```python
# In this lecture, we learn

# (1) how to do ARITHMETIC
# (2) how to use CELLS
# (3) about FORMAT

# To run a CELL, you either select the "play cell" symbol above or
# On a Mac: command+enter
# On a PC: control+enter

# You may want to run a SINGLE LINE!!
# There is also a button for that on Spyder.

# NOTE: if you start running a code,
# but want to interrupt it
# Type: control+c

# NOTE: another way to stop a code
# is by closing the Console.
# If you do that, we will need to reopen a new Console.
# Go to Consoles -> Open an IPython console
# Also, nothing that you have ran before will be in
# the computer's memory.

# %%
#####################
# ARITHMETIC
#####################

# We have already encountered some mathematical operations.
# Let us see some more of them
print()
print("----------")
print("ARITHMETIC")
print("----------")

# Let us consider two real variables.
x=25.0
y=4.0
# They can also be assigned in a single line
x,y = 25.0, 4.0
print("Variables:")
print("x=",x," &  y=",y)
# The mathematical operations are

print()
print("Addition:",x+y )
print("Subtraction:",x-y )
print("Multiplication:",x*y )
print("Division:",x/y )
print("Raising x to the power of y:",x**y )
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```python
print("Integer part of x divided y:",x//y )
print("Modulo: remainder after x is divided by y:",x%y )

# Note
# (1) If all variables involved are of a certain type,
# the result will be of the same type.
# (2) If they are of different types,
# the result has the more general of the two types, that is
# Add float and integer: result is float
# Add complex and float: result is complex
# (3) EXCEPTION: division never results in an integer.

# %%
print()
print("NOTE!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!")
print("We can get the square root of a number with the power 1/2")
print("sqrt(x) = ", x**(1/2))
# NOTE that the result above is different from
print("NOT sqrt(x):", x**1/2)


# %%
print()
print("SCIENTIFIC NOTATION!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!")
print("We can write the number as 0.00114")
x=0.00114
print(x)
print("Or we can use scientific notation as 1.14e-3")
x=1.14e-3
print(x)
print("Or we can write it as a power as 1.14.*(10**-3)")
x=1.14*(10**-3)
print(x)


# FORMAT: sometimes we do not want to see printed all digits of a number,
# such as 0.033763886032268264 that we see for sqrt(0.00114).
# To reduce the number of digits, we can use
# print("%4.2f" % 0.033763886032268264)
# This gives a number with 4 spaces (counting also ".")
# and 2 digits after ".", in our case: 0.03
# More can be found at
# https://www.python-course.eu/python3_formatted_output.php
# https://mail.python.org/pipermail/tutor/2008-June/062649.html
print()
print("FORMAT")
print("sqrt(x) = %4.2f" % x**(1/2))
print("sqrt(x) = %5.3f" % x**(1/2))
print("sqrt(x) = %.3e" % x**(1/2))
print("sqrt(x) = %.3e" % x**(1/2), "s, where s is for seconds")
```

```python
# %%
print()
print("--------------")
print("ALGEBRA RULES")
print("--------------")
# The operations follow rules as in normal algebra
print("x+2y = ",x + 2*y)
print("(x+2)y = ",(x + 2)*y)

# CAREFUL!
# Computations go on the right side of the equal sign
# NOT on the left side
# 2*x = y does NOT work!!

# %%
# The computer executes what is on the right side first.
# This is why the lines below make sense
print()
print("----------------------------------")
print("EXECUTION of the RIGHT SIDE FIRST")
print("----------------------------------")
x = 11.0
x = x + 6.3
print(x)

# %%
print()
print("----------")
print("MODIFIERS")
print("----------")
# Some tricks that some people find useful once they get used to it.
x, y = 27.,12.
print("x = ", x, " y = ", y)

print()
print("x += 1 means x+1 ")
x += 1
print("x becomes ", x)

print()
print("x -= 4 means x-4 ")
x -= 4
print("x becomes ", x)

print()
print("x *= -2.6 means x*(-2.6) ")
x *= -2.6
print("x becomes ", x)

print()
```

```python
print("x /= 5*y means x/(5y) ")
x /= 5*y
print("x becomes ", x)


# %%
######################
# SOLVING PROBLEMS
######################

print()
print("-----------")
print("EXAMPLE 2.1")
print("-----------")

# A ball is dropped from a tower of height h.
# It has initial velocity zero.
# It accelerates due to gravity: g = 9.8 m/s^2.
# Note m = meter; s = second
# The equation for the position "x" of the ball above the ground
# at certain time "t" is
# x = h - (1/2)gt^2
# Suppose the height of the tower is 100 meters
# What is the position of the ball after 1 second?
#
# The first thing to do is to enter the constants of the problem
g = 9.8
h = 100.

# You can give the value of the variable "t"
t = 1.0
# or input it with
# t = float(input("Enter the time interval: "))

# Now let us do the computation and print the output
x = h - (1/2)*g*t**2
print("The height of the ball after 1s is ", x, "m")
```