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Room 142 to 600 S Michigan: **Θ(n) in worst case, Ω(1) in best** (where n is time spent at red lights)

- Stand outside of Room 142
- Turn East
- Move to the exit of the building
- Open the exit
- Walk through exit
- Stand outside of exit and turn North
- Move forward until you reach a stoplight
- Integer Time Passed Through Lights = 0
- While(Time Passed Through Lights < 3)
    - If (stoplight is green)
        - Time Passed Through Light++
        - Cross the street
        - Move forward until you reach a stoplight
    - Else
        - Wait
- Turn East
- Integer Time Passed Through Lights = 0
- While(Time Passed Through Lights < 1)
    - If (stoplight is green)
        - Time Passed Through Light++
        - Cross the street
    - Else
        - Wait
- Move forward 290ft
- Turn South
- Approach Door
- Open Door
- Walk Through Door
- Don’t hold the door for the person behind you

Frosty The Snowman **O(1)**

- Orientate piece of paper vertically
- Divide the paper into three equal, horizontal sections
- Draw a vertical midline splitting the page into two equal halves
- In the bottom section, draw a circle that touches the top and bottom edges of its section and whose center is on the midline

- In the middle section, draw a circle ¾ the diameter of the bottom circle, above the first circle, and whose center is on the midline
- Remove the section dividers but keep the midline
- Draw a circle ½ the diameter of the bottom circle, above the middle circle, and whose center is on the midline
- Draw 3 filled-in circles 1/20th the diameter of the bottom circle on the midline within the middle circle that are evenly spaced between each other and the circumference of the middle circle
- Draw a circle 1/20th the diameter of the bottom circle on the midline on the lower horizontal 3rd line of the upper circle
- Draw two filled-in circles 1/20th the diameter of the bottom circle, equal distance from the midline and the upper circle's circumference, on the vertical halfway point of the upper circle
- Lastly, Draw a magic hat with the bottom circumference matching the length of the cord of the upper horizontal third of the upper circle
- Draw two lines equal in length to half the diameter of the bottom circle, the first extending from the left furthest point of the middle circle, the second extending from the right furthest point of the middle circle

<u>24 Matryoshka doll sets</u>

1. O(n) - *same runtime every time*
2. Ω(n), $O(n^2)$ - *first n represents counting the dolls nested in the original 24, the second n represents sorting them from smallest to largest. The first step is always going to take the same amount of time 0(1). The best runtime would be if they were already in order, the worst runtime would be if each of the 24 needed to be reordered.*
3. Ω(1), O(n) - *the best runtime would be if the first doll checked was the one with a crack in it, the worst runtime would be if the last doll checked was the one with a crack in it.*

Code 1

- Int count = 0
- For each DollSet in Shelf
    - Int doll_in_this_set = 0
    - For each doll in DollSet
        - Count++
        - doll_in_this_set++
    - Write doll_in_this_set on outer set

Code 2

- For (i=0; i < DollSet-1; i++)
    - For (j=0; j < DollSet; j++)
        - if(DollSet of j size is greater than next DollSet of j+1 size)
        - Swap DollSet of j and DollSet of j+1
    - if(Shelf is Sorted)

        - Stop

Code 3

- For each DollSet in Shelf
    - For each doll in DollSet
        - if(has crack)
            - Stop

<u>What did we learn</u> 🌈

- In 3 you don't have to count all the dolls
- In 2, checking if the collection is sorted reduced the bubble sort's best case from $\Omega(n^2)$ to $\Omega(n)$
- In general, we learned how to look at and figure out the Upper and Lower bounds of Big O