

CSC165 fall 2017

average — graphs

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Web page:

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Using Course notes: average analysis; graphs



Outline

notes



average...

$$\mathcal{I}_{f,n} = \{i \mid i \text{ is an input to } f \wedge |i| = n\}$$

```
def has_even(number_list):  
    for number in number_list:  
        if number % 2 == 0:  
            return True  
    return False
```



summation...

$$\sum_{i=0}^{i=n} ir^i = \frac{nr^n}{r-1} + \frac{r-r^{n+1}}{(r-1)^2}$$



finding a needle...

...when you know it's in the haystack

```
# num_list is a list of numbers,  
# a permutation of {1, 2, 3, ..., n}  
def find_one(num_list):  
    for i in range(len(num_list)):  
        if num_list[i] == 1:  
            return i
```



graphs (discrete ones)...

what can you do with them?

- ▶ represent friendships
- ▶ represent lecture sections
- ▶ represent tasks $\leftrightarrow$ person



definitions...

$$G = (V, E) \in \mathcal{G}$$



degree, degree-sum, max number of edges?



paths, connectedness... in $G = (V, E)$

A path from u to v : Distinct vertices $v_0, \dots, v_k$ in V where:

- ▶ $u = v_0, v = v_k$
- ▶ if $0 \leq i \leq k - 1$, then $(v_i, v_{i+1}) \in E$

We allow $k = 0$ — there is a path from v to itself

path length from u to v : number of edges in path from u to v

u, v are connected: There is a path from u to v .

graph G is connected: every pair $u, v \in G$ is connected



$\forall n \in \mathbb{N}, \exists M \in \mathbb{N}, \forall G =$
 $(V, E), (|V| = n \wedge |E| \geq M) \Rightarrow G \text{ is connected?}$



Notes