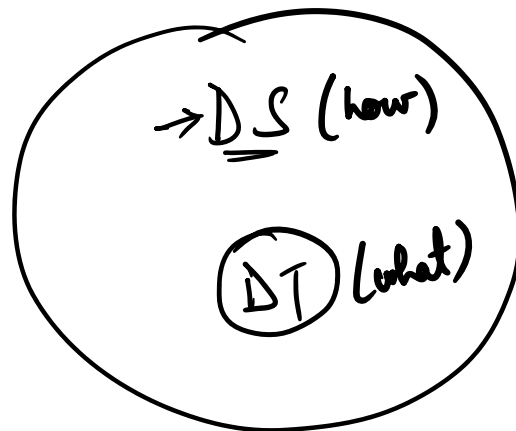


DS vs DT ?



Constraints

$0 \leq a, b \leq 100$

... = 20

→ console.log(a/b)

if(b == 0)
Invalid
else

age = 20

if (age ≥ 18)
Eligible to vote ✓
else
Not Eligible ✓

else

Nested Else-if ladder

m = 85

if (m > 90 && n ≤ 100)

g = 'A' ✓
else if (m > 80 && n ≤ 90) ✓
g = 'B' ✓
! ✓
✓

w → 1 to 7 → 3

Switch case

switch (w)

case 1:

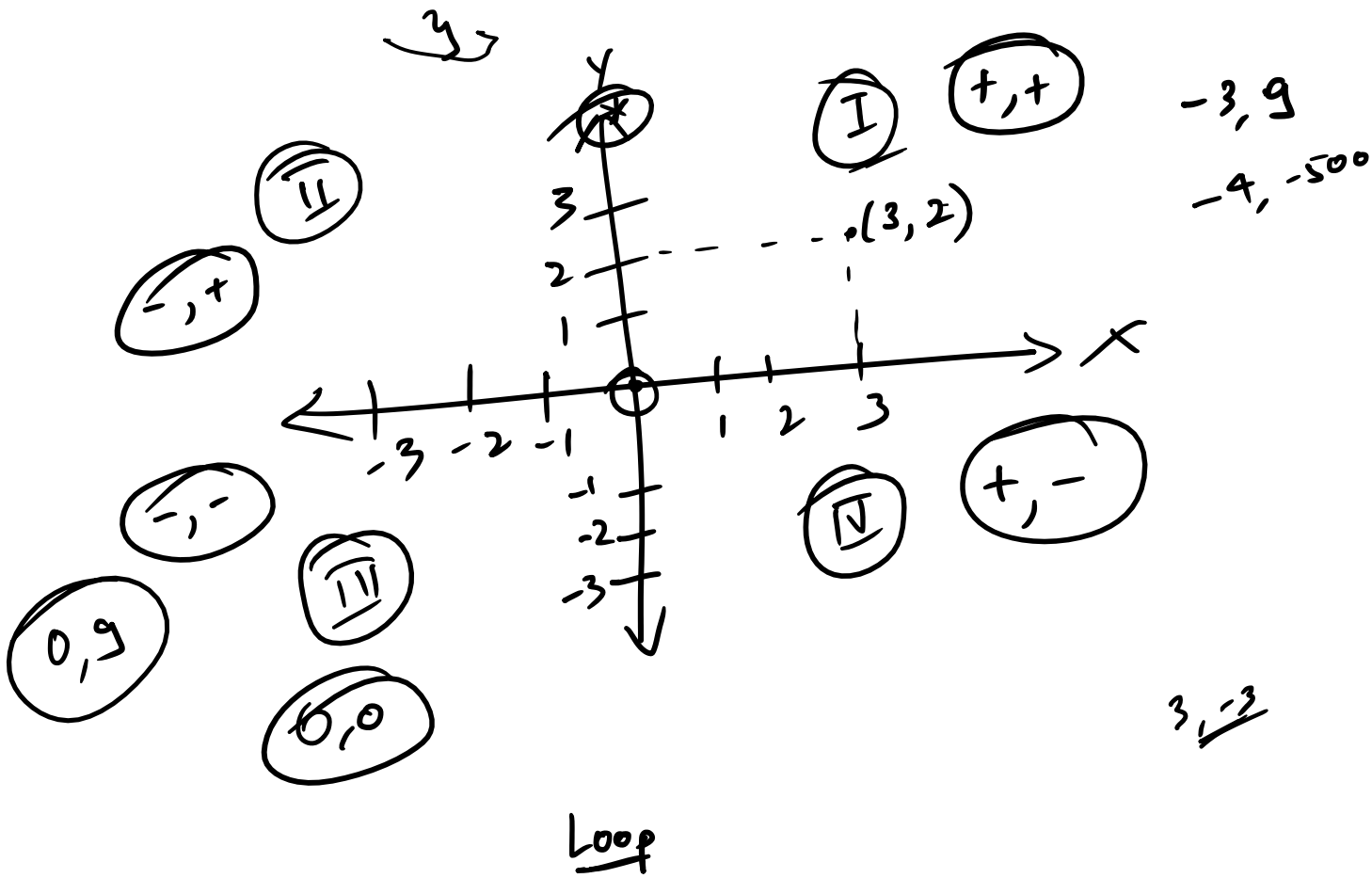
Mon
break;

case 2:

Tue
break

default: Invalid

Wed



for(initialization; condition; update)

{

for($i = 0$; $i \leq 5$; $i++$)

{

print()

}

}

→

$i = 0$

while($i \leq 5$) → Entry controlled loop

{

print —

$i++$

```

    }
    i++
}
→ i = 10; ✓
do {
    → print
    → i++
} while (i < 5);
→ 10 → 11

```

→ Exit controlled loop

(counter)
Entry controlled

Shopping Malls

↑↑ Exit controlled

```

for (i = 0; i < 5; i++)
{
    if (i == 2) {
        break; continue;
    }
    print('hello')
}

```

→

```
while (fuel is not empty)
{
    if (type puncture) {
        break;
    }
    // drive
}
```

```
for (i = 1; i ≤ 30; i++)
{
    if (raining) {
        continue;
    }
    // play
}
```

Time

→ no. of lines
→ execution time
→ hardware

Time Complexity

"no. of times a stat is executed wrt i/p"

$a = 10$ — ①

0, 1, 2, 3, 4, 5

```
for (i = 0; i ≤ n; i++)
{
    // ...
}
```

$n = 10$ — ⑦ ✓

$a = 10$ — (n) ✓
 $\{ \quad \} \quad \checkmark \quad \cancel{3n+2} \Rightarrow \cancel{3n} + \underline{2n^0}$
 \downarrow
 (n) ✓
 $\underline{O(n)}$
 Big-oh

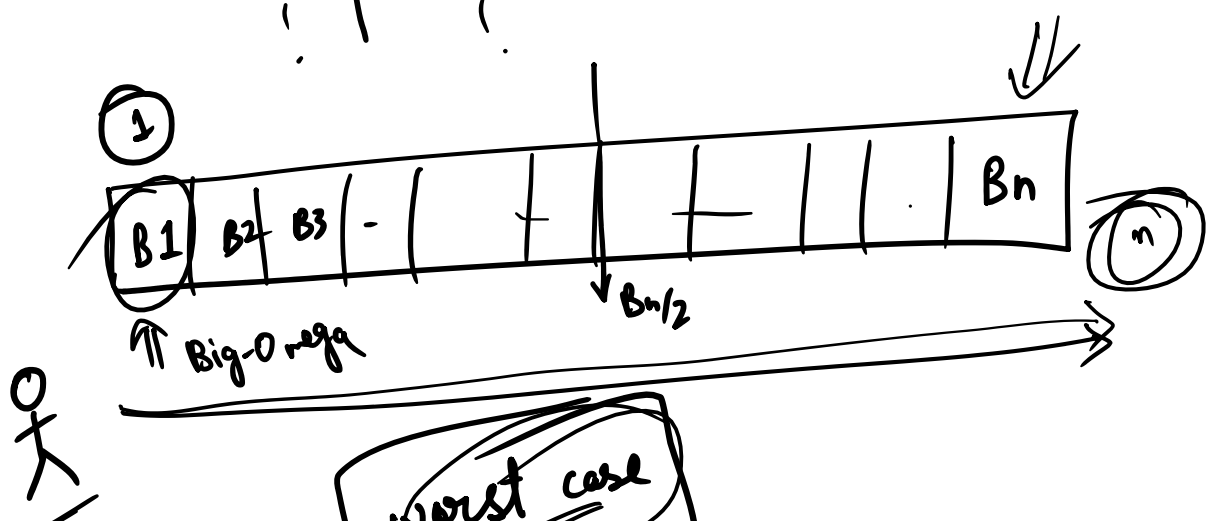
Age? \Rightarrow 21, 23 years

\hookrightarrow dominant

"round it off to highest power of n
 & ignore all constants"

n	n^2	n^3
1	1	1
10	100	1000
100	10000	1000000
\vdots	\vdots	\vdots

$(n^3) \gg \gg n$



λ

worst case

Big-Oh

Asymptotic Notation

for(i=0; i<n; i++) $\Rightarrow O(n)$ Linear
{
}

for(i=0; i<n; i++)
{

for(j=0; j<n; j++)
{
for(k=0; k<n; k++)

}

}



$O(n^2)$

$n \times n$

$\rightarrow O(n^3)$

for(i=0; i<n; i++)

{ $\rightarrow n$
}

+
for(i=0; i<n; i++) $\rightarrow n$

{

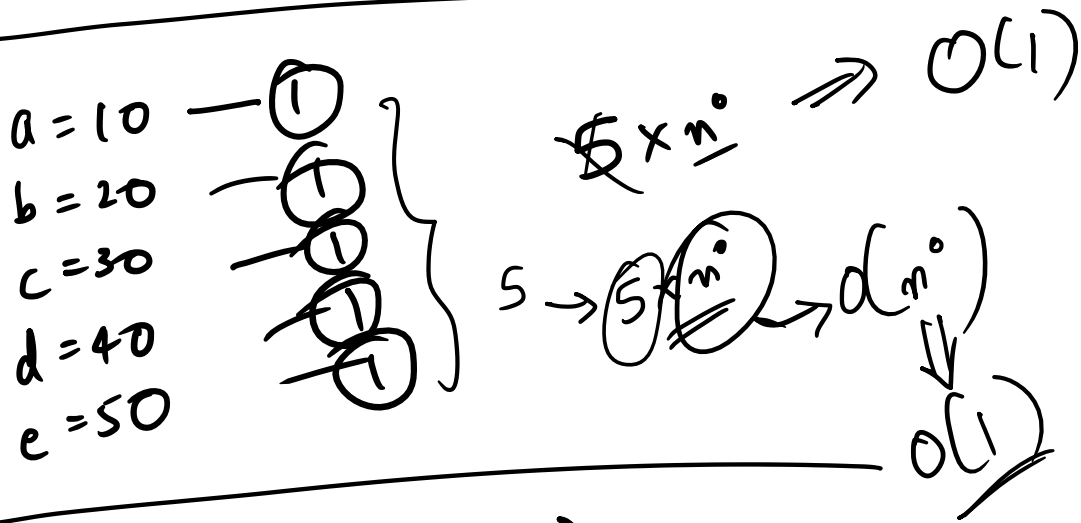
}

~~$2n$~~

$O(n)$

$n(1)$

3



$\{ \text{for } i=0; i < 500; i++ \}$
 $\Rightarrow \mathcal{O}(1)$

3

$\{ \text{for } i=n; i \leq n; i++ \} \rightarrow 1$
 $\rightarrow \mathcal{O}(1)$

3

$\{ \text{for } i=0; i \leq \sqrt{n}; i++ \} \rightarrow \sqrt{n}^{1/2}$
 $\mathcal{O}(\sqrt{n})$

$\{ \text{for } i=0; i < n; i+=2 \}$
 $\rightarrow \frac{n}{2} \Rightarrow \mathcal{O}(n)$

3

repeated division/multiplication

$\log N$ \Rightarrow repeated division/multiplication

12, 12/2 12/2

$\times 2, \times 2, \times 2$

while($n > 0$)
{
 $n = n/2$
}

8
↓
4
↓
2
↓
1
↓
0

$O(\log N)$

for($n =$; $n > 0$; $n = \underline{n/2}$) {
}

for($i \rightarrow 0$ to 5)
{
 for($j \rightarrow 0$ to n)
 {
 }
 }
}

$5 \times n \rightarrow O(n)$

$n \log n$

for($i \rightarrow 0$ to n) $\rightarrow n$
{
 while($n > 0$) $\rightarrow \log n$
 {
 $n = n/2$
 }

1

```

while (n > 1)
{
    n = n / 2
}

```

$$O(n \times \log n)$$

$$n(\log n)$$

$$n^2 + n^3$$

$$n \log n$$

$$n^2$$

$$n \times n$$

$$\cancel{n} + n \log n$$