Introduction to Web Science

Assignment 1

Prof. Dr. Steffen Staab
staab@uni-koblenz.de

René Pickhardt
rpickhardt@uni-koblenz.de

Korok Sengupta
koroksengupta@uni-koblenz.de

Institute of Web Science and Technologies
Department of Computer Science
University of Koblenz-Landau

Submission until: November 2, 2016, 10:00 a.m.
Tutorial on: November 4th, 2016, 12:00 p.m.

The main objective of this assignment is for you to use different tools with which you can understand the network that you are connected to or you are connecting to in a better sense. These tasks are not always specific to "Introduction to Web Science". For all the assignment questions that require you to write a code, make sure to include the code in the answer sheet, along with a separate python file. Where screen shots are required, please add them in the answers directly and not as separate files.

1 Ethernet Frame (5 Points)

Ethernet Frame is of the given structure:

Preamble	Destination MAC address	Source MAC address	Type/Length	User Data	Frame Check Sequence (FCS)
8	6	6	2	46 - 1500	4

Figure 1: Ethernet Frame Structure

Given below is an Ethernet frame without the Preamble and the Frame Check Sequence.

```
00 27 10 21 fa 48 00 13     10 e8 dd 52 08 06 00 01
08 00 06 04 00 01 00 13     10 e8 dd 52 c0 a8 02 01
00 00 00 00 00 00 c0 a8     02 67
```

Find:

1. Source MAC Address
2. Destination MAC Address
3. What protocol is inside the data payload?
4. Please mention what the last 2 fields hold in the above frame.

- 00 13 10 e8 dd 52
- 00 27 10 21 fa 48
- ARP - Address Resolution Protocol - Used to map IP addresses to MAC addresses
- c0 a8 02 67 - represents the IP address of the destination machine, in this 02 and 67 represents the last two bytes of IP address, 00 00 00 00 00 00 - destination mac address

2 Cable Issue (5 Points)

Let us consider we have two cables of 20 meters each. One of them is in a 100MBps network while the other is in a 10MBps network. If you had to transfer data through each of them, how much time it would take for the first bit to arrive in each setting? (For your calculation you can assume that the speed of light takes the same value as in the videos.) Please provide formulas and calculations along with your results.

Answer:

It will take the same time for both network speed to have its 1st bit of data to reach the destination. Since the speed of the light is the same which is $3 * 10^8$ meters per second. But it will have make a lot of difference for whole data to reach, since the encoding speed differs.

Speed = Distance / time

Speed is speed of light = $3 * 10^8$ meters per second Distance = 20 metres

$Time = Distance/Speed = 20/3 = 66.7 nanosecond$

3 Basic Network Tools (10 Points)

Listed below are some of the commands which you need to ”google” to understand what they stand for:

1. *ipconfig / ifconfig*
2. *ping*
3. *traceroute*
4. *arp*
5. *dig*

Consider a situation in which you need to check if `www.wikipedia.org` is reachable or not. Using the knowledge you gained above to find the following information:

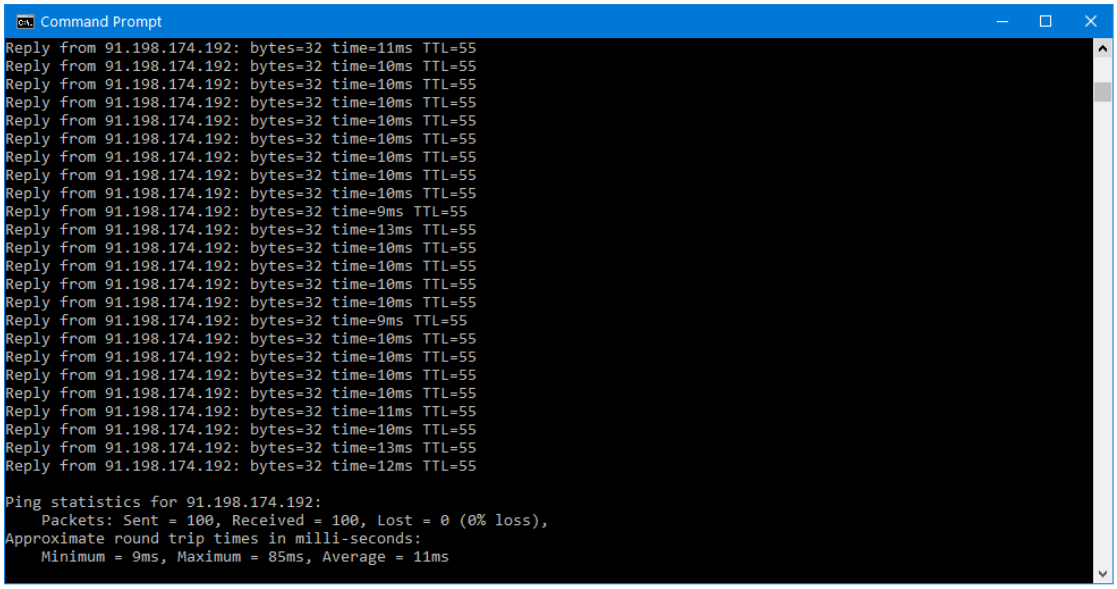
1. The *% packet loss* if at all it happened after sending 100 packets.
2. *Size* of the packet sent to *Wikipedia* server
3. *IP address* of your machine and the *Wikipedia* server
4. *Query Time* for DNS query of the above url.
5. Number of *Hops* in between your machine and the server
6. MAC address of the device that is acting as your network gateway.

Do this once in the university and once in your home/dormitory network. With your answers, you must paste the screen shots to validate your find.

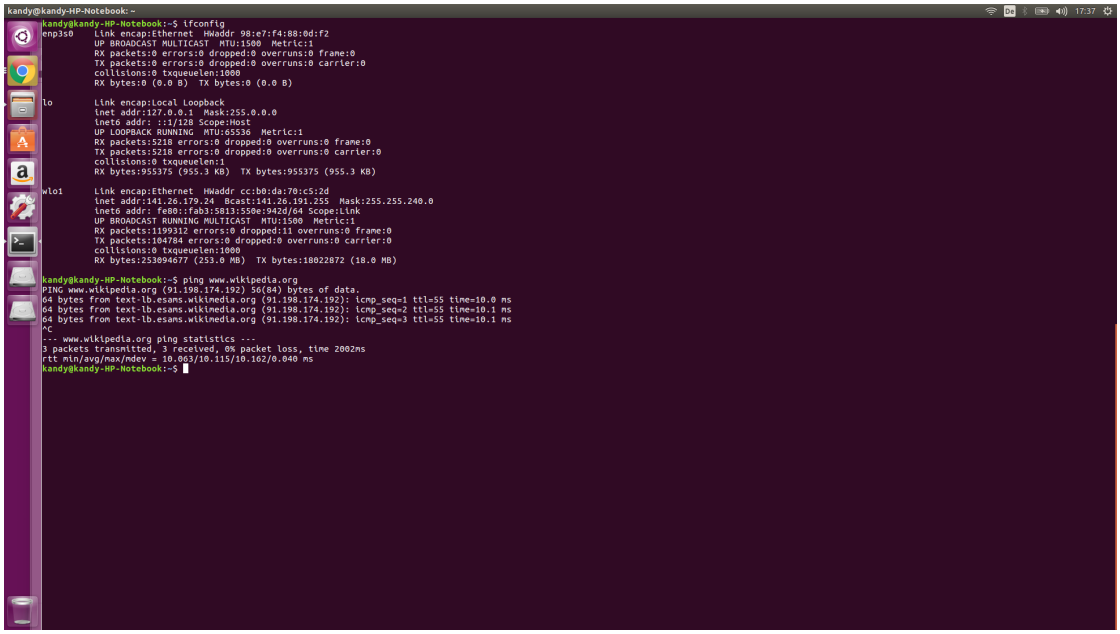
Ans:

From the university:

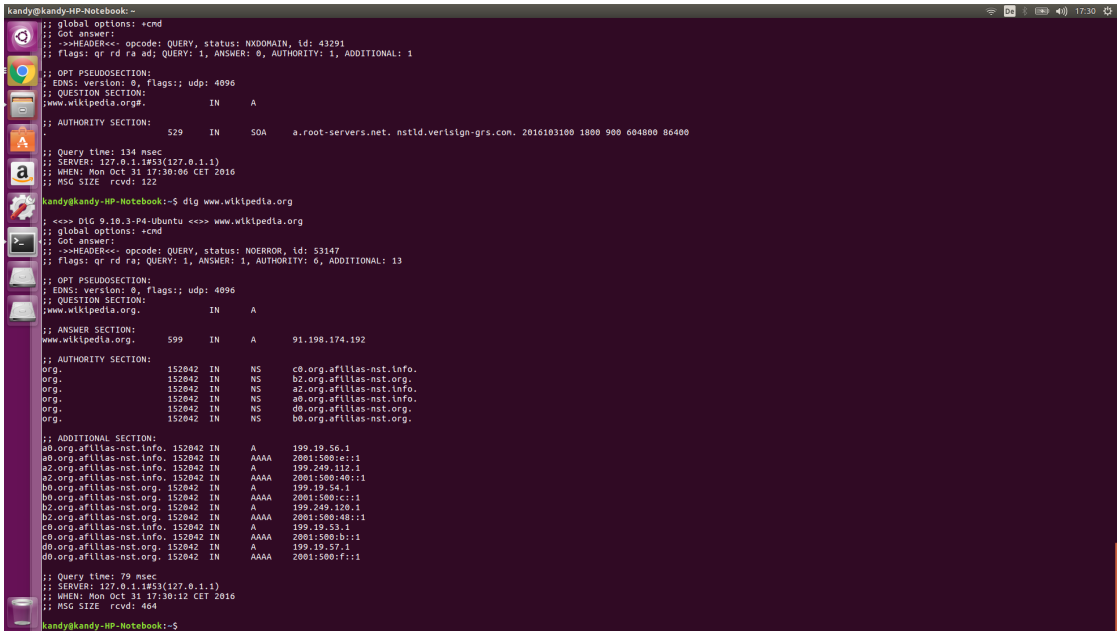
1. Packet loss - 0
2. Size - 32 bytes



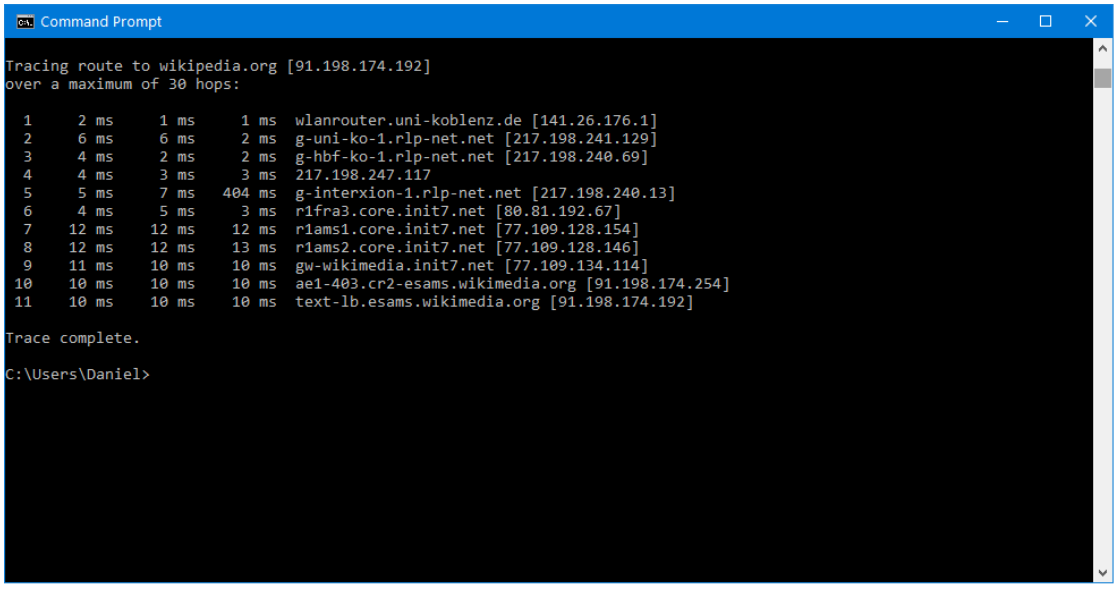
3. IP address - my machine -141.26.179.24 wikipedia server - 91.198.174.192



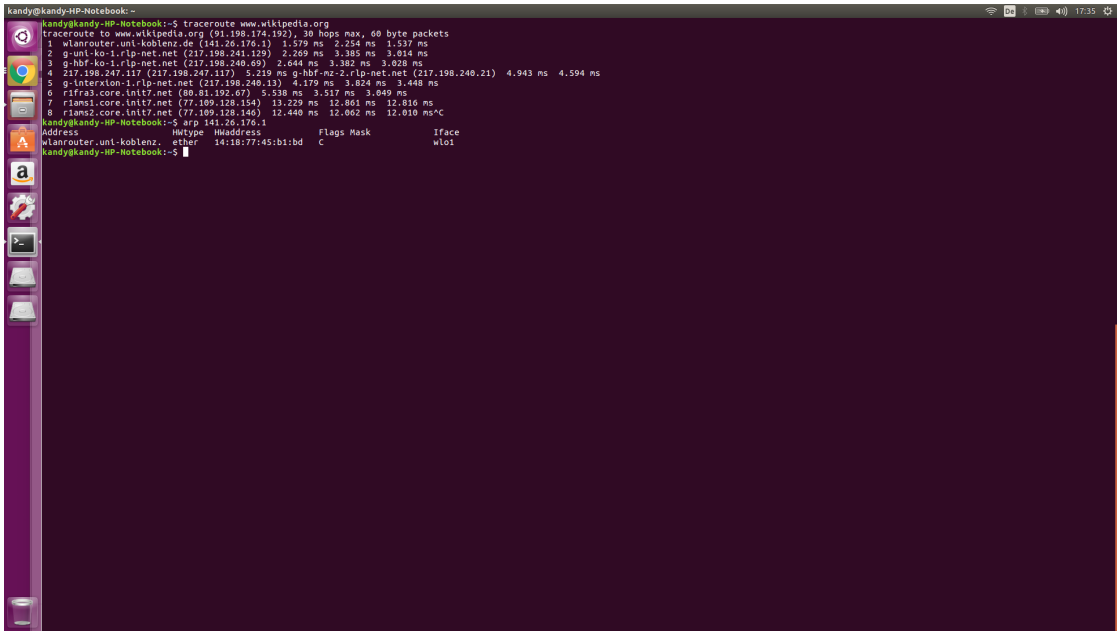
4. 79 msec



5. 11 hops

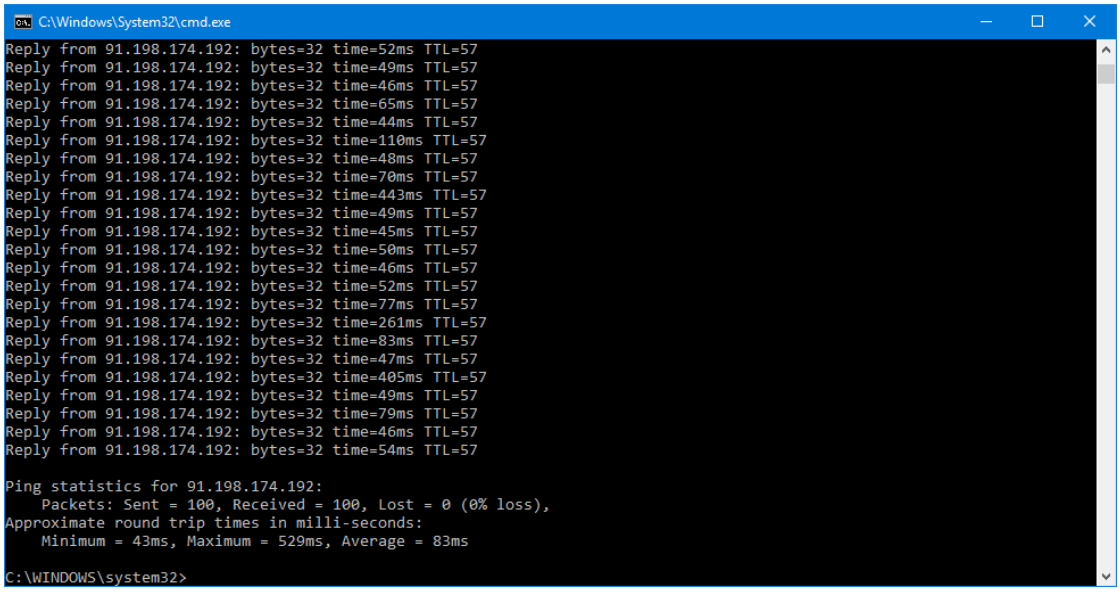


6. Gateway Mac address - 14:18:77:45:b1:bd

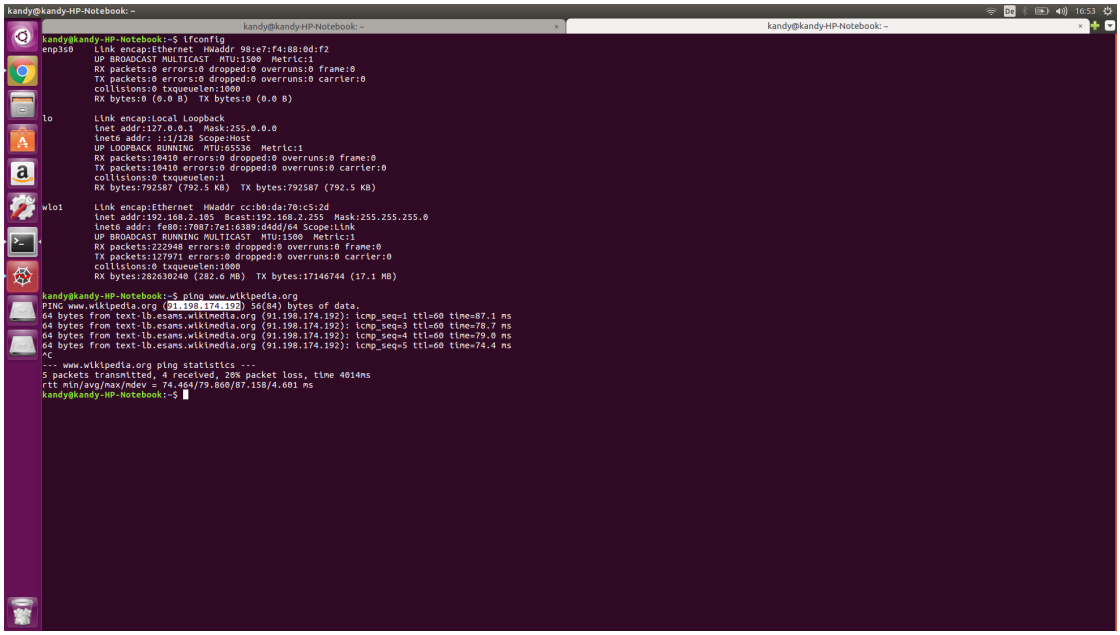


From home:

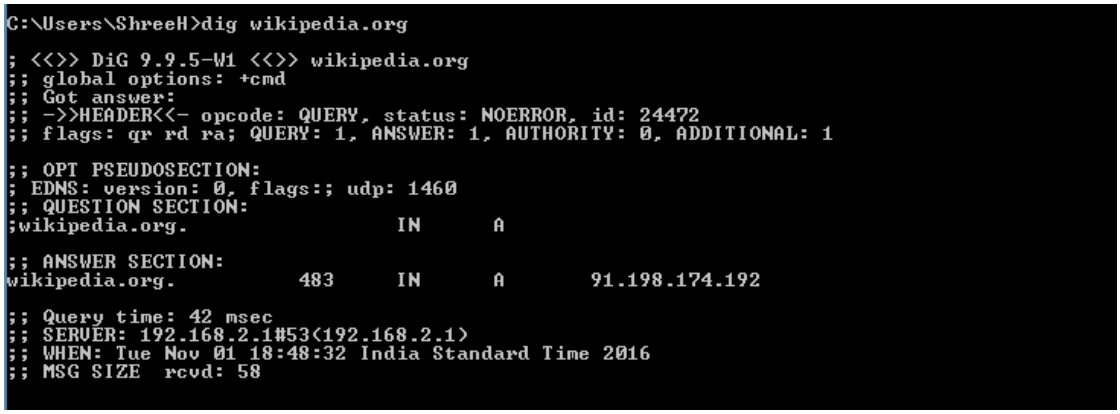
1. Packet loss - 0
2. Size - 32 bytes



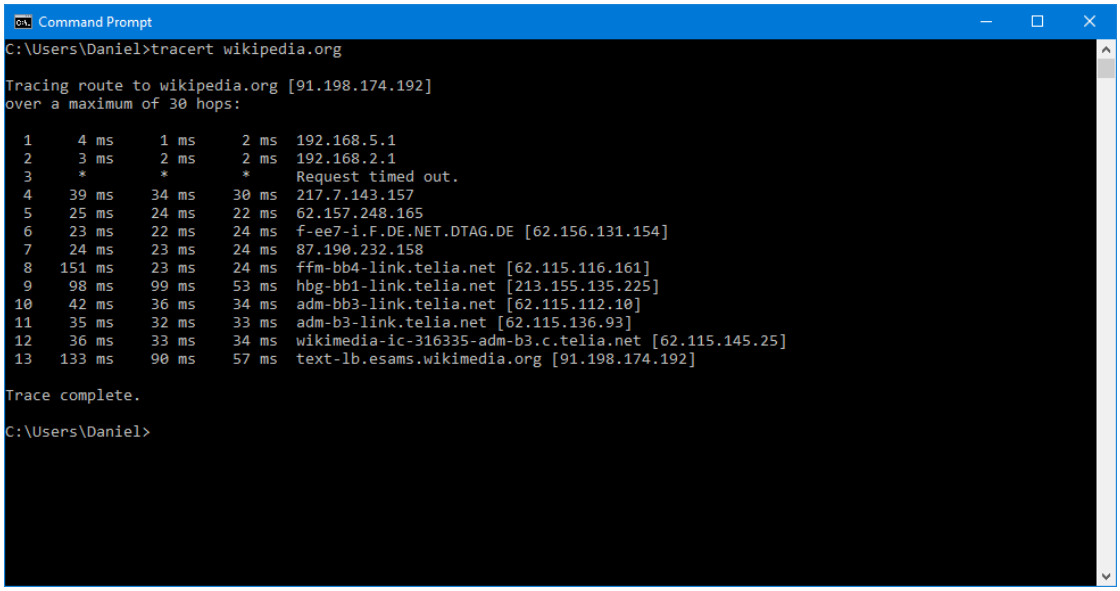
3. IP address - my machine -192.168.2.105 wikipedia server - 91.198.174.192



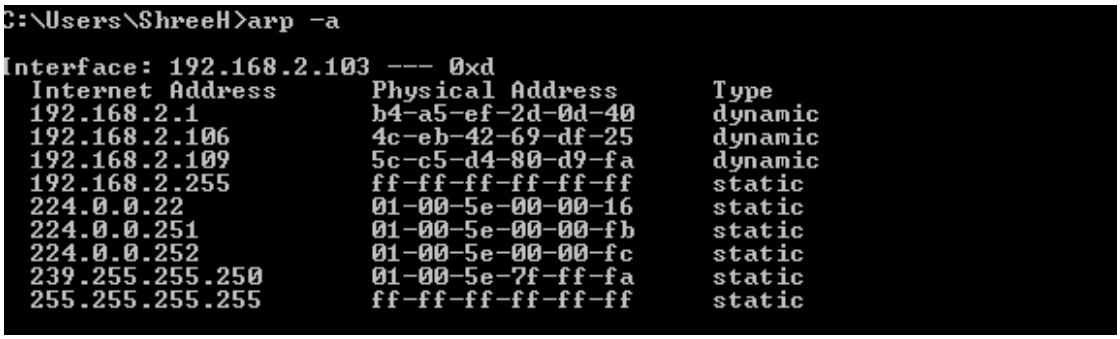
4. 42msec



5. 13 hops



6. Gateway Mac address - b4:a5:ef:2d:0d:40



4 Simple Python Programming (10 Points)

Write a simple python program that does the following:

1. Generate a random number sequence of 10 values between 0 to 90.
2. Perform `sine` and `cosine` operation on numbers generated.
3. Store the values in two different arrays named SIN & COSIN respectively.
4. Plot the values of SIN & COSIN in two different colors.
5. The plot should have labeled axes and legend.

Python program

```
# -*- coding: utf-8 -*-
"""
Team Bravo
Daniyal Akbari (akbari@uni-koblenz.de)
Shriharsh Ambhore (ashriharsh@uni-koblenz.de)
Kandhasamy Rajasekaran (kandhasamy@uni-koblenz.de)
"""

import random , numpy as np, matplotlib.pyplot as plt

list=[]
sin=[]
cosin=[]
for i in range(0,10):
    x = random.randint(0,90)
    list.append(x)
    sin.append(np.sin(x))
    cosin.append(np.cos(x))

# Create a figure of size 8x6 inches, 80 dots per inch
plt.figure(figsize=(8, 6), dpi=80)
# Create a new subplot from a grid of 1x1
plt.subplot(1, 1, 1)

plt.title('Sine & Cosine')
plt.xlabel('t (radians)')
plt.ylabel('red: sin (t), blue: cos (t)')
plt.grid(True)

plt.scatter(list,sin, color="red", label="sine")
plt.scatter(list,cosin, color="blue", label="cosine")
plt.legend()

plt.show()
```

Important Notes

Submission

- Solutions have to be checked into the github repository. Use the directory name `groupname/assignment1/` in your group's repository.
- The name of the group and the names of all participating students must be listed on each submission.
- Solution format: all solutions as *one* PDF document. Programming code has to be submitted as Python code to the github repository. Upload *all* `.py` files of your program! Use `UTF-8` as the file encoding. *Other encodings will not be taken into account!*
- Check that your code compiles without errors.
- Make sure your code is formatted to be easy to read.
  - Make sure you code has consistent indentation.
  - Make sure you comment and document your code adequately in English.
  - Choose consistent and intuitive names for your identifiers.
- Do *not* use any accents, spaces or special characters in your filenames.

Acknowledgment

This latex template was created by Lukas Schmelzeisen for the tutorials of "Web Information Retrieval".