CS2040S DISCUSSION GROUP

WEEK 4

ABOUT ME

- Name: Abdul Fatir Ansari (call me *Fatir*)
- 3rd year PhD Student
  - Working in the area of generative models.
- Email: abdulfatir@u.nus.edu

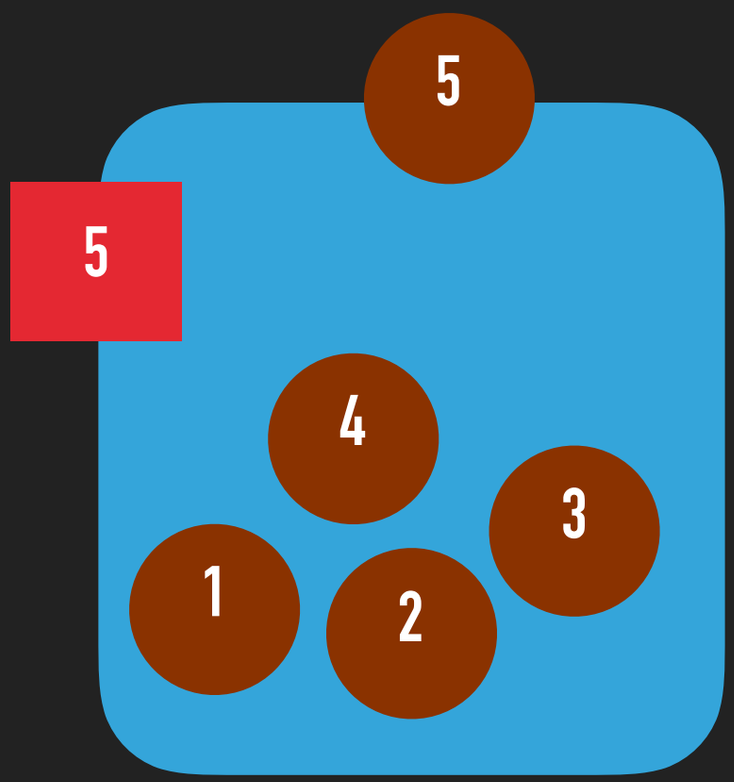
PROBLEM

- You are given a running list of diameters of cookies.
- Whenever queried with a '#', remove the cookie with median diameter.
  - If the number of cookies ***N*** is odd, remove ***(N+1)/2***th cookie.
  - If ***N*** is even, remove ***(N/2+1)***th cookie.

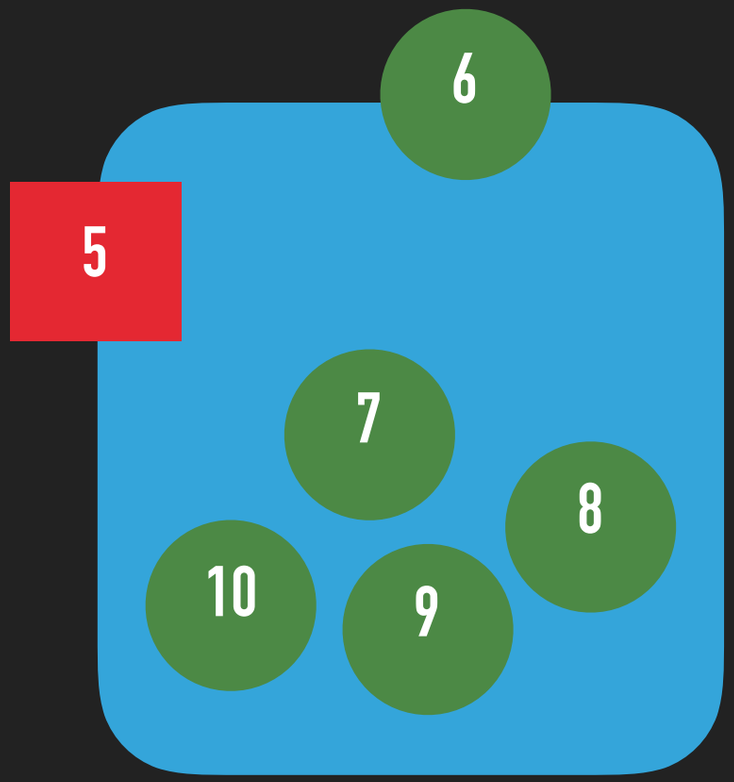
KEY IDEA

- At some point, let there be ***N*** cookies.
- Imagine that you have two “buckets” B1 and B2.
- B1 stores cookies from smallest to $N/2^{th}$-smallest.
- B2 stores cookies from $(N/2+1)^{th}$-smallest to largest.
- The number of cookies in B2 are *more than* B1 by at most one (1).

ADDING A NEW COOKIE



SMALLEST TO $(N/2)^{TH}$ SMALLEST



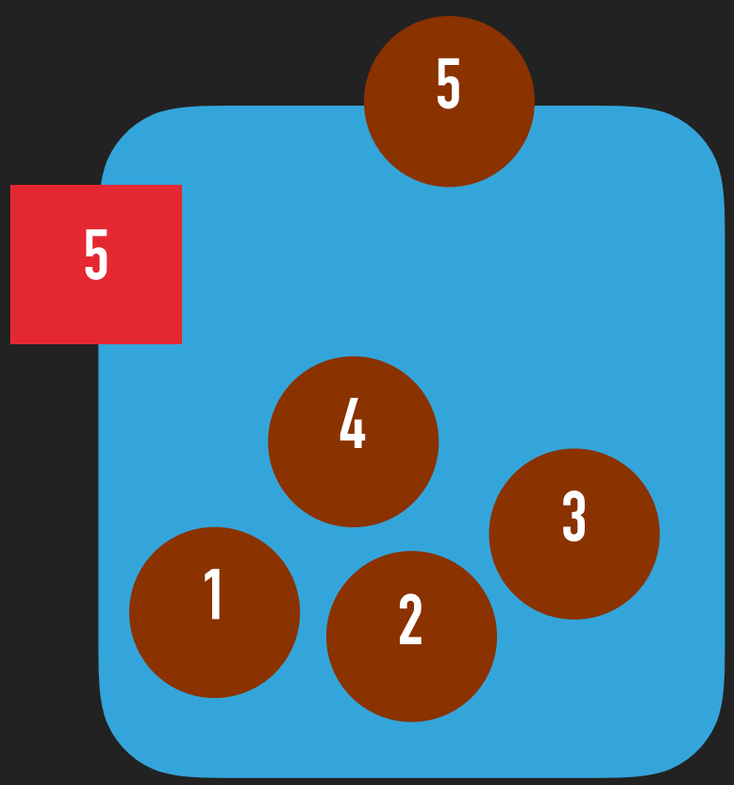
$(N/2+1)^{TH}$ TO LARGEST

ADDING A NEW COOKIE

SMALLEST TO $(N/2)^{TH}$ SMALLEST

$(N/2+1)^{TH}$ TO LARGEST

ADDING A NEW COOKIE



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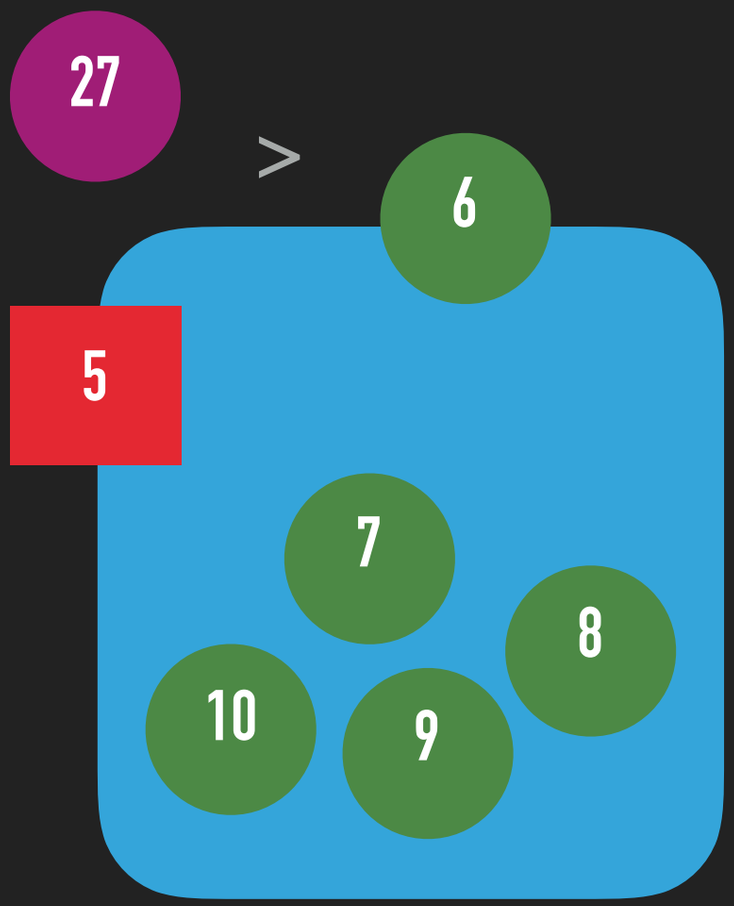

$(N/2+1)^{TH}$ TO LARGEST

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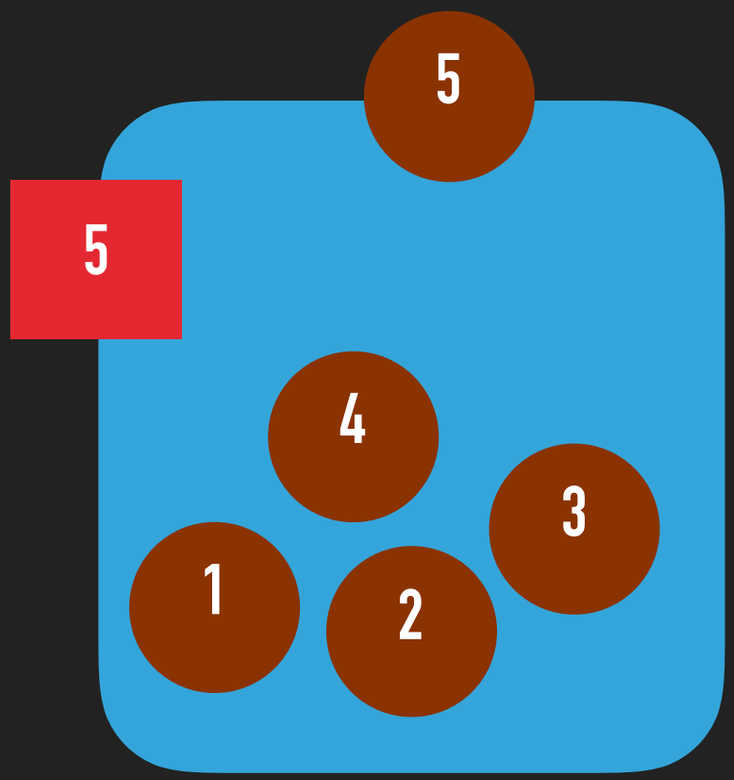
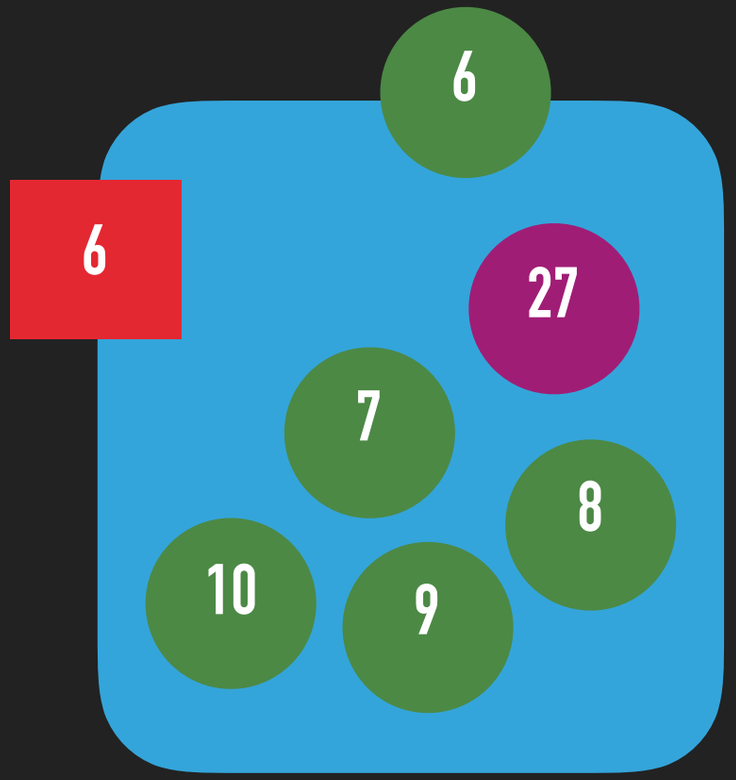
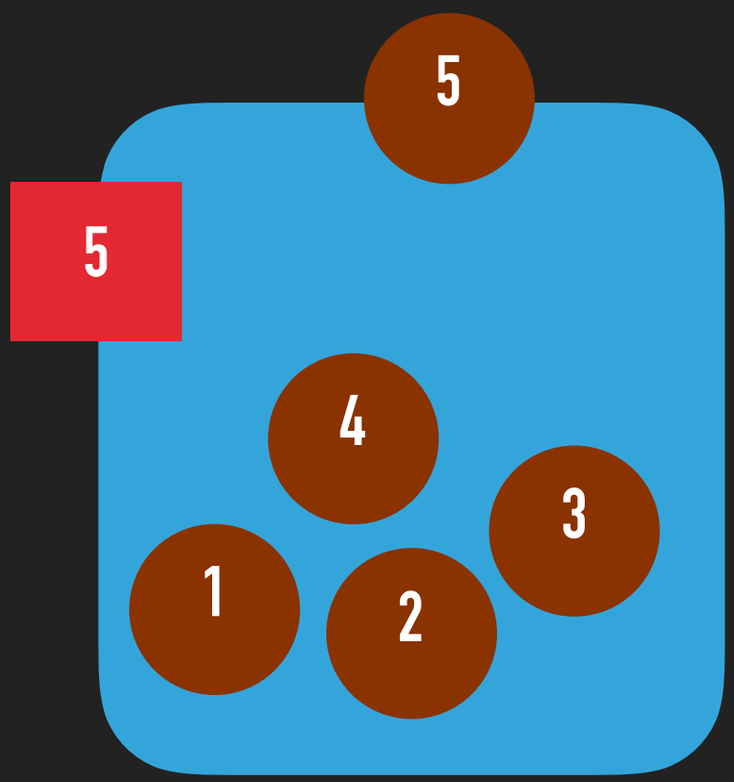


SMALLEST TO (N/2)TH SMALLEST

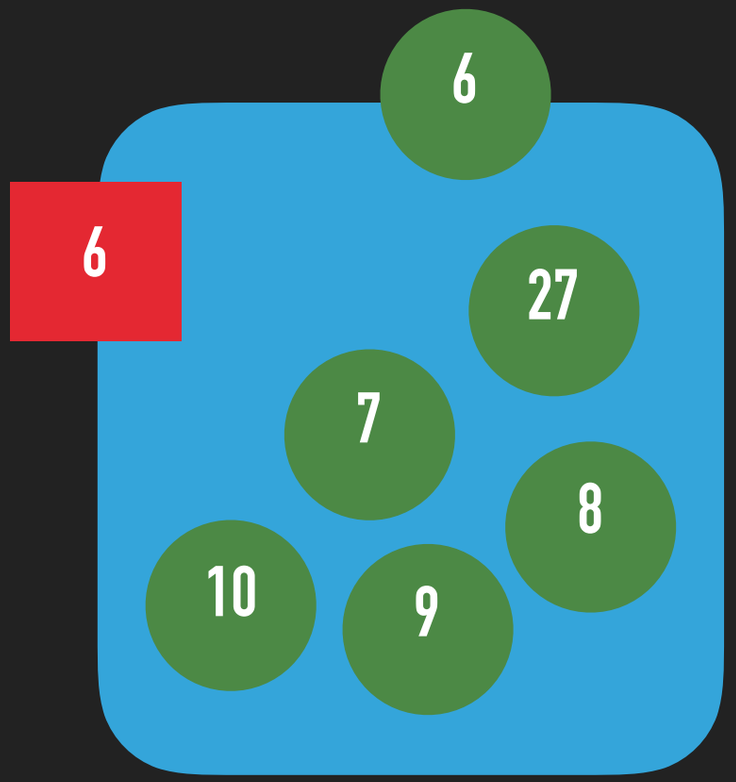


(N/2+1)TH TO LARGEST

ADDING A NEW COOKIE



SMALLEST TO $(N/2)^{TH}$ SMALLEST



$(N/2+1)^{TH}$ TO LARGEST

ADDING A NEW COOKIE

SMALLEST TO $(N/2)^{TH}$ SMALLEST

$(N/2+1)^{TH}$ TO LARGEST

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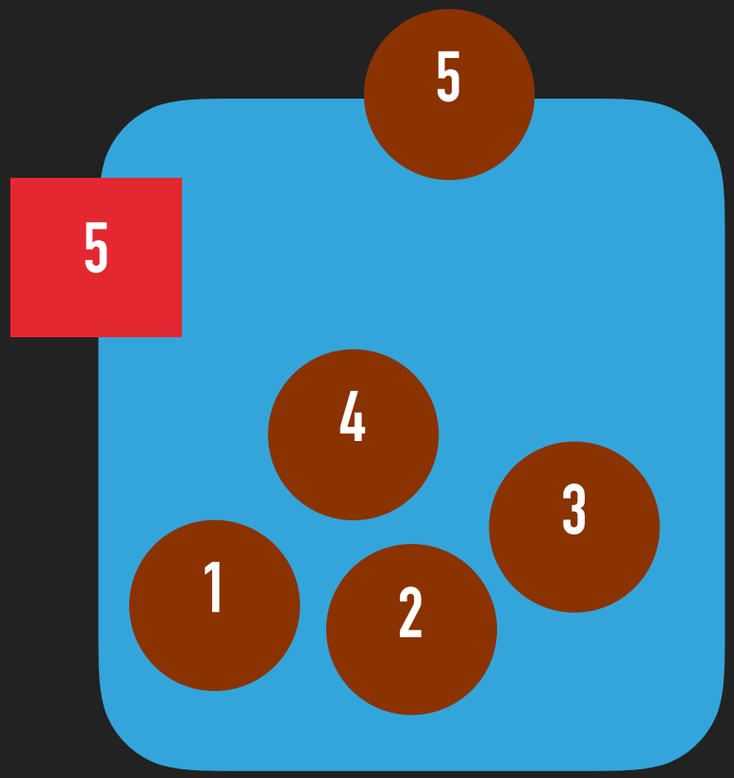

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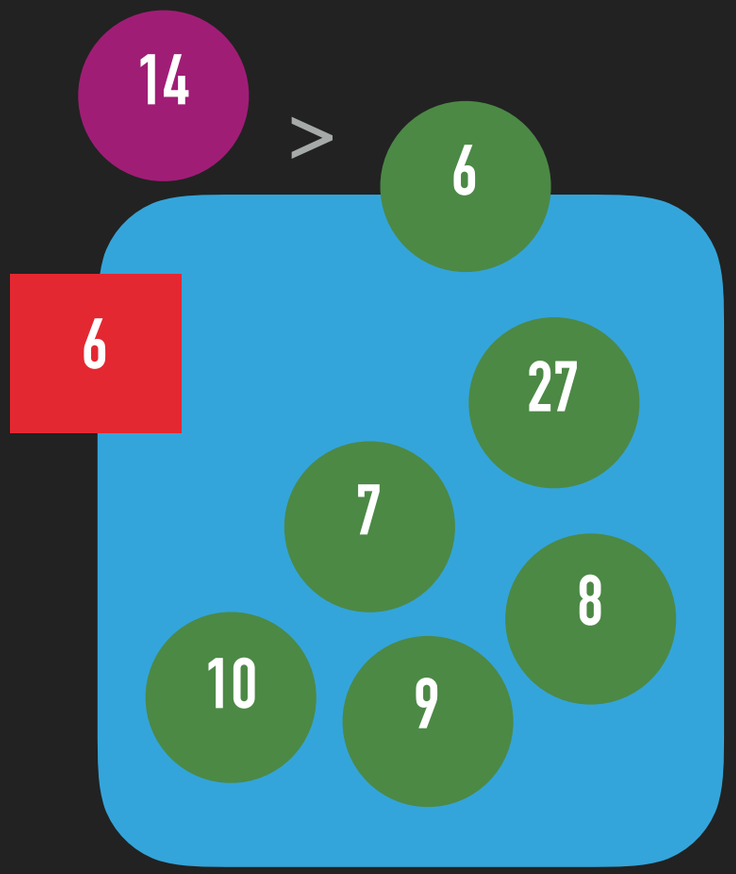
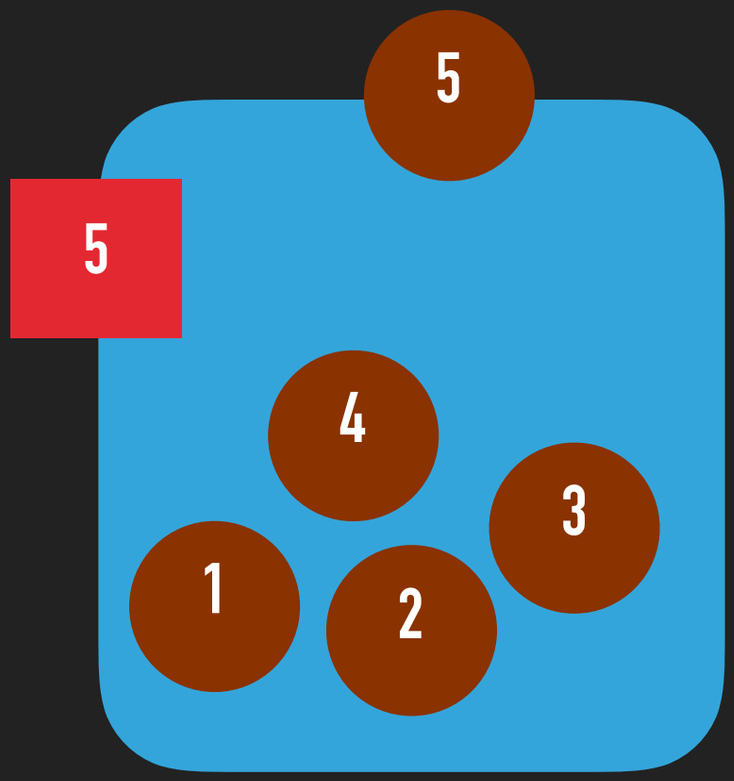


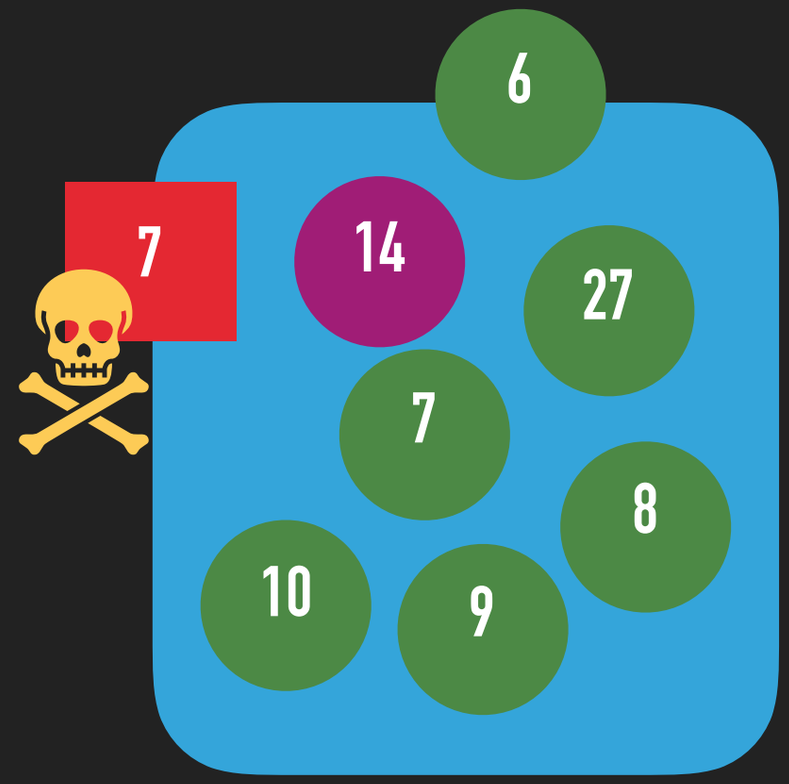
(N/2+1)TH TO LARGEST

ADDING A NEW COOKIE

What can we do to solve this problem?

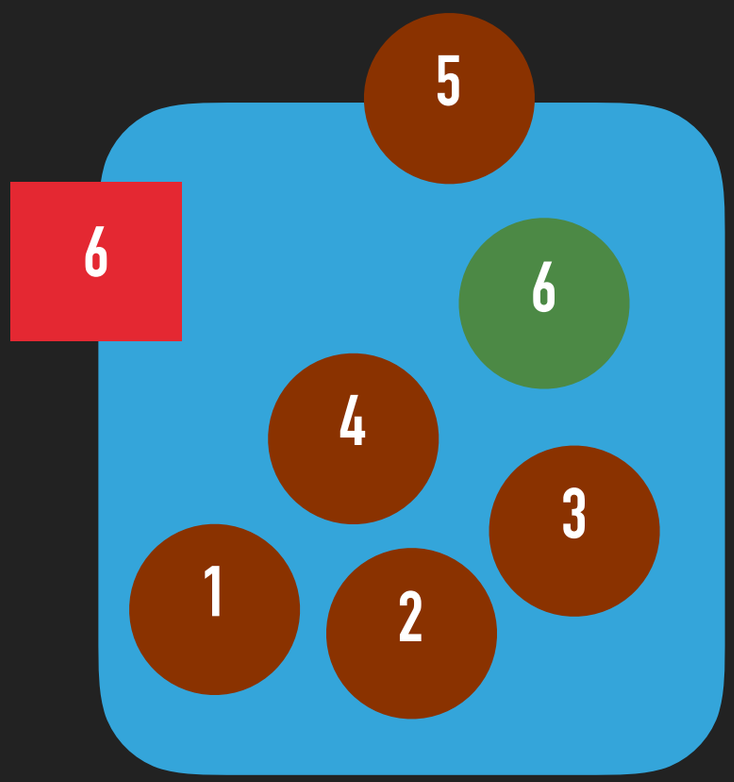


SMALLEST TO $(N/2)^{TH}$ SMALLEST



$(N/2+1)^{TH}$ TO LARGEST

ADDING A NEW COOKIE



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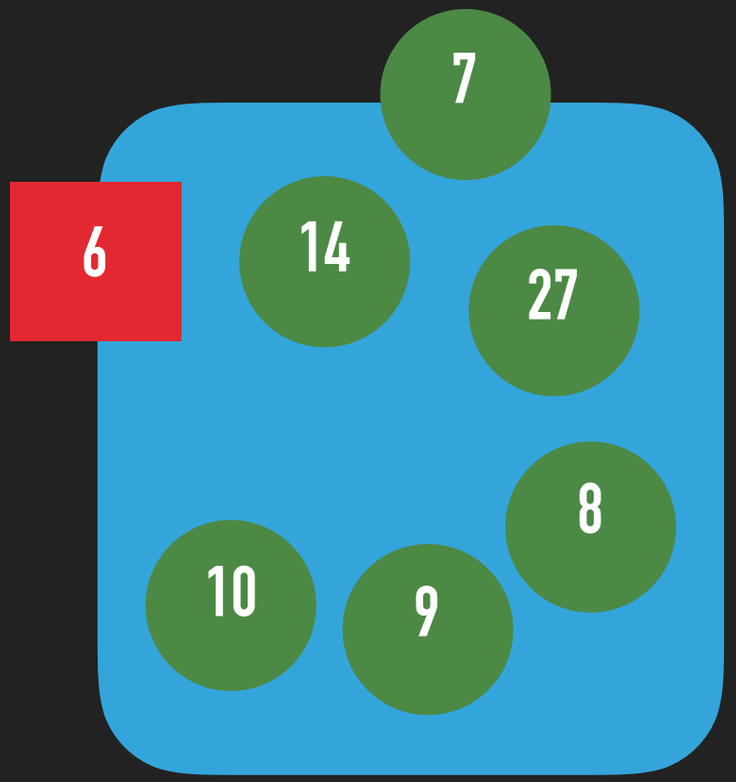
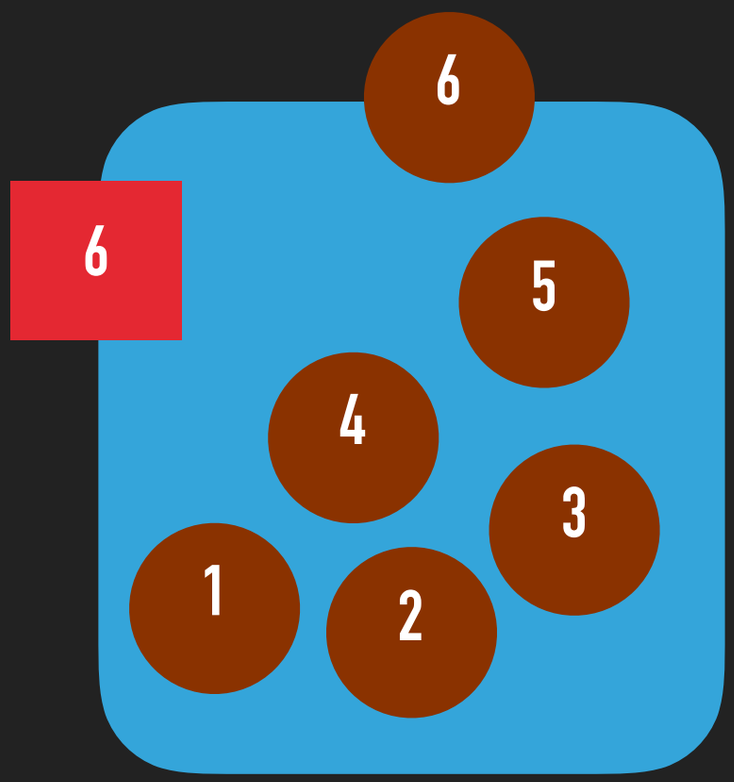


$(N/2+1)^{TH}$ TO LARGEST

ADDING A NEW COOKIE



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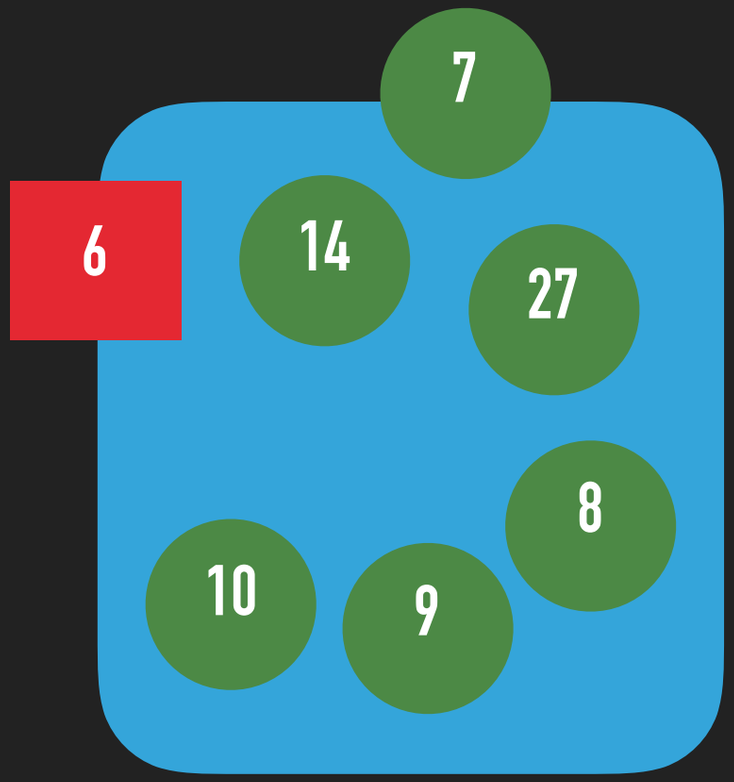
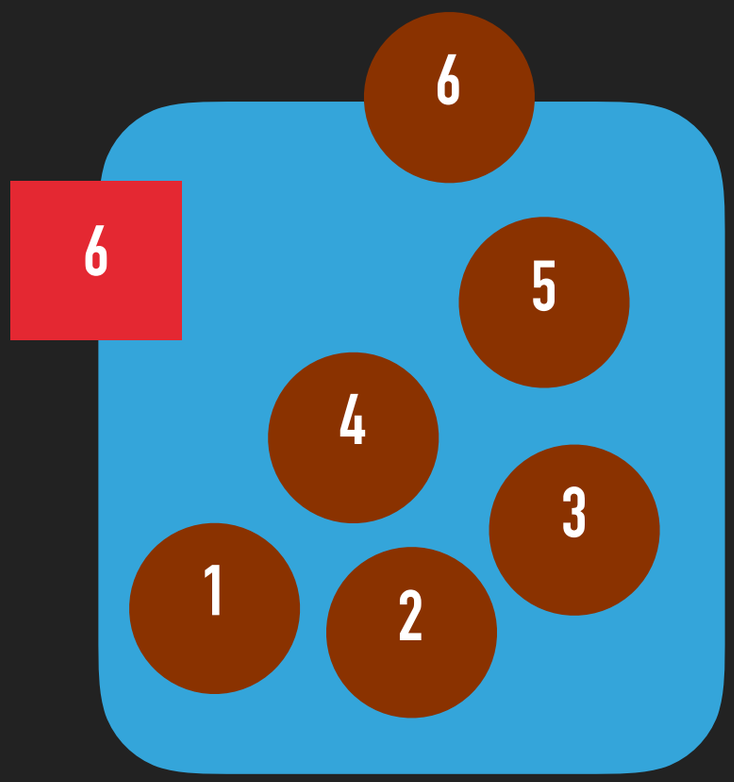


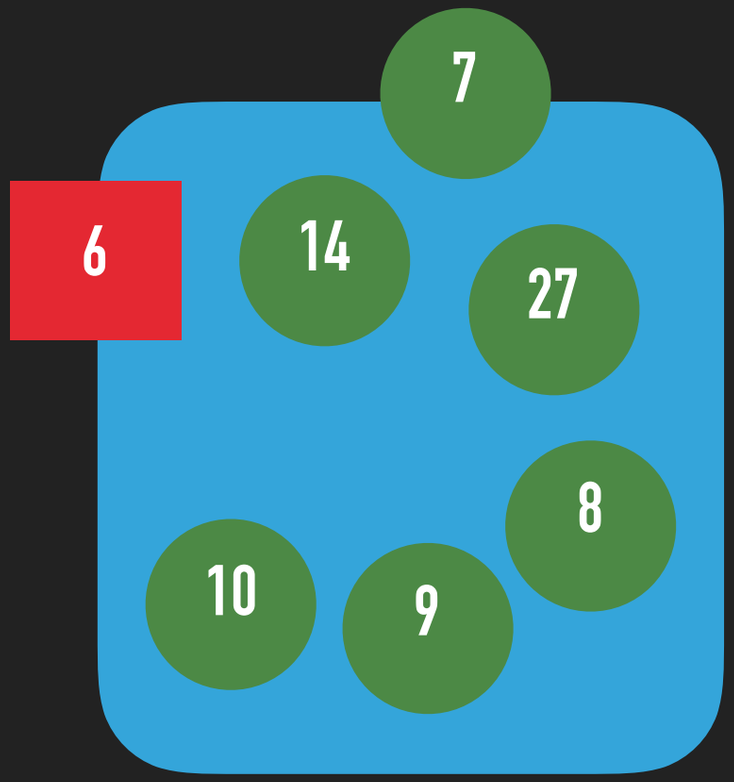
$(N/2+1)^{TH}$ TO LARGEST

COOKIE INSPECTION

N = 12



SMALLEST TO (N/2)TH SMALLEST

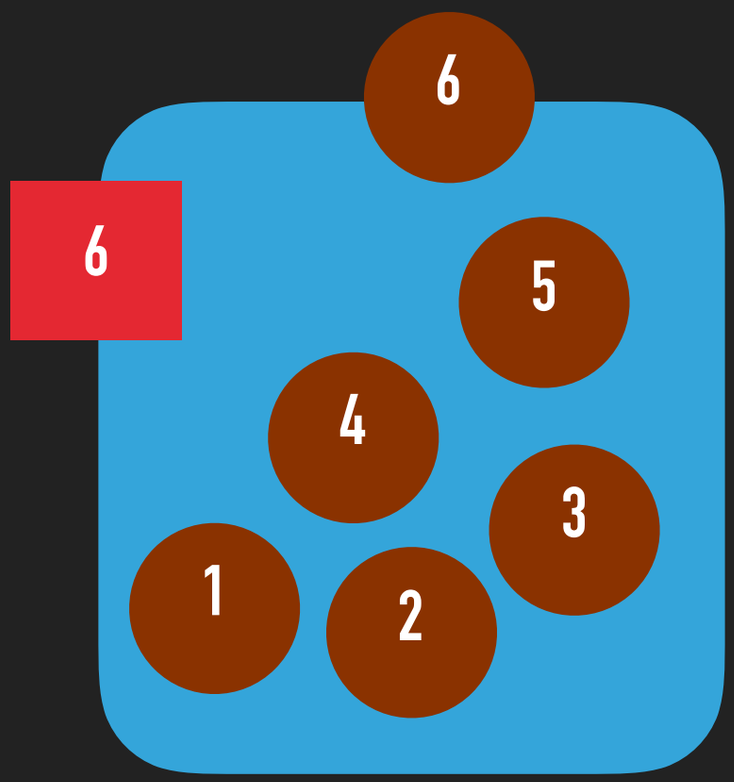


(N/2+1)TH TO LARGEST

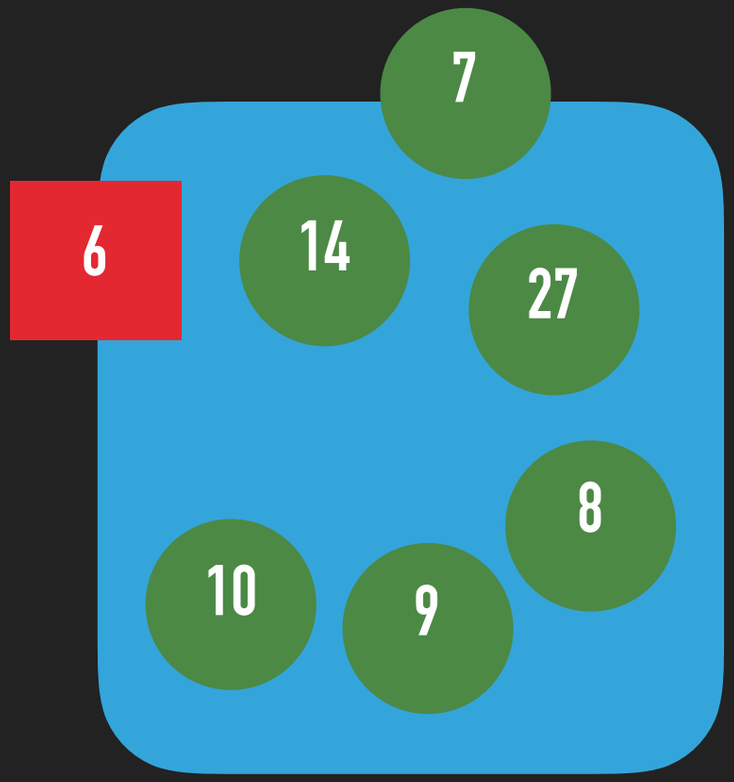
COOKIE INSPECTION

N = 12

N/2 + 1 = 7



SMALLEST TO (N/2)TH SMALLEST

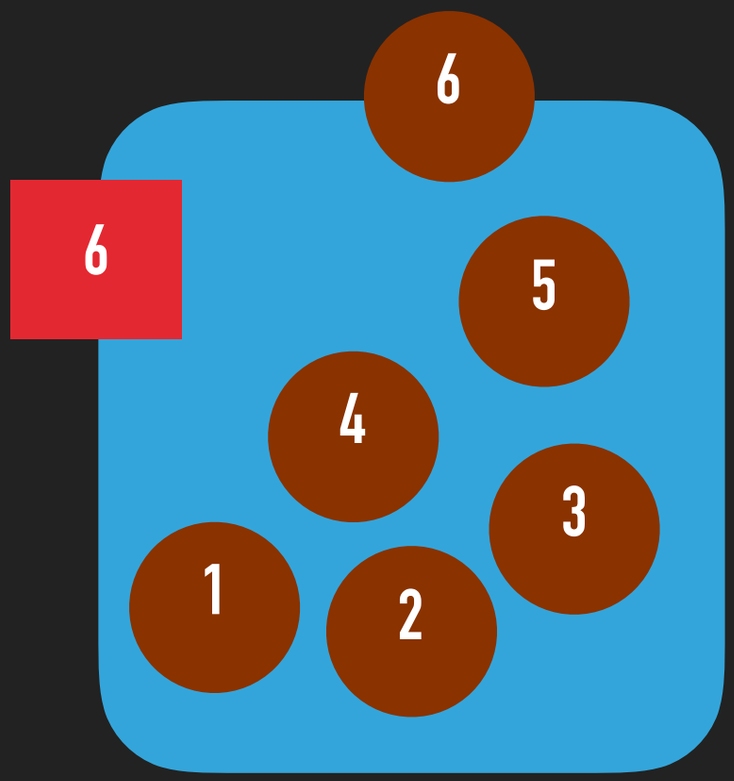


(N/2+1)TH TO LARGEST

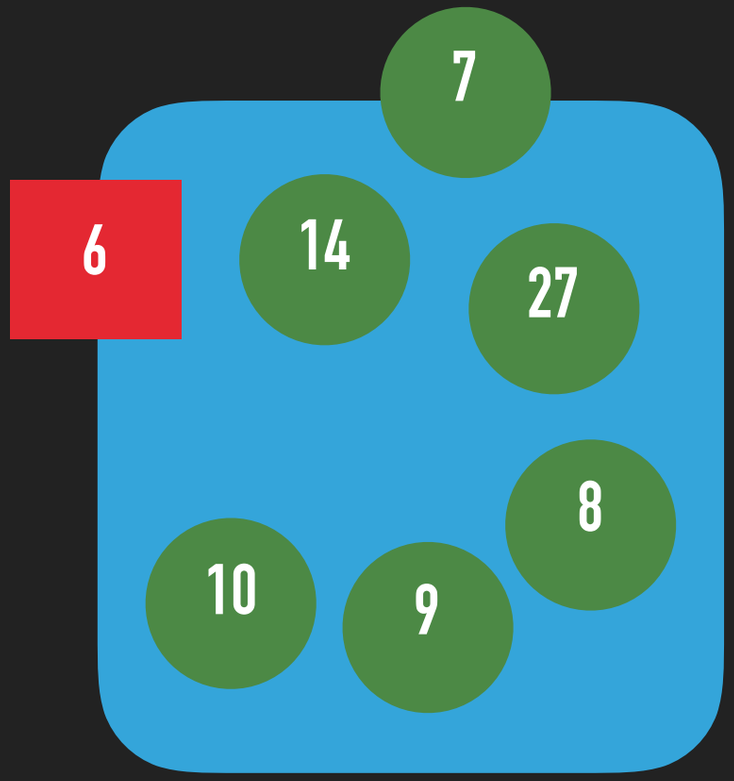
COOKIE INSPECTION

N = 12

Send the 7th cookie!



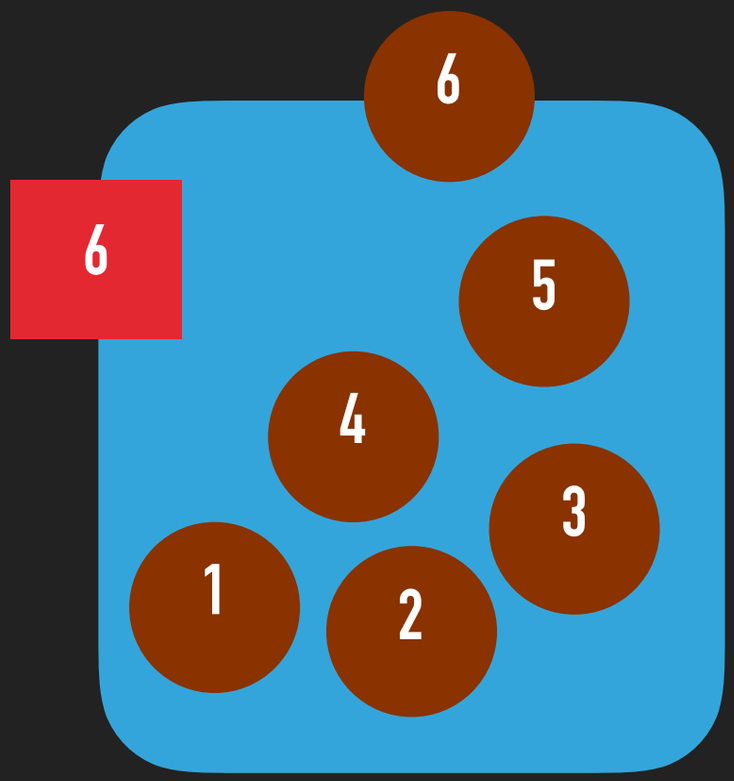
SMALLEST TO (N/2)TH SMALLEST



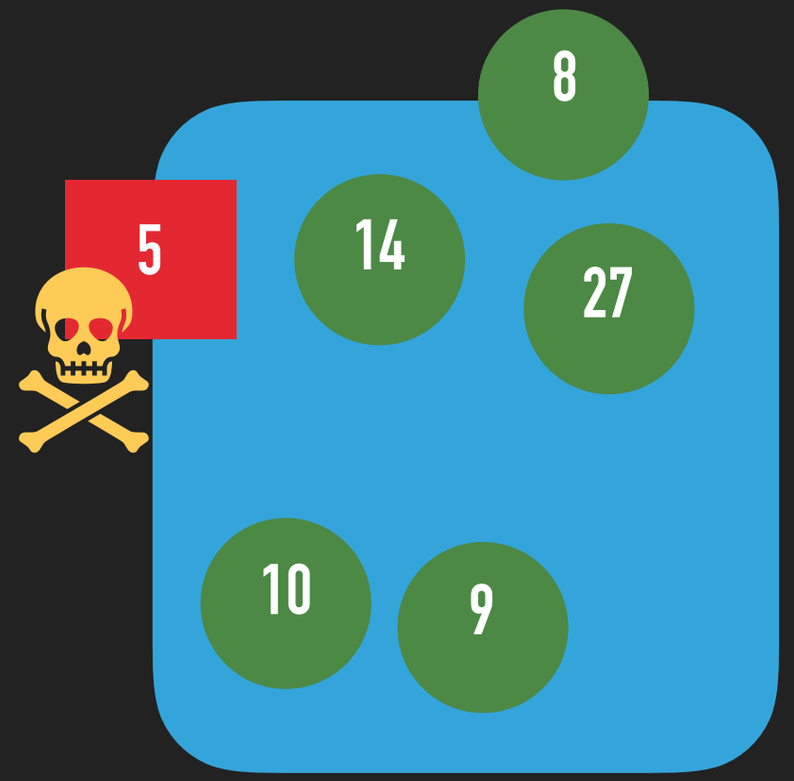
(N/2+1)TH TO LARGEST

COOKIE INSPECTION

What can we do to solve this problem?

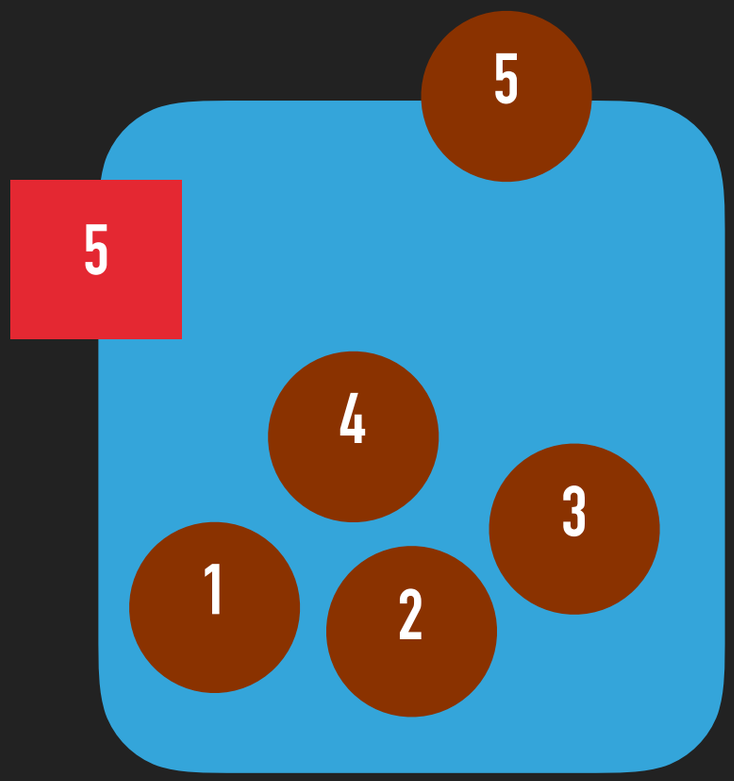


SMALLEST TO (N/2)TH SMALLEST

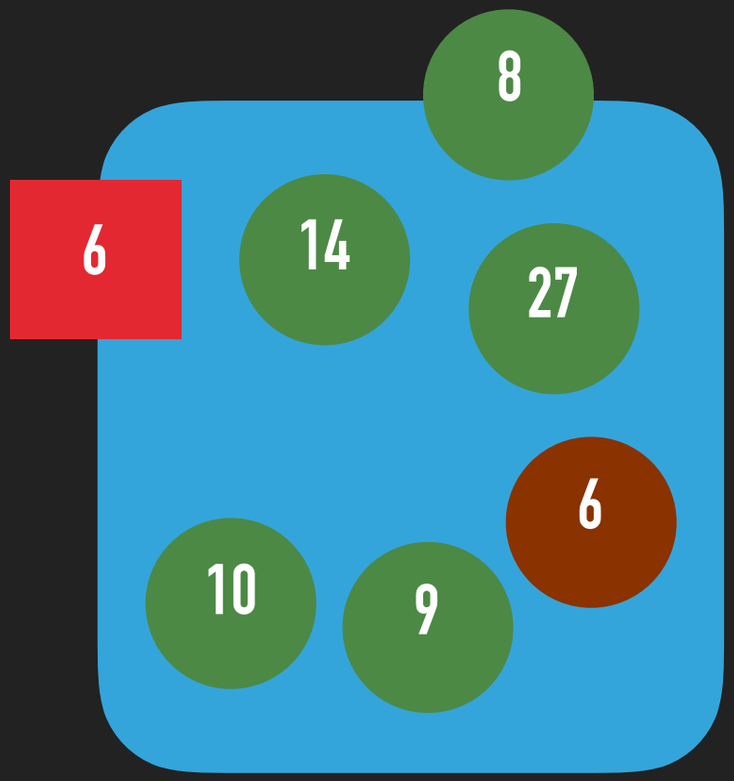


(N/2+1)TH TO LARGEST

COOKIE INSPECTION

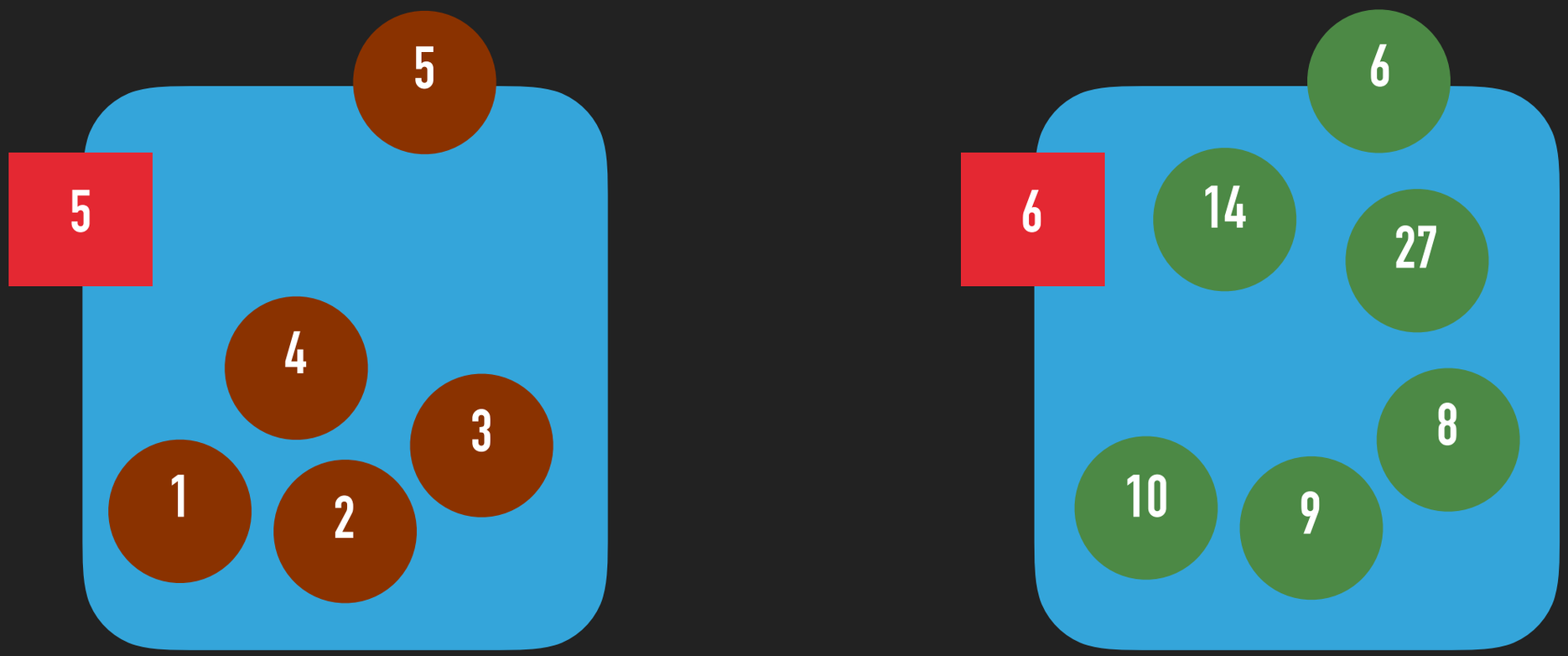


SMALLEST TO $(N/2)^{TH}$ SMALLEST



$(N/2+1)^{TH}$ TO LARGEST

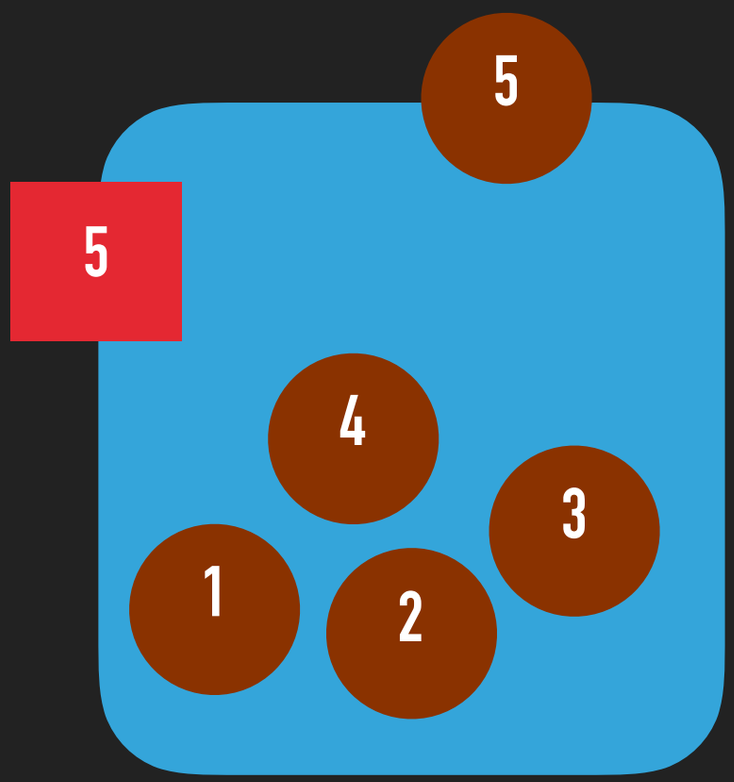
COOKIE INSPECTION



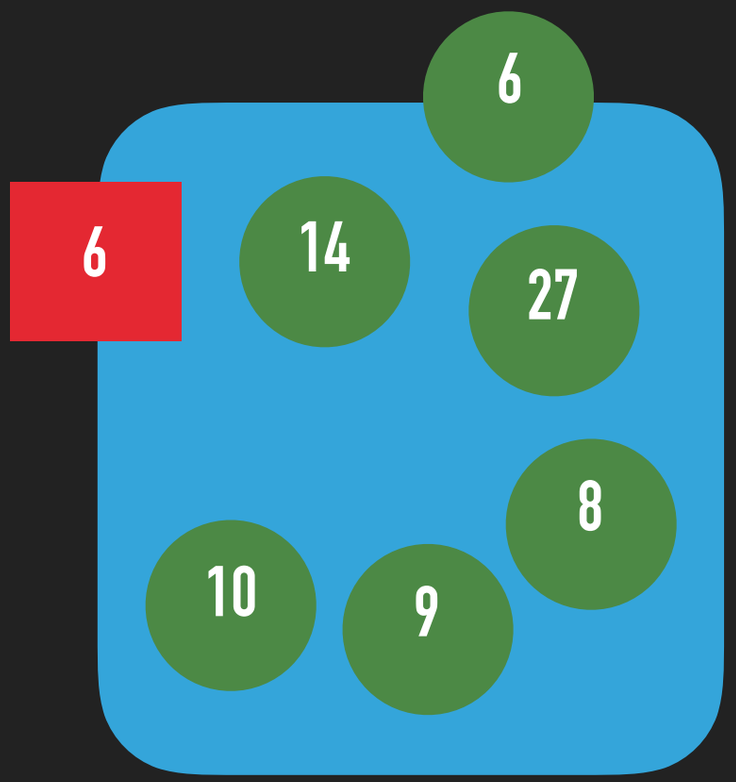
SMALLEST TO $(N/2)^{TH}$ SMALLEST

$(N/2+1)^{TH}$ TO LARGEST

WHAT ARE THESE "BUCKETS"?



SMALLEST TO $(N/2)^{TH}$ SMALLEST



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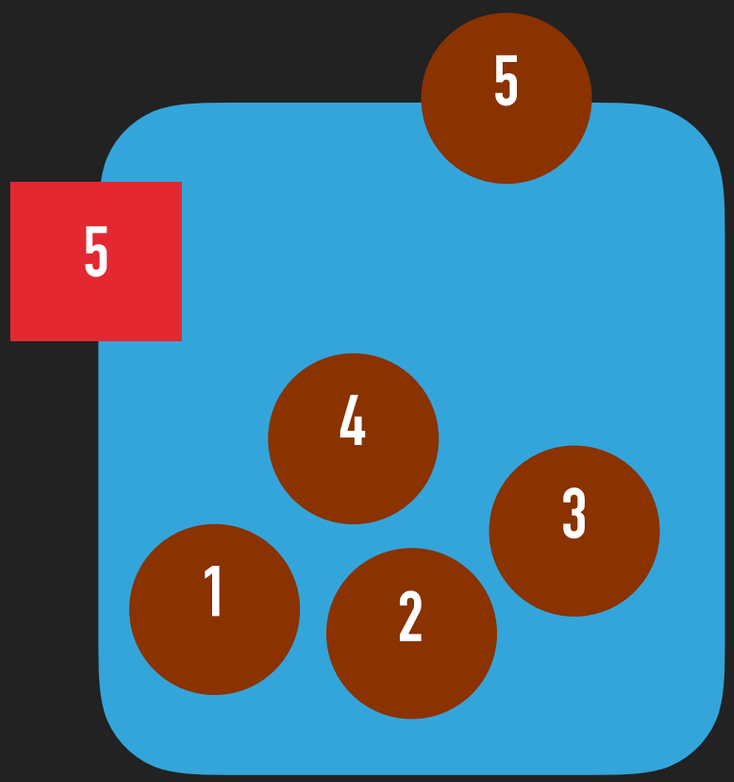
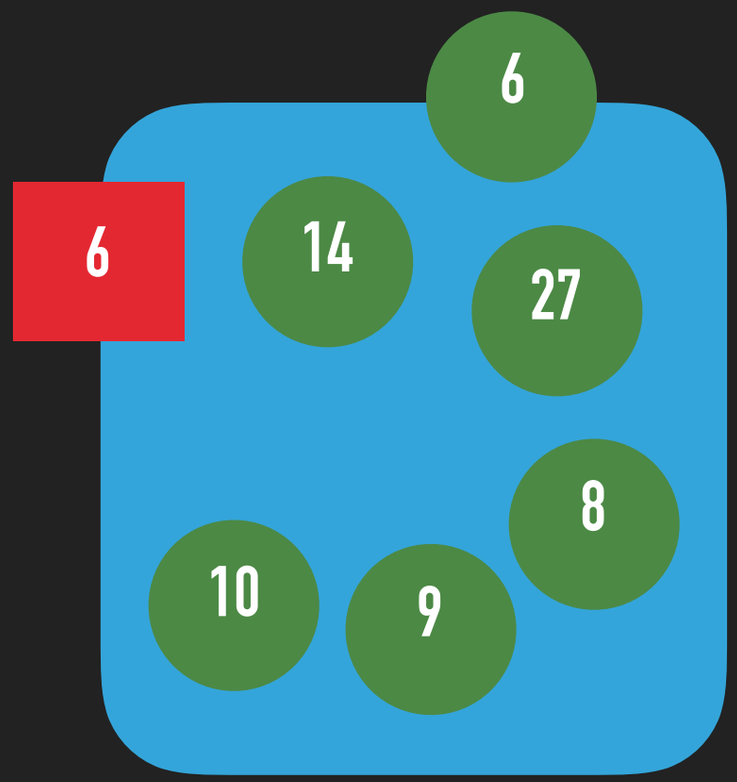


SMALLEST TO $(N/2)^{TH}$ SMALLEST

MAX HEAP



$(N/2+1)^{TH}$ TO LARGEST

MIN HEAP