

```

import scipy.constants as _sc
import numpy as np

# solar mass, radius, luminosity
Msun = 1.98848e30 # kg
Rsun = 6.957e8 # m
Lsun = 3.828e26 # W

#print("The Mean Molecular Weight for\
# interstellar gas is {:.5}".format(mue_gas))

```

```

if __name__ == "__main__":

```

SNAKESHIT

A Short Musical

constants = [Book, Music, and Lyrics by D. Q. Pham

```

    ("solar mass", Msun, "kg"),
    ("solar radius", Rsun, "m"),
    ("solar luminosity", Lsun, "W"),
    ("gravitational constant", G, "m**3 s**-2 kg**-1"),
    ("Planck constant", h, "J s"),
    ("Planck constant, reduced", hbar, "J s"),
    ("electron mass", m_e, "kg"),
    ("proton mass", m_p, "kg"),
    ("neutron mass", m_n, "kg"),
    ("atomic mass unit", m_u, "kg"),
    ("speed of light", c, "m s**-1"),
    ("Boltzmann constant", k, "J K**-1"),
    ("parsec", pc, "m"),
    ("astronomical unit", au, "m"),
    ("year", year, "s"),

```

© D. Q. Pham ("Stefan-Boltzmann constant", sigmaSB, "W m**-2 K**-4")

Cast of Characters

<u>UNUK:</u>	Woman (preferably neither Asian/White), mezzo-soprano, an astronomy student who neglects Python.
<u>GUDJA:</u>	Woman, soprano, an astronomy professor who brings Python into an everyday language.
<u>MARFIK:</u>	Man, tenor, a student who gets Python.
<u>ALYA:</u>	Woman, alto, a student who gets Python.
<u>YED:</u>	Man, bass, a student who gets Python.

Place

Classroom

Time

1990s or 2000s

Musical Numbers

main(**S**)

Unuk

repeat(**STRANGLE**)

Company

print(**SLITHER OFF**)

Unuk and Gudja

Setting: A classroom contains a desk.

At Rise: UNUK, carrying a stack of papers, enters.

(Song: "S")

UNUK (breathlessly.)

UNUK. PLEASE TAKE A BREATH,
UNUK. SEMESTER'S DONE, UNUK.
ASTRONOMY, UNUK. WEED-OUT
COURSES OVER. DEEP RELEVANT
HOMEWORK.

(Placing the stack on the desk.)

THE SCOPE OF THE TELE.
BUTTERFLIES IN BELLY. YOU ARE
STELLAR, UNUK.
CONSTELLATIONS APART. TIME
TO TACKLE THE DARK.
SUPERNOVAE TO START.
LAGRANGIAN'S BEEN HARD.

(MARFIK, ALYA, and YED stroll in.)

COMMUNITIES OF STARS. SIGN
THAT ALL LEAVE A MARK.

(GUDJA, carrying a portable computer, marches in.)

A HOLY STAY, GUDJA.

(GUDJA examines the stack.)

THE BREAK'S BEGUN.

(GUDJA removes the stack. She places the computer on the desk.)

(They gather around the desk.)

(Song: "STRANGLE")

GUDJA

ALL I ASK OF YOUR MENTAL
ENVI-MENT. SAVE IT. EXPORT
THEM. YA'LL WERE TAUGHT THIS
IN HIGH SCHOOL.

(UNUK alienates the computer.)

PRESENT, WELCOME BACK TO
THE FUTURE!

(Activating the computer.)

(The computer throttles.)

(UNUK chokes up.)

TIME'S JUST A SCALAR
QUANTITY THOUGH.

(Pointing to the computer.)

FILE... COMPUTE ORBITS AND
ENERGIES FOR THE SMALLEST
TIMESTEPS FOR EACH
INTEGRATION. YED. ALYA.
MARFIK. U. N N SERPENTIS HAS
AN ELIPSICAL PERIOD. IT IS ONLY
PYTHON.

(Moving aside.)

(MARFIK, ALYA, and YED take control of the computer.)

MARFIK	ALYA	YED
README M D.	RUN MATPLOTLIB.	OPEN NUMPY.
SOLAR	LIGHT SPEED	ATOMIC MASS
LUM-NOSITY.	INVERSE M S.	UNIT.

(UNUK discreetly takes a piece of paper from the hidden stack.)

ENERGY PLOT FUNCTIONS AND
THE OUTPUT.

(UNUK writes on the paper.)

(MARFIK, ALYA, and YED turn their attention to UNUK.)

WHITE.	COLD.	DWARF.
--------	-------	--------

(Taking the paper from UNUK.)

COLD WHITE DWARF STAR.
CALC-LATE MASS RADIUS. FOR
US.

(Setting UNUK up to the computer.)

MAKE YOURSELF USEFUL.	TRY TO BE ON TOP.	DON'T GET LEFT BEHIND.
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(UNUK holds her head.)

YES PRESSURE.	YES PRESSURE.	YES PRESSURE.
---------------	---------------	---------------

(Pointing to the computer.)

(UNUK glances at the paper.)

(MARFIK, ALYA, and YED rip up the paper. They step aside. They occasionally scour through other papers in the hidden stack.)

UNUK (disorientedly.)

STRANGLEHOLD. I CANNOT SAY
IT IN ASTRONOMY. DON'T KNOW
COMPUTERS.

GUDJA

PYTHON IS ELEGANT SYNTAX,
SCRIPTING.

UNUK

ITS TYPE'S TOO... DYNAMICALLY.

GUDJA

PERHAPS QUIT ANALYZING THIS
TO HAVE DISCOV-RIES MADE ON
THE WEB.

(Moving aside.)

UNUK

NOTHING GOOD COMES OUT OF
RESEARCHING PYTHON ON THE
WEB.

(Typing then entering on the computer.)

WELCOME TO THE JAVA...

(Scrolling with conviction.)

(MARFIK, ALYA, and YED slithers back. They move UNUK aside and retake control of the computer.)

MARFIK

TOO MUCH
PRESSURE.
'QUATION OF
STATE UNIT.
P-D RELATIONSHIP, BRANCH UNCOMMIT.

ALYA

TOO MUCH
PRESSURE.
'QUATION OF
STATE TESTED.

YED

DENS-TY
DEFINED.
'QUATION OF
STATE UNIT.

(UNUK forces herself onto the computer. She
hastily types.)

(MARFIK, ALYA, and YED force UNUK off the
computer. They continue typing.)

STOP WITH
ARTISTRY.
SEE, NOTHING TOO
COMPLEX.
PLUS, 3 D AIN'T
WORTH IT.
PLUS,

STOP THIS
IMPRI-TY.
SEE, DO NOT FEEL
SO STRESSED.
PLUS, 3 D ARE FOR
NERDS.
PLUS,

STOP FEELING
FREELY.
SEE, JUST GIVE IT
A REST.
PLUS, 3 D LOADS
TOO SLOW.
PLUS,

(Directing towards each wall except the fourth wall.)

BOXED IN.

BOXED IN.

BOXED IN.

(Boxing in UNUK into the computer.)

UNUK (reluctantly.)

FOREST WITH ALL INTRICATE
PARTS ARE MY MORAL CODE.
NATURE SNAKING AROUND WILL
NOT DO.

(UNUK types away.)

FLUSH. FOR CODES SO LUSH.
BYTE STREAM TO PUBLIC
SERVER.

(GUDJA takes control of the computer.)

GUDJA

PRIVATE. PRIVATE. PRIVATE.

(Returning the computer then scouring through
papers in the hidden stack.)

MARFIK

ALYA

YED

STRANGLEHOLD.

STRANGLEHOLD.

STRANGLEHOLD.

(GUDJA returns the computer to UNUK.)

UNUK

JAVA. IT PROVIDES THE AIR TO
BREATHE.

MARFIK

ALYA

YED

LANGUAGE NATIVE TO HER PEOPLE.

UNUK (sorely.)

YOU WANT ME TO INTEGRATE.
SERVES YOU. LET ME JUST...

(Pressing CTRL and C.)

COPY.

(GUDJA, MARFIK, ALYA, and YED express
shock.)

PASTE.

(Mashing CTRL and V.)

GUDJA

YOU HAVE JUST BROKEN THE
CODE OF...

MARFIK

ALYA

YED

OFF... OF THE LAWS OF ENTROPY.

UNUK

THOUGH IT'S NOT BAROQUE,
WELL FIX CENTRAL PRESSURE
ARRAY FOR MASS-RADIUS TABLE
IN A LIGHTWEIGHT CLASS.

GUDJA

CONDUCT. SEE ME AF...

MARFIK

ALYA

YED

THIS BOX HAS NO ROOM FOR A
PARTICULAR MOLECULE.

UNUK

PLOT ROOM FOR JAVA...
PROGRAMMERS.

MARFIK

ALYA

YED

VET-NAR-ANS.

ENGINEERS.

PERFORMERS.

(Pointing out.)

UNUK

I AM JUST AS MUCH OF AN
ASTRONOMER AS YOU ARE WITH
YOUR PRIVILEGED SELVES WITH
OUR DEGREE.

MARFIK

ALYA

YED

UNUK. FAILURE.

UNUK. CODE
BREAKER.

UNUK. CHEATER.

UNUK

I AGREE TO OWN THIS FOR I HAVE
ONLY CHEATED MYSELF. OH
WELL.

(Looking to GUDJA for approval.)

THIS ASSIGNMENT, GIVE ME A
ZERO.

MARFIK

NOT FOR US.

ALYA

NOT FOR US.

YED

NOT FOR US.

UNUK

PLEASE, YOU'RE AN INTEGRAL
HERO.

GUDJA

'TERWARDS.

UNUK

SAKE OF GROUP, MY WILL SAYS
I'LL JUST HAVE TO RETAKE WITH
CLASS.

(GUDJA ponders at the hidden stack.)

COLLEGE WON'T JUST BE FOR
THE RICH AS THIS STAR HOLDS
THE MANTLE OF THE FIRST
GENERATION.

(Feeling the weight of emotion.)

CHOKE.

(GUDJA dismisses MARFIK, ALYA, and YED.)

UNUK (Cont.)

I WILL NEVER DROP...

MARFIK

OUT.

ALYA

OUT.

YED

OUT.

(Exiting.)

(GUDJA deactivates the computer. She directs UNUK to her side. She grabs and sets down the stack.)

(Song: "SLITHER OFF")

GUDJA

YOU DON'T BELONG ON THIS
COURSE. YOUR WORK'S ALWAYS
BEEN TOO COMPLEX.

(Pointing out the stack.)

I KNEW WELL BEFORE I TOOK
YOU IN. JAVA'S A REL-TIVELY
NEW LANGUAGE.

(Handing the computer to UNUK.)

GET AHEAD WHILE YOU CAN.
DON'T GET CUT OFF. THERE ARE
TELESCOPES IN THE DISTANCE.
'STRON-MERS THAT CODE IN ALL
TONGUE. EXECUTE THE SCRIPT.

(Waving UNUK off.)

(UNUK appears mystified.)

RUN THE PROGRAM NOW!

(Departing.)

(UNUK may hold the computer. She may run out in the open. She activates the computer. She knows there is a lot to unpack.)

UNUK

THE WHOLE PACKAGE FOR A
UNIVERSE.

(Inhaling.)

AIR.

(Feeling lonely.)

‘ROR PROP-GATION.

(Collecting herself.)

DATA. READING. WRITING.
MANIPULATING.

(Feeling powerful.)

SYSTEM EXIT. ZERO.

(Pressing.)

FADE OUT

FIN

S *Snakeshit*

D. Q. PHAM

Andante

UNUK

Piano

Drum Set

Guitar

7

UNUK

Piano

Drum Set

Guitar

U - nuk. Please take a breath, U - nuk. Se- mes- ter's done,

U - nuk. A- stro- no- my, U - nuk. Weed- out cour- ses o - ver. Deep re-le- vant

The musical score is written for a song titled "Snakeshit" by D. Q. PHAM. The tempo is marked "Andante". The score is in 5/4 time. It consists of four staves: UNUK (vocals), Piano, Drum Set, and Guitar. The UNUK part has two systems of lyrics. The Piano part is mostly empty. The Drum Set part has a complex rhythm with many x's indicating hits. The Guitar part has chords F, G, and F in the first system, and G, D, E, A, C, F, G, F in the second system.

13

UNUK

home - work. The scope of the te - le. But - ter - flies in bel - ly. You are stel - lar,

Piano

Drum Set

Guitar

G F G D E A C

19

UNUK

U - nuk. Con - stel - lat - ions a - part. Time to tac - kle the dark. Su - per - no - vae

Piano

Drum Set

Guitar

G F G F G F

25

UNUK

to start. La-gran-gi-an's been hard. Com-mu-ni-ties of stars. Sign that all leave

Piano

Drum Set

Guitar

Chords: E, A, F, G, F, G, F

31

UNUK

a mark. A ho-ly stay, Gud - ja. The break's be- gun.

Piano

Drum Set

Guitar

Chords: F, F, E, A, E7

36

UNUK

Piano

Drum Set

Guitar

F#

A

C

Detailed description: This system covers measures 36, 37, and 38. The UNUK part consists of three whole rests. The Piano part features a sequence of chords in the right hand: F# major (measures 36-37) and C major (measure 38), while the left hand remains silent. The Drum Set maintains a consistent eighth-note pattern throughout. The Guitar part is composed of three sustained chords: F# major, A major, and C major, each held for a full measure.

39

UNUK

Piano

Drum Set

Guitar

E7

F#

C

GUDJA removes the stack.

Detailed description: This system covers measures 39, 40, and 41. The UNUK part consists of three whole rests. The Piano part plays chords in the right hand: F# major (measures 39-40) and C major (measure 41), with the left hand silent. The Drum Set continues with its eighth-note pattern. The Guitar part features three sustained chords: E7, F# major, and C major. A text box above the guitar staff in measure 40 states "GUDJA removes the stack." The score concludes with a double bar line at the end of measure 41.

STRANGLE

Snakeshit

D. Q. PHAM

Andantino

UNUK

GUDJA

MARFIK

ALYA

YED

Piano

Drum Set

UNUK

GUDJA

MARFIK

ALYA

YED

Piano

Drum Set

All I ask of your men-tal en-vi-ment. Save it. Ex-port them. Ya'll were taught this in high school. Pre-sent, wel-come

back to the fu-ture! Time's just a sca-lar quan-ti-ty though. File...Com-pute or-bits and e - ner-gies for the small-est time

12

UNUK

GUDJA

MARFIK

ALYA

YED

Piano

Drum Set

steps for each in-te-grat-ion. Yed. Al-ya. Mar-fik. U. N N Ser-pen-tis has an e - clip-si-cal pe-ri-od. It is on-ly Py-thon.

19

UNUK

GUDJA

MARFIK

ALYA

YED

Piano

Drum Set

Read-me M D. So - lar lum - no - si - ty. E - ner - gy plot funct-ions and the

Run mat-plot - lib. Light speed in-verse M S. E - ner - gy plot funct-ions and the

O - pen num - py. A - to - mic mass u - nit. E - ner - gy plot funct-ions and the

26

UNUK

GUDJA

MARFIK

out-put. White. Cold white dwarf star. Calc - late mass ra - di - us. For us. Make your-self use - ful. Yes pres

ALYA

out-put. Cold. Cold white dwarf star. Calc - late mass ra - di - us. For us. Try to be on top. Yes pres

YED

out-put. Dwarf. Cold white dwarf star. Calc - late mass ra - di - us. For us. Don't get left be - hind. Yes pres

Piano

Drum Set

34

UNUK

Stran - - gle - hold. I can - not say it in a-stro - no - my.

GUDJA

MARFIK

sure.

ALYA

sure.

YED

sure.

Piano

Drum Set

43

UNUK

Don't know com - pu - ters. Its type's too...

GUDJA

Py-thon is e - le-gant syn-tax, script - ing.

MARFIK

ALYA

YED

Piano

tr

Drum Set

52

UNUK

— Dy-na-mi - cal - ly.

GUDJA

Per-haps quit a-nal - yz-ing this to have dis - cov-ries made on the web.

MARFIK

ALYA

YED

Piano

Drum Set

60

UNUK

No-thing good comes out of re-search - ing Py-thon on the web. Wel - come to the ja - va.....

GUDJA

MARFIK

ALYA

YED

Piano

Drum Set

67

UNUK

tr~~~~~

GUDJA

MARFIK

Too much pres - sure. 'Quat - ion of state u - nit. P - D

ALYA

Too much pres - sure. 'Quat - ion of state test - ed. P - D

YED

Dens - ty de - fined. 'Quat - ion of state u - nit. P - D

Piano

Drum Set

75

UNUK

GUDJA

MARFIK

re-lat-ion - ship, branch un-com-mit. Stop with ar-tis-try. See, no-thing too com-plex. Plus, 3

ALYA

re-lat-ion - ship, branch un-com-mit. Stop this im-pri-ty. See, do not feel so stressed. Plus, 3

YED

re-lat-ion - ship, branch un-com-mit. Stop feel-ing free-ly. See, just give it a rest. Plus, 3

Piano

Drum Set

83

UNUK

Fo - rest with all in-tri-cate parts are my mo-ral code. Na-

GUDJA

MARFIK

D ain't worth it. Plus, boxed in.

ALYA

D are for nerds. Plus, boxed in.

YED

D loads too slow. Plus, boxed in.

Piano

Drum Set

89

UNUK *tr*
ture snak-ing a-round will not do... Flush. For codes so lush. Byte stream to pu-blic ser-ver. Ja - va.

GUDJA
Pri - vate. Pri - vate. Pri - vate.

MARFIK
Stran-gle-hold.

ALYA
Stran-gle-hold.

YED
Stran-gle-hold.

Piano

Drum Set

96

UNUK
It pro-vides the air to breathe. You want me to in-te-grate. Serves you. Let me just co-py. Paste. Though it's not

GUDJA
You have just bro-ken the code

MARFIK
Lan-guage na - tive to her peo - ple.

ALYA
Lan-guage na - tive to her peo - ple.

YED
Lan-guage na - tive to her peo - ple.

Piano

Drum Set

103

UNUK
ba-roque, well fix cen-tral pres-sure ar - ray for mass-ra-di-us ta-ble in a light-weight class.

GUDJA
of... Con duct. See me af...

MARFIK
Off of the laws of en - tro - py. This box has no room for a par-ti-

ALYA
Off of the laws of en - tro - py. This box has no room for a par-ti-

YED
Off of the laws of en - tro - py. This box has no room for a par-ti-

Piano

Drum Set

108

UNUK
Plot room for Ja - va... Pro - gram-mers. I am just as much of an a-stro-no-mer as you are

GUDJA

MARFIK
cu - lar mo - le - cule. Vet - nar - ans. U - gliss.

ALYA
cu - lar mo - le - cule. En - gin - neers. U - gliss.

YED
cu - lar mo - le - cule. Per - for - mers. U - gliss.

Piano

Drum Set

113

UNUK
with your pri-vi-leged selves with our de-gree. I a-gree to own this for I have on-ly cheat-ed my-self. Oh well. This

GUDJA

MARFIK
nuk. Fail - - - lure. gliss.

ALYA
nuk. Code break - er. gliss.

YED
nuk. Cheat - - - er. gliss.

Piano

Drum Set

119

UNUK
as-sign-ment, give me a ze-ro. Please, you're an in-te-gral he-ro. Sake of group, my will says I'll just have to re-take with

GUDJA
"Ter - wards.

MARFIK
Not for us.

ALYA
Not for us.

YED
Not for us.

Piano

Drum Set

125

UNUK class. Col-lege won't just be for the rich as this star holds the man-tle of the first

GUDJA

MARFIK

ALYA

YED

Piano

Drum Set

Detailed description: This block contains the musical score for measures 125 through 128. The UNUK part features a vocal melody starting on a half note, followed by eighth notes. The lyrics are: "class. Col-lege won't just be for the rich as this star holds the man-tle of the first". The other vocal parts (GUDJA, MARFIK, ALYA, YED) are silent. The Piano part provides a harmonic accompaniment with chords. The Drum Set part has a rhythmic pattern with eighth notes and rests.

129

UNUK ge - ner - at - ion. Choke. I will ne - ver drop...

GUDJA

MARFIK Out.

ALYA Out.

YED Out.

Piano

Drum Set

Detailed description: This block contains the musical score for measures 129 through 132. The UNUK part features a vocal melody with a slur over the last two measures. The lyrics are: "ge - ner - at - ion. Choke. I will ne - ver drop...". The other vocal parts (GUDJA, MARFIK, ALYA, YED) are silent. The Piano part provides a harmonic accompaniment. The Drum Set part has a rhythmic pattern with eighth notes and rests.

³SLITHER OFF

Snakeshit

D. Q. PHAM

Adagio

GUDJA sets down the stack.

UNUK

GUDJA

Piano

Drum Set

Guitar

You don't be - long on this course. Your work's al-ways been too com-plex. I knew well be-fore I took

This musical system consists of five staves. The UNUK staff has a treble clef, a key signature of one flat (Bb), and a common time signature (C). It contains seven measures of whole rests. The GUDJA staff has a treble clef, a key signature of one flat (Bb), and a common time signature (C). It contains seven measures of music: a whole rest, a half note Bb, a quarter note G, a quarter note F, a quarter note E, a quarter note D, a quarter note C, and a quarter note B. The Piano staff has a grand staff (treble and bass clefs), a key signature of one flat (Bb), and a common time signature (C). It contains seven measures of whole rests. The Drum Set staff has a single line with a common time signature (C) and a half note with an accent mark. The Guitar staff has a treble clef, a key signature of one flat (Bb), and a common time signature (C). It contains seven measures of whole rests.

8

UNUK

GUDJA

Piano

Drum Set

Guitar

you in. Ja-va's a rel-tive-ly new lan-guage. Get a-head while you can. Don't get cut off. There are tele-scopes in the

This musical system consists of five staves. The UNUK staff has a treble clef, a key signature of one flat (Bb), and a common time signature (C). It contains seven measures of whole rests. The GUDJA staff has a treble clef, a key signature of one flat (Bb), and a common time signature (C). It contains seven measures of music: a quarter note Bb, a quarter note G, a quarter note F, a quarter note E, a quarter note D, a quarter note C, and a quarter note B. The Piano staff has a grand staff (treble and bass clefs), a key signature of one flat (Bb), and a common time signature (C). It contains seven measures of whole rests. The Drum Set staff has a single line with a common time signature (C) and a half note. The Guitar staff has a treble clef, a key signature of one flat (Bb), and a common time signature (C). It contains seven measures of whole rests.

15

UNUK

GUDJA

Piano

Drum Set

Guitar

dis-tance.'Stron-mers that code in all tongue. Ex - e - cute the script. Run the pro-gram now!

Detailed description: This block contains the musical notation for measures 15 through 20. The UNUK part is silent. The GUDJA part has a melody with lyrics: "dis-tance.'Stron-mers that code in all tongue. Ex - e - cute the script. Run the pro-gram now!". The Piano, Drum Set, and Guitar parts are all silent, represented by whole rests.

21

UNUK

GUDJA

Piano

Drum Set

Guitar

The whole pac - kage for a u - ni - verse.

Detailed description: This block contains the musical notation for measures 21 through 26. The UNUK part has a melody with lyrics: "The whole pac - kage for a u - ni - verse.". The GUDJA part is silent. The Piano part has a simple accompaniment. The Drum Set part is silent. The Guitar part has a rhythmic accompaniment consisting of eighth notes.

27

UNUK

Air. 'Ror pro - gat - ion.

GUDJA

Piano

Drum Set

Guitar

34

UNUK

Da - - ta. Read - ing. Writ - ing.

GUDJA

Piano

Drum Set

Guitar

39

UNUK

Ma - ni - pu - lat - ing. Sy - stem e - xit. Ze - ro.

GUDJA

Piano

Drum Set

Guitar