

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

// and % with -ve and +ve integers

/ and //

Math.floor()

$\text{Math.floor}(x) = \lfloor x \rfloor$

- $\text{floor}(2) = \text{floor}(2.00001) = \text{floor}(2.999999) = 2$
- $\text{floor}(3) = \text{floor}(3.00001) = \text{floor}(3.999999) = 3$
- $\text{floor}(-2) = \text{floor}(-1.999999) = \text{floor}(-1.000001) = -2$
- $\text{floor}(-3) = \text{floor}(-2.999999) = \text{floor}(-2.00001) = -3$

/, // and %

- 50//12

A handwritten calculation on a light gray background. At the top, '50//12' is written in green. Below it is a long division: 12 goes into 50 four times (48), leaving a remainder of 2. A green arrow points from the '4' to the text 'floor(50/12)'. To the left of the remainder '2', '50%12' is written in green with a green arrow pointing to it. To the right of the remainder '2', '= (50-12*4)' is written in green.

$$\begin{array}{r} 50//12 \\ 12 \overline{) 50} \\ \underline{48} \\ 2 \end{array}$$

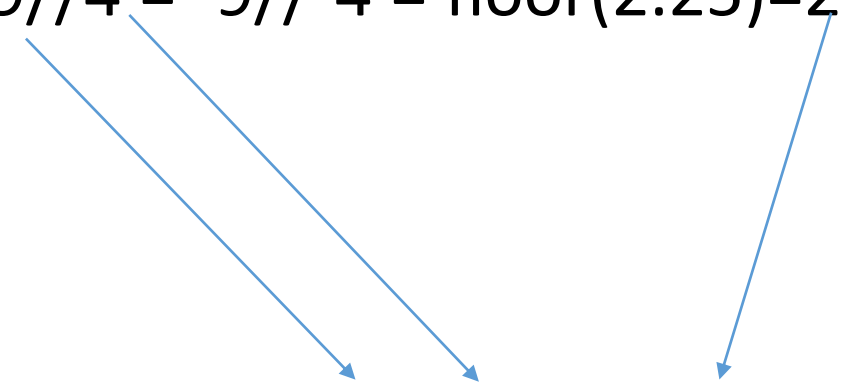
4 ← floor(50/12)

50%12 → 2 = (50-12*4)

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

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

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

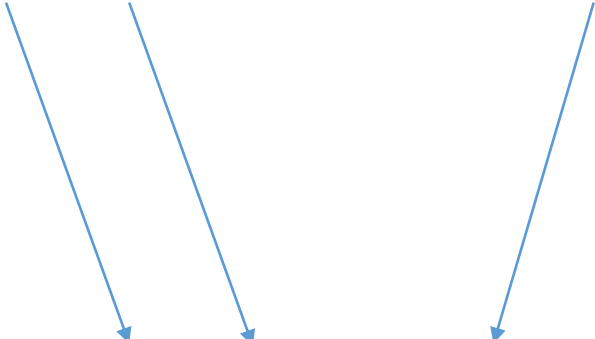


- $9\%4 = 9 - 4 * 2 = 9 - 8 = 1$

- $\text{remainder} = \text{dividend} - \text{divisor} * \text{floor}(\text{quotient})$

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

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

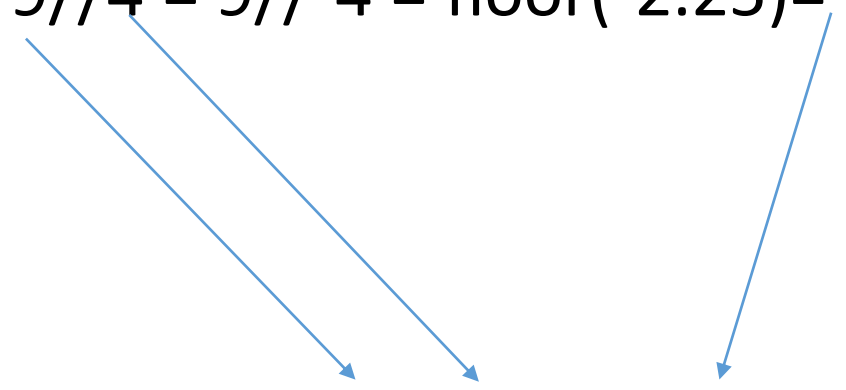


- $-9\%-4 = -9 - (-4) * 2 = -9 + 8 = -1$

- $\text{remainder} = \text{dividend} - \text{divisor} * \text{floor}(\text{quotient})$

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

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

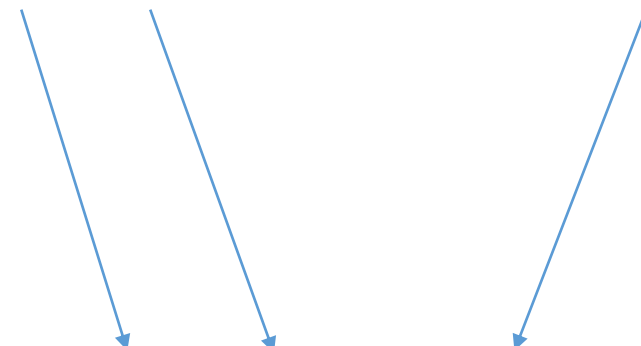


- $-9\%4 = -9 - 4 * (-3) = -9 + 12 = 3$

- $\text{remainder} = \text{dividend} - \text{divisor} * \text{floor}(\text{quotient})$

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

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



- $9\%-4 = 9 - (-4) * (-3) = 9 - 12 = -3$

- $\text{remainder} = \text{dividend} - \text{divisor} * \text{floor}(\text{quotient})$

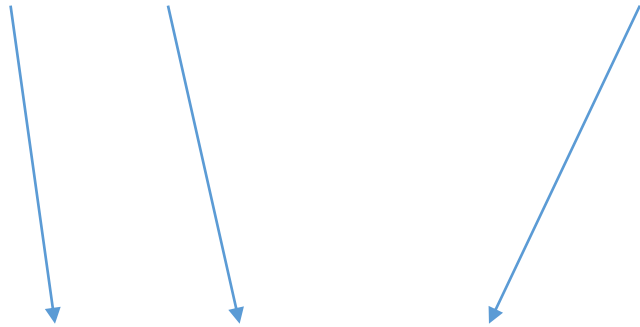
// and % with +ve and -ve floats (of same sign)

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

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

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

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



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

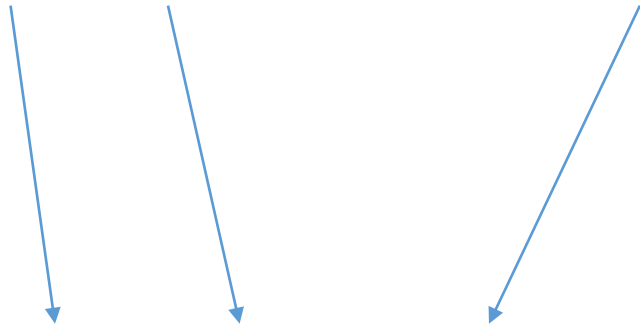
// and % with +ve and -ve floats (of opposite sign)

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

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

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

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



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

// and % in Python (Practice)

15//6, 15%6

-15//6, -15%6

15//-6, 15%-6

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

15.3//6.5, 15.3%6.5

-15.3//6.5, -15.3%6.5

15.3//-6.5, 15.3%-6.5

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

15.3// -6, -15.3%6

15//6.5, -15%6.5

15.3// -6.5, 15.3%-6

-15.3// -6, 15.3%-6.5