

Floor Division (//) and  
Modulo Operator(%)

// and % with -ve and +ve integers

/ and //

Math.floor()

## Math.floor(x)=[x]

- $\text{floor}(2)=\text{floor}(2.00001)=\text{floor}(2.99999)=2$
- $\text{floor}(3)=\text{floor}(3.00001)=\text{floor}(3.99999)=3$
- $\text{floor}(-2)=\text{floor}(-1.99999)=\text{floor}(-1.000001)=-2$
- $\text{floor}(-3)=\text{floor}(-2.99999)=\text{floor}(-2.00001)=-3$

# /, // and %

- $50//12$

$$\begin{array}{r} 50//12 \\ \hline 12) \overline{50} \quad \text{floor}(50/12) \\ \quad \quad \quad 48 \\ \hline \quad \quad \quad 2 \quad = (50 - 12 * 4) \\ 50 \% 12 \end{array}$$

- Remainder=dividend-divisor\*floor(quotient)  
 $a \% b = a - b * (a//b)$

// and % with +ve and -ve integers (of same sign)

- $9/4 = -9/-4 = 2.25$
- $9//4 = -9//-4 = \text{floor}(2.25) = 2$

$$\bullet \quad 9\%4 = 9 - 4 * 2 = 9 - 8 = 1$$

- remainder=dividend-divisor\*floor(quotient)

// and % with +ve and –ve integers (of same sign)

- $9/4 = -9/-4 = 2.25$
- $9//4 = -9// -4 = \text{floor}(2.25) = 2$

$$\bullet \quad -9 \% -4 = -9 - (-4) * 2 = -9 + 8 = -1$$

- remainder=dividend-divisor\*floor(quotient)

// and % with +ve and –ve integers (of opposite sign)

- $-9/4 = 9/-4 = -2.25$
- $-9//4 = 9//-4 = \text{floor}(-2.25) = -3$

$$\begin{aligned}-9 \% 4 &= -9 - 4 * (-3) = -9 + 12 = 3\end{aligned}$$

- remainder=dividend-divisor\*floor(quotient)

// and % with +ve and -ve integers (of same sign)

- $-9/4 = 9/-4 = -2.25$
- $-9//4 = 9//(-4) = \text{floor}(-2.25) = -3$

- 
- The diagram shows three blue arrows originating from the expression  $9 \% -4$ . One arrow points to the digit 9, another to the minus sign between 9 and 4, and a third to the digit 4.
- $9 \% -4 = 9 - (-4) * (-3) = 9 - 12 = -3$
  - remainder=dividend-divisor\*floor(quotient)

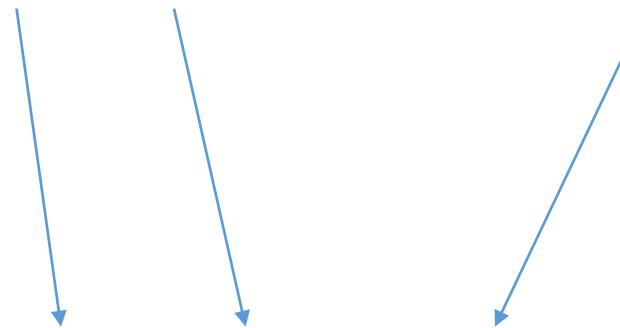
// and % with +ve and -ve floats (of same sign)

- $6.3/1.5 = -6.3/-1.5 = 4.2$
- $6.3//1.5 = -6.3// -1.5 = \text{floor}(4.2) = 4.0$

- 
- The diagram consists of two blue arrows originating from the operators in the equations above. One arrow points from the division operator in the first equation to the term  $6.3$  in the remainder formula. Another arrow points from the modulus operator in the second equation to the term  $4.0$  in the remainder formula.
- $6.3 \% 1.5 = 6.3 - 1.5 * 4.0 = 6.3 - 6.0 = 0.3$
  - remainder=dividend-divisor\*floor(quotient)

// and % with +ve and -ve floats (of same sign)

- $6.3/1.5 = -6.3/-1.5 = 4.2$
- $6.3//1.5 = -6.3// -1.5 = \text{floor}(4.2) = 4.0$



- $-6.3 \% -1.5 = -6.3 -(-1.5) * 4.0 = -6.3 + 6.0 = -0.3$
- remainder=dividend-divisor\*floor(quotient)

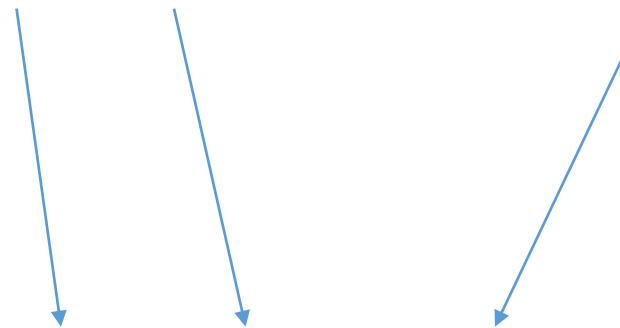
// and % with +ve and -ve floats (of opposite sign)

- $-6.3/1.5 = 6.3/-1.5 = -4.2$
- $-6.3//1.5 = 6.3// -1.5 = \text{floor}(-4.2) = -5.0$

- 
- The diagram consists of two blue arrows originating from the operators // and % in the first two bullet points above. The arrow from // points to the formula  $-6.3//1.5 = 6.3// -1.5 = \text{floor}(-4.2) = -5.0$ . The arrow from % points to the formula  $-6.3\%1.5 = -6.3 - 1.5 * (-5.0) = -6.3 + 7.5 = 1.2$ .
- $-6.3\%1.5 = -6.3 - 1.5 * (-5.0) = -6.3 + 7.5 = 1.2$
  - remainder=dividend-divisor\*floor(quotient)

// and % with +ve and -ve floats (of opposite sign)

- $-6.3/1.5 = 6.3/-1.5 = -4.2$
- $-6.3//1.5 = 6.3//(-1.5) = \text{floor}(-4.2) = -5.0$



- $6.3 \% -1.5 = 6.3 -(-1.5) * (-5.0) = 6.3 -7.5 = -1.2$
- remainder=dividend-divisor\*floor(quotient)

# // and % in Python (Practice)

15//6, 15%6

15.3//6.5, 15.3%6.5

15.3//-6, -15.3%6

-15//6, -15%6

-15.3//6.5, -15.3%6.5

15//6.5, -15%6.5

15// -6, 15%-6

15.3// -6.5, 15.3% -6.5

15.3// -6.5, 15.3% -6

-15// -6, -15%-6

-15.3// -6.5, -15.3% -6.5

-15.3// -6, 15.3% -6.5