Arithmetic Operators

Assume a =10
and b = 15

Operator	Description	Example
/	Division - Divides left hand operand by right hand operand and gives the result as a floating point number -- result is always floating point	c = b / a c = 15 / 10 = 1.5
%	Modulus - Divides left hand operand by right hand operand and returns the remainder	c = b % a c = 15 % 10 = 5

Arithmetic Operators

Although frequently referred to as *integer division*, Python's terminology of *floor division* is clearer.

Operator	Description	Example
//	Integer Division - Divides left hand operand by right hand operand and gives the result as an integer	*Text terminology poor but examples OK.*

//	Floor Division - Divides left hand operand by right hand operand (1) when the result is positive, it returns the integer portion (2) when the result is negative, it rounds away from zero to the nearest integer	(1) a=10, b=15
		c = b // a
		c = 15 // 10
		= 1
		(2) a=-10, b=15
		c = b // a
		c = -2

Modulus and Floor

Where would modulus be useful?

- Modulus gives a remainder – what is left over.

Where would floor be useful?

- Floor tells you how many times an amount can be divided evenly (with no remainder).

Typical application: a quantity of items is divided into groups … how many groups will you have? How many items are left over?

Where would modulus/floor be useful?

A packing company receives a skid containing 1300 packages of KD. These packages are repacked into bulk boxes for various vendors:

e.g. Sam's Club 12 packages/box
Amazon 15 packages/box
USA Food Store 35 packages/case.

Write a program to prompt the user for the vendor's name and the number of packages in the bulk container and calculate the number of boxes/cases of KD and the number of remaining packages given one skid.

Arithmetic Operators

Operator	a=0.5 b=10.0	a=4 b=15.0	a=-5 b=12
+	c= a + b=10.5	c= a + b=19.0	c= a + b=7
-	c= a – b=-9.5	c= a – b=-11.0	c= a – b=-17
*	c= a * b=5.0	c= a * b=60.0	c= a * b=60
**	c= a**b=0.5^{10} = 0.0009765625	c= a**b=$4^{15.0}$ = 1073741824.0	c=a**b= -5^{12} = 244140625
/	c= b / a=20.0	c= b / a=37.5	c= b / a=2.4
//	c= b // a=20.0	c= b // a=3.0	c= b // a=-3
%	c= b % a=0.0	c= b % a=3.0	c= b % a=-3

Operator Precedence

From highest to lowest:

1. calculations in brackets
2. exponentiation (**)
3. multiplication (*),
   division (/ or //), remainder (%)
4. addition (+), subtraction (-)

If operators in same precedence level, execute left to right.

Calculation Examples

30/10 + 5 * 6/2 =

30/(10 + 5 * 6)/2 =

30/(10 + 5) * (6/2) =

Formulas to Equations

$$\vec{F} = m\vec{a} \qquad \vec{p} = m\vec{v} \qquad KE = \frac{1}{2}mv^2 = \frac{p^2}{2m} \qquad W_{tot} = \Delta(KE) = KE_f - KE_i \qquad A_{sphere\text{-}surface} = 4\pi r^2$$

$$\frac{mv^2}{R} \qquad k = 8.99\,(10)^9 \left[\frac{Nm^2}{C^2}\right] \qquad k = \frac{1}{4\pi\varepsilon_o} \qquad A_{circle} = \pi r^2$$

$$F = k\frac{q_1 q_2}{r^2} = \frac{1}{4\pi\varepsilon_o}\frac{q_1 q_2}{r^2} \qquad \varepsilon_o = 8.85\,(10)^{-12}\left[\frac{C^2}{Nm^2}\right] \qquad \varepsilon_o = 8.85\,(10)^{-12}\left[\frac{C^2}{Nm^2}\right] \qquad V_{sphere} = \frac{4}{3}\pi r^3$$

$$E = \frac{F}{q} \qquad E = k\frac{q}{r^2} = \frac{1}{4\pi\varepsilon_o}\frac{q}{r^2} \qquad V = k\frac{q}{r} = \frac{1}{4\pi\varepsilon_o}\frac{q}{r} \qquad V = \frac{U}{q} \qquad \sim e^{-t/RC}$$

$$\sum_{surf} E_\perp \Delta A = \frac{q}{\varepsilon_o} \qquad Q = VC \qquad C = \frac{A\varepsilon_o}{d} \qquad \sigma = \frac{Q}{A} \qquad V = Ed \qquad E = \frac{\sigma}{\varepsilon_o} \qquad U = \frac{QV}{2} = \frac{CV^2}{2} = \frac{Q^2}{2C}$$

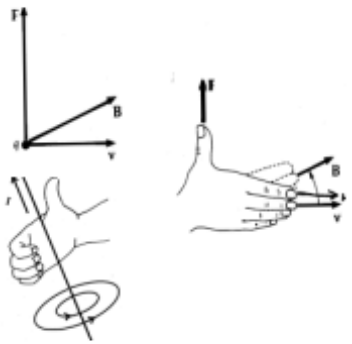
$$\sum_{junc} I_j = 0 \qquad \sum_{loop} V_j = 0 \qquad V = IR \qquad P = IV = I^2R = \frac{V^2}{R} \qquad R_{eff} = R_1 + R_2 \qquad \frac{1}{C_{eff}} = \frac{1}{C_1} + \frac{1}{C_2}$$

$$\frac{1}{R_{eff}} = \frac{1}{R_1} + \frac{1}{R_2} \qquad C_{eff} = C_1 + C_2$$

$$F = qvB_\perp = qv_\perp B = qvB\sin(\theta)$$

$$F = ILB_\perp = I_\perp LB = ILB\sin(\theta)$$

$$\sum_{curv} B_\parallel \Delta l = \mu_o I_\perp$$



$$B = \frac{\mu_o I}{2\pi r}$$

$$\mu_o = 4\pi(10)^{-7}\ Tm/A$$