

# FLOATS

COERCING TO INTEGERS

Float → Integer      data loss

different ways to configure this data loss

10.4

10.5

10.6

10?    11?

10.0001

10.9999

truncation

floor

data loss in all cases

ceiling

pick your poison!

rounding

## Truncation

truncating a float simply returns the integer portion of the number

i.e. ignores everything after the decimal point

The `math` module provides us the `trunc( )` function:

```
import math  
  
math.trunc(10.4) → 10  
math.trunc(10.5) → 10  
math.trunc(10.6) → 10  
  
math.trunc(-10.4) → -10  
math.trunc(-10.5) → -10  
math.trunc(-10.6) → -10
```

## The `int` Constructor

The Python `int` constructor will accept a `float`

uses truncation when casting the `float` to an `int`

`int(10.4) → 10`

`int(10.5) → 10`

`int(10.6) → 10`

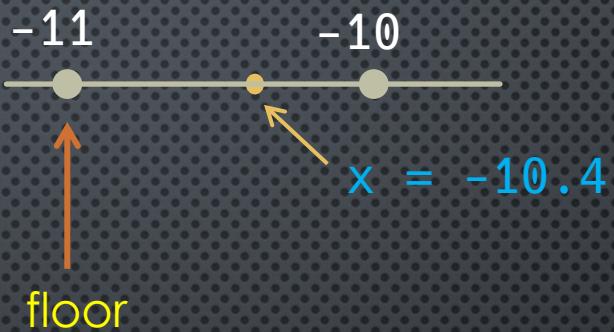
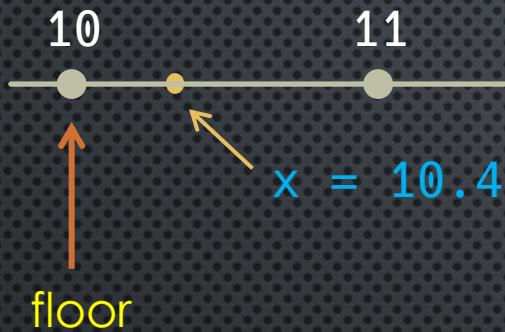
`int(-10.4) → -10`

`int(-10.5) → -10`

`int(-10.6) → -10`

## Floor

Definition: the floor of a number is the largest integer less than (or equal to) the number



$$\text{floor}(x) = \max \{i \in \mathbb{Z} \mid i \leq x\}$$

For positive numbers, floor and truncation are equivalent but not for negative numbers!

Recall also our discussion on integer division – aka floor division: //

We defined floor division in combination with the mod operation  $n = d * (n // d) + (n \% d)$

But in fact, floor division defined that way yields the same result as taking the floor of the floating point division

```
a // b == floor (a / b)
```

## Floor

The `math` module provides us the `floor( )` function:

```
import math
```

```
math.floor(10.4) → 10
```

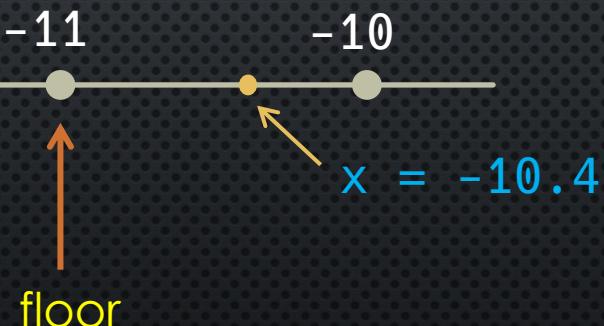
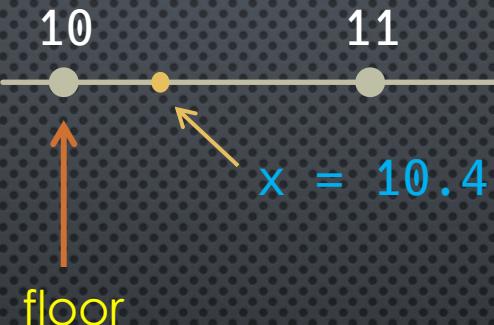
```
math.floor(10.5) → 10
```

```
math.floor(10.6) → 10
```

```
math.floor(-10.4) → -11
```

```
math.floor(-10.5) → -11
```

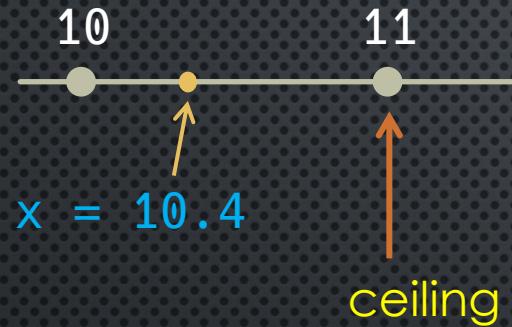
```
math.floor(-10.6) → -11
```



## Ceiling

Definition: the ceiling of a number is the smallest integer greater than (or equal to) the number

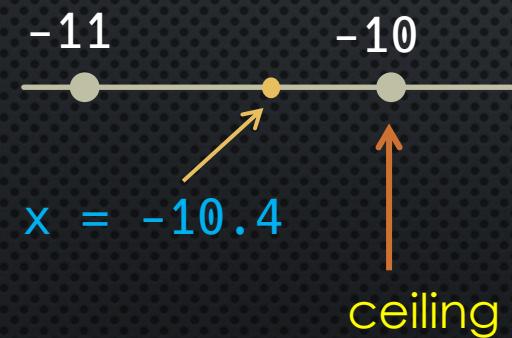
$$\text{ceil}(x) = \min \{i \in \mathbb{Z} \mid i \geq x\}$$



$$\text{math.ceil}(10.4) \rightarrow 11$$

$$\text{math.ceil}(10.5) \rightarrow 11$$

$$\text{math.ceil}(10.6) \rightarrow 11$$



$$\text{math.ceil}(-10.4) \rightarrow -10$$

$$\text{math.ceil}(-10.5) \rightarrow -10$$

$$\text{math.ceil}(-10.6) \rightarrow -10$$

Code