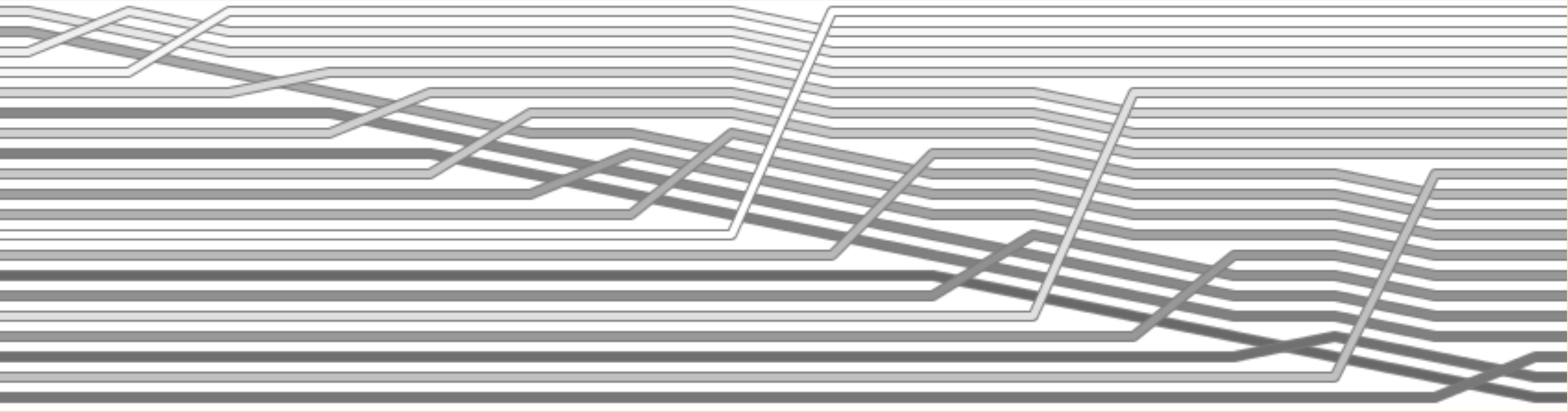
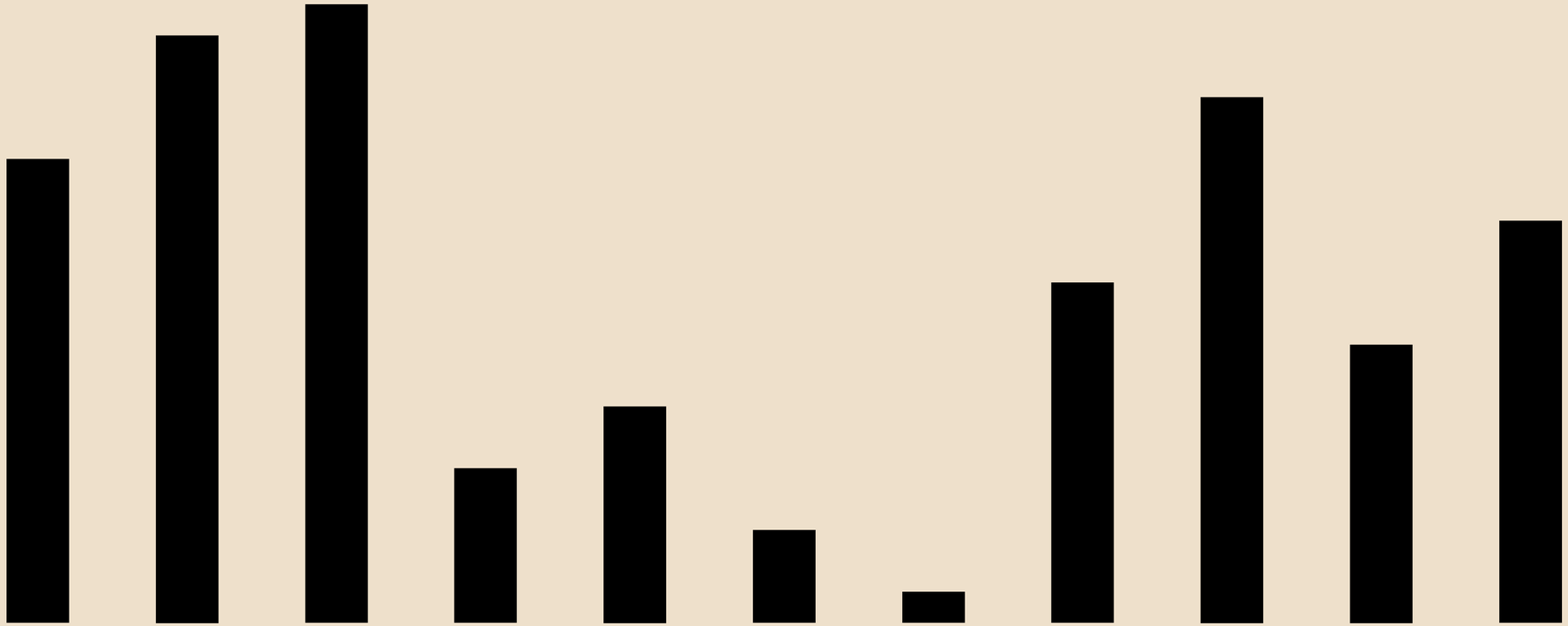
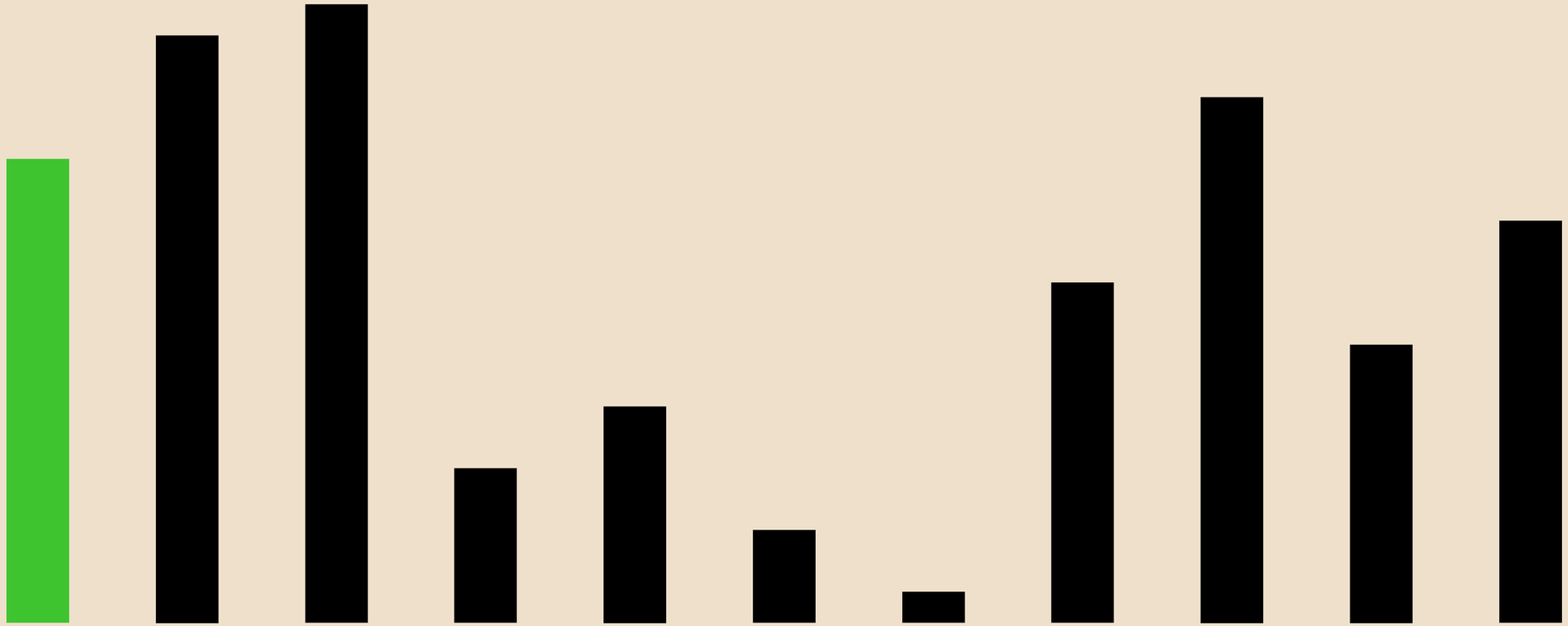
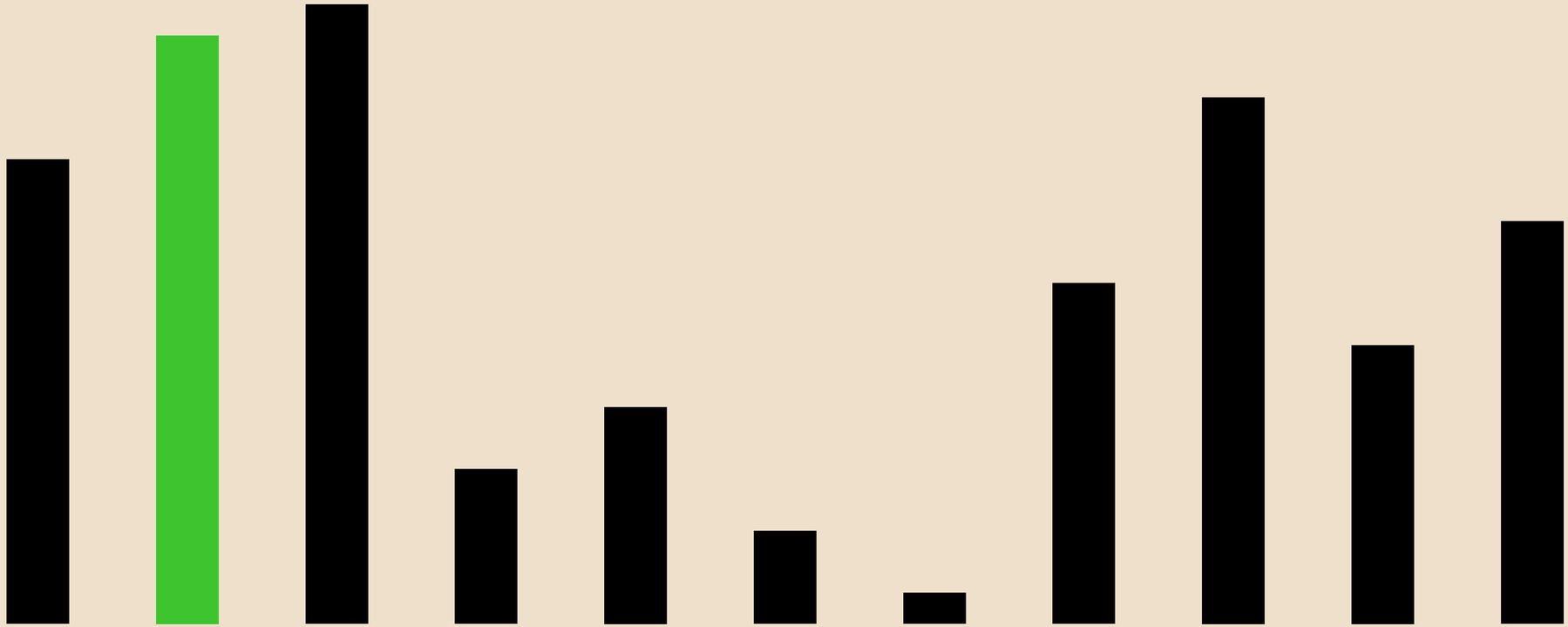
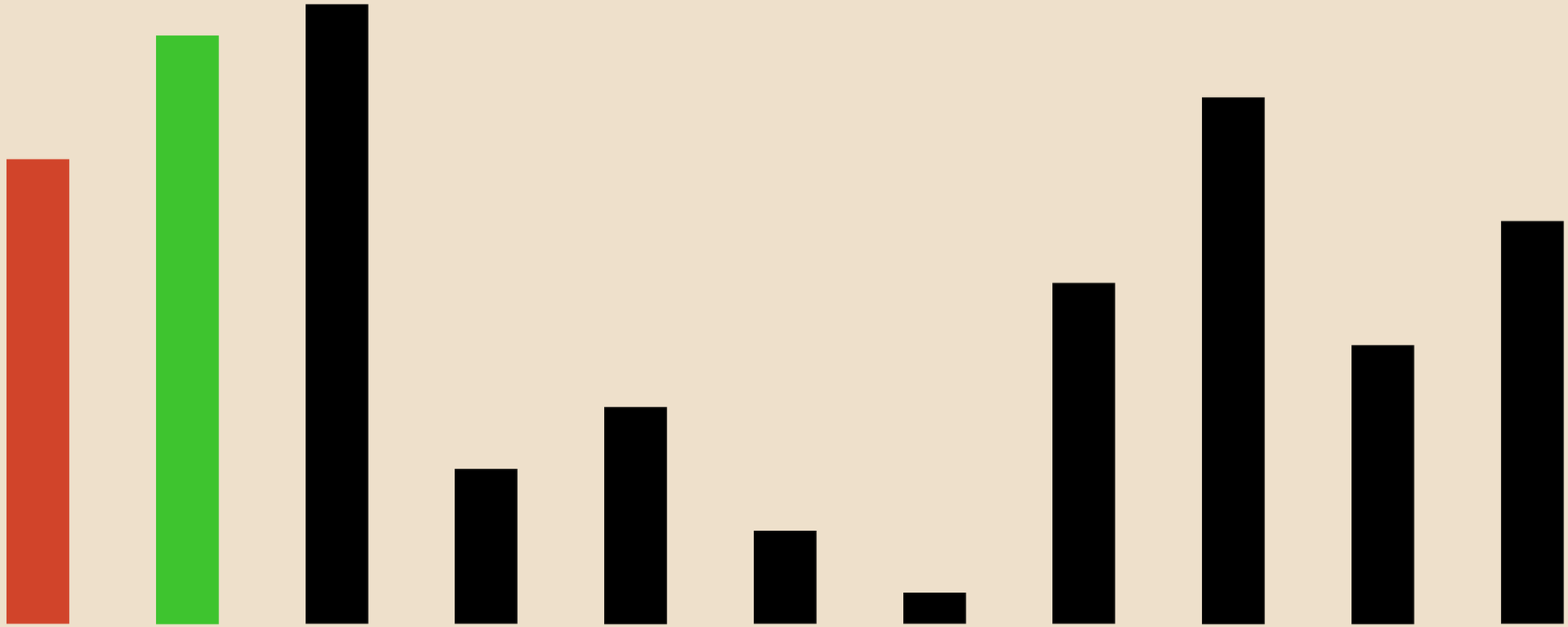


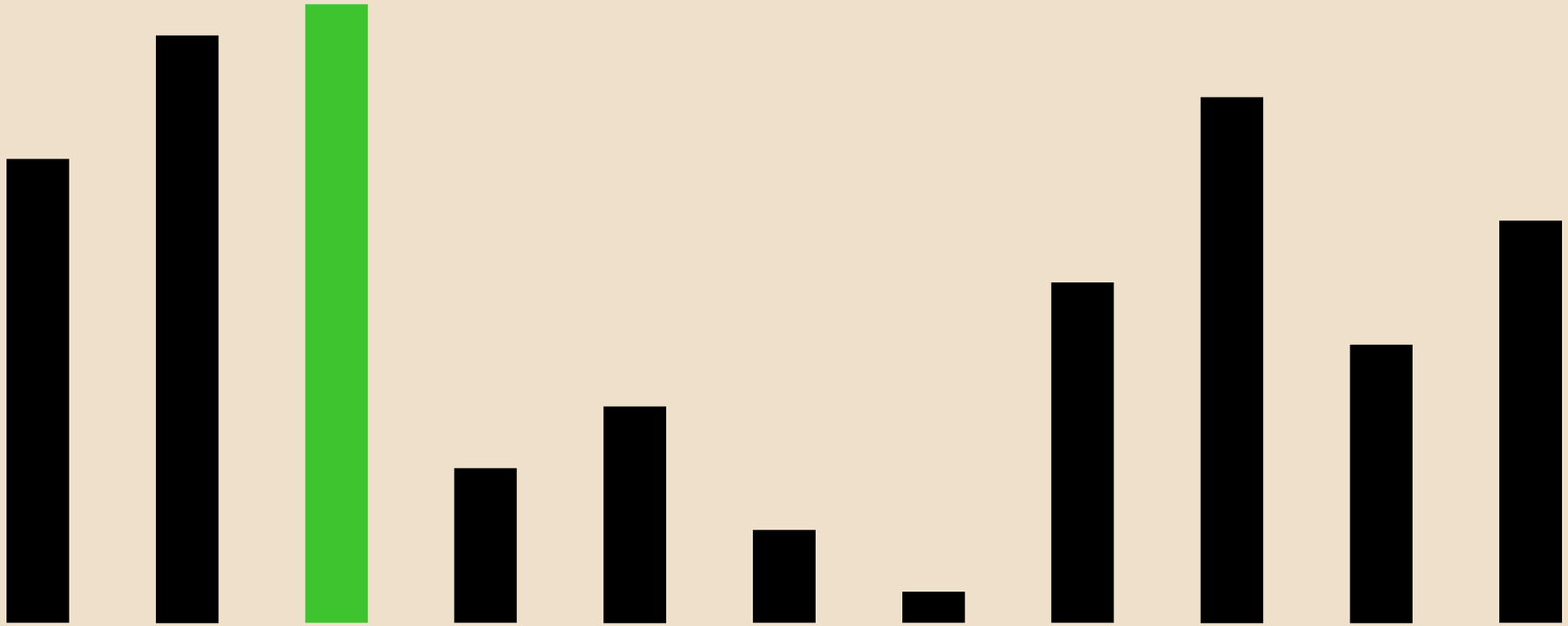
Insertion Sort

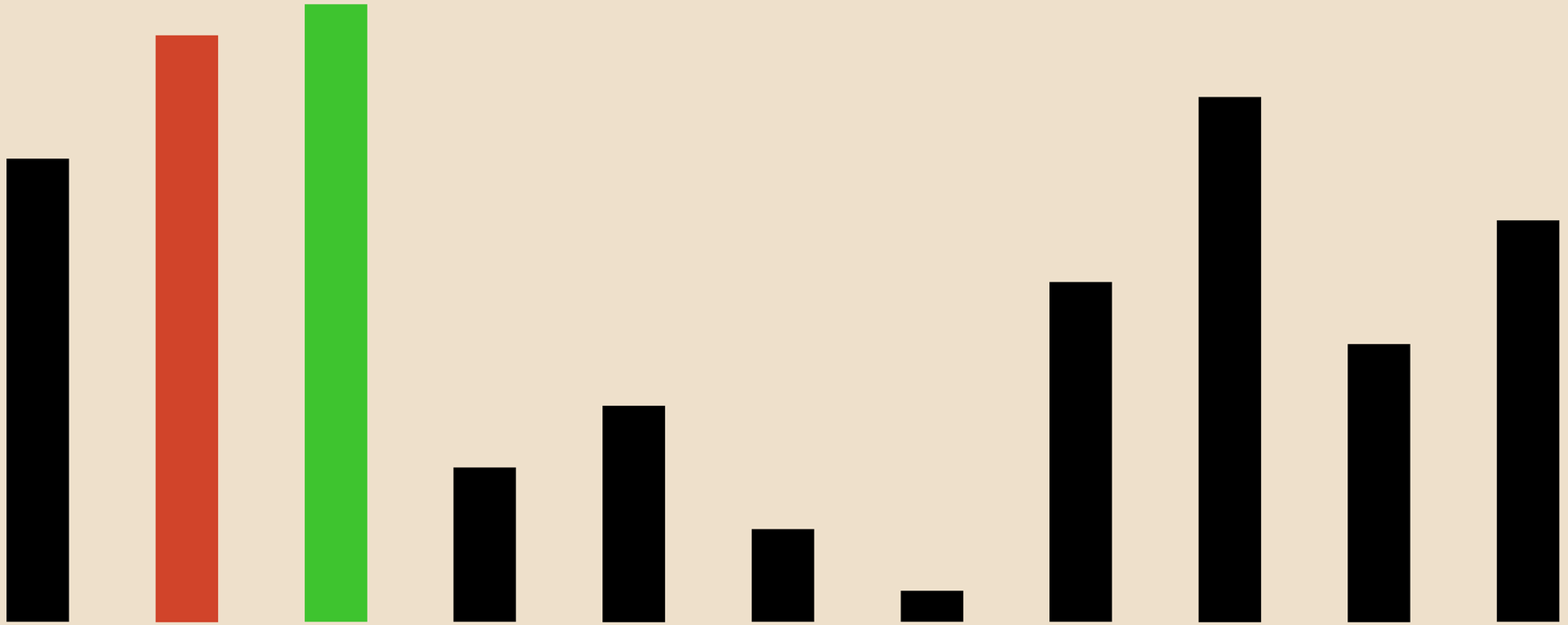


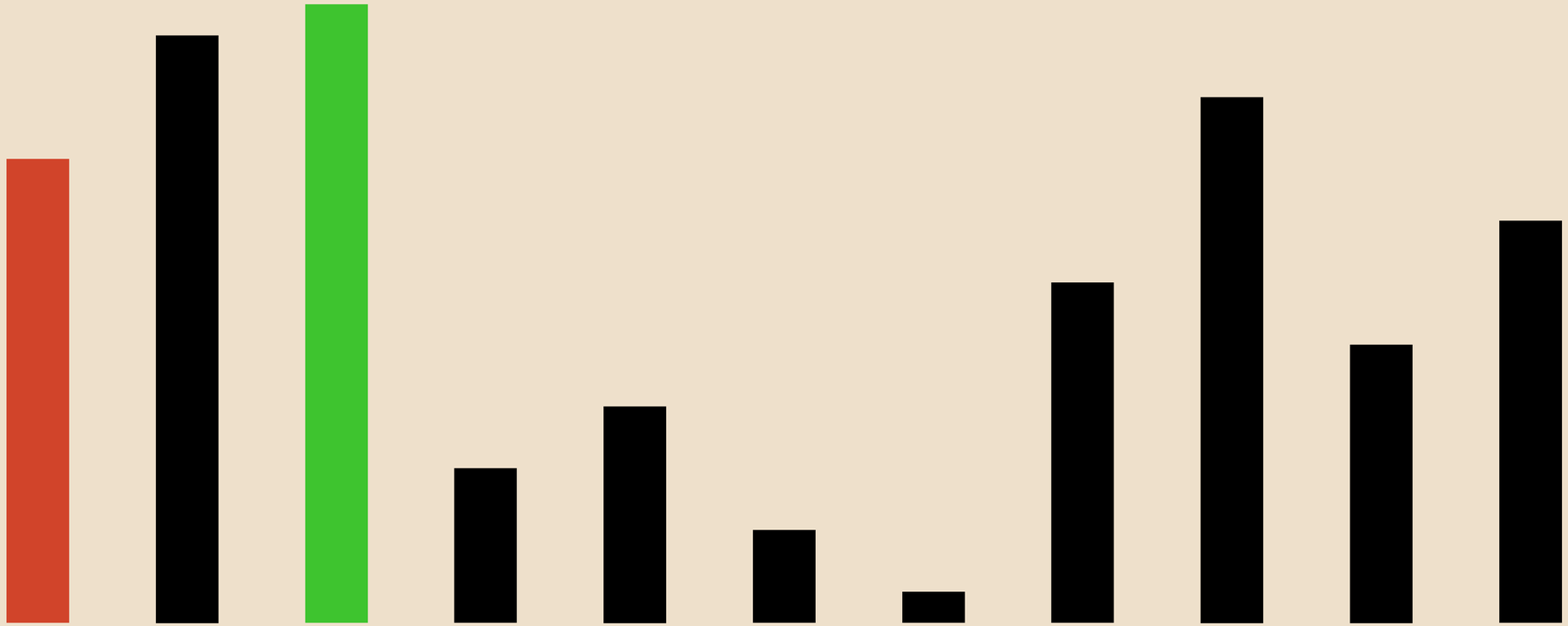


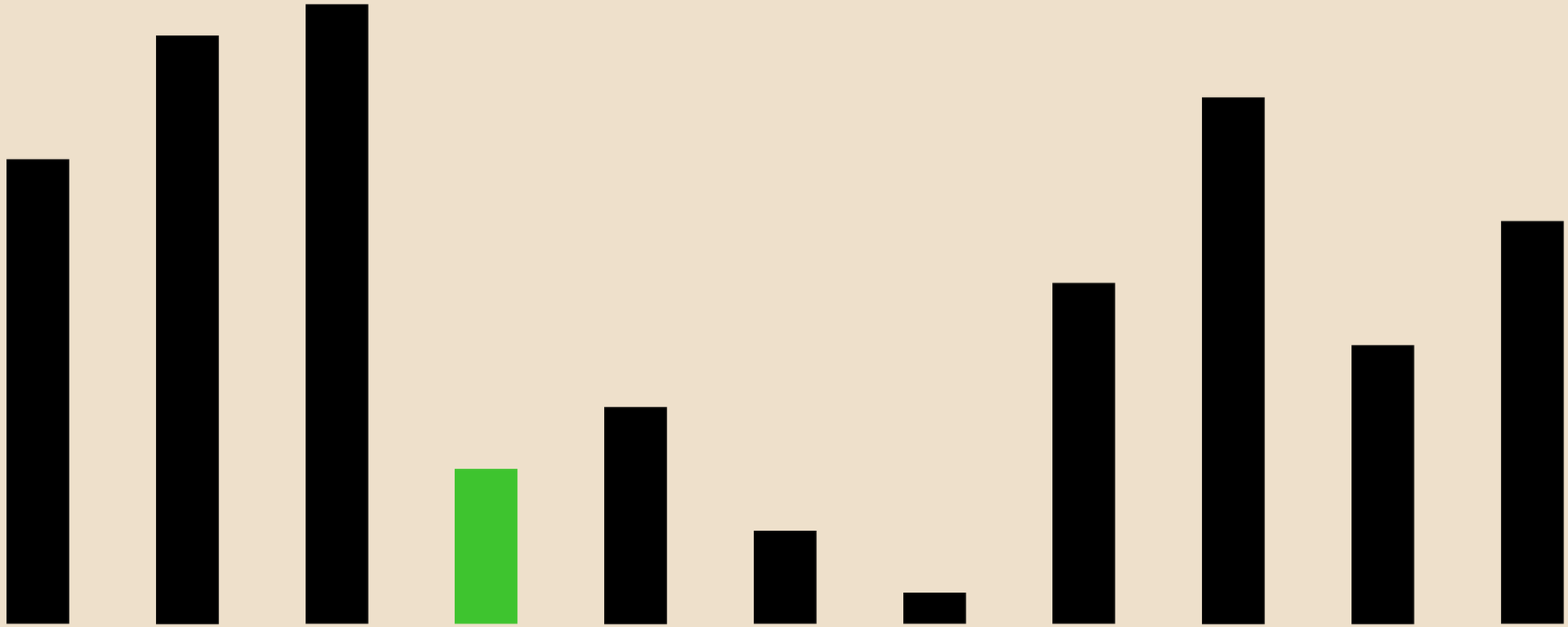


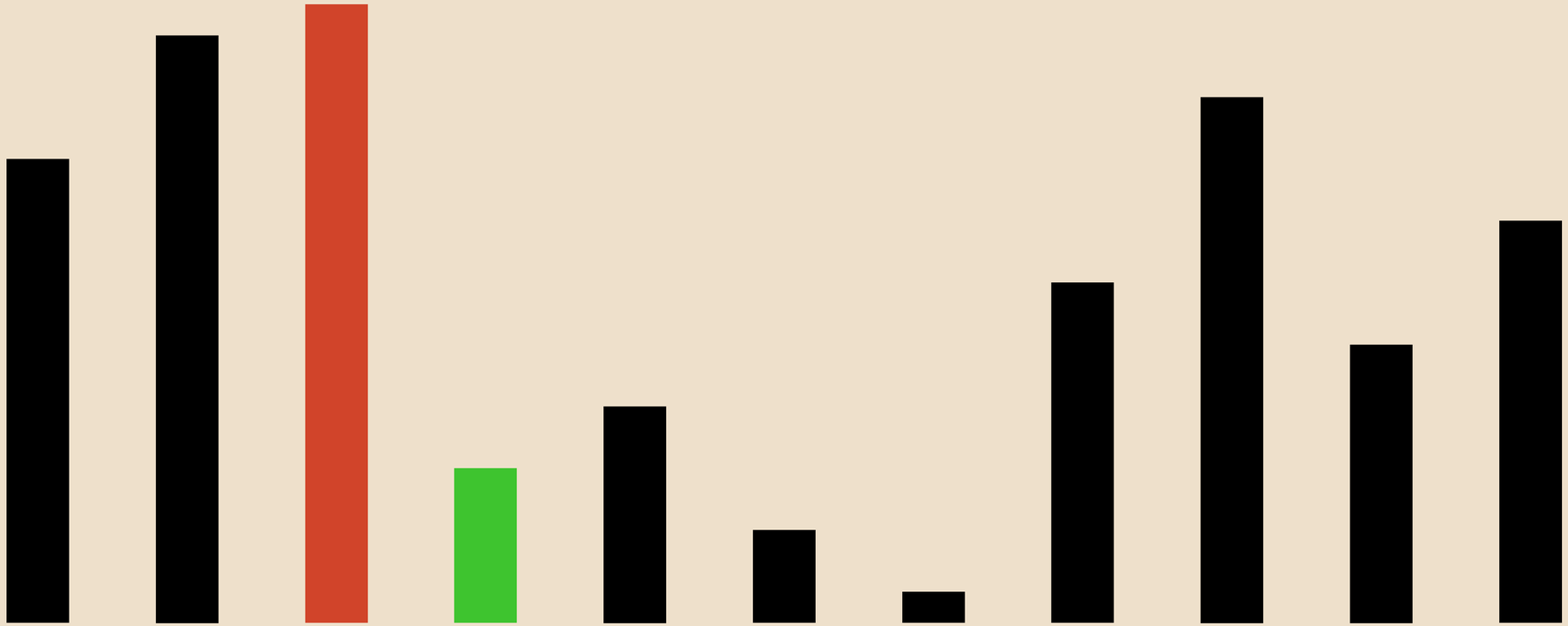


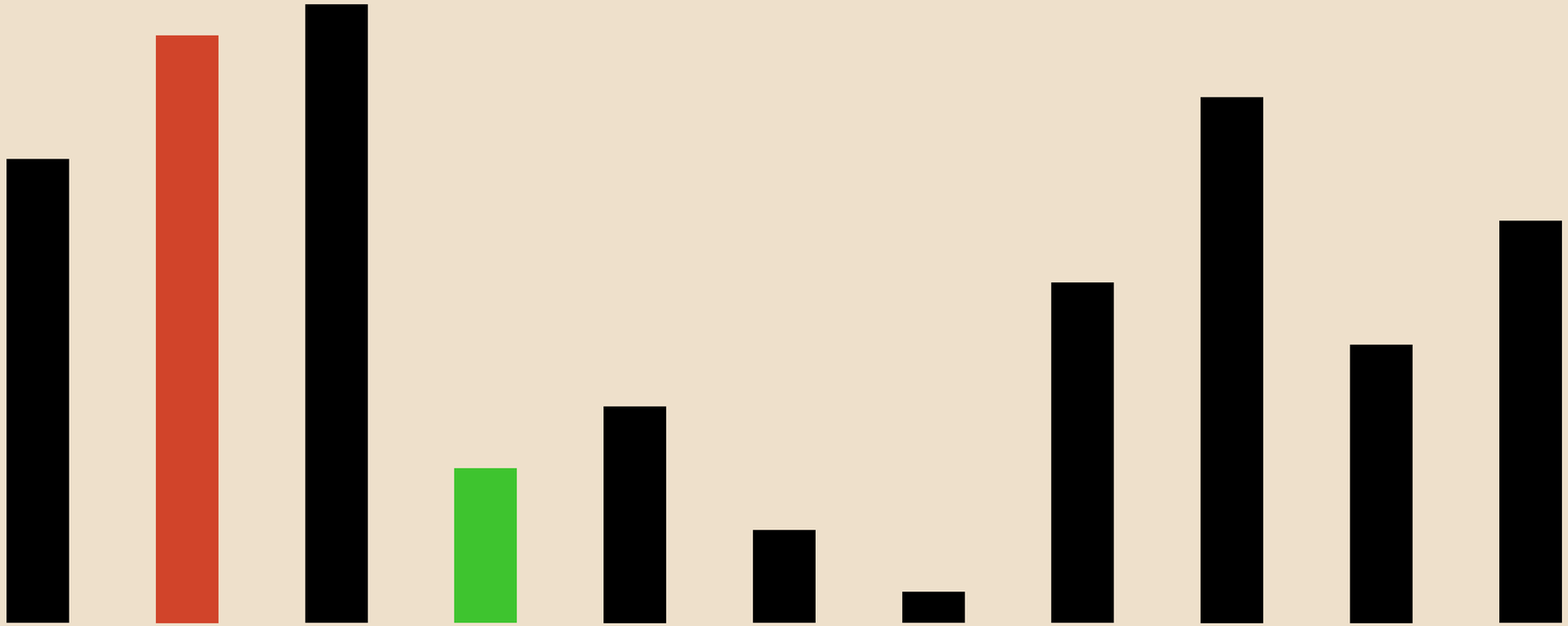


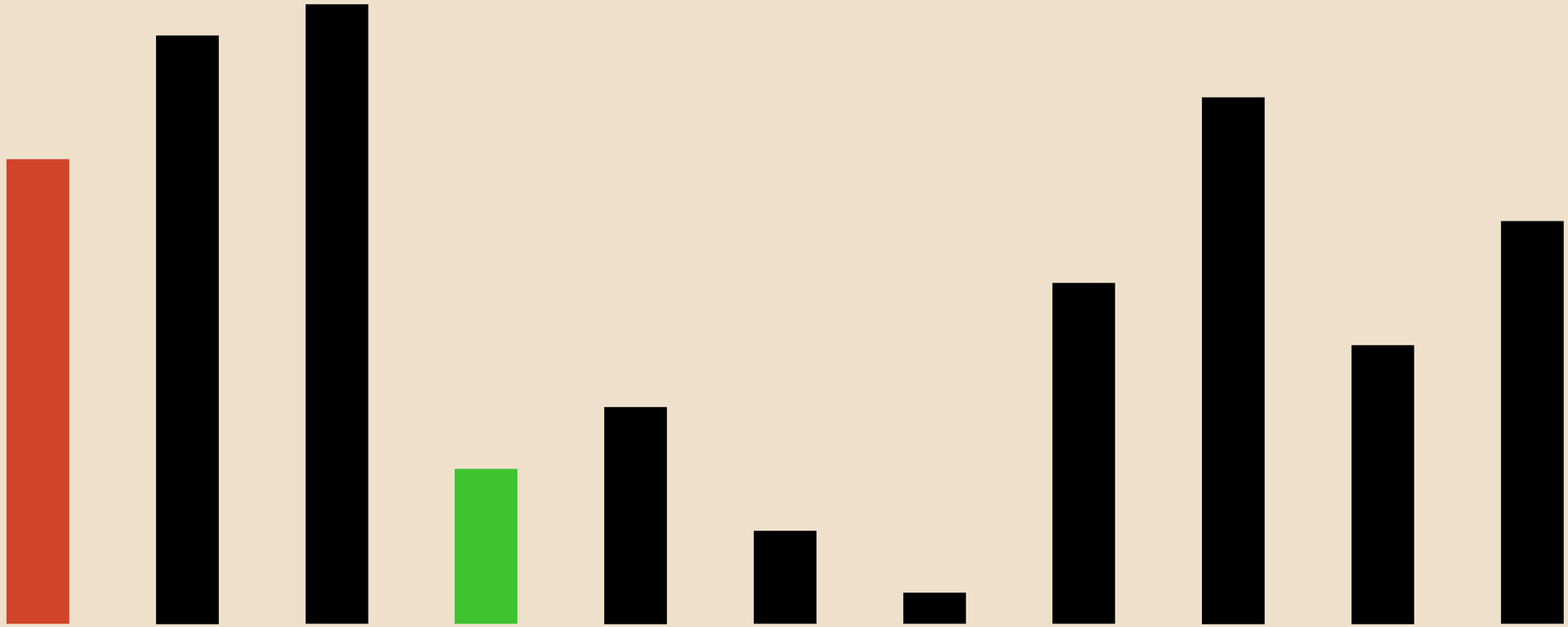


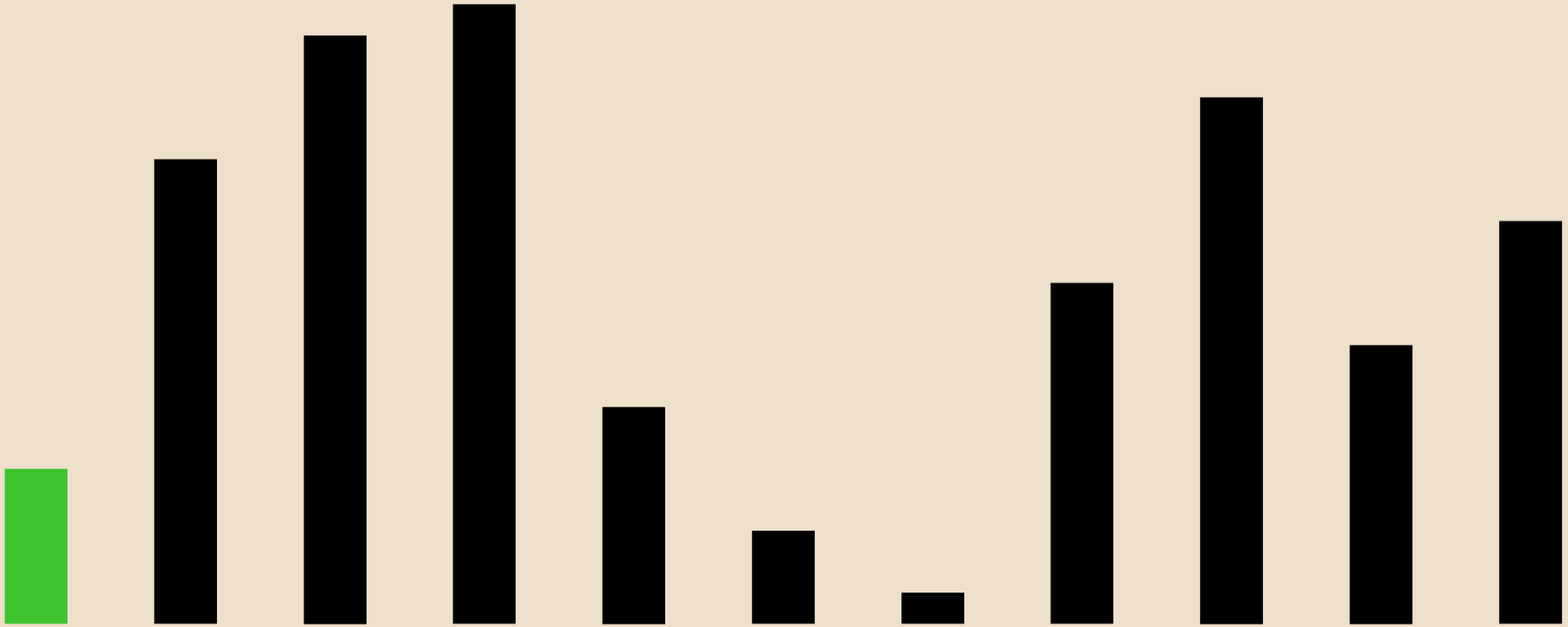


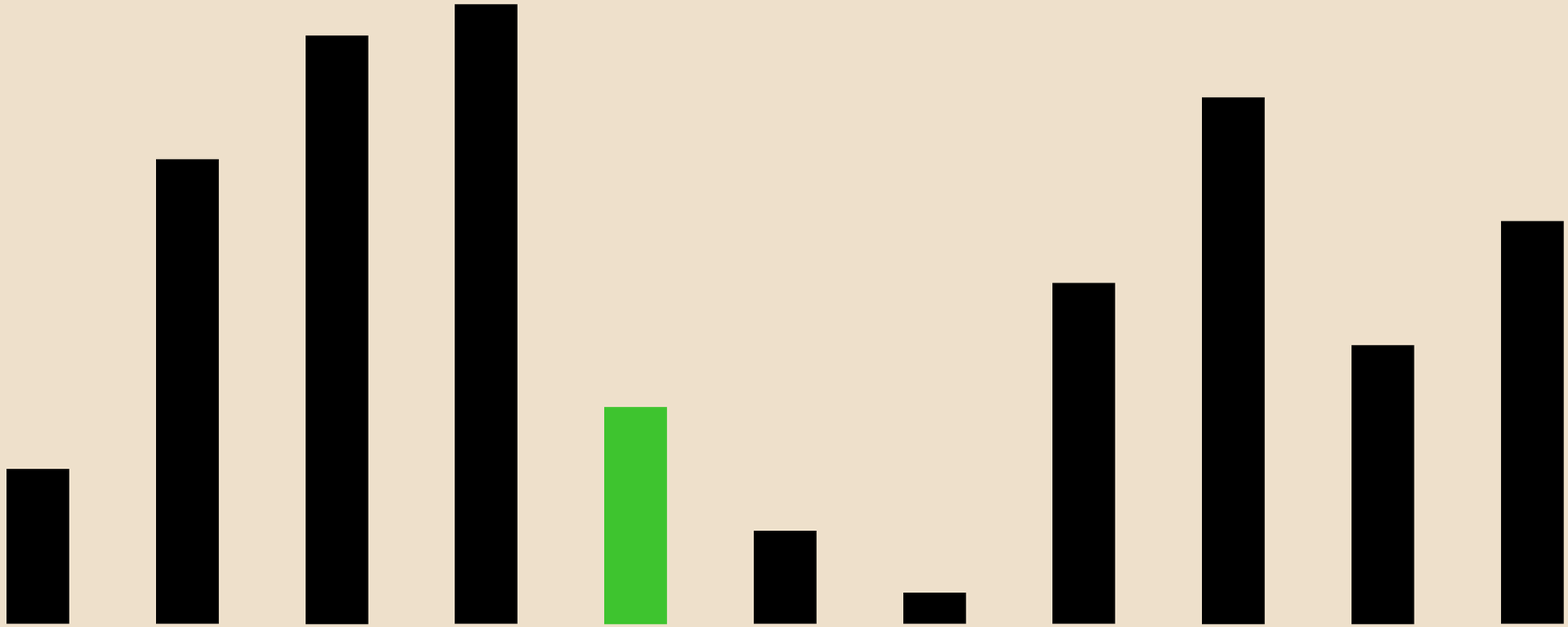


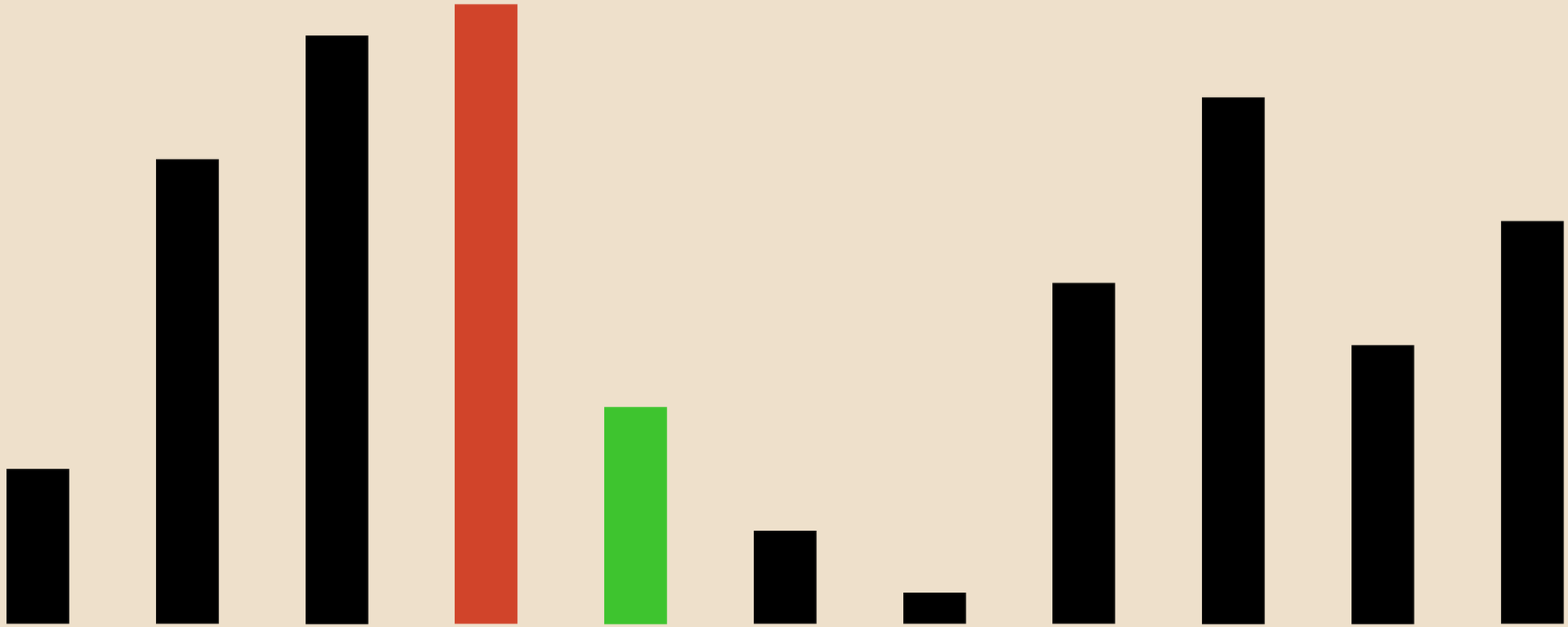


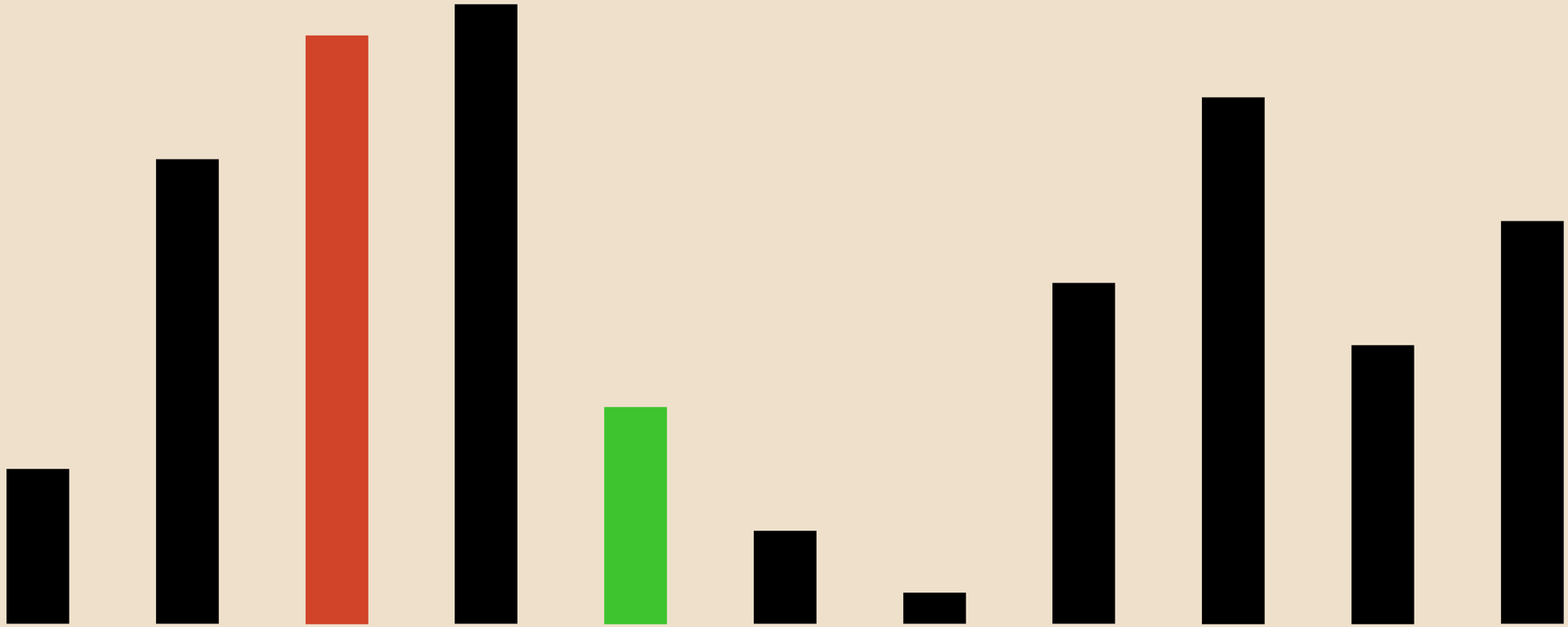


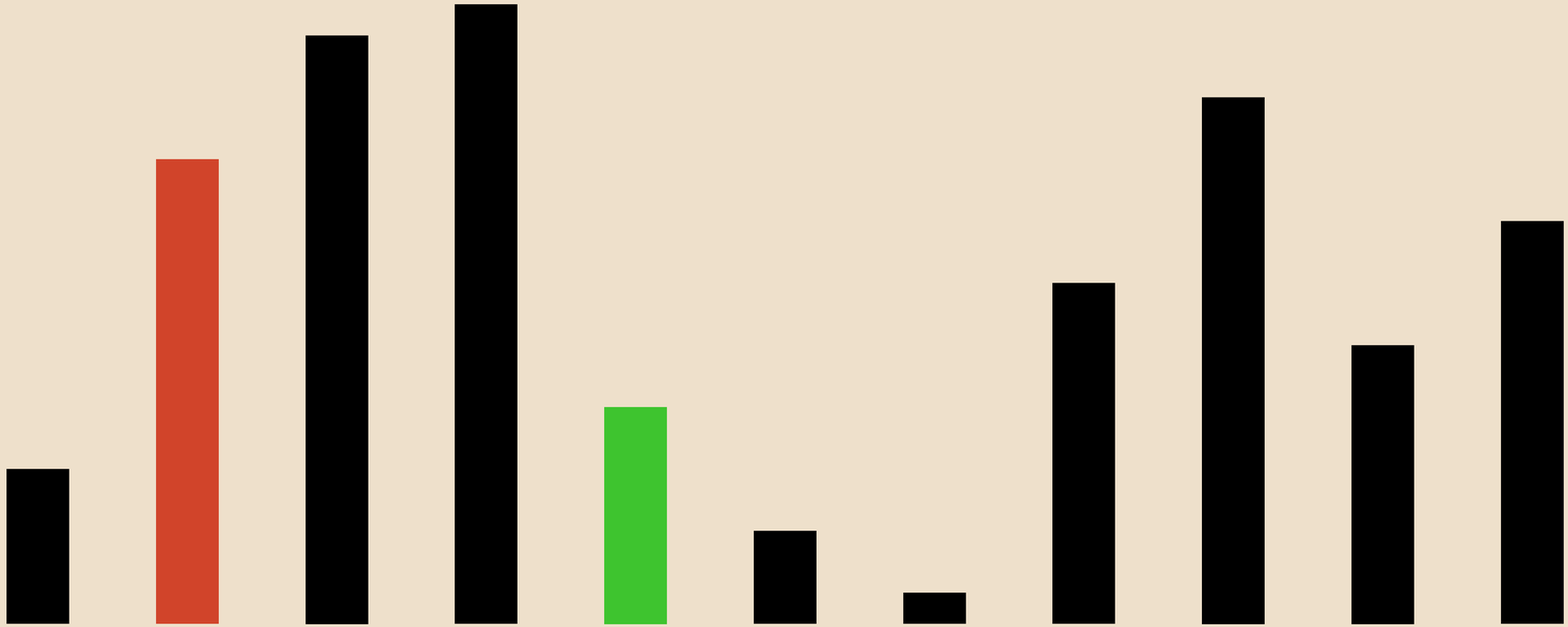


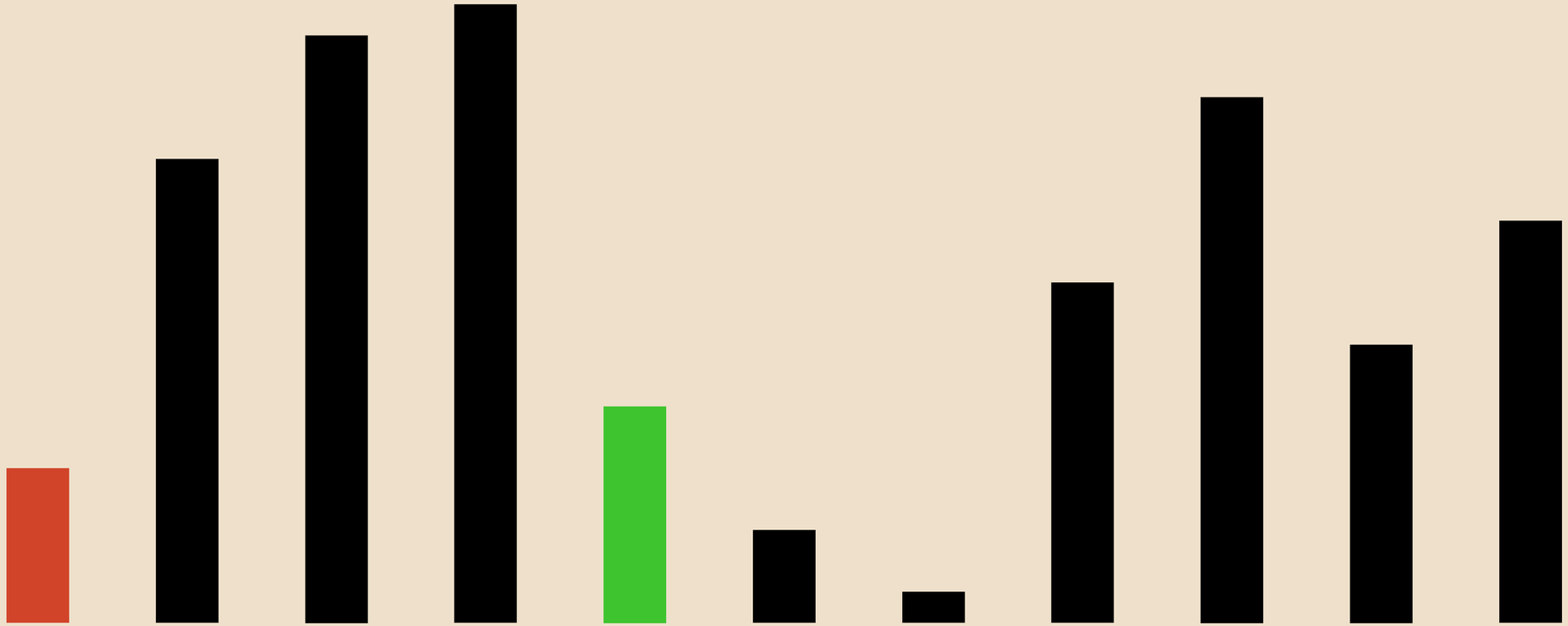


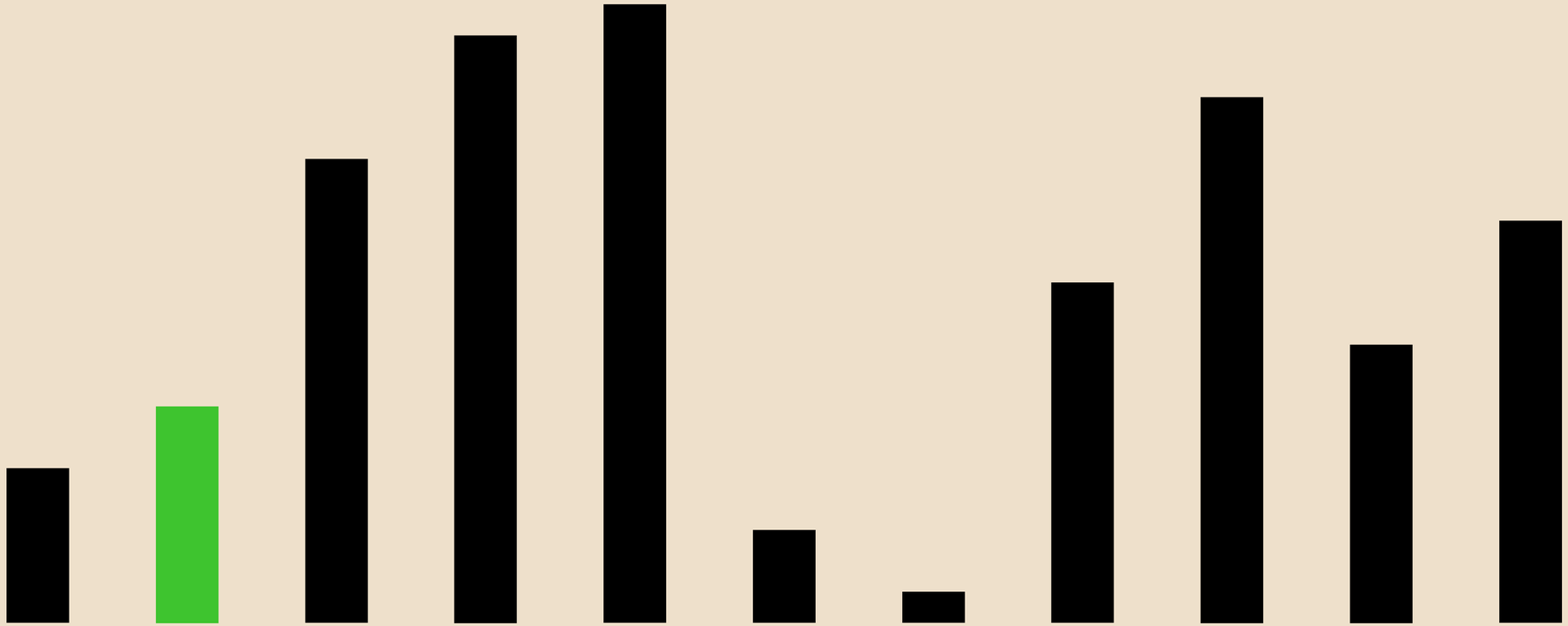


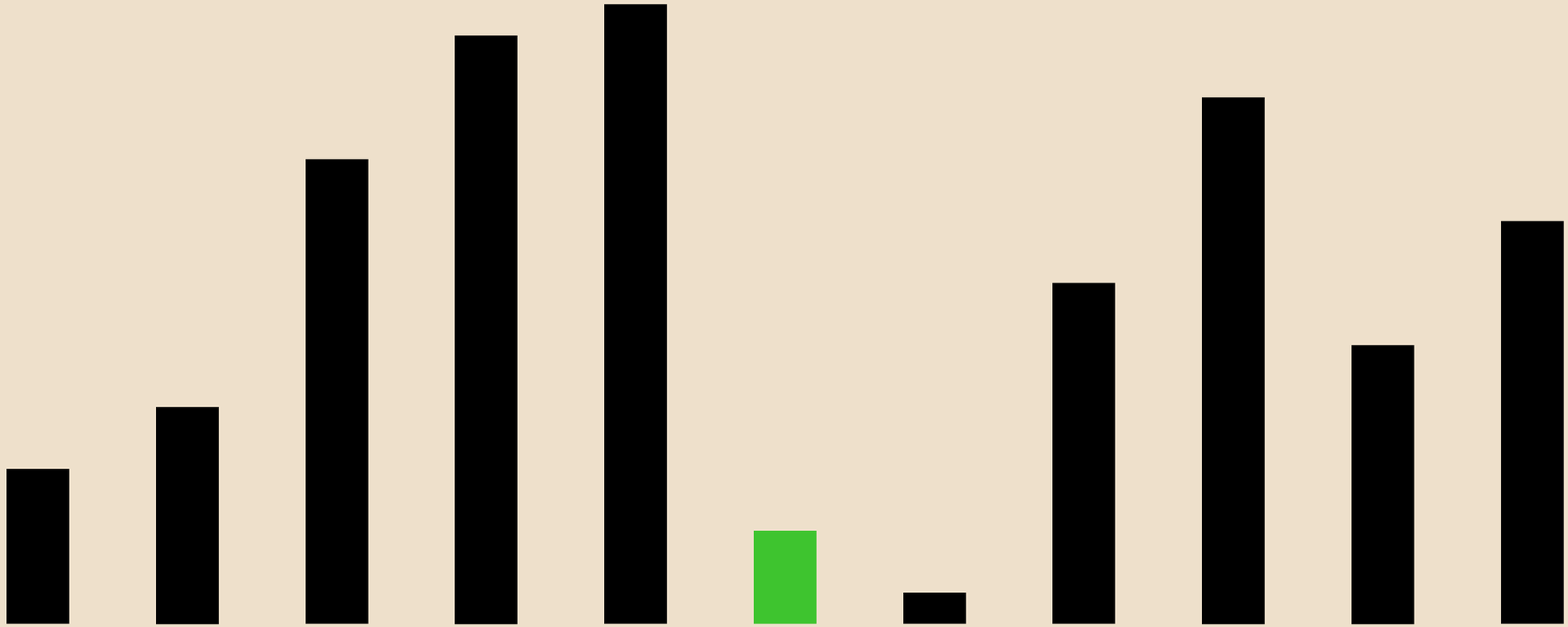


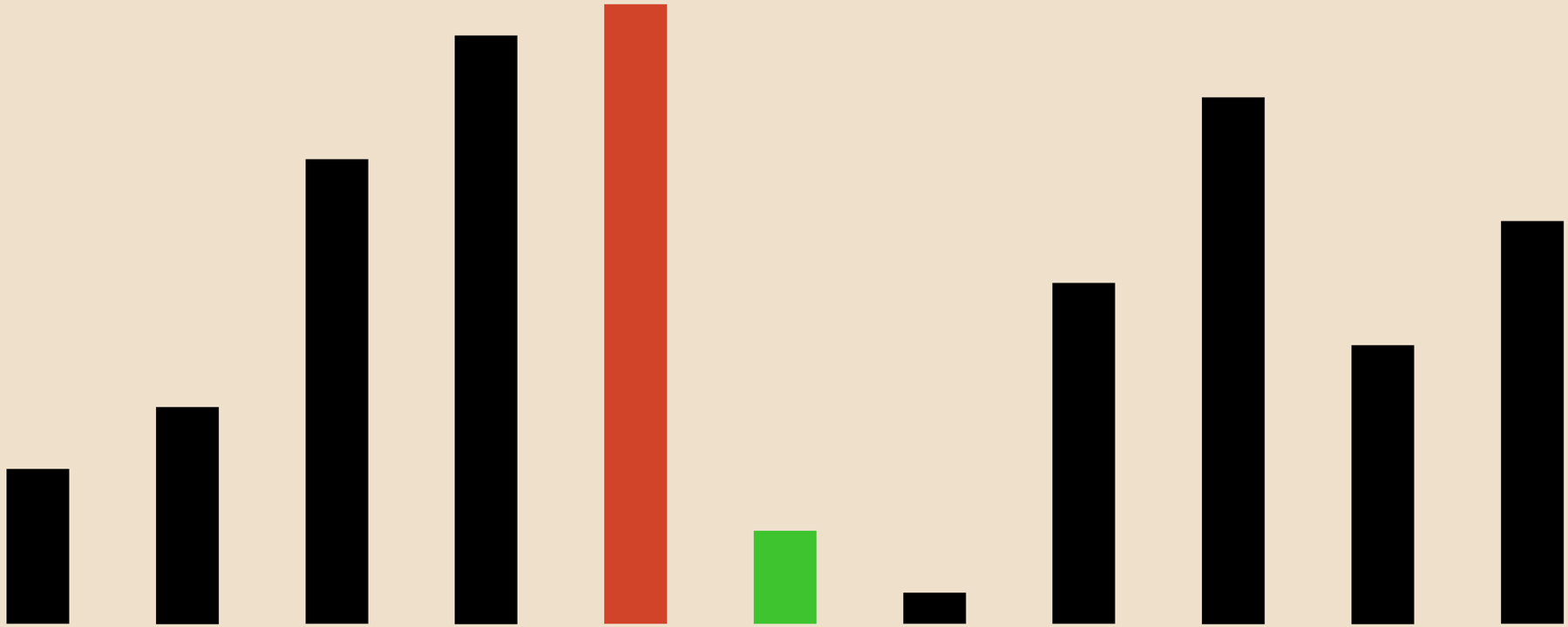


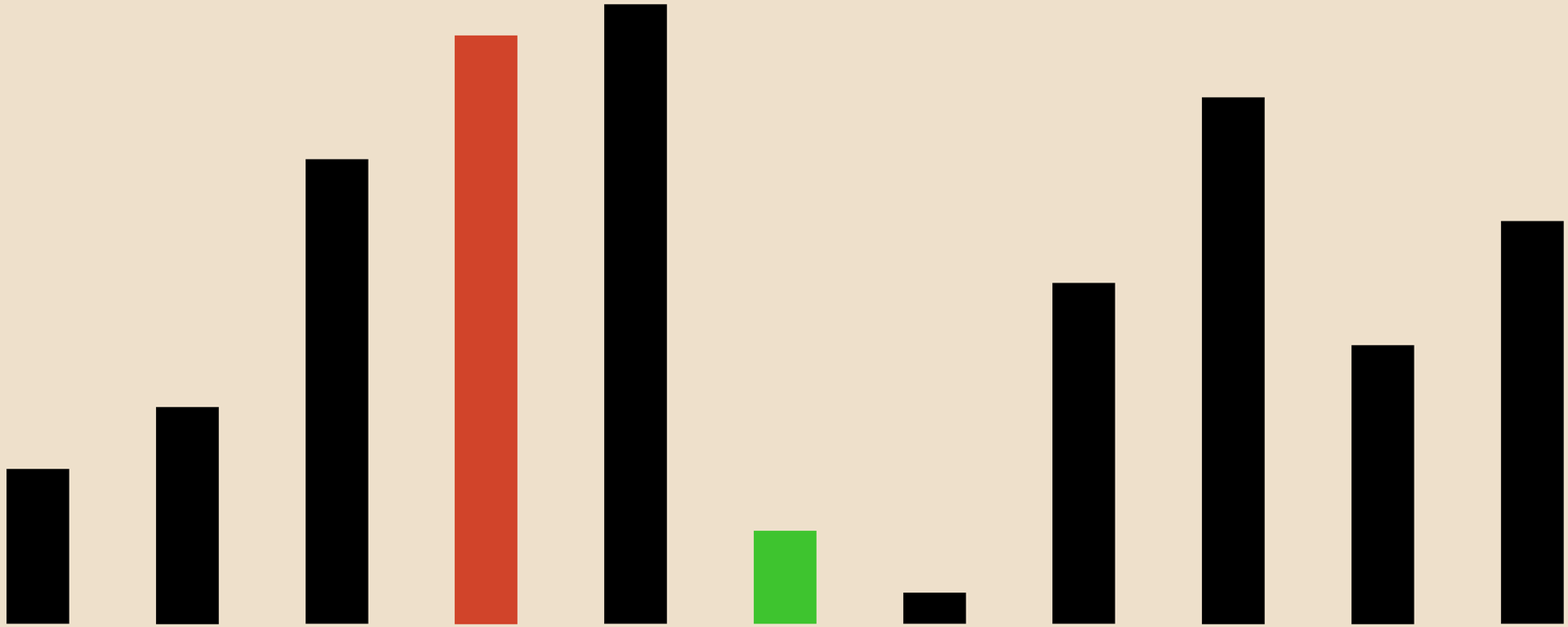


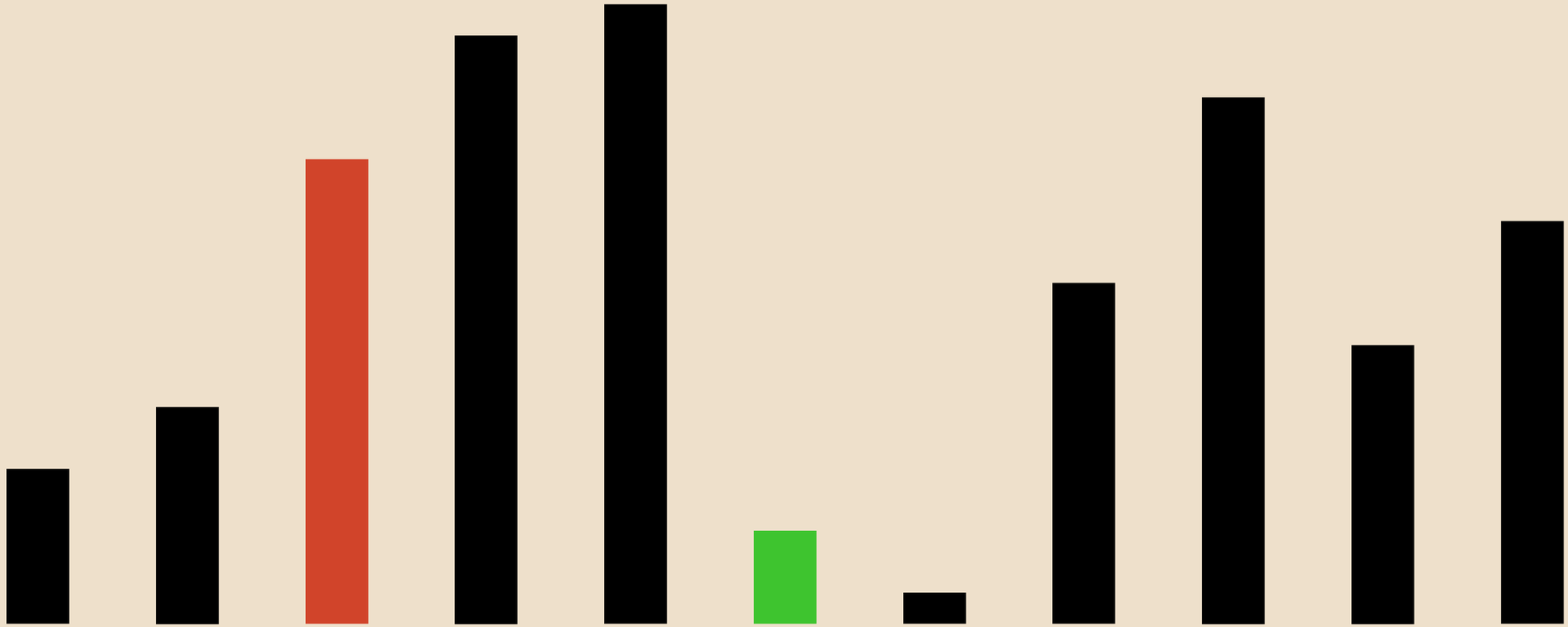


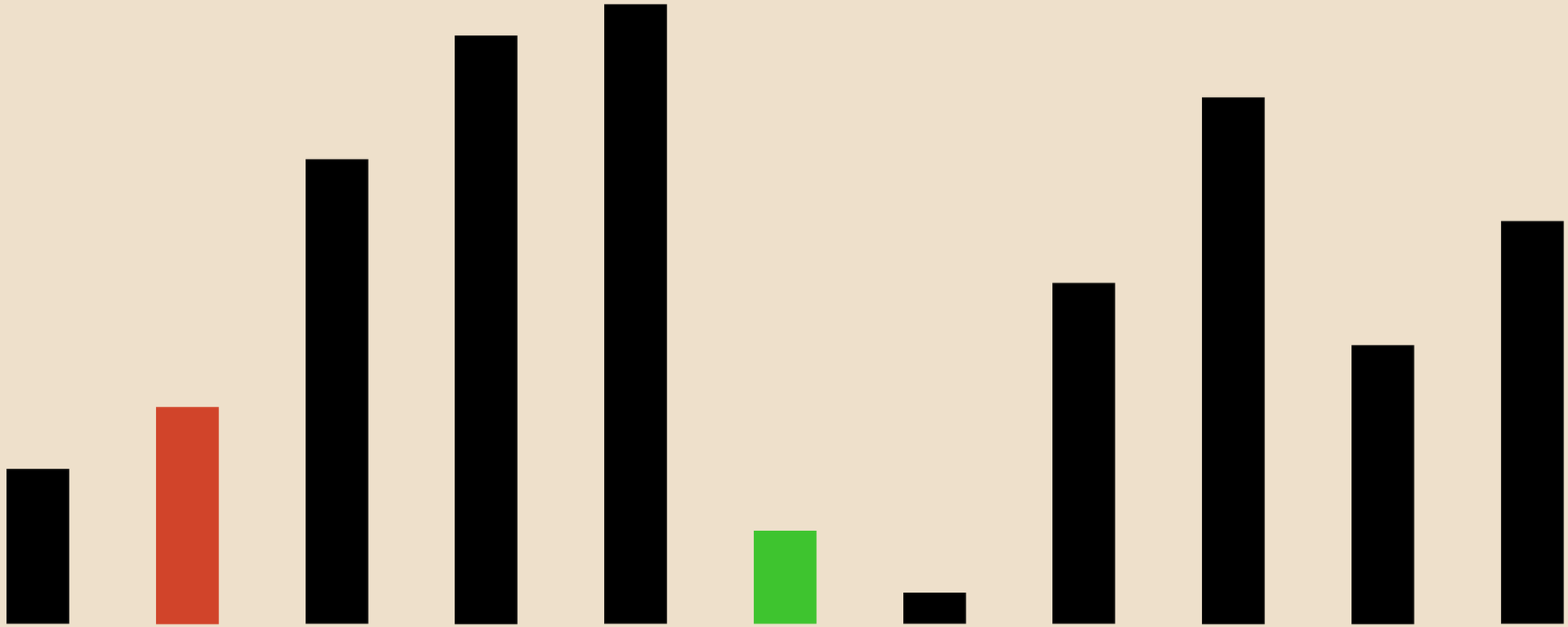


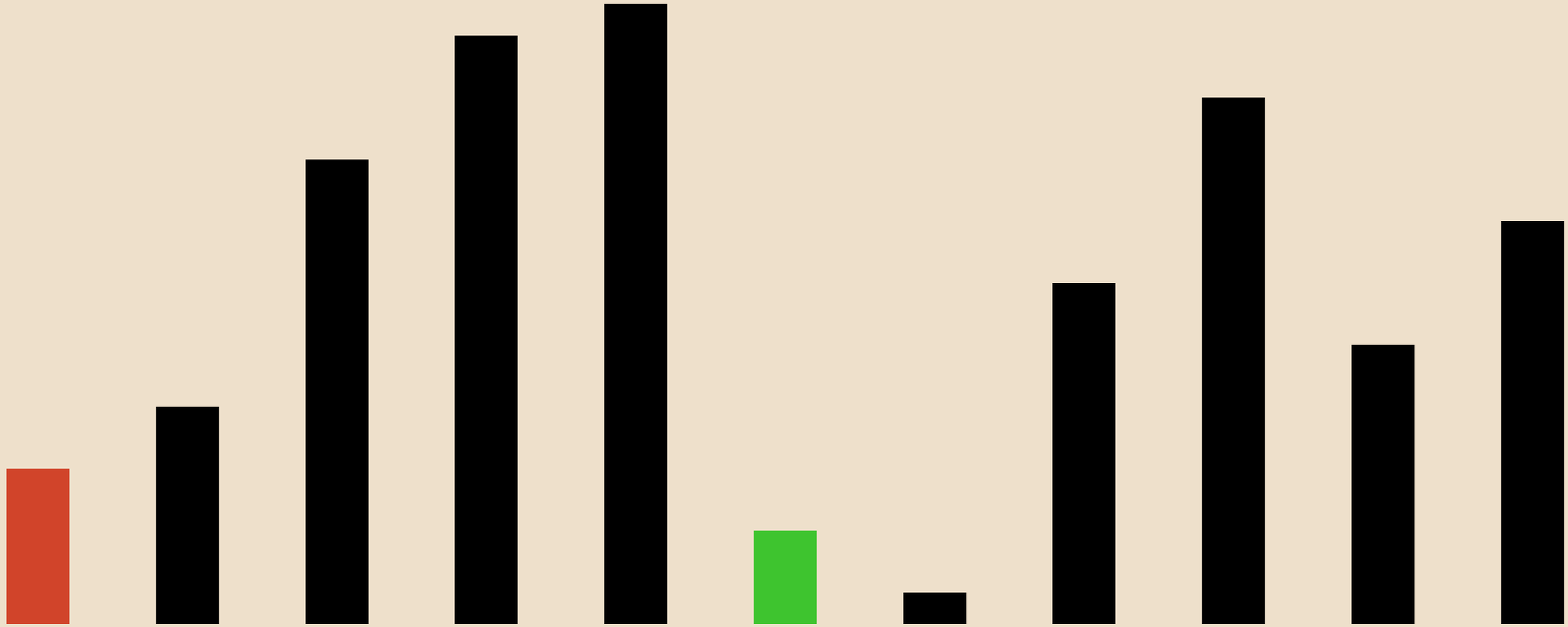


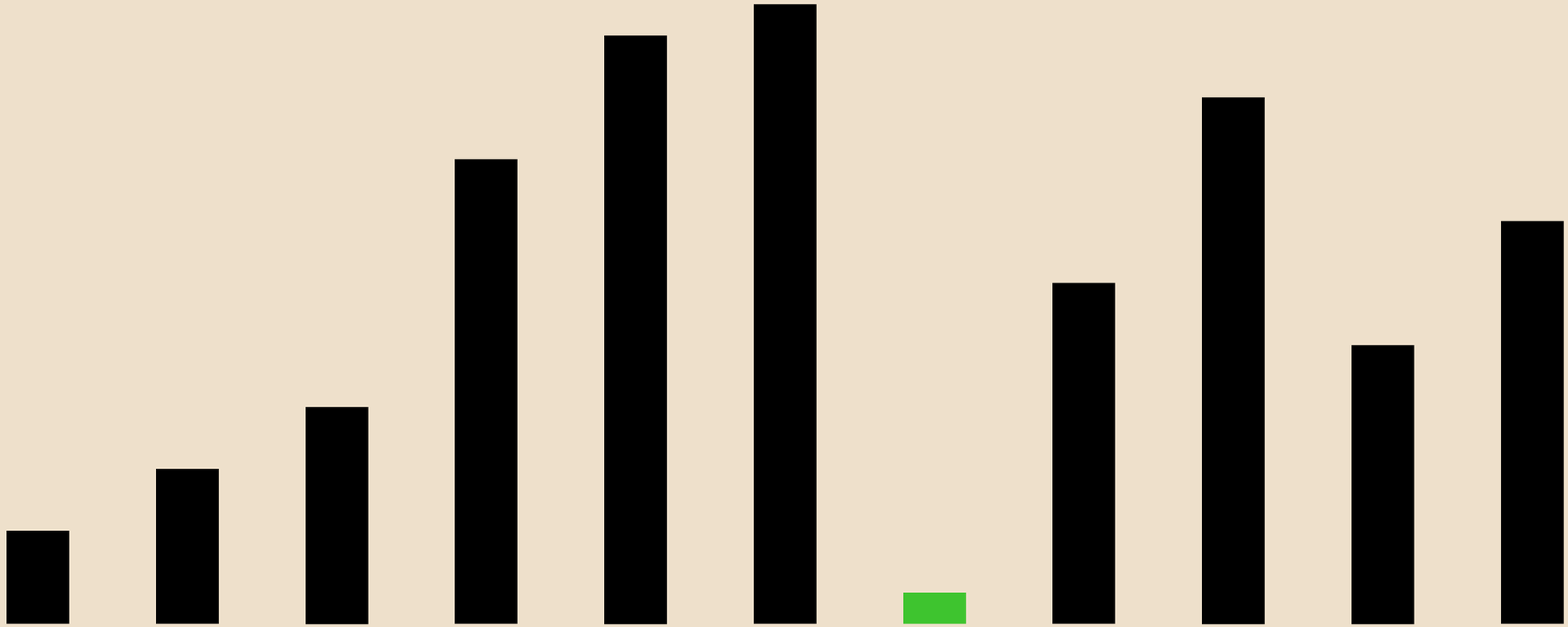


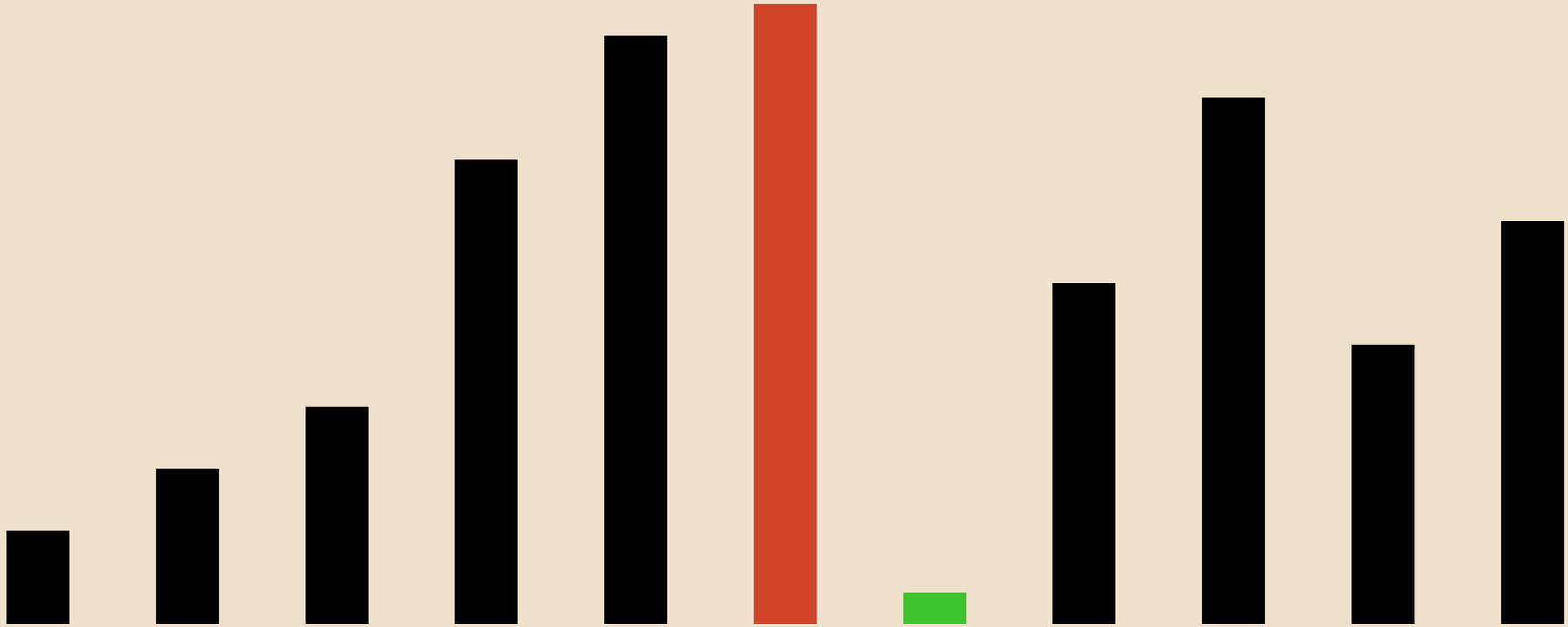


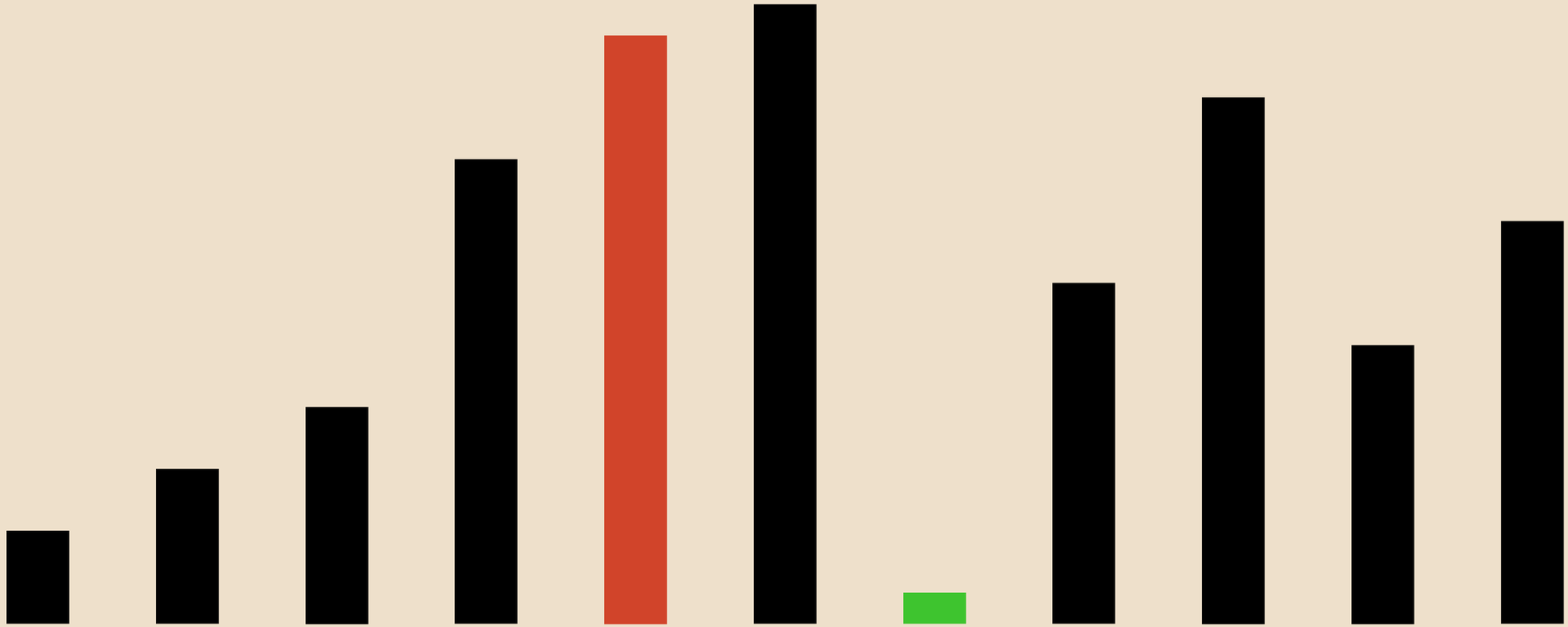


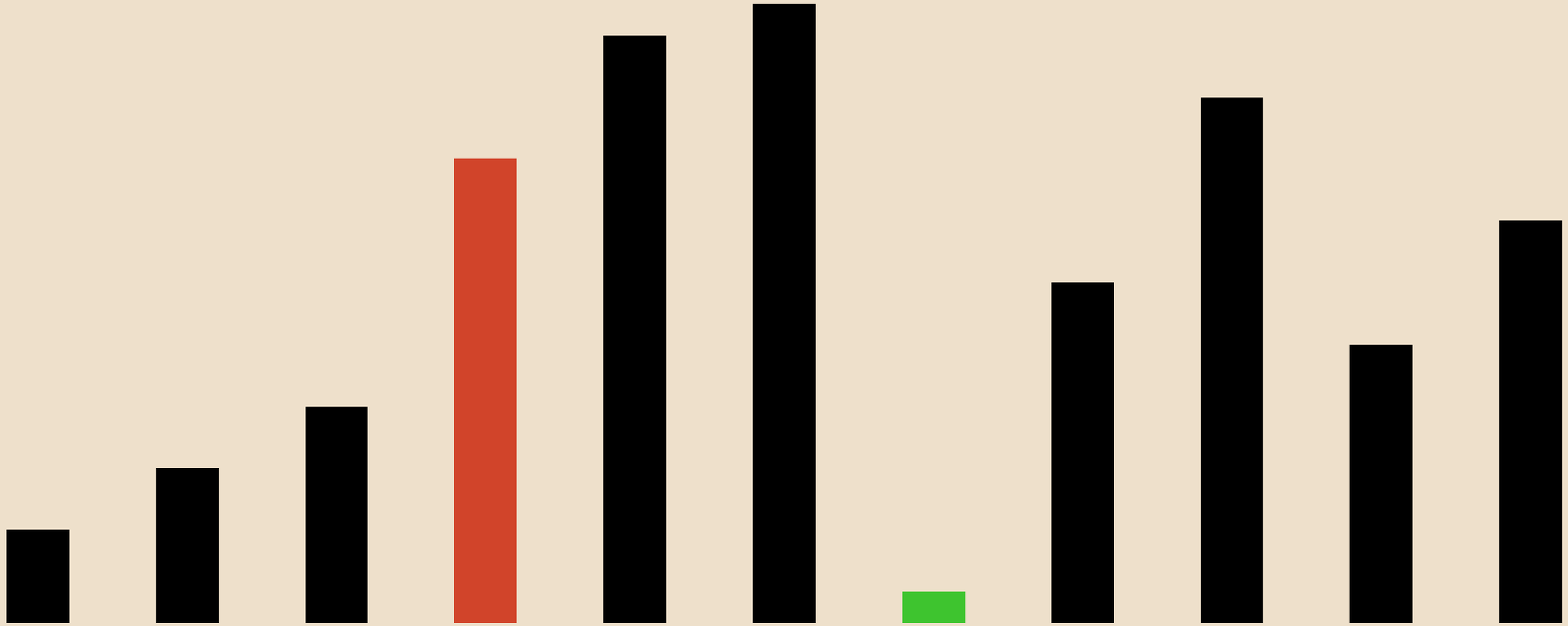


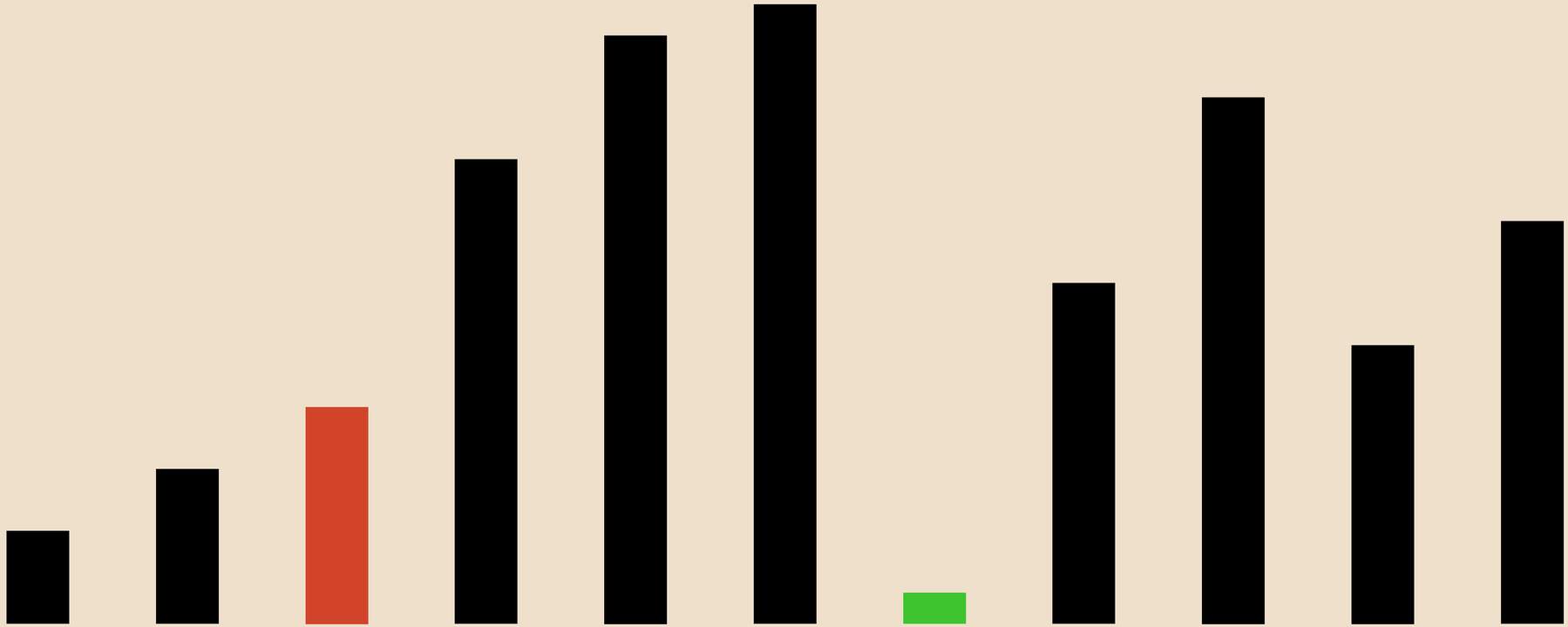


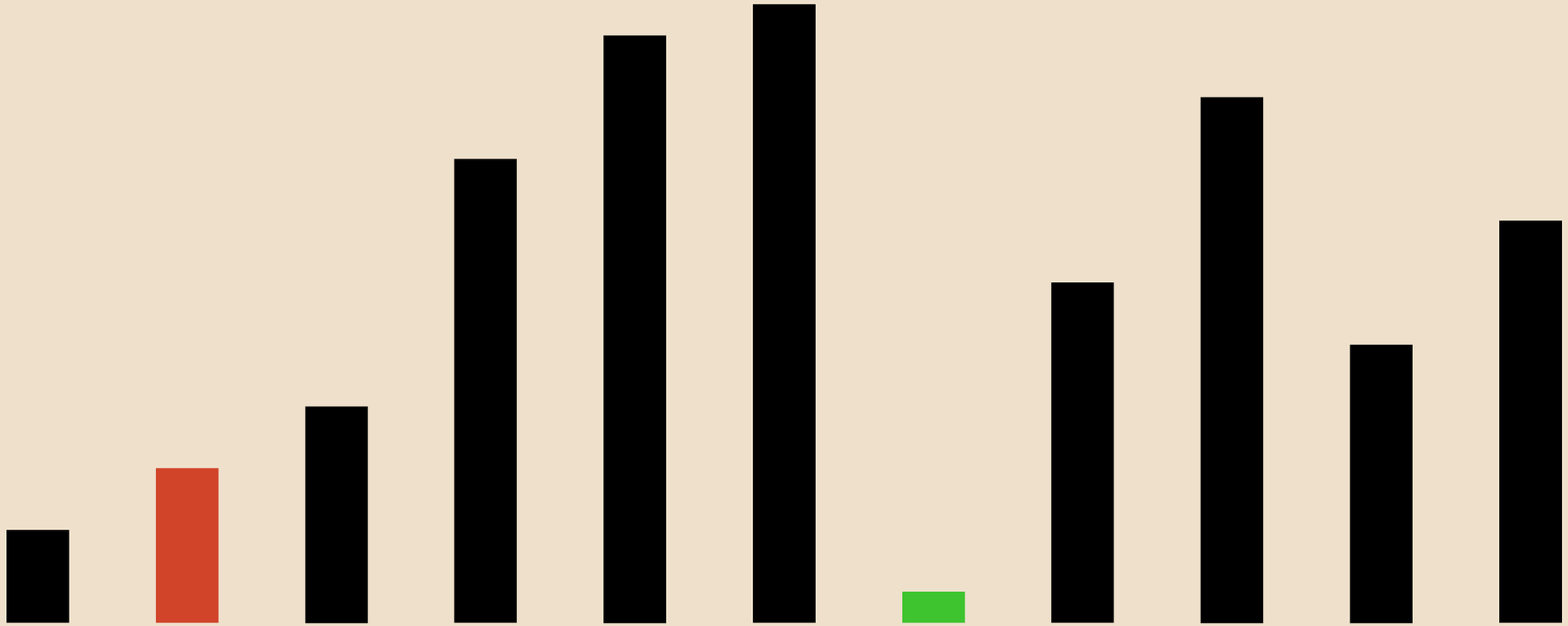


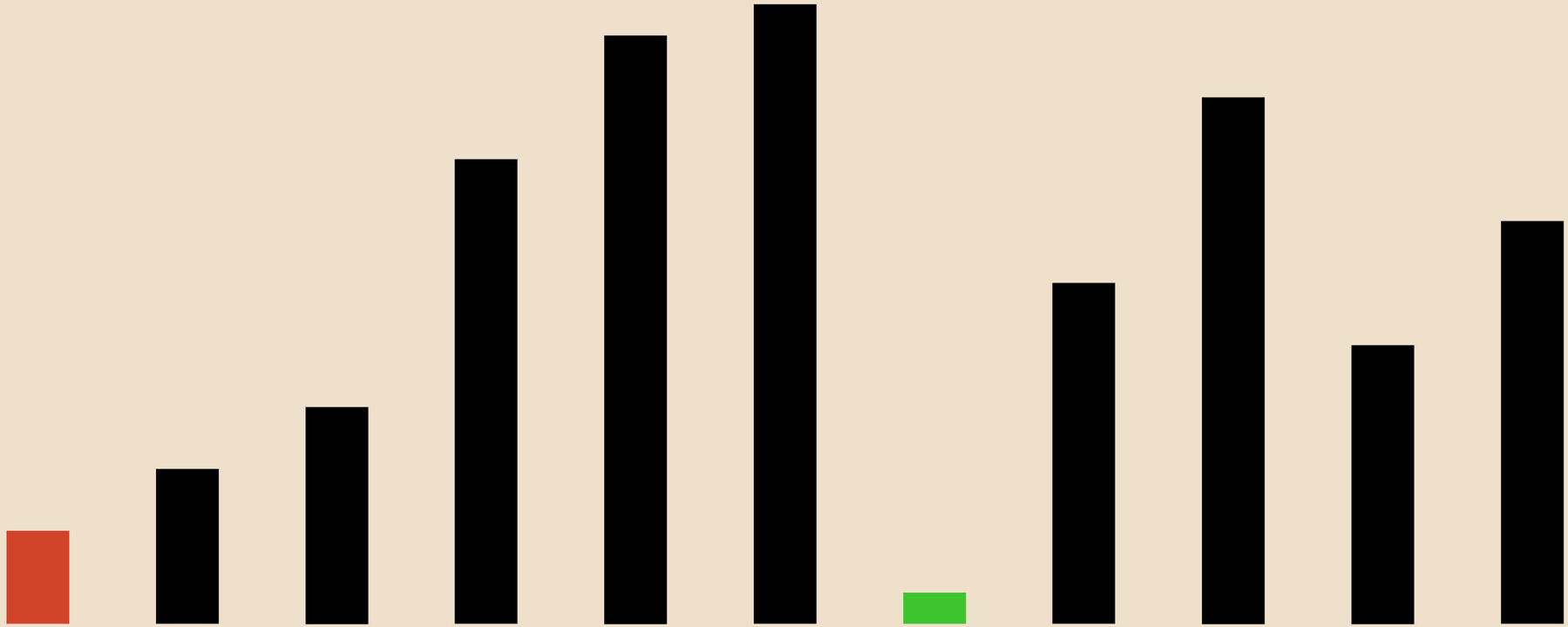


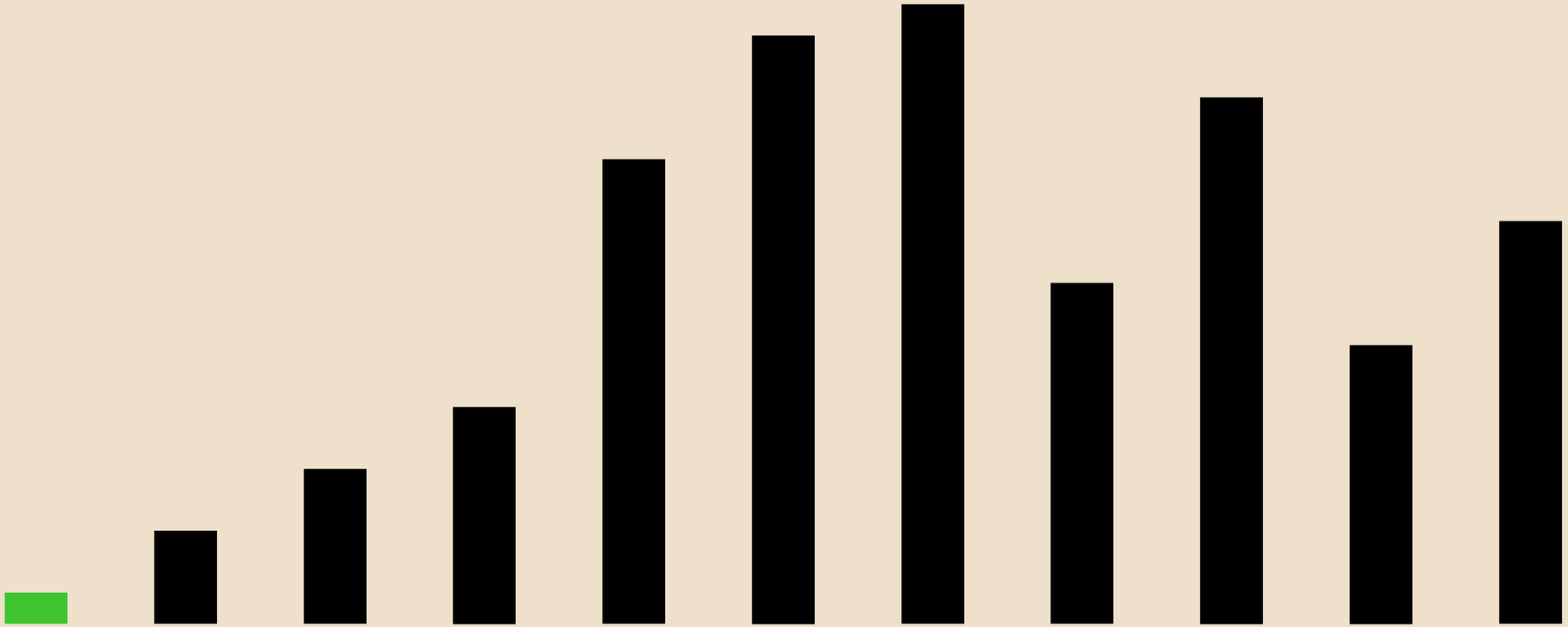


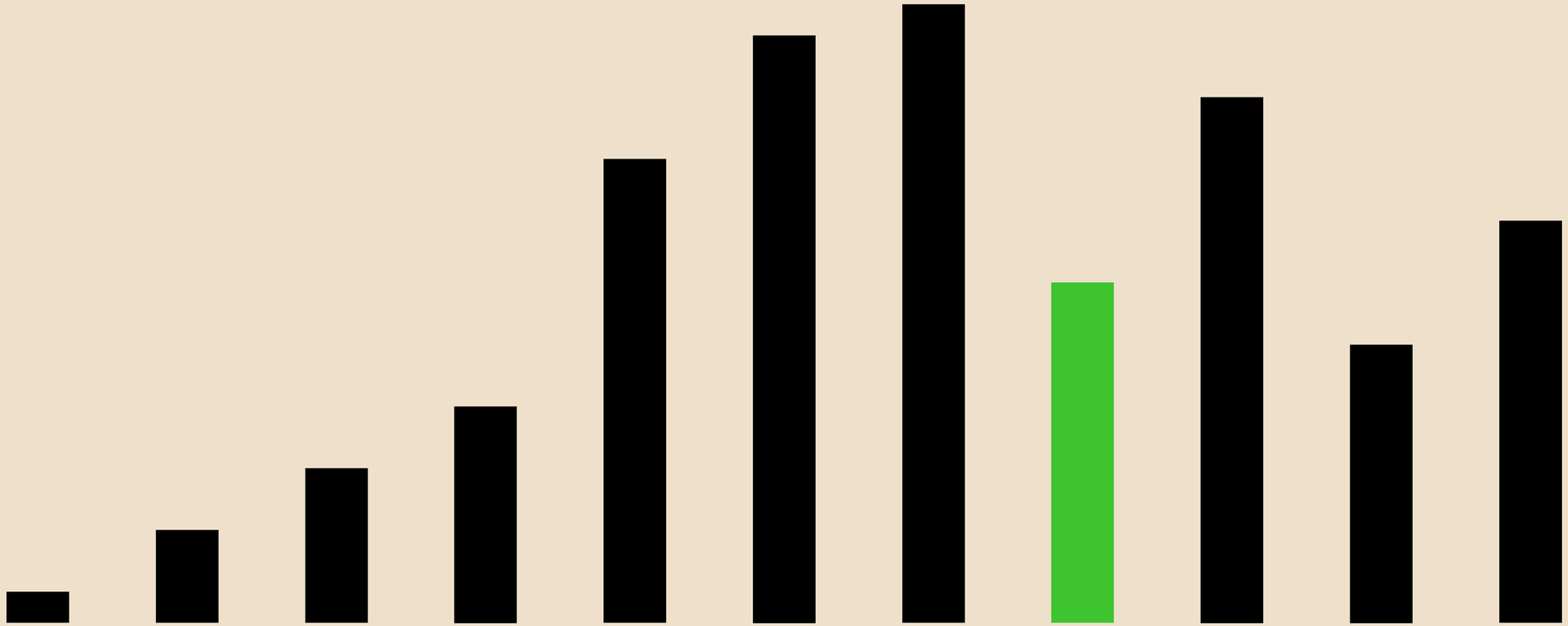


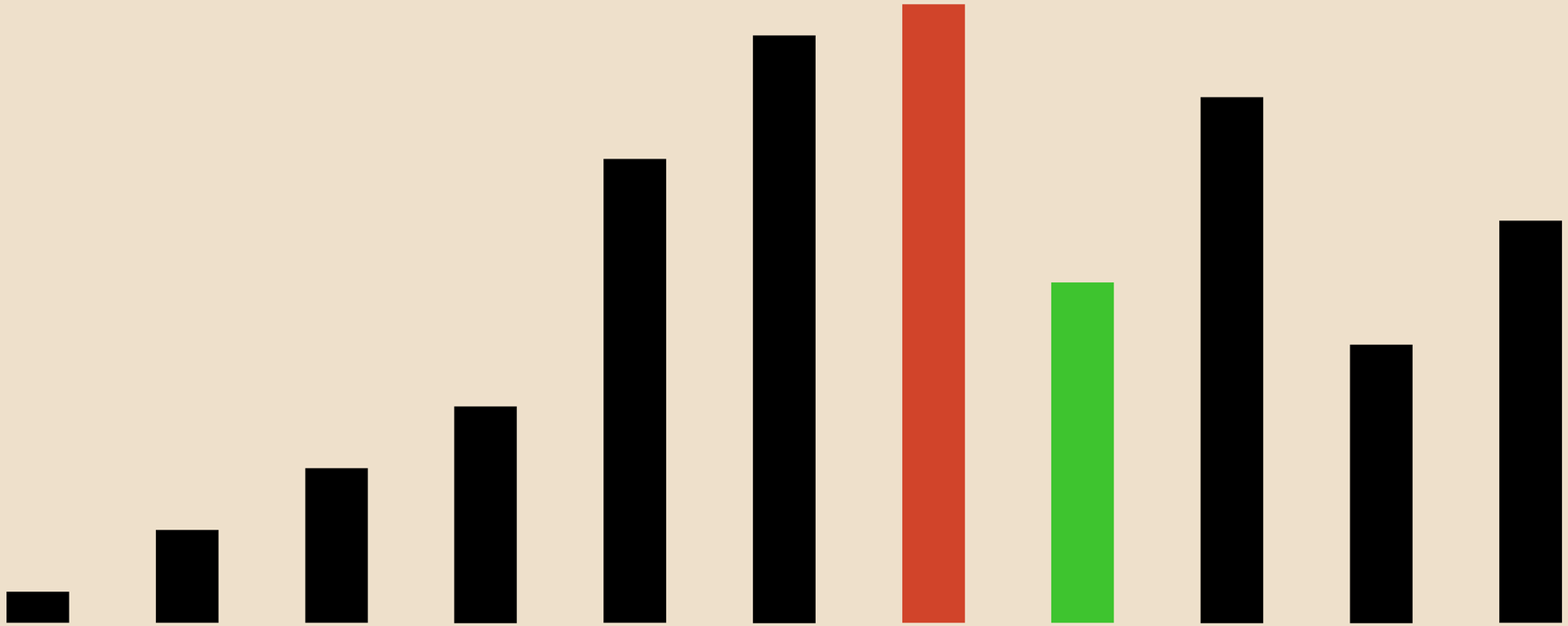


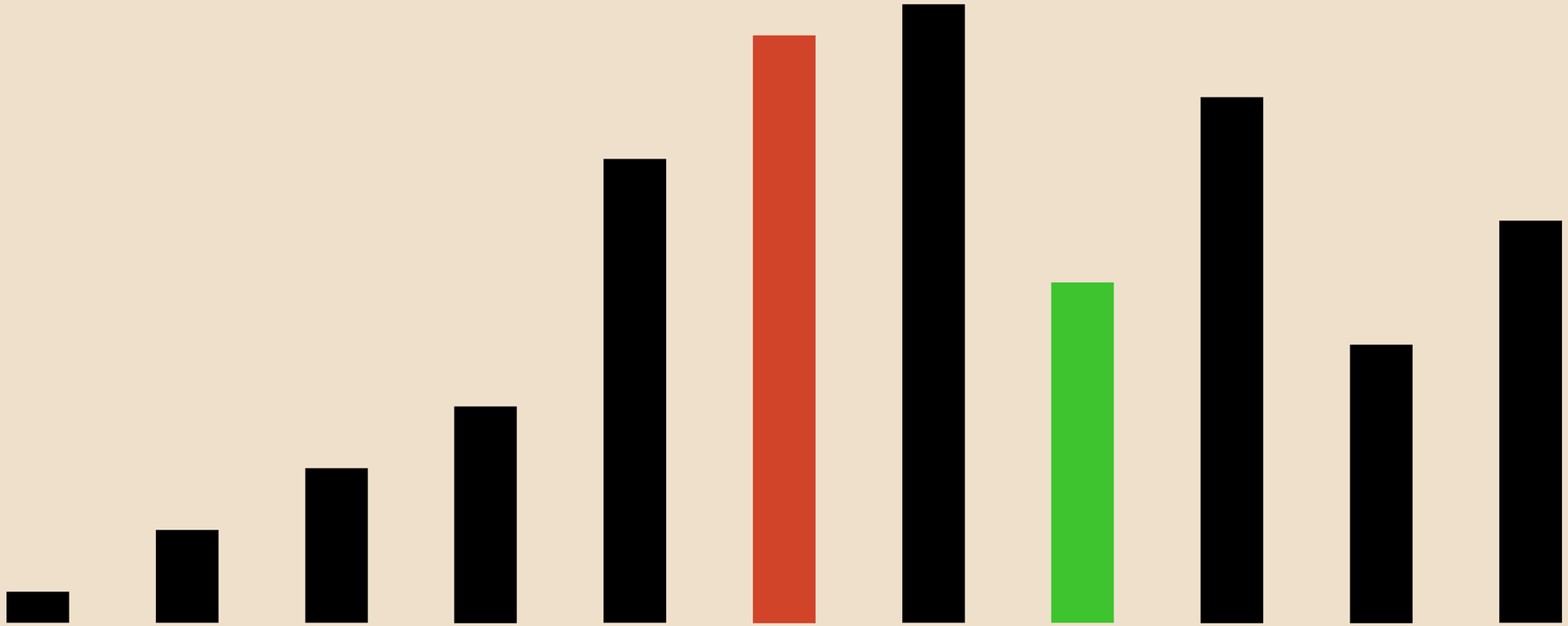


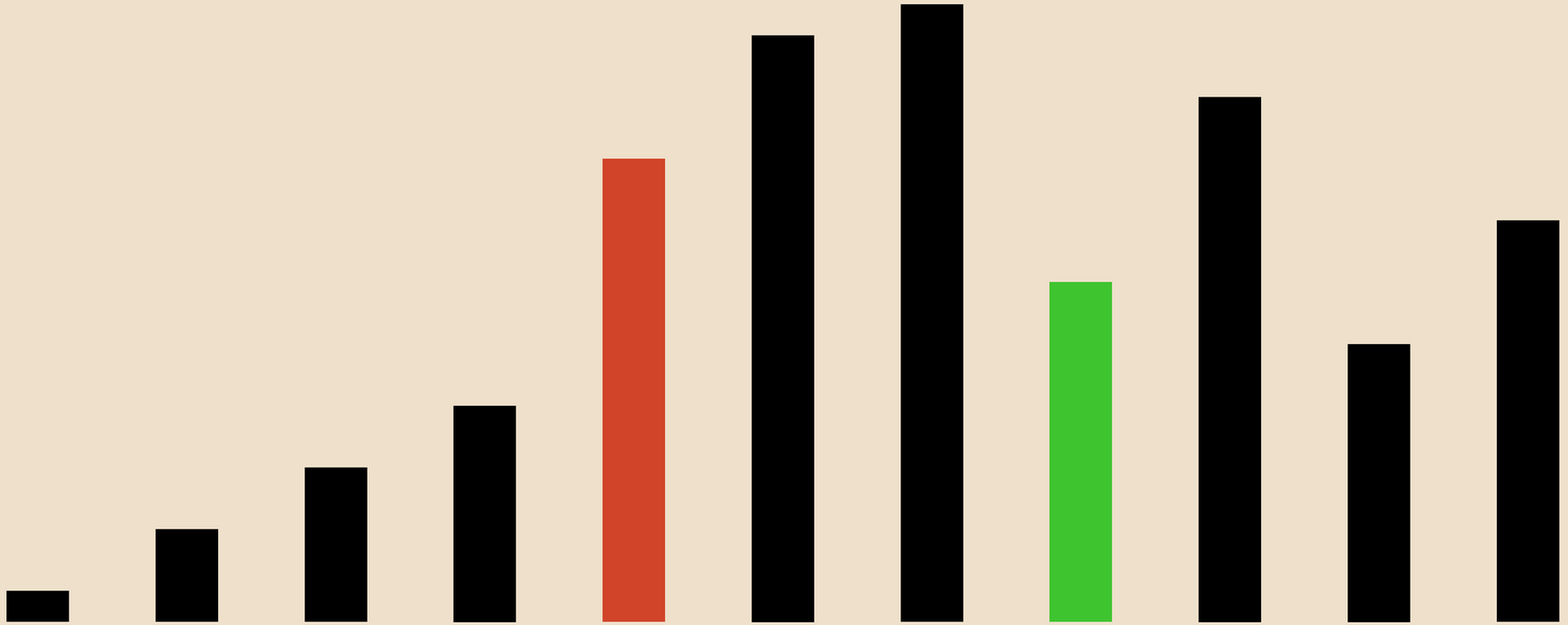


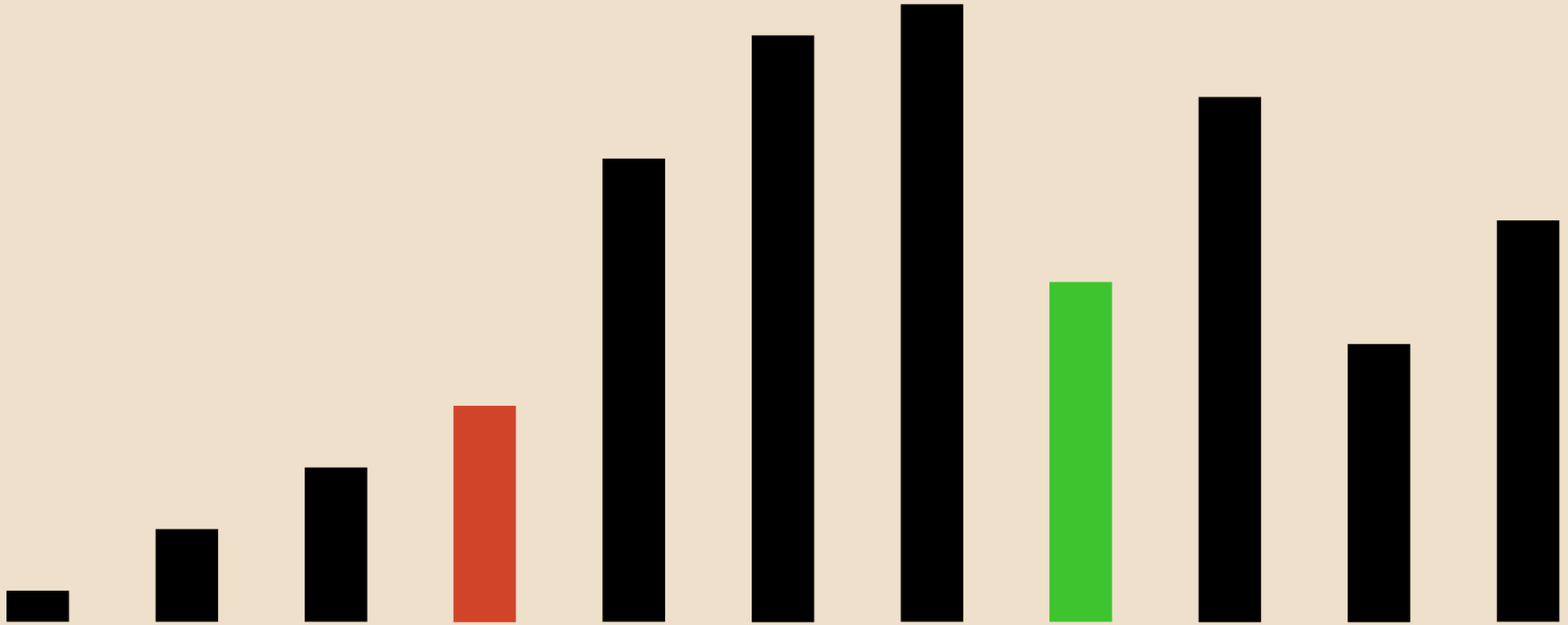


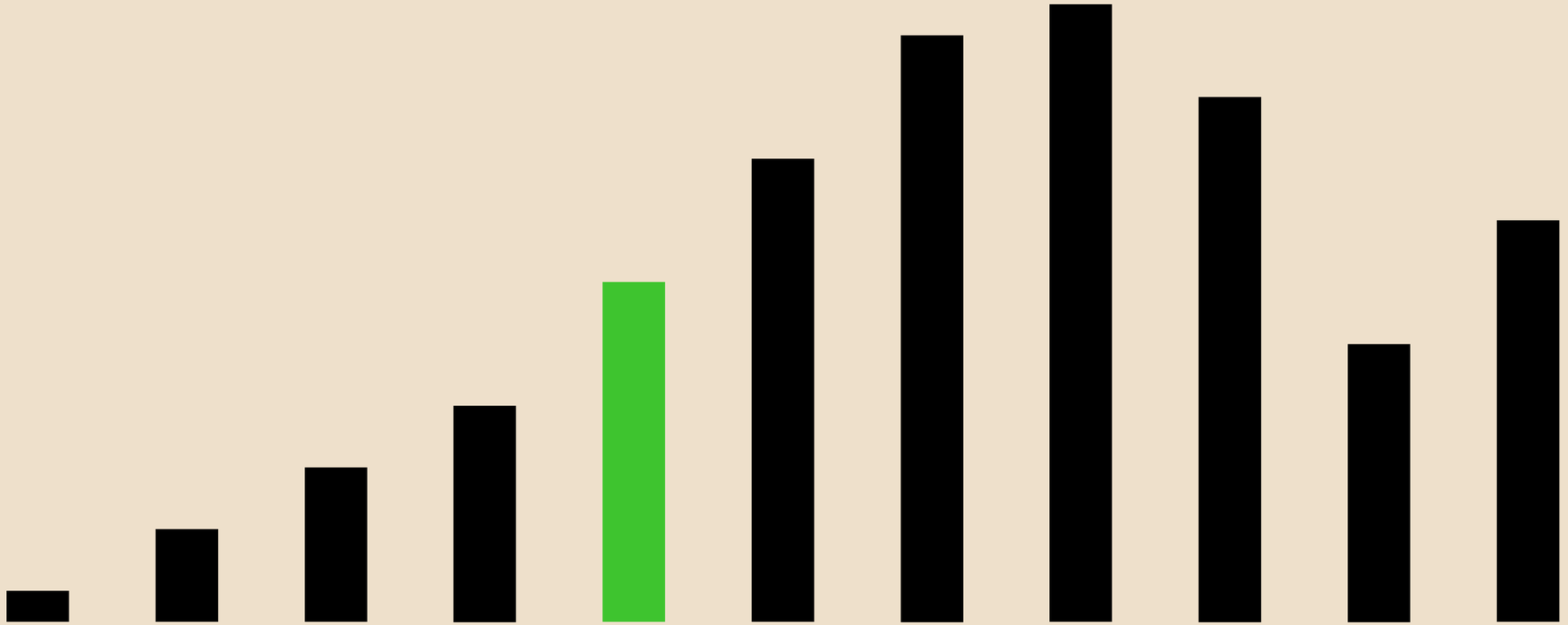


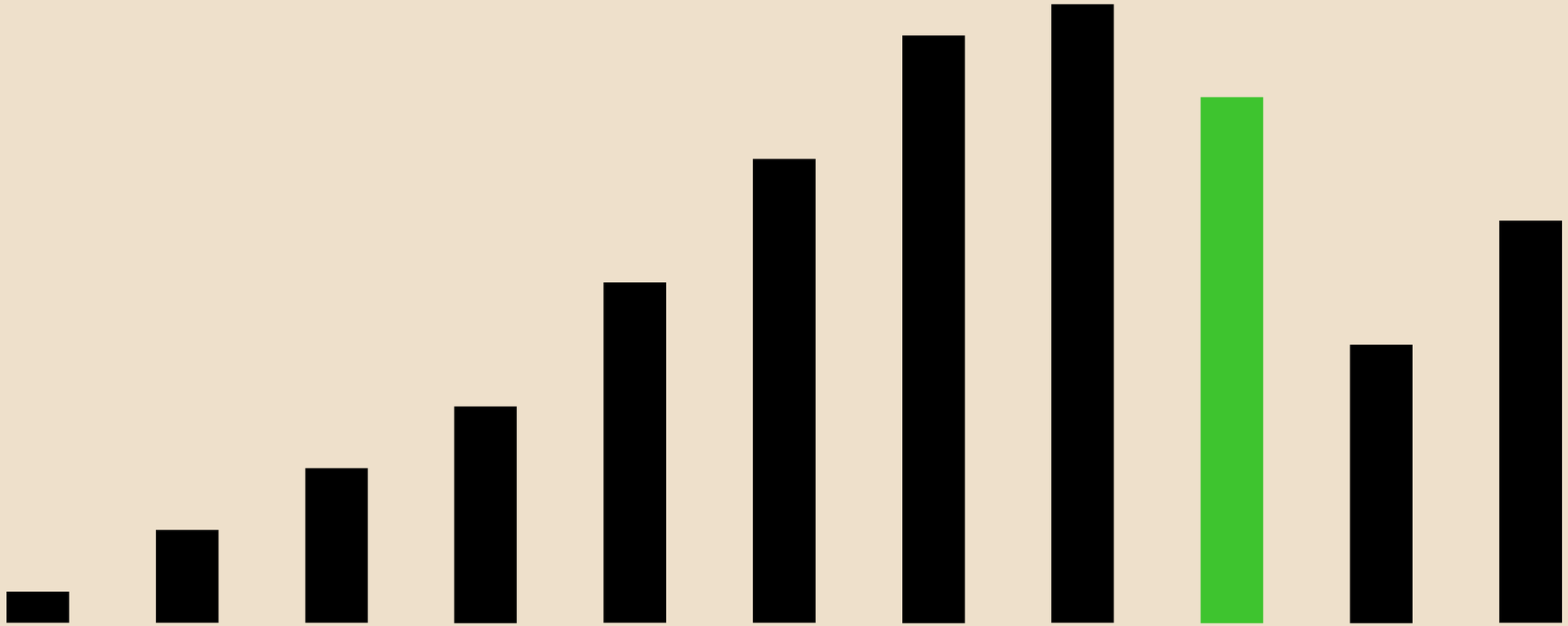


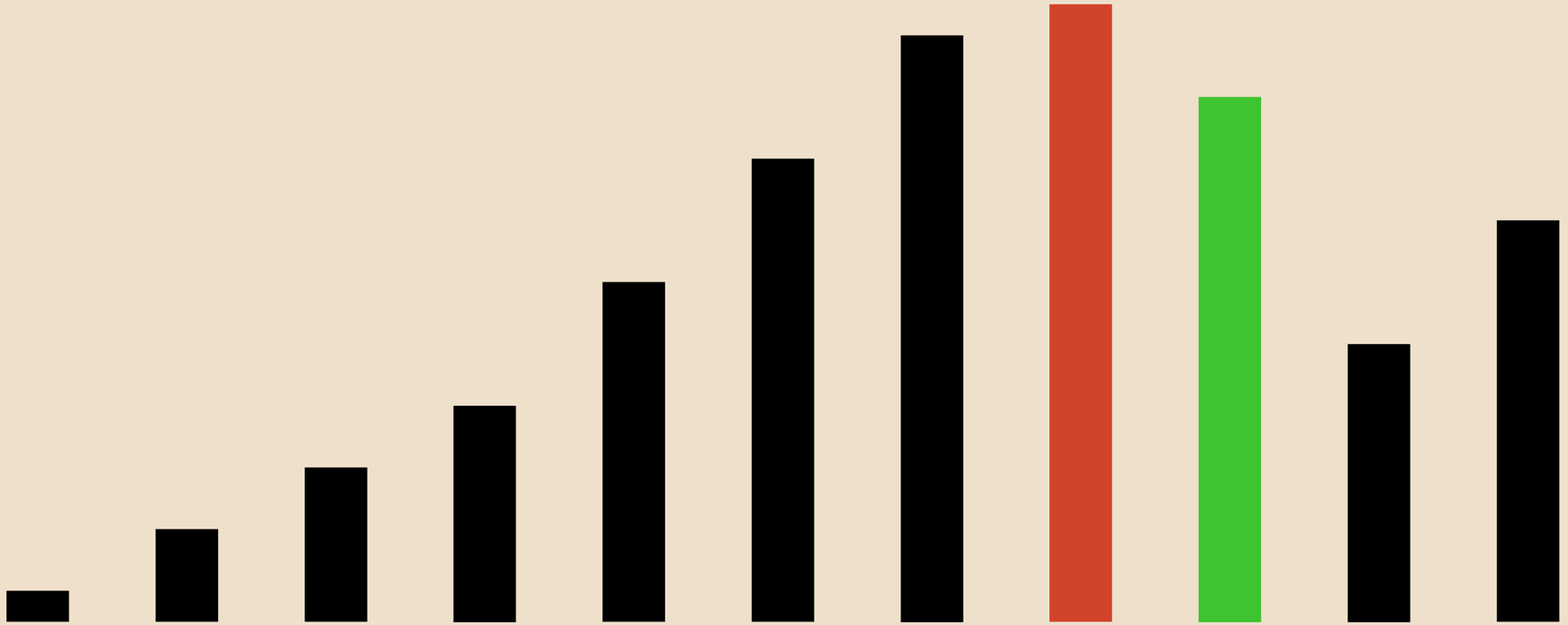


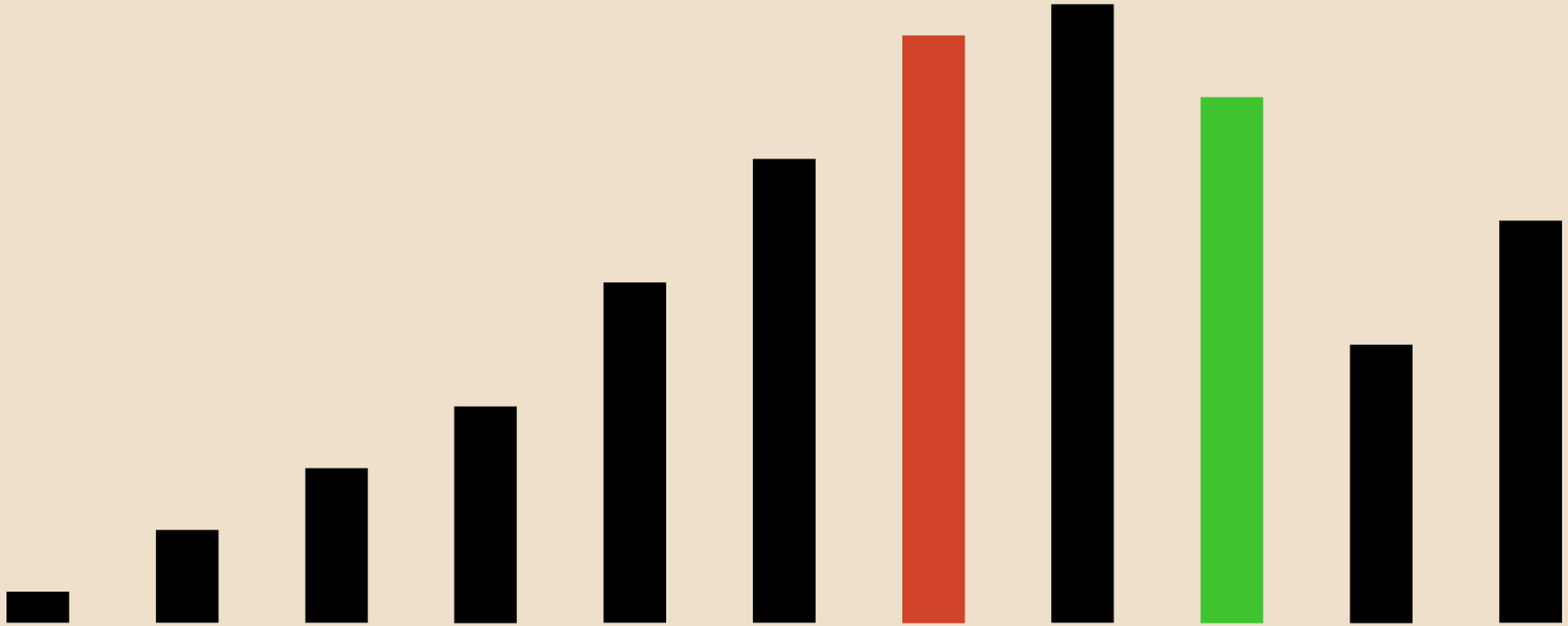


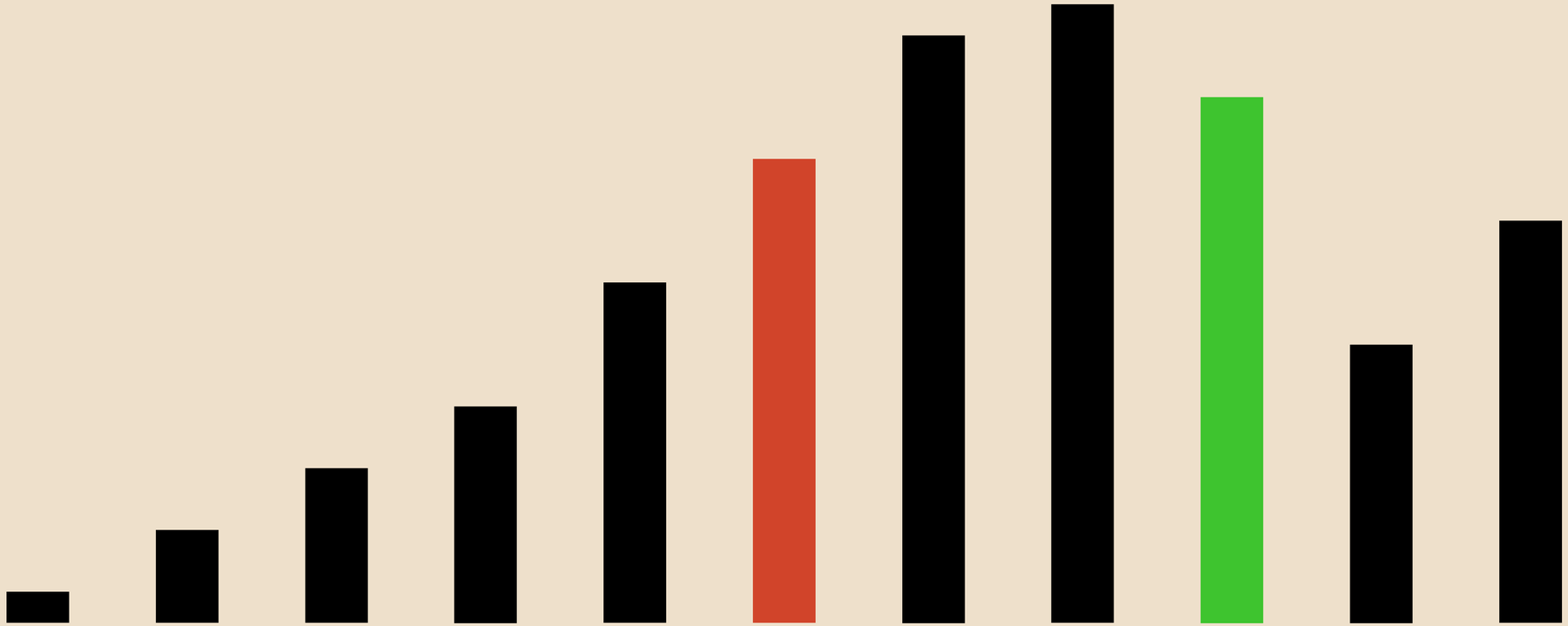


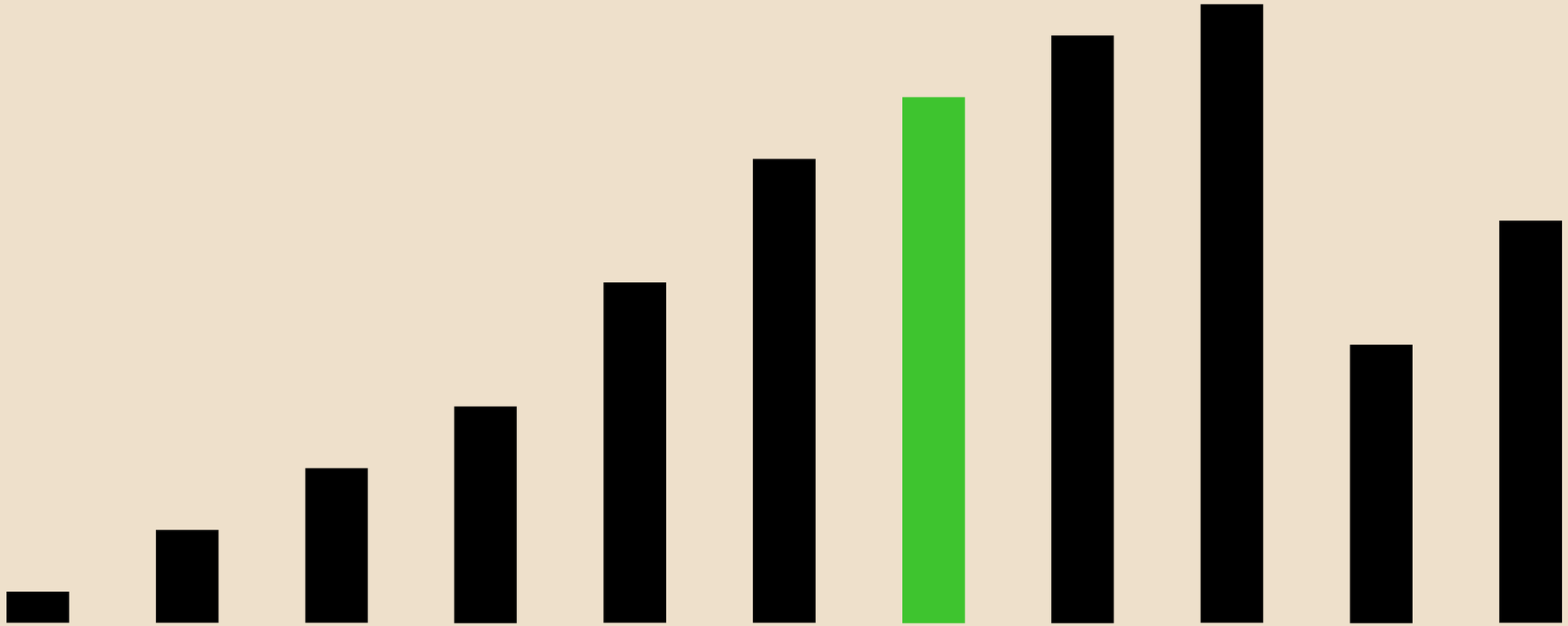


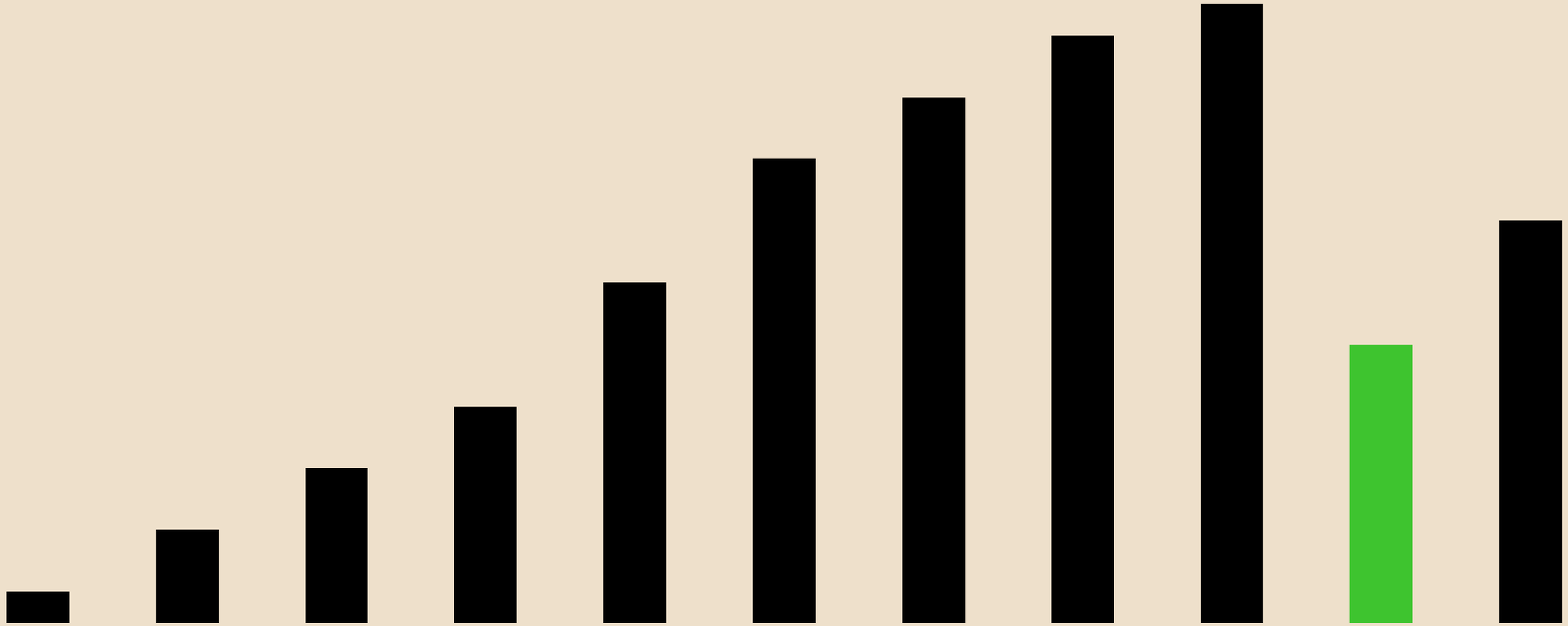


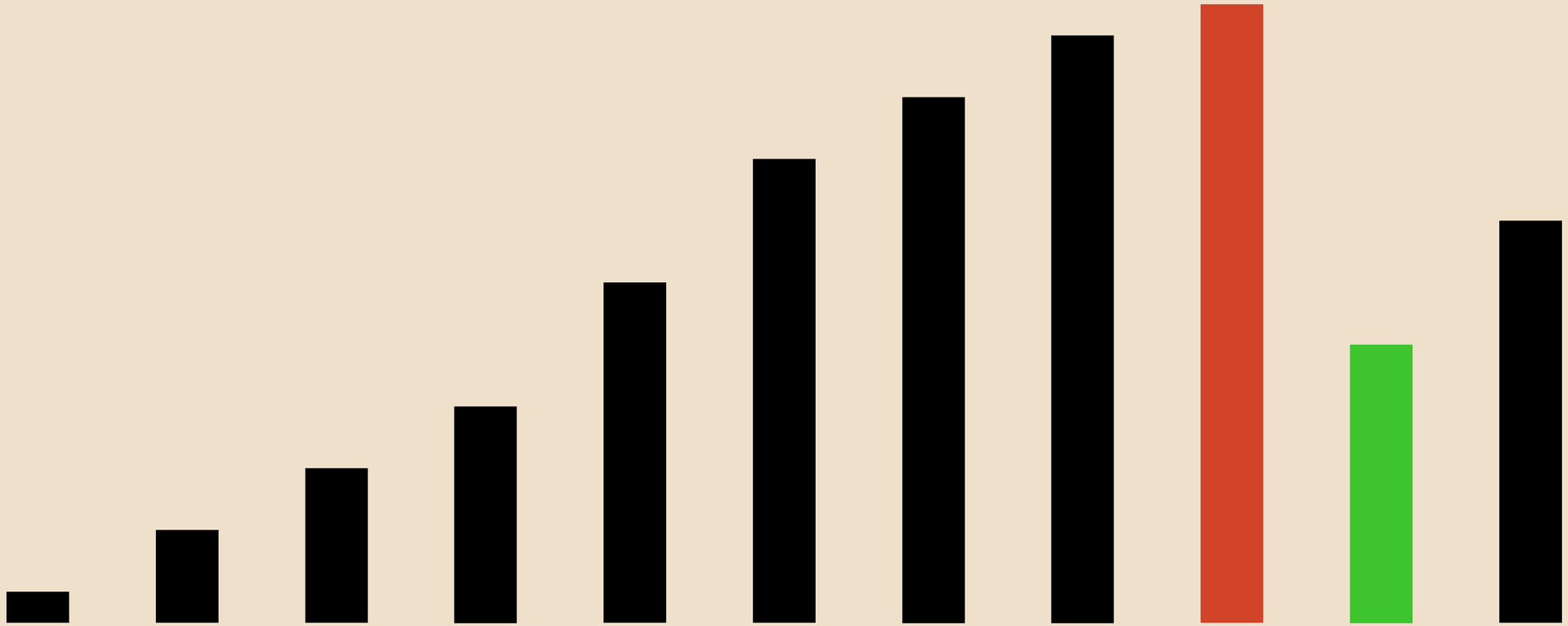


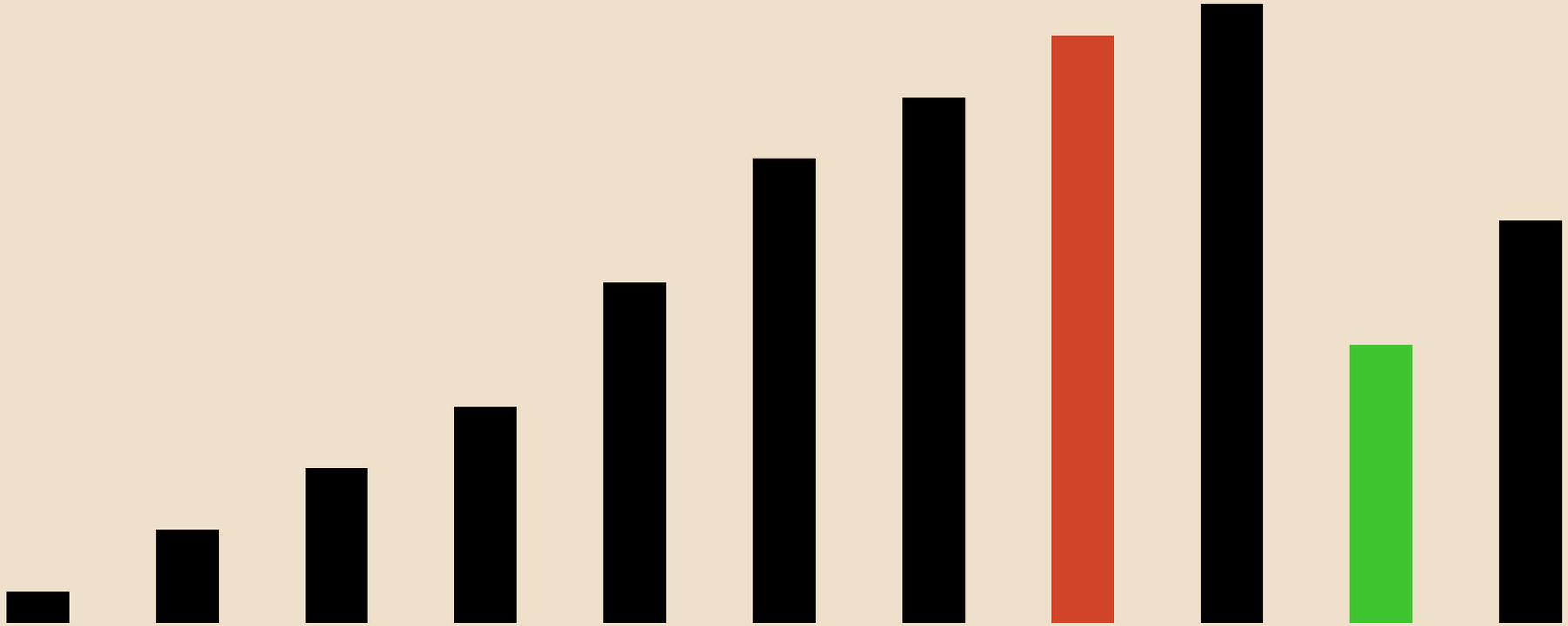


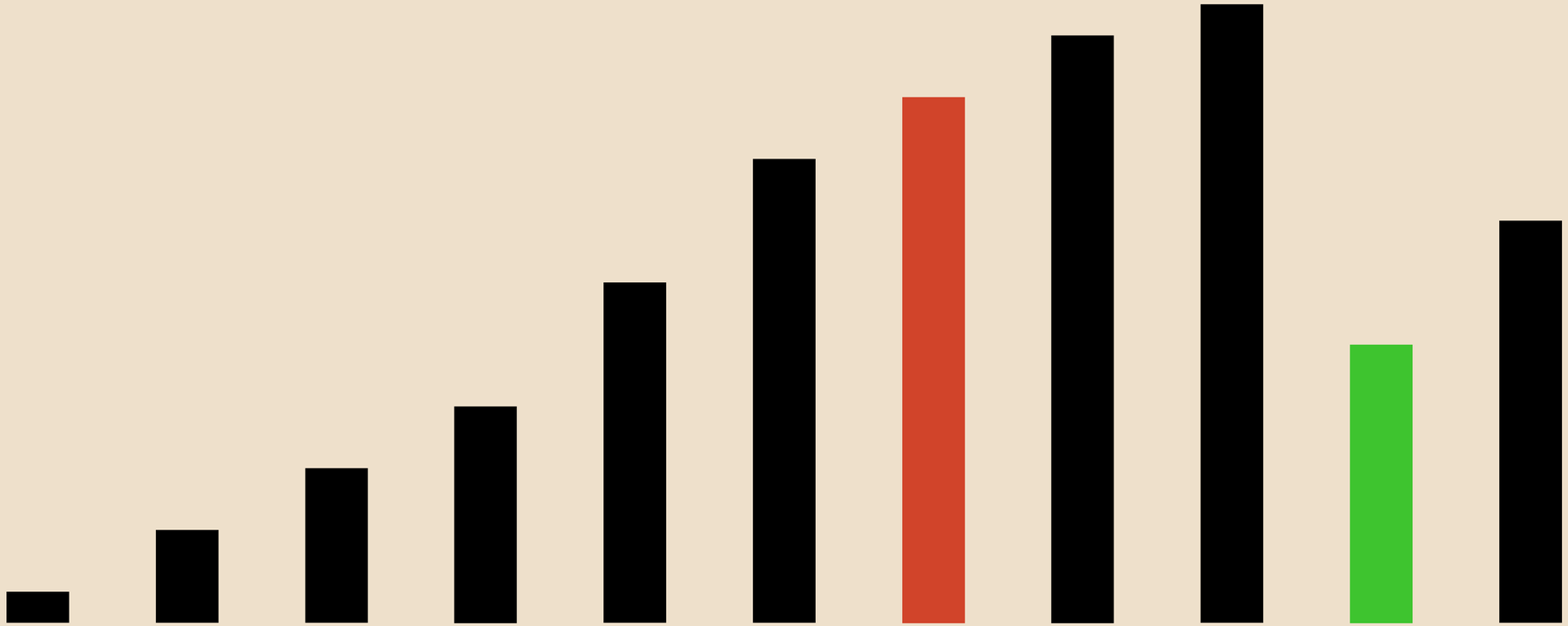


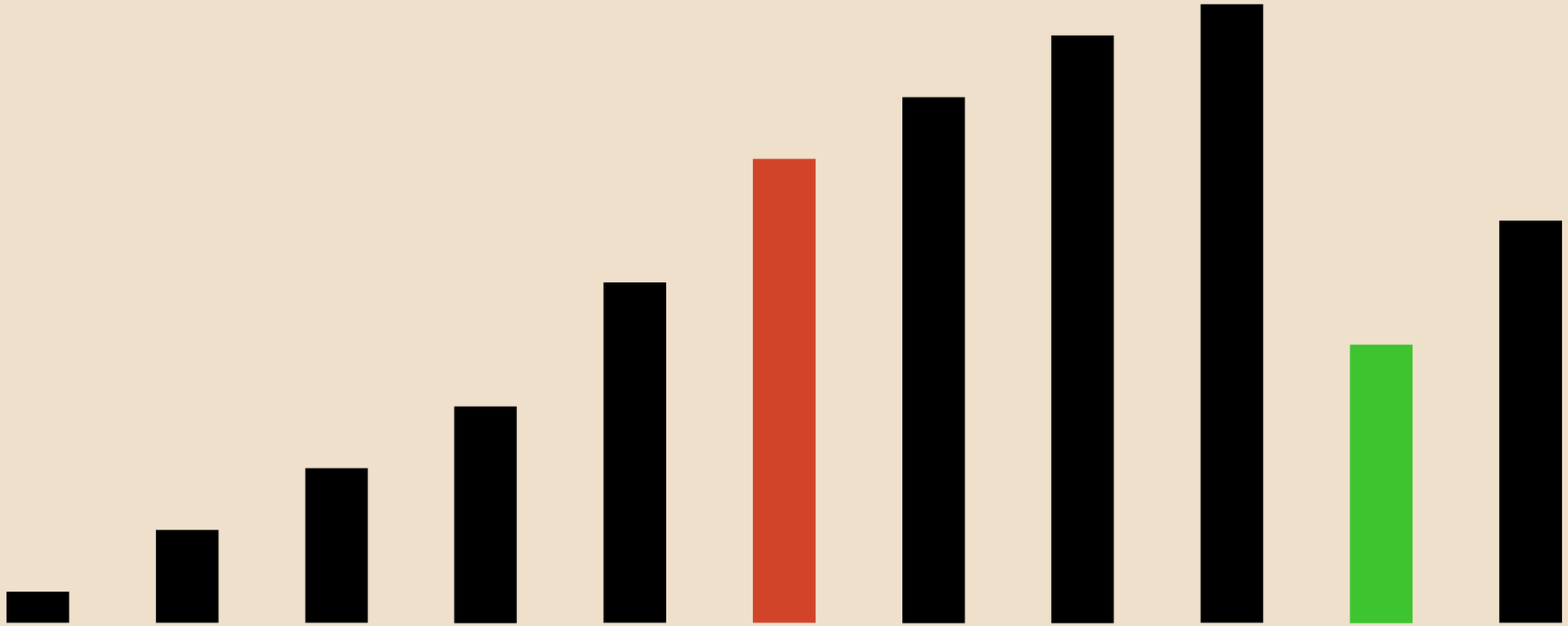


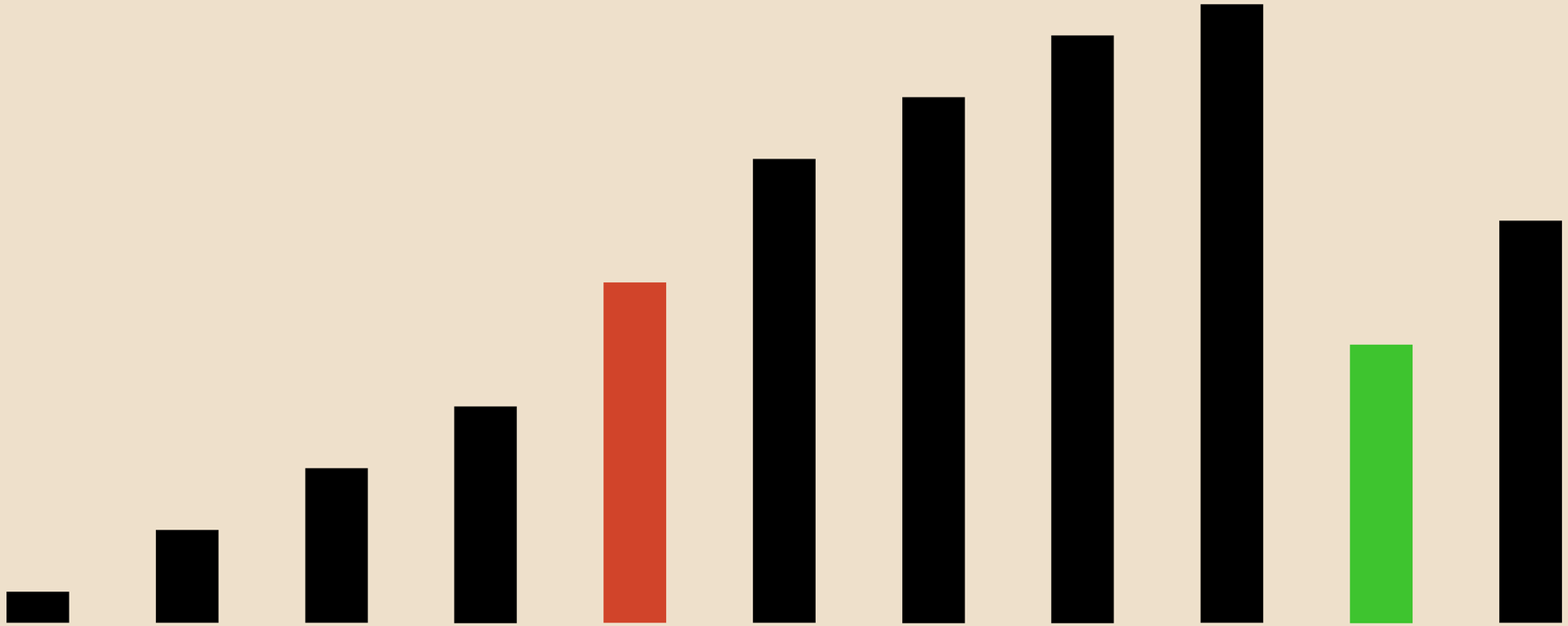


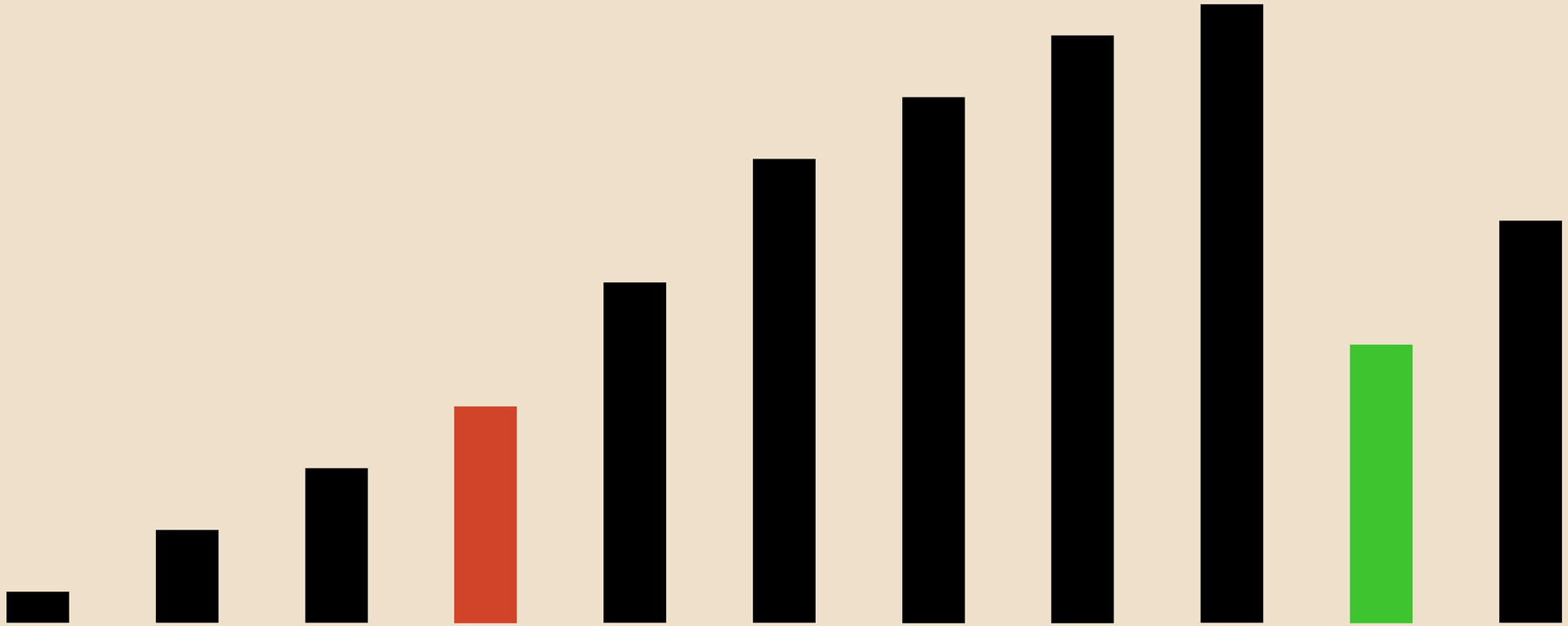


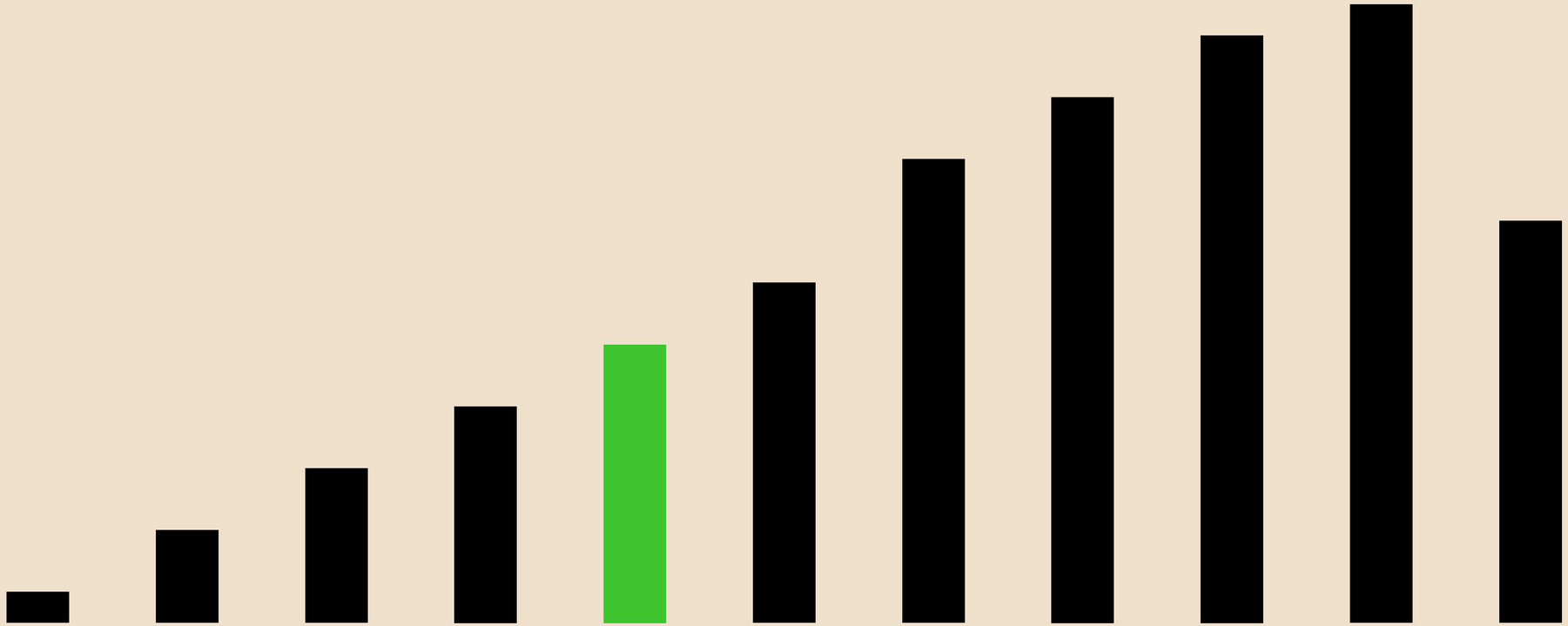


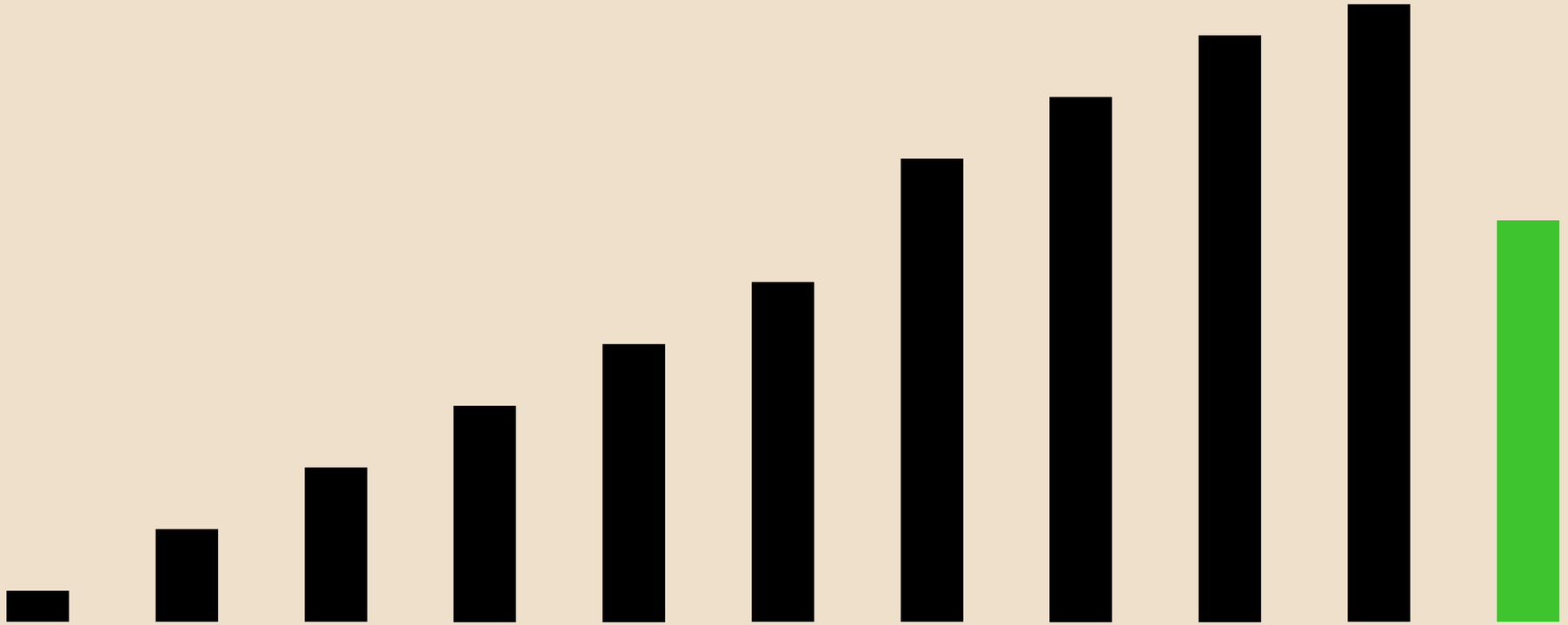


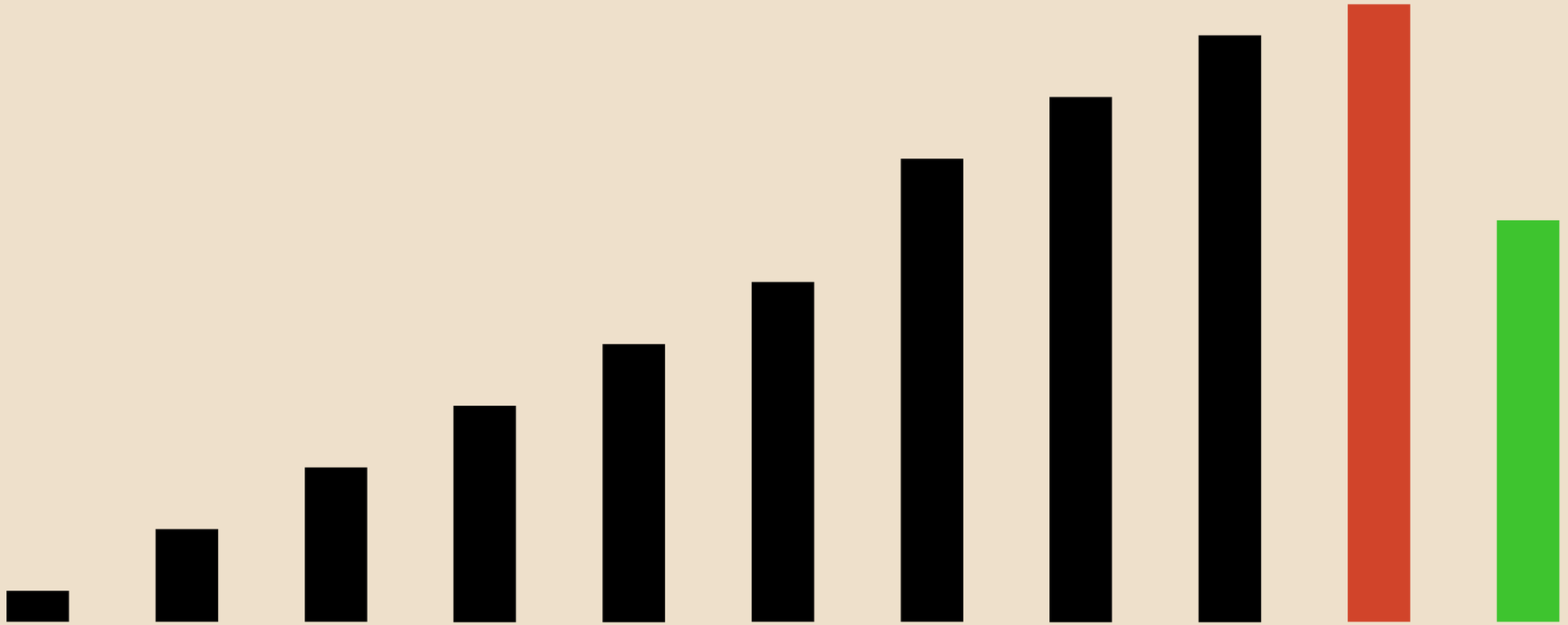


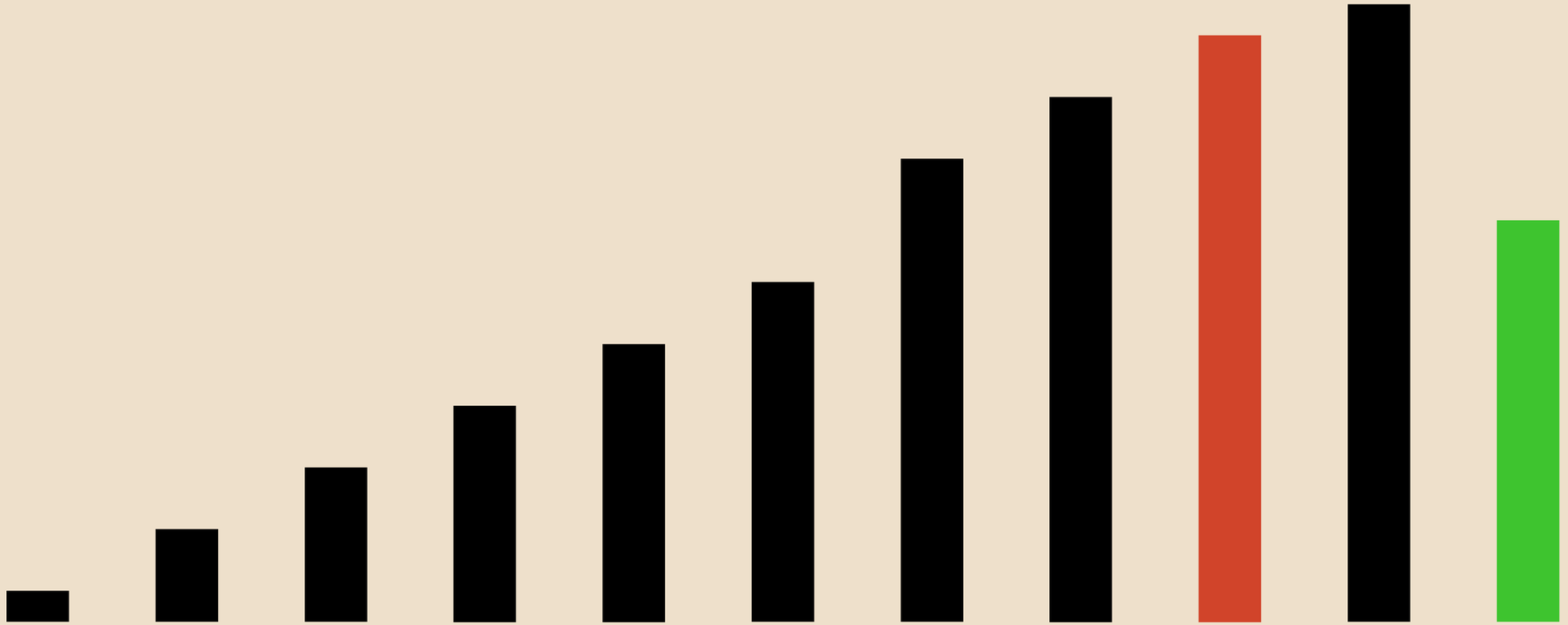


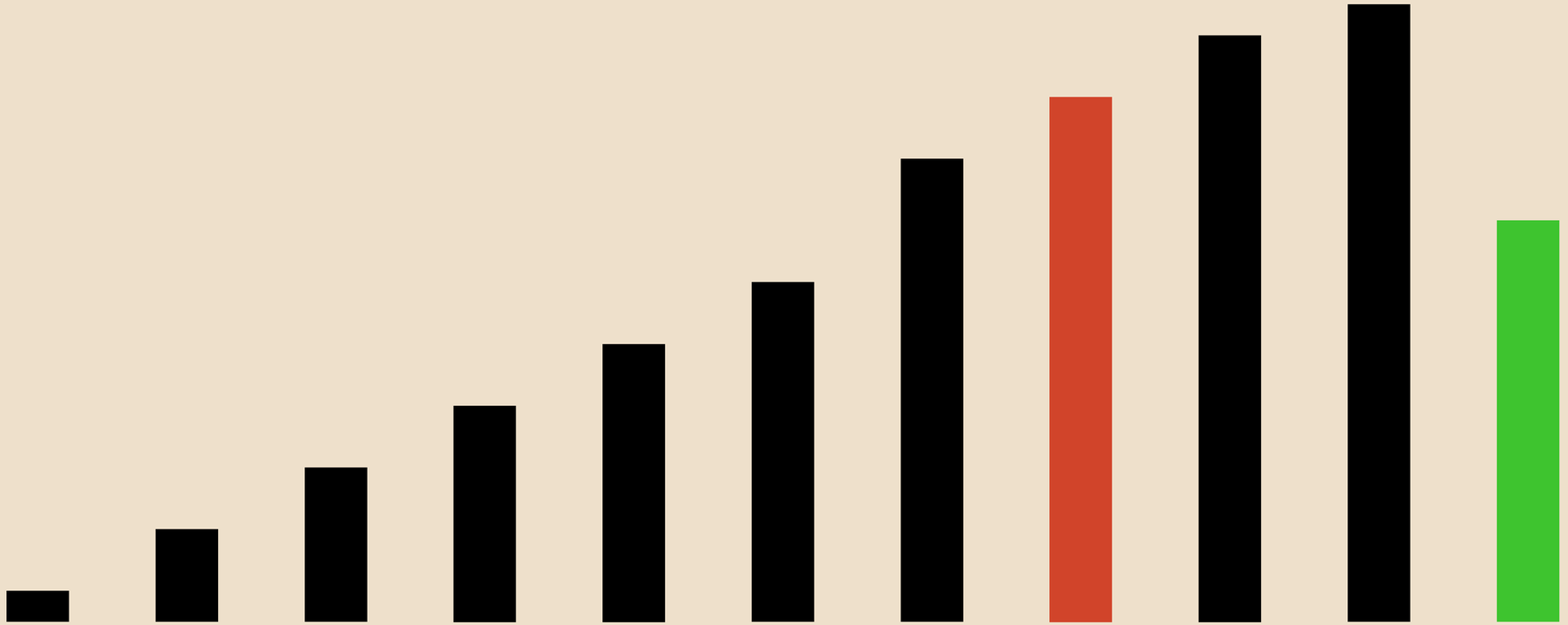


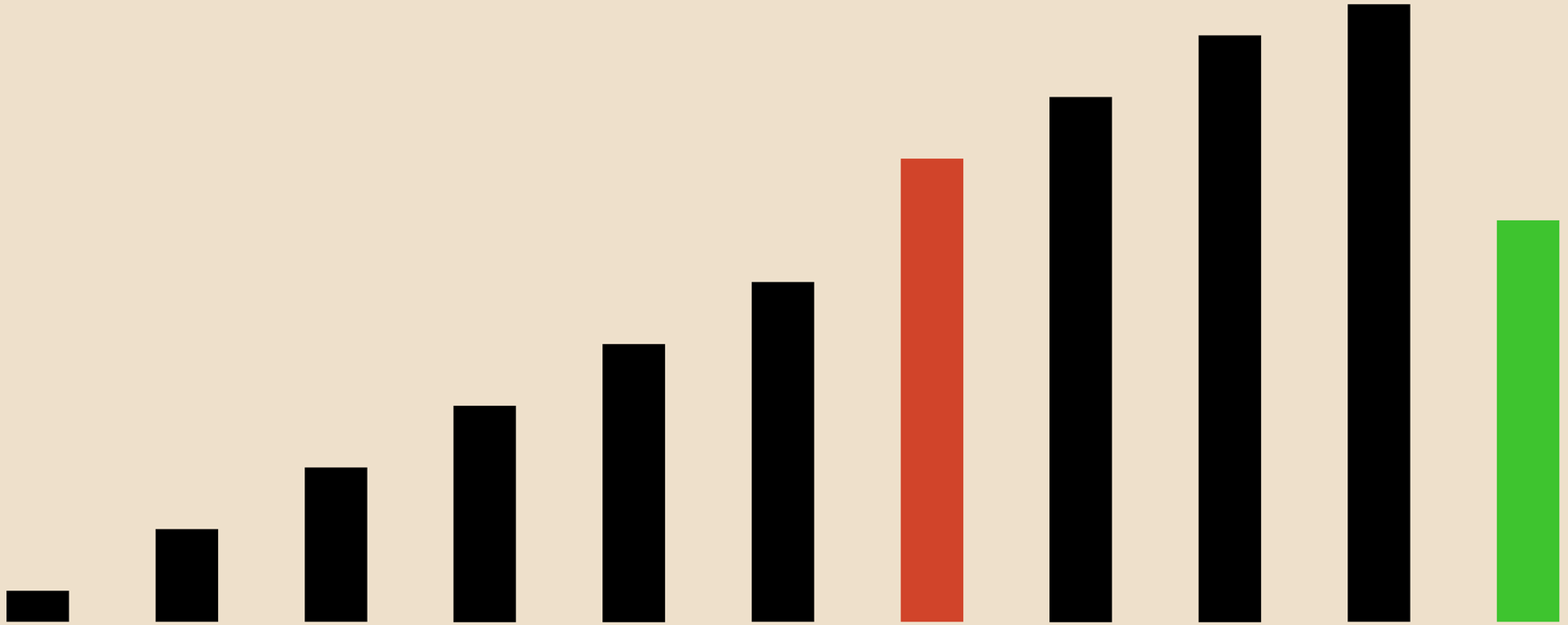


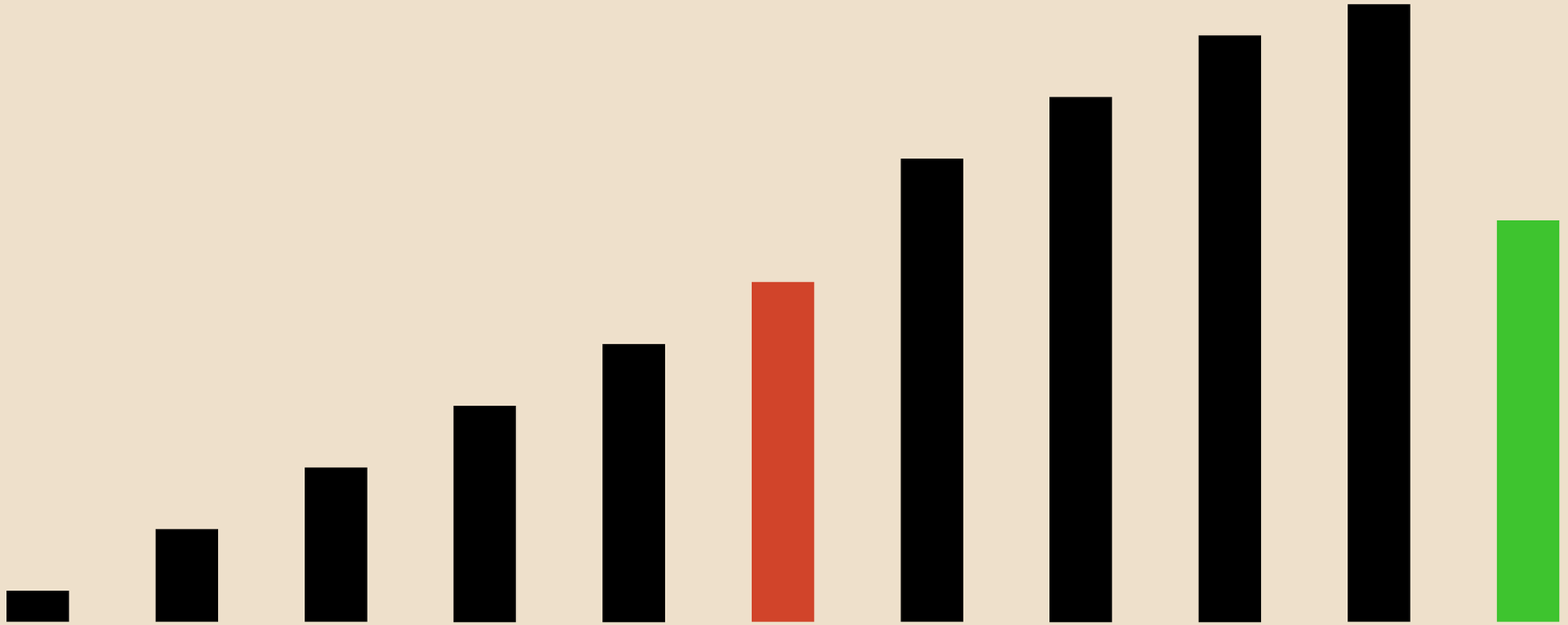


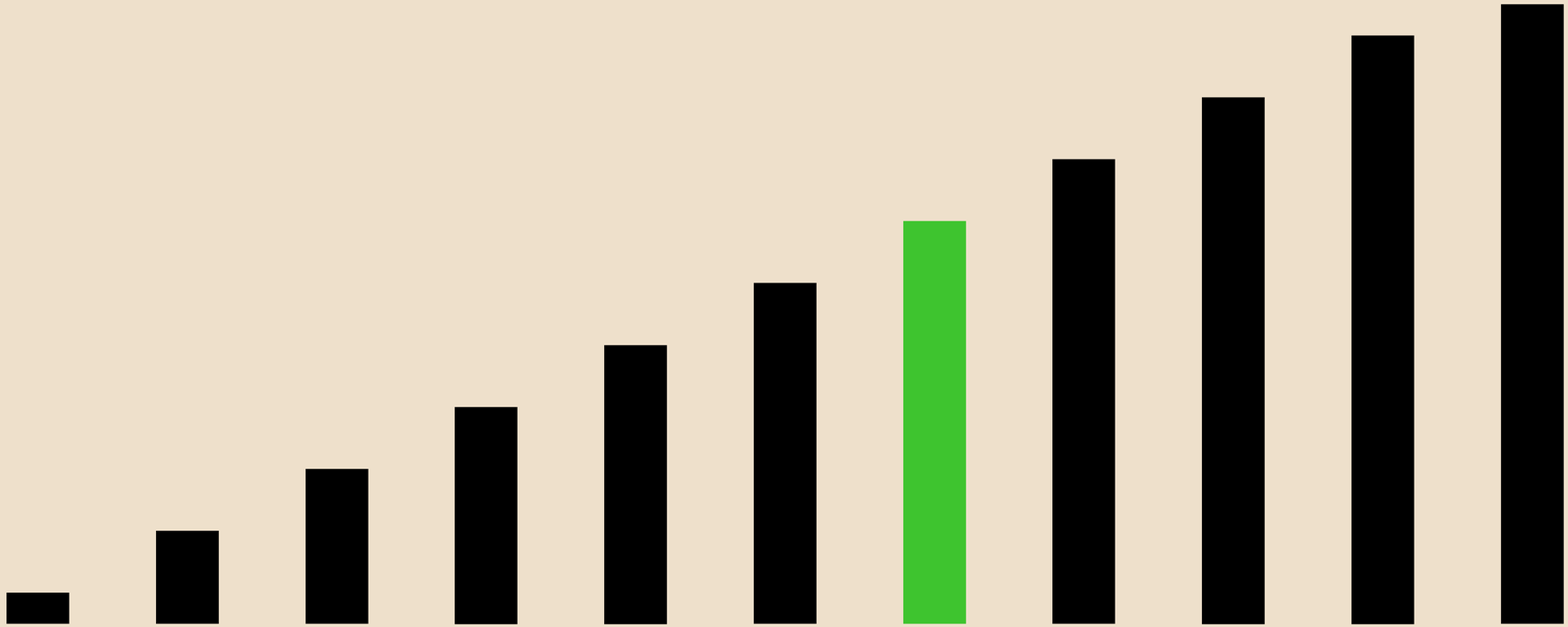


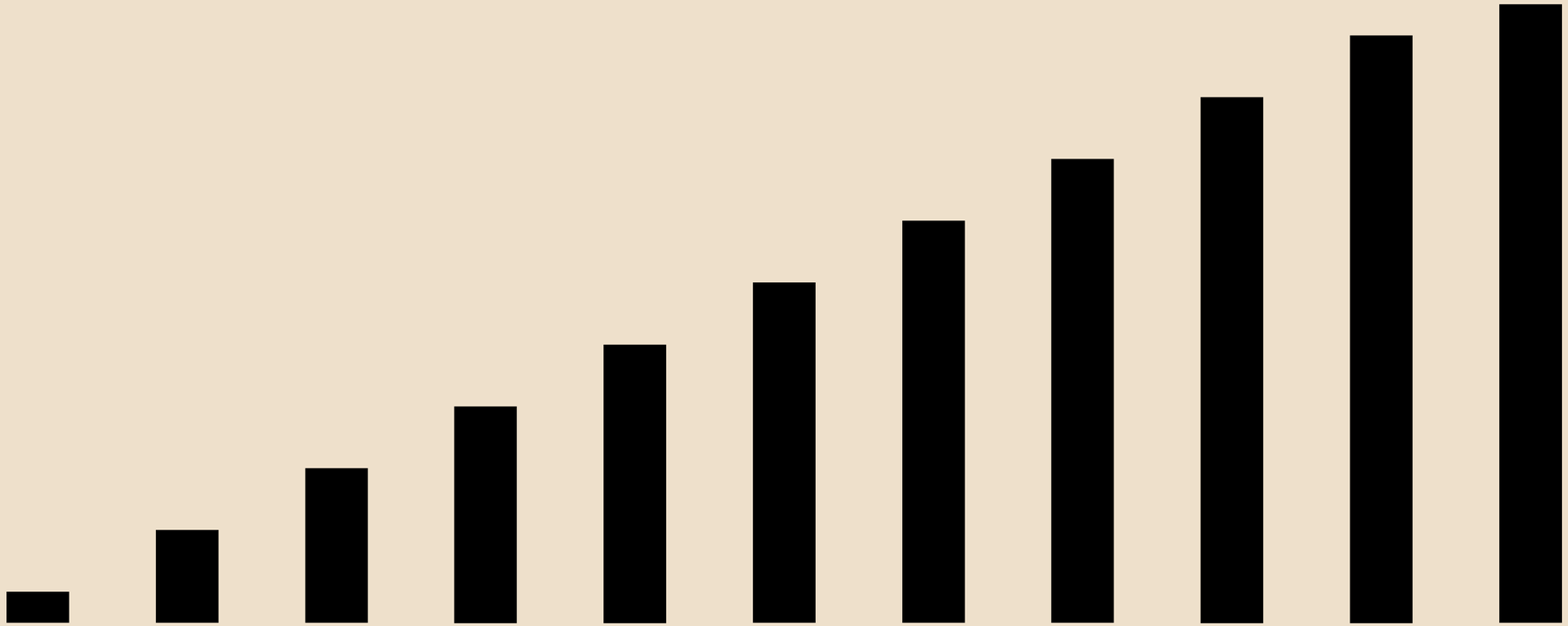








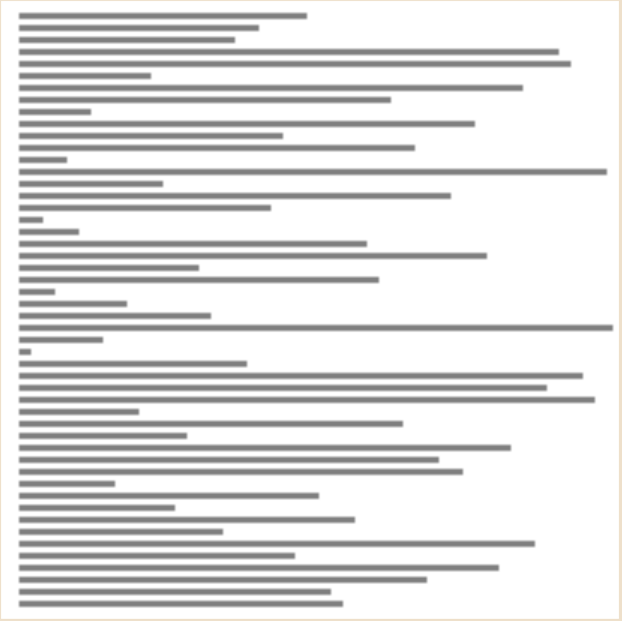




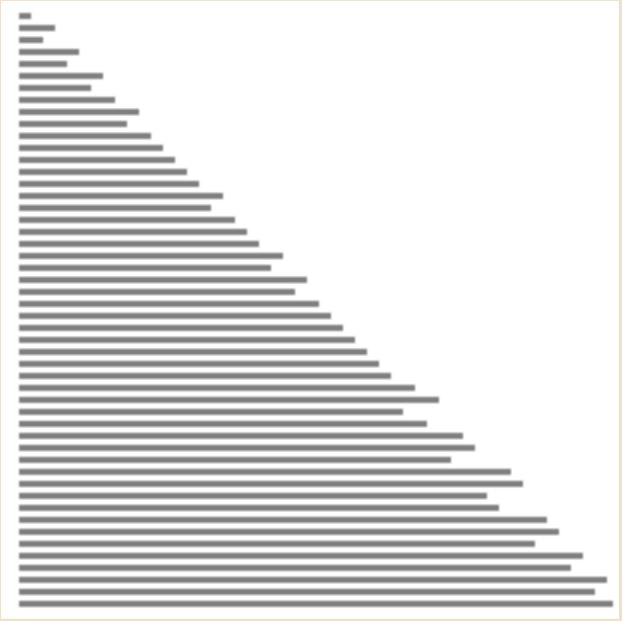
$$O(n^2)$$

$$\Omega(n)$$

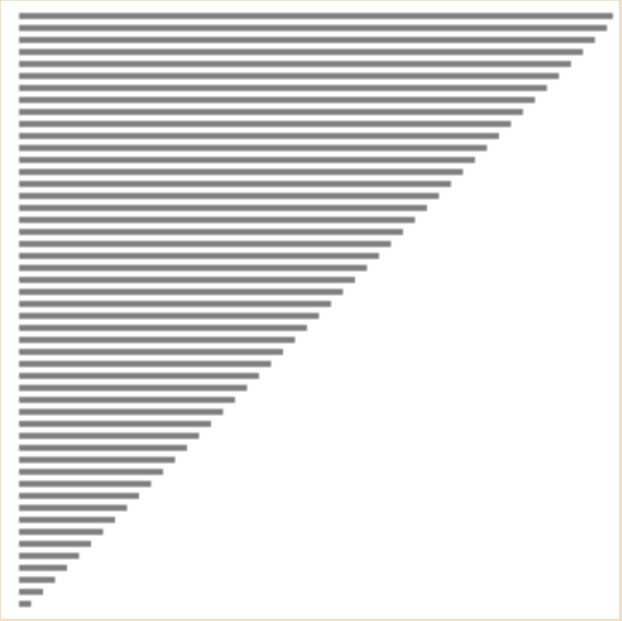
Random



Nearly Sorted



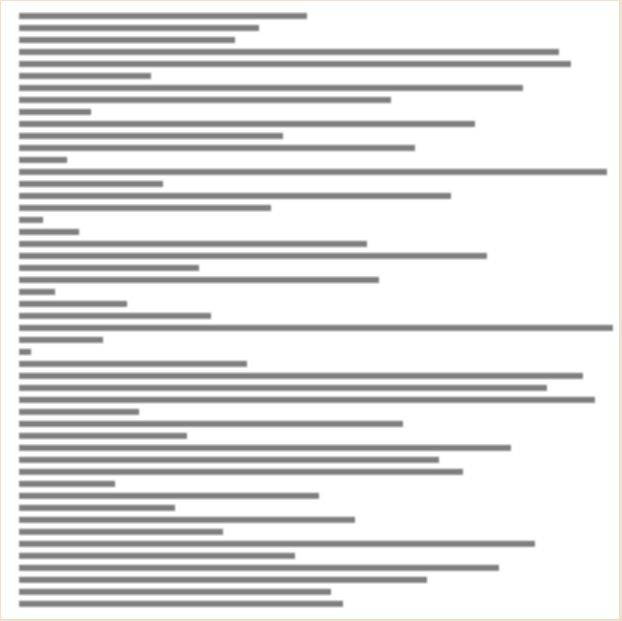
Reversed



Few Unique

https://www.toptal.com/developers/sorting-algorithms/insertion-sort

Random



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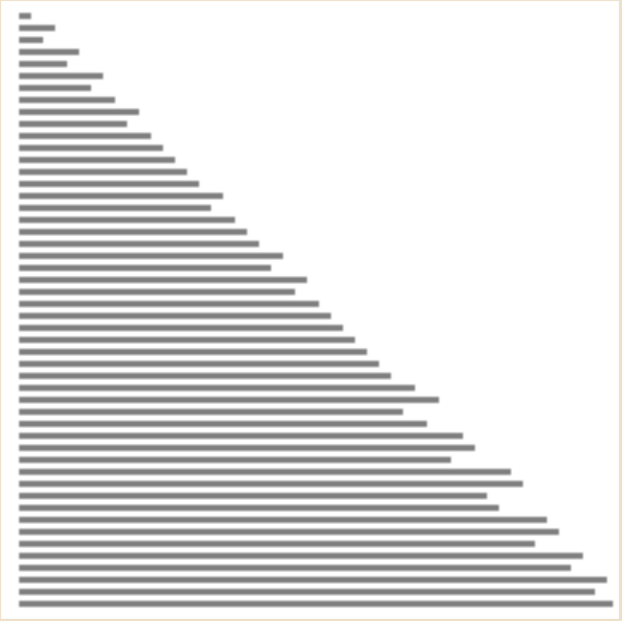

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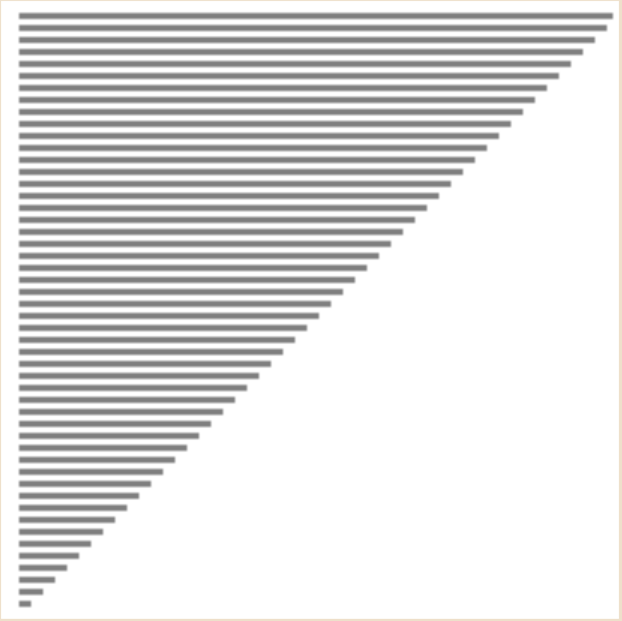

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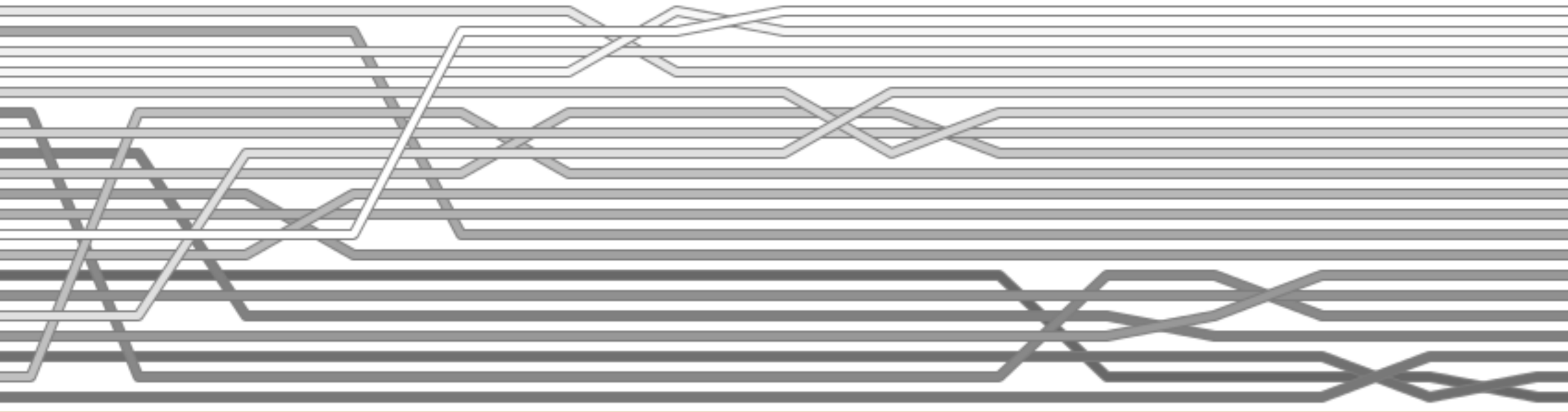
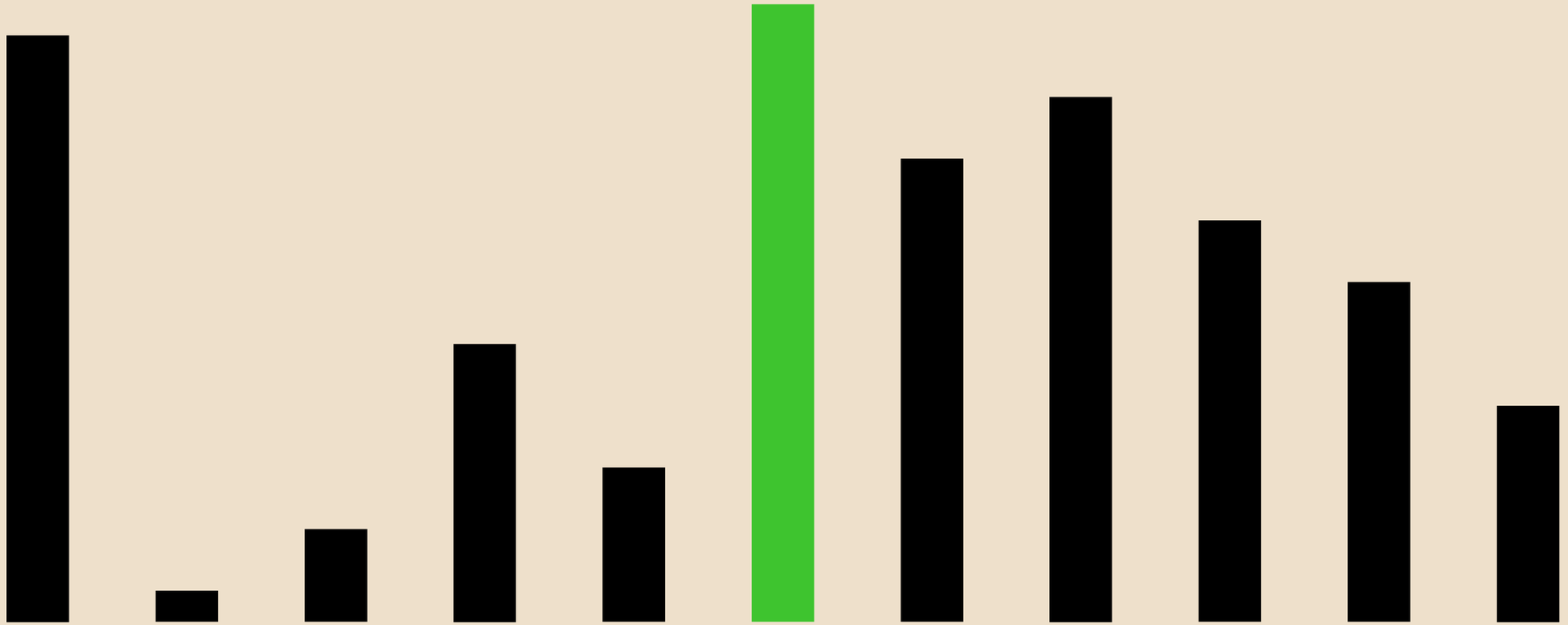
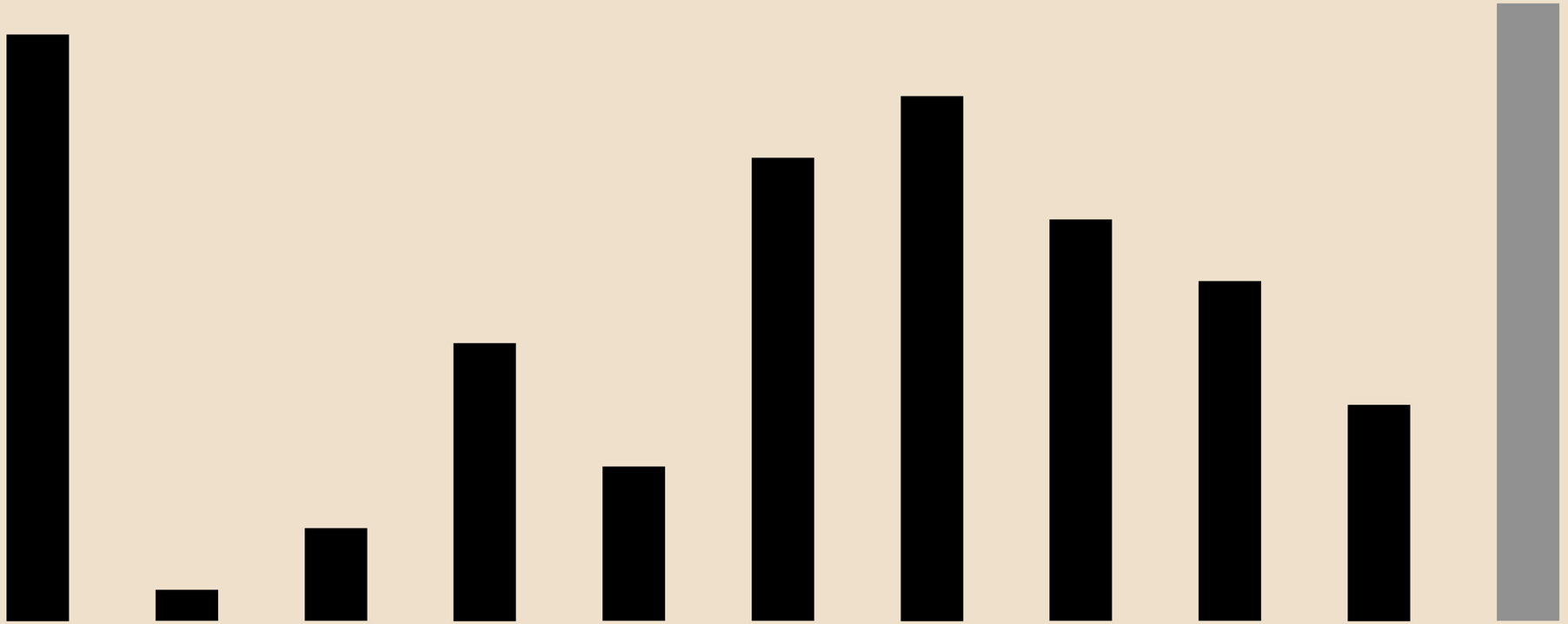
https://www.toptal.com/developers/sorting-algorithms/insertion-sort



Quicksort

$$O(n^2)$$

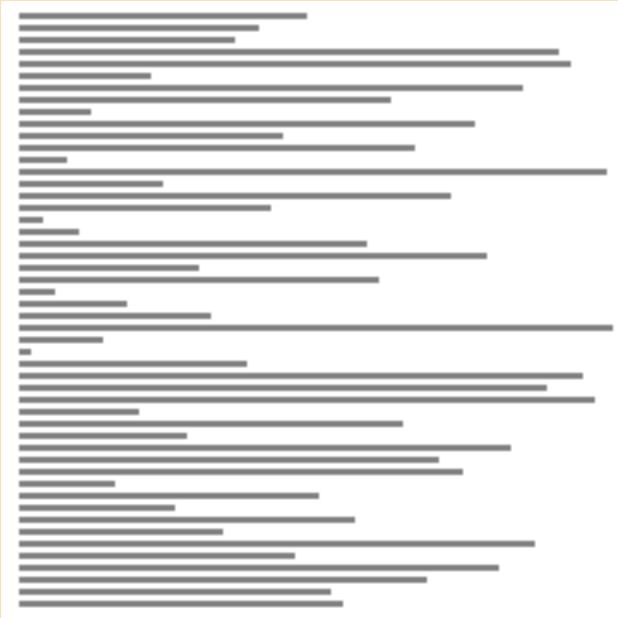




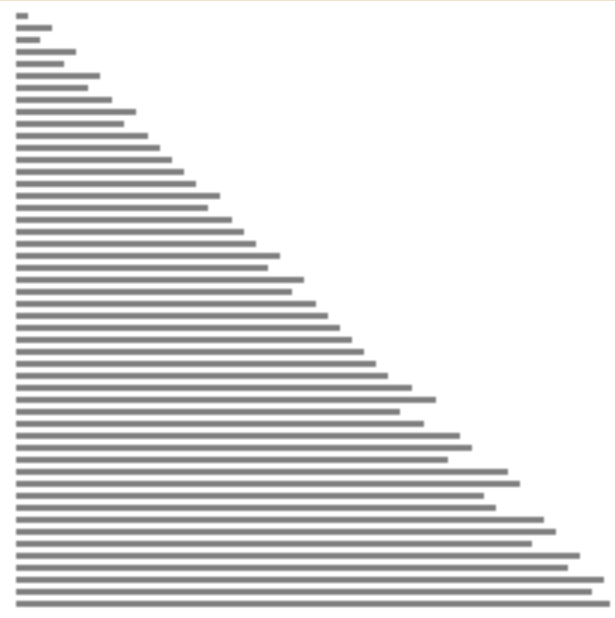
$$\mathcal{O}(n \log n)$$

$$\Omega(n \log n)$$

Random



Nearly Sorted



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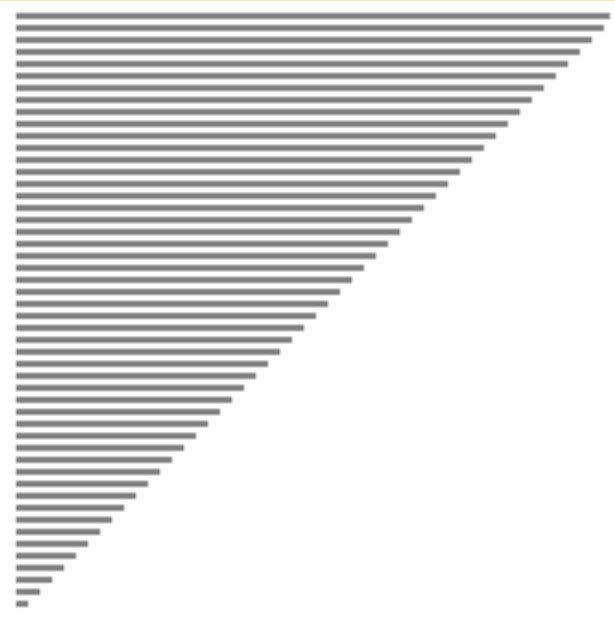

Few Unique

https://www.toptal.com/developers/sorting-algorithms/quick-sort

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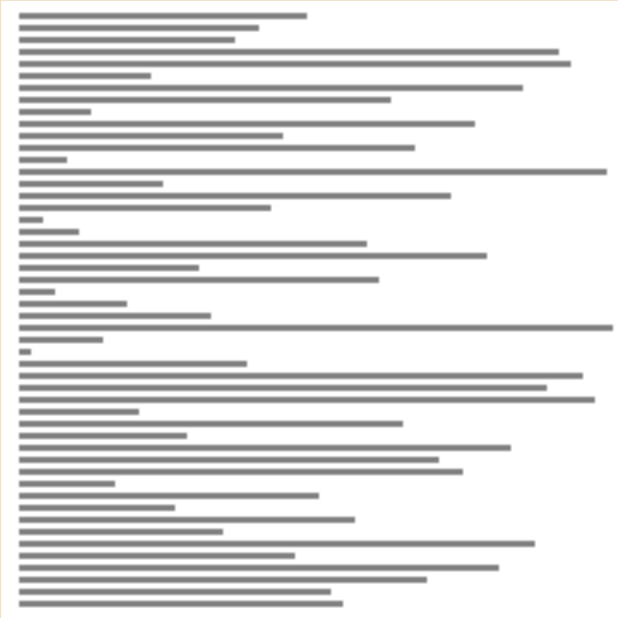

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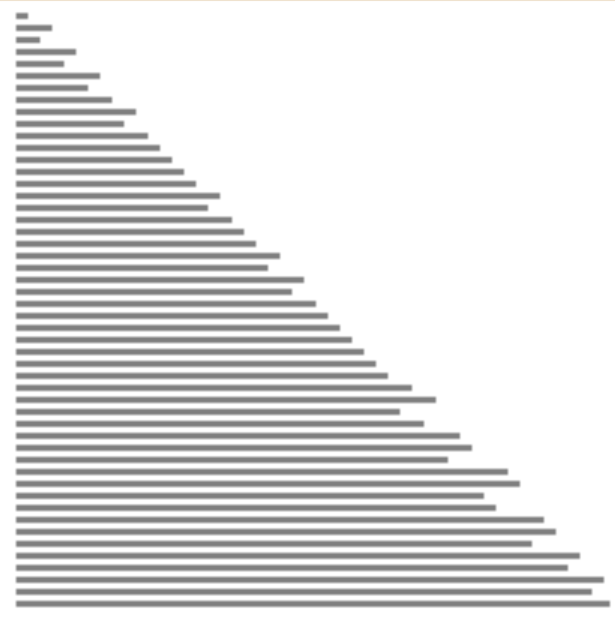
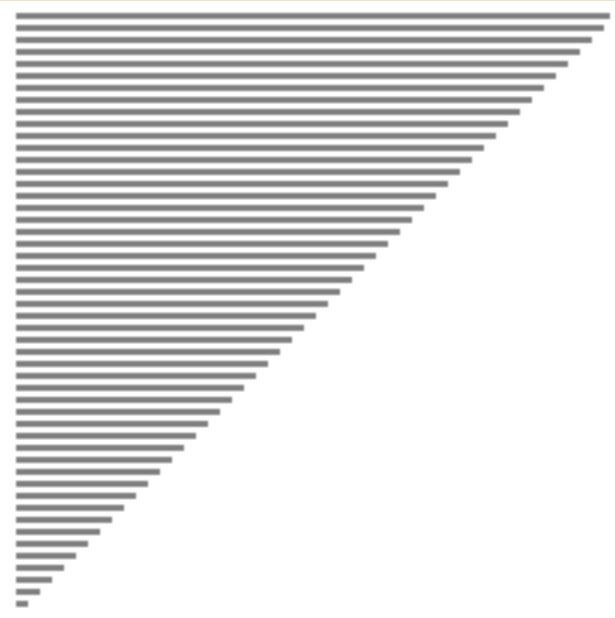
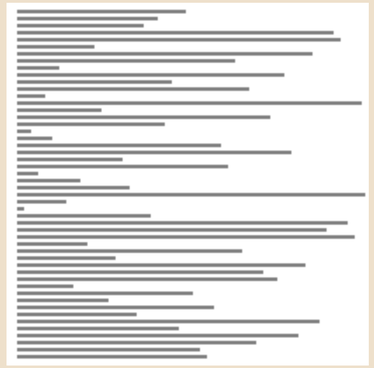
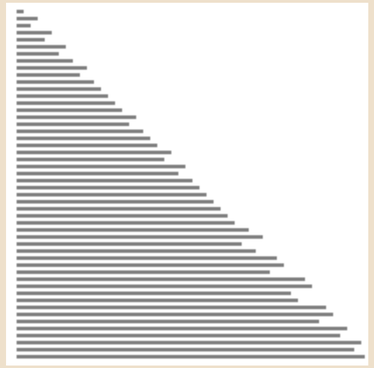
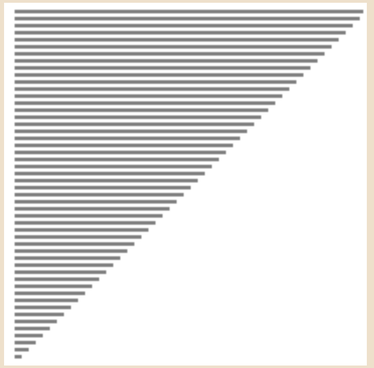
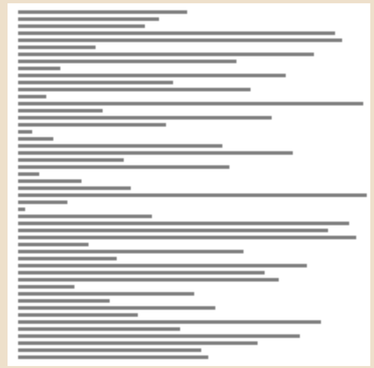
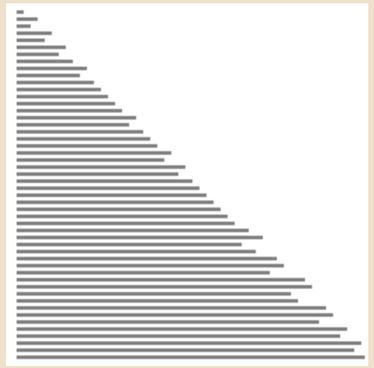
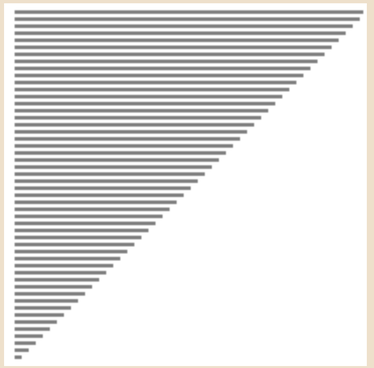
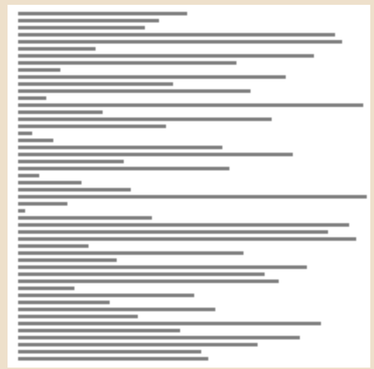
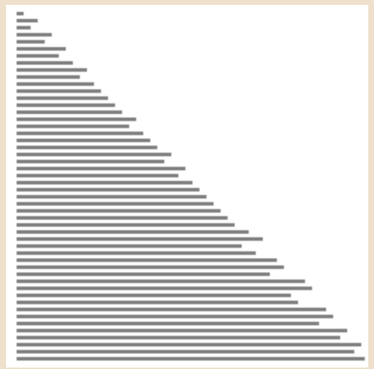
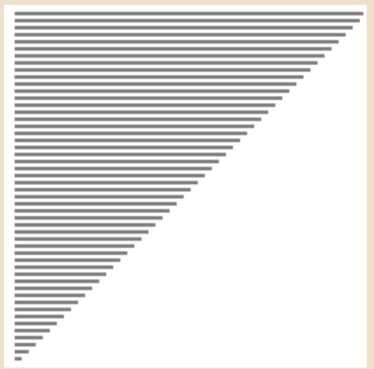


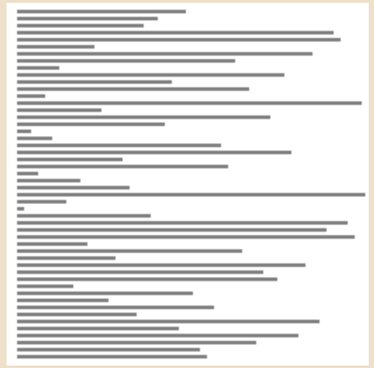
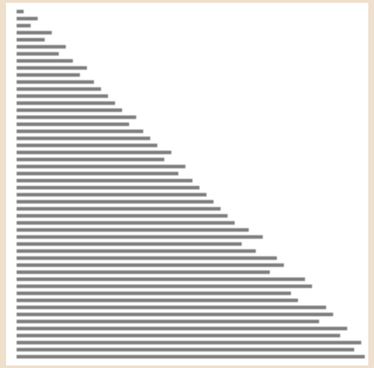
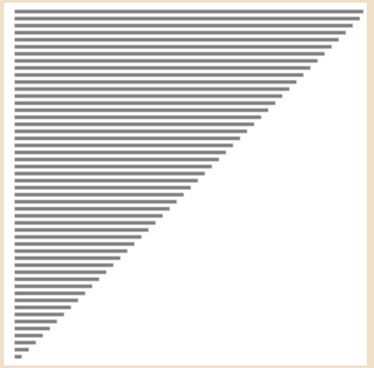
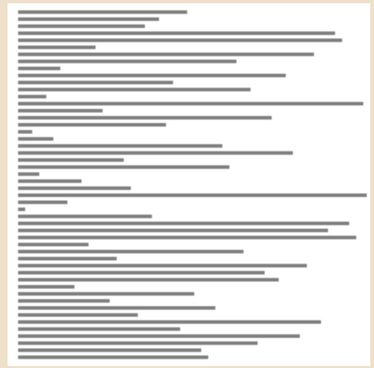
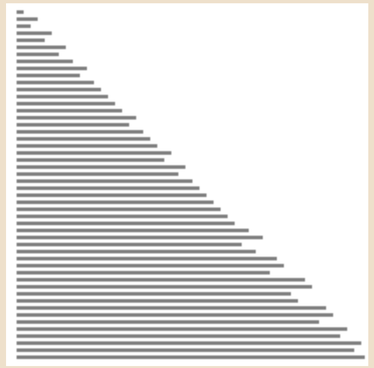
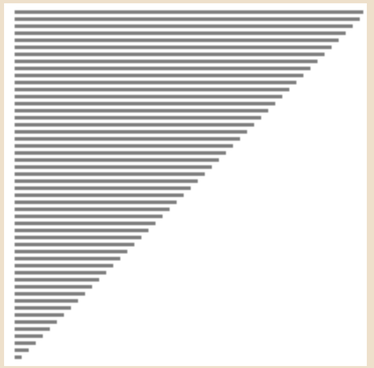
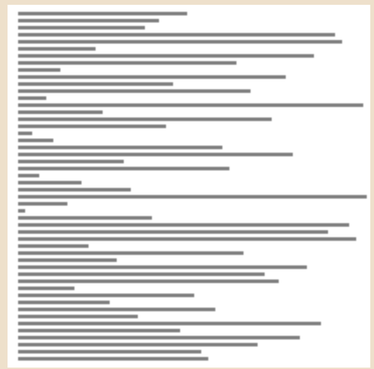
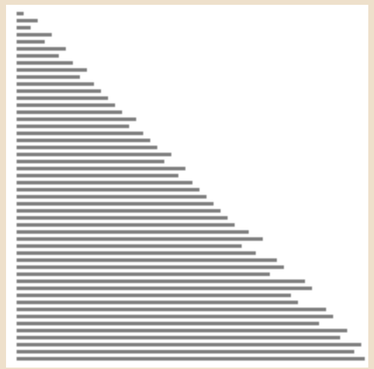
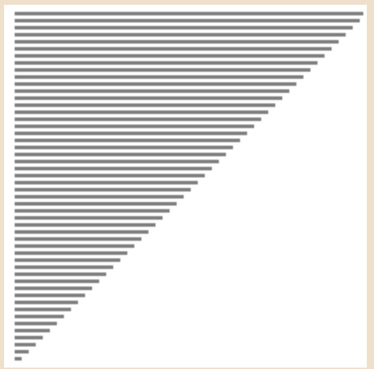
Reversed



Few Unique

https://www.toptal.com/developers/sorting-algorithms/quick-sort

	Random	Nearly Sorted	Reversed	Few Unique
Bubble				
Insertion				
Quick				

	Random	Nearly Sorted	Reversed	Few Unique
Bubble				
Insertion				
Quick				

Gracias.

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- https://www.youtube.com/watch?v=gOKVwRIyWdg
- Big O and Big Omega graphics: https://texblog.org/2014/06/24/big-o-and-related-notations-in-latex/