Mathematics for Computer Science
MIT 6.042J/18.062J

Proof by Cases

Java Logical Expression

```
if ((x>0) || (x <= 0 && y>100))
```

OR ⋮ AND

(more code)

---

better: `if ((x>0) || y>100)`

⋮

(more code)

Case 1: $x > 0$

true

```
if ((x>0) || (x <= 0 && y>100))
```

OR AND

---

true

```
if ((x>0) || y>100)
```

OR

so both are true

Case 2: $x \leq 0$

false

```
if ((x>0) || (x <= 0 && y>100))
```

OR AND

---

false

```
if ((x>0) || y>100)
```

OR

Case 2: $x \leq 0$

true

```
if          (x <= 0 && y>100)
```

AND

```
if (         y>100)
```


Case 2: $x \leq 0$

```
if          (          y>100)
```

```
if (         y>100)
```

so both still the same

Proof by Cases

Reasoning by cases can break a complicated problem into easier subproblems.
Some philosophers* think reasoning this way is worrisome.

*intuitionists

$1,000,000 Question

Is P = NP ?

$1,000,000 Question

The answer is on my desk!
(Proof by Cases)