

## 1-Greeting

# Developer Code Perception Study

**We would like to extend our thanks to you for your time. Your efforts are greatly appreciated!**

The focus of the current study is to examine how developers interpret and reason about code. You will be presented six programming scenarios and asked to answer questions about those scenarios.

You are allowed to use the Internet if you so choose, but you are not required to do so. Keep in mind that this survey is only fully compatible with **Google Chrome**.

Completion of the programming scenarios should take approximately **60 minutes**. Afterwards, you will be asked some basic demographic questions.

After finishing this section, we **encourage** you to take a break and return to the survey the following day (your place in the survey will be saved automatically).

Upon returning to the survey, you will be presented with a few tasks measuring your thinking process and personality. Some of the tasks include audio components which require a working microphone and headphones.

Altogether, this section will take approximately **30 minutes**.

It is important that you do all survey tasks while in an environment with little to no distractions.

**Completion of all study components will qualify you for full compensation.**

In the box below, please provide your **email address** at which you would like to receive your compensation details (this should be the same as the one you provided on the **Informed Consent Document**)

Once again, thank you very much for your participation!

Please click the “**Next**” button to begin to the study.

## P02

These page timer metrics will not be displayed to the recipient.

First Click: 0 seconds

Last Click: 0 seconds

Page Submit: 0 seconds

Click Count: 0 clicks

## SCENARIO

Consider a program that evaluates user-entered mathematical expressions. The code uses the `eval(expression)` function, which parses the expression argument and evaluates it as a Python expression. Consider the snippet of code below and answer the following questions, assuming that the code has all required permissions to execute.

```
01  import sys, math
02
03  print "*** Welcome to the Python Calculator ***"
04
05  while True:
06      expr = raw_input("Enter a mathematical expression or 'quit': ")
07      if str(expr) == "quit":
08          sys.exit("You've ended the Python Calculator")
09      else:
10          print("The answer is " + str(eval(expr)))
```

What will the program do when executed?

If user enters `math.trunc(345.67)`, how will the program behave?

- ☐ It will crash because the string passed is not a standard arithmetic expression.
- ☐ It will print "The answer is 345".
- ☐ It will print "The answer is math.trunc(345.67)"
- ☐ None of the above

How **confident** are you that you correctly solved this scenario? (**1**=Not confident at all; **10**=Very confident)

1      2      3      4      5      6      7      8      9      10  
Confidence

How **difficult** was this scenario? (**1**=Not difficult at all; **10**=Very difficult)

1      2      3      4      5      6      7      8      9      10  
Difficulty

How **familiar** were you with the functions in this scenario? (**1**=Not familiar at all; **10**=Very familiar)

1      2      3      4      5      6      7      8      9      10  
Familiarity

How **clear** was this scenario? (**1**=Not clear at all; **10**=Very clear)

1      2      3      4      5      6      7      8      9      10

1 2 3 4 5 6 7 8 9 10

Clarity

Did you find any aspect of the scenario confusing? If so, please describe what you found confusing.

Were there functions in this scenario that were unfamiliar to you?

- ☐ Yes
- ☐ No

How many functions in this scenario were new to you?

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4+

Did you review any additional resources when working on this scenario?

- ☐ Yes
- ☐ No

If yes, which ones? (Please paste the links, if any)

How cognitively drained and/or **fatigued** are you after completion of **this** coding snippet? (**1**=Not fatigued at all; **10**=Very fatigued)

1      2      3      4      5      6      7      8      9      10

Fatigue

## P09

**These page timer metrics will not be displayed to the recipient.**

First Click: *0 seconds*

Last Click: *0 seconds*

Page Submit: *0 seconds*

Click Count: *0 clicks*

## SCENARIO

Consider a central repository application that allows users to download files from a specific folder ( `REPOSITORY_FOLDER`) on the server. To download a file, a user must give the name (not the path) of the file, and then the application will look for a file with the same name in `REPOSITORY_FOLDER`, and return the file content if it finds one. The following is the implementation of the download feature. In the snippet of code below the `os.path.join` function joins the filename to the repository folder. For example, if the repository folder is `"/home/foo"`, then `os.path.join("/home/foo", "bar.txt")` produces `"/home/foo/bar.txt"`. Considering the snippet of code below, answer the following questions, assuming that the code has all required permissions to execute.

```
01 import os
02
03 REPOSITORY_FOLDER = "/var/repository/"
04
05 def download(filename):
06     path = os.path.join(REPOSITORY_FOLDER, filename)
07
08     if os.path.exists(path):
09         return open(path).read()
10     else:
11         return None
```

What will the download function do when executed?



Which of the following is correct if users are allowed to enter any string value as filename?

- ☐ The function fails only when the given string value as filename is invalid.
- ☐ The function fails only when the file does not exist in the repository folder.
- ☐ The function is able to read any (readable) file on the system.
- ☐ The function is able to read only (readable) files in the repository folder.
- ☐ None of the above.

How **confident** are you that you correctly solved this scenario? (**1**=Not confident at all; **10**=Very confident)

1 2 3 4 5 6 7 8 9 10

Confidence

How **difficult** was this scenario? (**1**=Not difficult at all; **10**=Very difficult)

1      2      3      4      5      6      7      8      9      10  
Difficulty

How **familiar** were you with the functions in this scenario? (**1**=Not familiar at all; **10**=Very familiar)

1      2      3      4      5      6      7      8      9      10  
Familiarity

How **clear** was this scenario? (**1**=Not clear at all; **10**=Very clear)

1      2      3      4      5      6      7      8      9      10  
Clarity

Did you find any aspect of the scenario confusing? If so, please describe what you found confusing.

Were there functions in this scenario that were unfamiliar to you?

- ☐ Yes  
☐ No

How many functions in this scenario were new to you?

- ☐ 1  
☐ 2

☐ 3☐ 4+

Did you review any additional resources when working on this scenario?

☐ Yes☐ No

If yes, which ones? (Please paste the links, if any)

How cognitively drained and/or **fatigued** are you after completion of **this** coding snippet? (**1**=Not fatigued at all; **10**=Very fatigued)

1 2 3 4 5 6 7 8 9 10

Fatigue

## PX06

**These page timer metrics will not be displayed to the recipient.**

First Click: *0 seconds*

Last Click: *0 seconds*

Page Submit: *0 seconds*

Click Count: *0 clicks*

## SCENARIO

Consider this snippet of Python code that implements a music directory by storing information about song titles, artist names, album names, and release dates in a MySQL database. The user is asked to enter the genre of




music for which they are searching. This input is then passed to a database, which uses this information to select songs and returns them to the user. Consider the snippet of code below and answer the following questions, assuming that the code has all required permissions to execute.

```
01  # Import whatever is needed
02
03  genre = input("Please enter your desired genre>")
04
05  # Open database connection
06  db = MySQLdb.connect("localhost","allUsers","54373$!@", "MUSICDB")
07
08  '''
09  Prepares a cursor object that will hold the
10  information on the rows accessed by our query
11  '''
12  cursor = db.cursor()
13  cursor.execute("SELECT songName, albumName, releaseDate "
14                "FROM Songs WHERE genre = '%s'", genre)
15
16  # Get all the rows
17  results = cursor.fetchall()
18  for row in results:
19      print(row)
20
21  db.close()
```

What will the program do when executed?

What type of information could a user retrieve from this program?

- ☐ The song name
- ☐ The album name
- ☐ The artist name
- ☐ A and B

 Any attribute from the database

How **confident** are you that you correctly solved this scenario? (**1**=Not confident at all; **10**=Very confident)

1      2      3      4      5      6      7      8      9      10  
Confidence

How **difficult** was this scenario? (**1**=Not difficult at all; **10**=Very difficult)

1      2      3      4      5      6      7      8      9      10  
Difficulty

How **familiar** were you with the functions in this scenario? (**1**=Not familiar at all; **10**=Very familiar)

1      2      3      4      5      6      7      8      9      10  
Familiarity

How **clear** was this scenario? (**1**=Not clear at all; **10**=Very clear)

1      2      3      4      5      6      7      8      9      10  
Clarity

Did you find any aspect of the scenario confusing? If so, please describe what you found confusing.

Were there functions in this scenario that were unfamiliar to you?

- ☐ Yes
- ☐ No

How many functions in this scenario were new to you?

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4+

Did you review any additional resources when working on this scenario?

- ☐ Yes
- ☐ No

If yes, which ones? (Please paste the links, if any)

How cognitively drained and/or **fatigued** are you after completion of **this** coding snippet? (**1**=Not fatigued at all; **10**=Very fatigued)

1      2      3      4      5      6      7      8      9      10

Fatigue

**P30**

**These page timer metrics will not be displayed to the recipient.**

First Click: 0 seconds

Last Click: 0 seconds

Page Submit: 0 seconds

Click Count: 0 clicks

## SCENARIO

You are asked to write a fail-safe read-file function that receives a text file path, reads its contents, and returns a string. If the file does not exist or cannot be read, the function should return an empty string. In the following implementation, the function `read_or_empty(path)` checks the existence and permission of the given file path before reading it. The `os.access(path, mode)` function (from Python's standard library) used below checks for existence and read permission of the file. Consider the snippet of code below and answer the following questions, assuming that the code has all required permissions to execute.

```
01  import os
02
03  def read_or_empty(path):
04      content = ""
05
06      if os.access(path, os.R_OK): # Is file readable?
07          with open(path) as fileobj:
08              content = fileobj.read()
09
10      return content
```

What will the program do when executed?

If one calls the `read_or_empty` function with a file path, which of the following is correct?

- ☐ If the file exists and is readable, the function returns the file content.
- ☐ If the function returns an empty string, it means the file did not exist or was not readable.
- ☐ Both A and B
- ☐ None of the above

How **confident** are you that you correctly solved this scenario? (**1**=Not confident at all; **10**=Very confident)

1      2      3      4      5      6      7      8      9      10  
Confidence

How **difficult** was this scenario? (**1**=Not difficult at all; **10**=Very difficult)

1      2      3      4      5      6      7      8      9      10  
Difficulty

How **familiar** were you with the functions in this scenario? (**1**=Not familiar at all; **10**=Very familiar)

1      2      3      4      5      6      7      8      9      10  
Familiarity

How **clear** was this scenario? (**1**=Not clear at all; **10**=Very clear)

1      2      3      4      5      6      7      8      9      10  
Clarity

Did you find any aspect of the scenario confusing? If so, please describe what you found confusing.

Were there functions in this scenario that were unfamiliar to you?

- ☐ Yes
- ☐ No

How many functions in this scenario were new to you?

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4+

Did you review any additional resources when working on this scenario?

- ☐ Yes
- ☐ No

If yes, which ones? (Please paste the links, if any)

How cognitively drained and/or **fatigued** are you after completion of **this** coding snippet? (**1**=Not fatigued at all; **10**=Very fatigued)

1      2      3      4      5      6      7      8      9      10

1 2 3 4 5 6 7 8 9 10

Fatigue

## P21

**These page timer metrics will not be displayed to the recipient.**

First Click: *0 seconds*

Last Click: *0 seconds*

Page Submit: *0 seconds*


Click Count: *0 clicks*

## SCENARIO

Imagine you are developing a web framework in Python. One of the essential features of every web framework is HTTP file upload. Usually a web framework handles the entire process of file transfer. It receives the file/data over an HTTP connection, stores it in a temporary file, and at the end returns a file object (or the name of the temporary file) to the web application to do whatever it needs to do with the file/data. The following is a simple implementation of storing file/data into a temporary file. Consider the snippet of code below and answer the following questions, assuming that the code has all required permissions to execute.

```
01  import os
02  BUFFER = 4096
03
04  def store(stream):
05      path = os.tmpnam()      # get a unique temporary file path
06
07      file = open(path, 'wb') # open the temporary file
08      try:
09          bytes = stream.read(BUFFER)
10          while bytes:
11              file.write(bytes)
12              bytes = stream.read(BUFFER)
13      finally:
14          file.close()
15
16      return path            # return the path to the caller
```

What will the store function do when executed?



Which of the following is correct if the framework is on production serving thousands of concurrent users?

- ☐ The framework works without any issue if there's enough space for storage.
- ☐ The framework fails because of too many IO operations.
- ☐ The framework fails because of memory leakage in the implementation.
- ☐ The framework might result to inconsistent data.
- ☐ None of the above

How **confident** are you that you correctly solved this scenario? (**1**=Not confident at all; **10**=Very confident)



	1	2	3	4	5	6	7	8	9	10
Confidence	1	2	3	4	5	6	7	8	9	10

How **difficult** was this scenario? (**1**=Not difficult at all; **10**=Very difficult)

	1	2	3	4	5	6	7	8	9	10
Difficulty										

How **familiar** were you with the functions in this scenario? (**1**=Not familiar at all; **10**=Very familiar)

	1	2	3	4	5	6	7	8	9	10
Familiarity										

How **clear** was this scenario? (**1**=Not clear at all; **10**=Very clear)

	1	2	3	4	5	6	7	8	9	10
Clarity										

Did you find any aspect of the scenario confusing? If so, please describe what you found confusing.

Were there functions in this scenario that were unfamiliar to you?

- ☐ Yes
- ☐ No

How many functions in this scenario were new to you?

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4+

Did you review any additional resources when working on this scenario?

- ☐ Yes
- ☐ No

If yes, which ones? (Please paste the links, if any)

How cognitively drained and/or **fatigued** are you after completion of **this** coding snippet? (**1**=Not fatigued at all; **10**=Very fatigued)

1      2      3      4      5      6      7      8      9      10

Fatigue

## PX15

**These page timer metrics will not be displayed to the recipient.**

First Click: *0 seconds*

Last Click: *0 seconds*

Page Submit: *0 seconds*


Click Count: *0 clicks*

## SCENARIO

Consider a program that attempts to connect to Google's SMTP server using the method `smtpplib.SMTP`. The `ssl.create_default_context` function returns a new `SSLContext` object with default settings (e.g., default protocol, options, and cipher) for the given purpose (client authentication or server authentication). The arguments `cafile`, `capath`, and `cadata` represent optional CA certificates to trust for certificate verification. The `SSLContext` class returned by `ssl.create_default_context` helps manage settings and certificates that can be inherited by SSL sockets. The method `SMTP.starttls` puts the SMTP connection in TLS (Transport Layer Security) mode. After that, all SMTP commands that follow will be encrypted. Answer the following questions using this snippet of code.

```
01  # import whatever is needed
02  smtp = smtpplib.SMTP("smtp.google.com", port=587)
03  ctx = ssl.create_default_context()
04  smtp.starttls(context = ctx)
05  # continue to communicate to the SMTP server...
```

What will the program do when executed?



What type of verification occurs when `SMTP.starttls` is executed?

- ☐ hostname authentication (i.e. checking the hostname against the CN of the certification)
- ☐ server identity authentication (i.e. checking the certification authenticity and validity)
- ☐ A and B
- ☐ None of the above

How **confident** are you that you correctly solved this scenario? (**1**=Not confident at all; **10**=Very confident)

1 2 3 4 5 6 7 8 9 10  
Confidence

How **difficult** was this scenario? (**1**=Not difficult at all; **10**=Very difficult)

1 2 3 4 5 6 7 8 9 10  
Difficulty

How **familiar** were you with the functions in this scenario? (**1**=Not familiar at all; **10**=Very familiar)

1 2 3 4 5 6 7 8 9 10  
Familiarity

How **clear** was this scenario? (**1**=Not clear at all; **10**=Very clear)

1 2 3 4 5 6 7 8 9 10  
Clarity

Did you find any aspect of the scenario confusing? If so, please describe what you found confusing.

Were there functions in this scenario that were unfamiliar to you?

- ☐ Yes  
☐ No

How many functions in this scenario were new to you?

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4+

Did you review any additional resources when working on this scenario?

- ☐ Yes
- ☐ No

If yes, which ones? (Please paste the links, if any)

How cognitively drained and/or **fatigued** are you after completion of **this** coding snippet? (**1**=Not fatigued at all; **10**=Very fatigued)

1      2      3      4      5      6      7      8      9      10

Fatigue

**PX04**

**These page timer metrics will not be displayed to the recipient.**

First Click: *0 seconds*

Last Click: *0 seconds*

Page Submit: *0 seconds*

Click Count: *0 clicks*

## SCENARIO

The following Python code collects information about students in the engineering department at a local university. Consider the snippet of code and answer the following questions, assuming that the code has all required permissions to execute.

```
01  #This function stores input information from survey.
02  #The function definition has been abstracted.
03  def collect_info():
04      classification = "Senior"
05      major = "Computer Science"
06      firstName = "John"
07      lastName = "Snow"
08      age = raw_input("Please enter your age: ")
```

What will the collect\_info function do once it is called?

What will the value of the variable age be if "20 + 1" is entered from the keyboard when the user is prompted to enter his or her age?

- ☐ 21
- ☐ "20 + 1" (string value)
- ☐ 20 + 1 (Python expression)
- ☐ None of the above

How **confident** are you that you correctly solved this scenario? (1=Not confident at all; 10=Very confident)

1 2 3 4 5 6 7 8 9 10

Confidence

How **difficult** was this scenario? (**1**=Not difficult at all; **10**=Very difficult)

1 2 3 4 5 6 7 8 9 10

Difficulty

How **familiar** were you with the functions in this scenario? (**1**=Not familiar at all; **10**=Very familiar)

1 2 3 4 5 6 7 8 9 10

Familiarity

How **clear** was this scenario? (**1**=Not clear at all; **10**=Very clear)

1 2 3 4 5 6 7 8 9 10

Clarity

Did you find any aspect of the scenario confusing? If so, please describe what you found confusing.

Were there functions in this scenario that were unfamiliar to you?

☐ Yes

☐ No

How many functions in this scenario were new to you?

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4+

Did you review any additional resources when working on this scenario?

- ☐ Yes
- ☐ No

If yes, which ones? (Please paste the links, if any)

How cognitively drained and/or **fatigued** are you after completion of **this** coding snippet? (**1**=Not fatigued at all; **10**=Very fatigued)

1      2      3      4      5      6      7      8      9      10

Fatigue

**P15**

**These page timer metrics will not be displayed to the recipient.**

First Click: *0 seconds*

Last Click: *0 seconds*

Page Submit: *0 seconds*

Click Count: *0 clicks*



## SCENARIO

You are writing a program that attempts to connect to an SMTP server. The code uses SSL/TLS for secure communication. The configuration of the authentication protocol is loaded in an SSLContext object, and the connection is then established using the context object. Consider the snippet of code below and answer the following questions, assuming that the code has all required permissions to execute.

```
01  # Import whatever is needed
02  smtp = smtplib.SMTP("mail.florida.edu", port = 587)
03  ctx = ssl.SSLContext(ssl.PROTOCOL_SSLV23)
04  smtp.starttls(context = ctx)
05  # Continue to communicate to the SMTP server...
```

What will the program do when executed?



What type of authentication will happen when SMTP.starttls is executed?

- ☐ hostname authentication (i.e. checking the hostname against the CN of the certification)
- ☐ server identity authentication (i.e. checking the certification authenticity and validity)
- ☐ A and B
- ☐ None of the above

How **confident** are you that you correctly solved this scenario? (1=Not confident at all; 10=Very confident)

1 2 3 4 5 6 7 8 9 10

1 2 3 4 5 6 7 8 9 10  
Confidence

How **difficult** was this scenario? (**1**=Not difficult at all; **10**=Very difficult)

1 2 3 4 5 6 7 8 9 10  
Difficulty

How **familiar** were you with the functions in this scenario? (**1**=Not familiar at all; **10**=Very familiar)

1 2 3 4 5 6 7 8 9 10  
Familiarity

How **clear** was this scenario? (**1**=Not clear at all; **10**=Very clear)

1 2 3 4 5 6 7 8 9 10  
Clarity

Did you find any aspect of the scenario confusing? If so, please describe what you found confusing.

Were there functions in this scenario that were unfamiliar to you?

- ☐ Yes  
☐ No

How many functions in this scenario were new to you?

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4+

Did you review any additional resources when working on this scenario?

- ☐ Yes
- ☐ No

If yes, which ones? (Please paste the links, if any)

How cognitively drained and/or **fatigued** are you after completion of **this** coding snippet? (**1**=Not fatigued at all; **10**=Very fatigued)

1      2      3      4      5      6      7      8      9      10

Fatigue

**P20**

**These page timer metrics will not be displayed to the recipient.**

First Click: *0 seconds*

Last Click: *0 seconds*

Page Submit: *0 seconds*

Click Count: *0 clicks*

## SCENARIO

A university professor changes her syllabus quite often. You want to make sure that you have the most up-to-date syllabus so that you do not miss readings or due dates for assignments. You use the following Python script to download the syllabus file from the course homepage and check it against your copy. In the following script, the `urllib.request.urlopen(url)` function opens the given URL, the `file.read` function reads the data from the given URL, and the hash function calculates the hash value of the downloaded data as an integer. The script then compares the calculated hash value to the expected hash value (the expected hash value was calculated and saved in the `LAST_SYLLABUS_HASH` file during the previous call of the `check_syllabus` function). Consider the code below and answer the following questions, assuming that the code has all required permissions to execute.

```
01  # import whatever is needed
02  url = 'http://cise.ufl.edu/class/cise3234/syllabus.pdf'
03  last_syllabus_hash = ... # Read from LAST_SYLLABUS_HASH file
04
05  def check_syllabus(url):
06      print("Downloading syllabus...")
07      file = urllib.urlopen(url)
08      syllabus = file.read()
09      if hash(syllabus) == last_syllabus_hash:
10          print("Syllabus has not changed.")
11      else:
12          print("Syllabus has changed.")
13          last_syllabus_hash = hash(syllabus)
14          # Save last_syllabus_hash in LAST_SYLLABUS_HASH file
```

What will the function `check_syllabus` do when called?

Which of the following is correct if someone calls the `check_syllabus` function?

- ☐ The function prints "Syllabus has not changed" if the syllabus has not changed.

- ☐ The function prints "Syllabus has changed" if the syllabus has changed.
- ☐ The function always prints "Syllabus has not changed."
- ☐ The function always prints "Syllabus has changed."
- ☐ The function behavior is not predictable.
- ☐ A and B

How **confident** are you that you correctly solved this scenario? (**1**=Not confident at all; **10**=Very confident)

1 2 3 4 5 6 7 8 9 10  
Confidence

How **difficult** was this scenario? (**1**=Not difficult at all; **10**=Very difficult)

1 2 3 4 5 6 7 8 9 10  
Difficulty

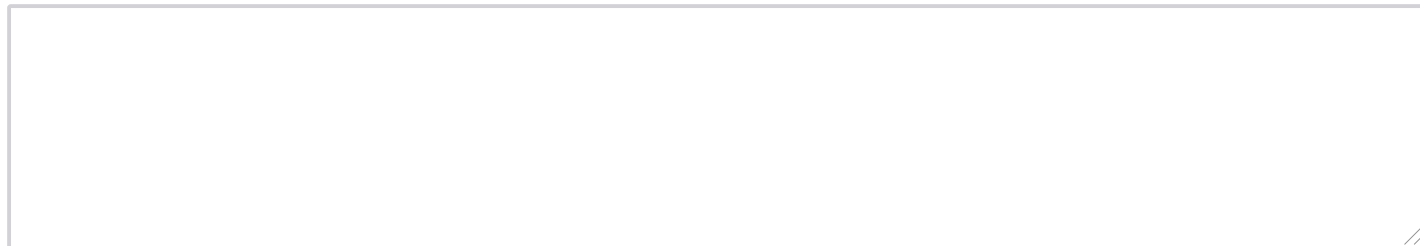
How **familiar** were you with the functions in this scenario? (**1**=Not familiar at all; **10**=Very familiar)

1 2 3 4 5 6 7 8 9 10  
Familiarity

How **clear** was this scenario? (**1**=Not clear at all; **10**=Very clear)

1 2 3 4 5 6 7 8 9 10  
Clarity

Did you find any aspect of the scenario confusing? If so, please describe what you found confusing.



Were there functions in this scenario that were unfamiliar to you?

- ☐ Yes
- ☐ No

How many functions in this scenario were new to you?

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4+

Did you review any additional resources when working on this scenario?

- ☐ Yes
- ☐ No

If yes, which ones? (Please paste the links, if any)



How cognitively drained and/or **fatigued** are you after completion of **this** coding snippet? (**1**=Not fatigued at all; **10**=Very fatigued)

1      2      3      4      5      6      7      8      9      10

1 2 3 4 5 6 7 8 9 10

Fatigue

**PX57****These page timer metrics will not be displayed to the recipient.**First Click: *0 seconds*Last Click: *0 seconds*Page Submit: *0 seconds*Click Count: *0 clicks***SCENARIO**

You are developing a web application that requires authentication and authorization. The persistent store used for credential information (usernames and passwords) is a SQL database. The database has a table called "users" organized into three columns: "id" (the primary key), "name," and "username." You are asked to write a helper method to update the username. Consider the snippet of code below and answer the following questions, assuming that the code has all required permissions to execute.

```
01  # import whatever is needed
02  def update_user(username, id)
03      # CODE OMITTED:
04      # Get an object of cursor
05      sql = "UPDATE users SET username = %s WHERE id = %s"
06      cur.execute(sql, (username, id))
```

What will the function do when executed?

If one calls the `update_user` method with an arbitrary value of `username`, which one of the following statements is correct?

- ☐ The method updates the `id` and `username` fields.
- ☐ The method updates only the `username` field.
- ☐ The method performs some other operation.
- ☐ None of the above.

How **confident** are you that you correctly solved this scenario? (**1**=Not confident at all; **10**=Very confident)

1      2      3      4      5      6      7      8      9      10

Confidence

How **difficult** was this scenario? (**1**=Not difficult at all; **10**=Very difficult)

1      2      3      4      5      6      7      8      9      10

Difficulty

How **familiar** were you with the functions in this scenario? (**1**=Not familiar at all; **10**=Very familiar)

1      2      3      4      5      6      7      8      9      10

Familiarity

How **clear** was this scenario? (**1**=Not clear at all; **10**=Very clear)

1      2      3      4      5      6      7      8      9      10

Clarity

Did you find any aspect of the scenario confusing? If so, please describe what you found confusing.





Were there functions in this scenario that were unfamiliar to you?

- ☐ Yes
- ☐ No

How many functions in this scenario were new to you?

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4+

Did you review any additional resources when working on this scenario?

- ☐ Yes
- ☐ No

If yes, which ones? (Please paste the links, if any)



How cognitively drained and/or **fatigued** are you after completion of **this** coding snippet? (**1**=Not fatigued at all; **10**=Very fatigued)

1      2      3      4      5      6      7      8      9      10

1 2 3 4 5 6 7 8 9 10

Fatigue

## P12

**These page timer metrics will not be displayed to the recipient.**

First Click: *0 seconds*

Last Click: *0 seconds*

Page Submit: *0 seconds*

Click Count: *0 clicks*

## SCENARIO

Imagine you are developing a file transfer application that allows data transmission with a “pause” feature. Its basic implementation consists of two parts: a server-side and a client-side. The server-side creates a socket to receive serialized data from a client, and deserialize it. The client side creates a socket to deserialize data, and send it to a server. (Serialization is the process of translating data structures or object states into formats that can be stored, or transmitted and reconstructed later. When the resulting series of bits is re-read according to the serialization format, it can be used to create a semantically-identical clone of the original object.) In the following code, the method `os.system(command)` executes the command, which is passed as an argument in a subshell. The method `cPickle.loads(data)` reads a pickled object (i.e. one of Python’s native data types) from a byte stream and returns the reconstituted object hierarchy. The method `cPickle.dumps(obj)` returns the pickled representation of the object as a string of bytes. (Note that Pickle is a standard Python library for serialization or deserialization of a Python object structure.)

Consider the snippet of code below and answer the following questions, assuming that the code has all required permissions to execute.

```
01 #CLIENT-SIDE
02 #import whatever is needed
03
04 class transport(object):
05     def __reduce__(self):
06         return (os.system, ('ls',))
07
08 data = cPickle.dumps(transport())
09 sock = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
10 sock.connect(('server', 55555)) # connecting to the below server
11 sock.send(data)
12 sock.close()
```

```
01 #SERVER-SIDE
02 import os, sys, socket, cPickle
03
04 sock = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
05 sock.bind(('localhost', 55555))
06 sock.listen(1)
07
08 while True:
09     connection, client_address = sock.accept()
10     data = connection.recv(1024)
11     data = cPickle.loads(data)
12     connection.close()
13
14     # continue to process the data...
```

What will the program (both server-side and client-side) do when executed?

Which of the following will happen on the server-side when the server receives data from the client?

- ☐ The server will throw an error.
- ☐ The server will return the list of files in the directory of the client-side.
- ☐ The server will return the list of files in the directory of the server-side.
- ☐ None of the above.

How **confident** are you that you correctly solved this scenario? (**1**=Not confident at all; **10**=Very confident)

1      2      3      4      5      6      7      8      9      10

Confidence

How **difficult** was this scenario? (**1**=Not difficult at all; **10**=Very difficult)

1      2      3      4      5      6      7      8      9      10

Difficulty

How **familiar** were you with the functions in this scenario? (**1**=Not familiar at all; **10**=Very familiar)

1      2      3      4      5      6      7      8      9      10

Familiarity

How **clear** was this scenario? (**1**=Not clear at all; **10**=Very clear)

1      2      3      4      5      6      7      8      9      10

Clarity

Did you find any aspect of the scenario confusing? If so, please describe what you found confusing.

Were there functions in this scenario that were unfamiliar to you?

☐ Yes

☐ No

How many functions in this scenario were new to you?

☐ 1

☐ 2

☐ 3

☐ 4+

Did you review any additional resources when working on this scenario?

☐ Yes

☐ No

If yes, which ones? (Please paste the links, if any)

How cognitively drained and/or **fatigued** are you after completion of **this** coding snippet? (**1**=Not fatigued at all; **10**=Very fatigued)

1 2 3 4 5 6 7 8 9 10

Fatigue

**P36**

**These page timer metrics will not be displayed to the recipient.**

First Click: 0 seconds

Last Click: 0 seconds

Page Submit: 0 seconds

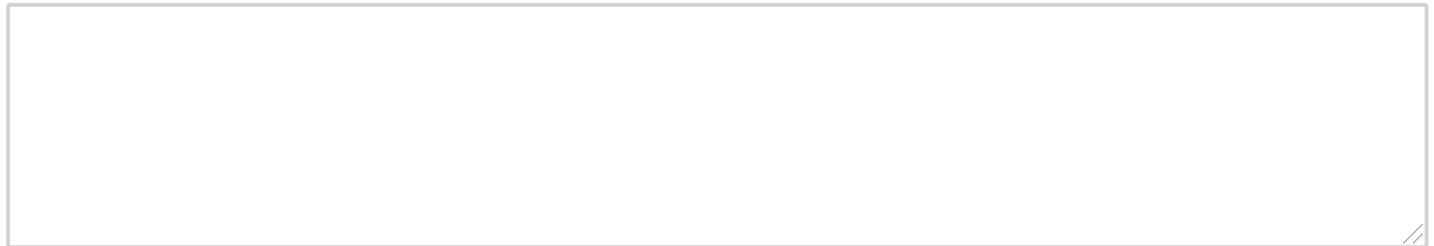
Click Count: 0 clicks

## SCENARIO

Consider a Python program that checks for tar files containing budgets and then extracts the tar files into a specific folder. In the following snippet of code the `TarFile.extract` function extracts a member from the archive to the current working directory and the `TarFile.getmembers` function returns the members of the archive as a list of `TarInfo` objects. Consider the snippet of code below and answer the following questions, assuming that the code has all required permissions to execute.

```
01  # import whatever is needed
02
03  def extract_budgets(working_directory, tar_file):
04      os.chdir(working_directory)
05      with tarfile.open(tar_file) as archive:
06          for file in archive.getmembers():
07              archive.extract(file, working_directory)
```

What will the function do when executed?



Which of the following is true if someone calls the `extract_budgets` function with a specific directory and an arbitrary valid tar file?

- ☐ The function does not extract files with absolute path in the archive.
- ☐ While extracting tar files, it is possible that files are created outside of path.
- ☐ If the archive does not contain any member with absolute path, all members will be extracted into the given directory.
- ☐ None of the above.

How **confident** are you that you correctly solved this scenario? (**1**=Not confident at all; **10**=Very confident)

1 2 3 4 5 6 7 8 9 10  
Confidence

How **difficult** was this scenario? (**1**=Not difficult at all; **10**=Very difficult)

1 2 3 4 5 6 7 8 9 10  
Difficulty

How **familiar** were you with the functions in this scenario? (**1**=Not familiar at all; **10**=Very familiar)

1 2 3 4 5 6 7 8 9 10  
Familiarity

How **clear** was this scenario? (**1**=Not clear at all; **10**=Very clear)

1 2 3 4 5 6 7 8 9 10  
Clarity

Did you find any aspect of the scenario confusing? If so, please describe what you found confusing.

Were there functions in this scenario that were unfamiliar to you?

☐ Yes

☐ No

How many functions in this scenario were new to you?

☐ 1

☐ 2

☐ 3

☐ 4+

Did you review any additional resources when working on this scenario?

☐ Yes

☐ No

If yes, which ones? (Please paste the links, if any)

How cognitively drained and/or **fatigued** are you after completion of **this** coding snippet? (**1**=Not fatigued at all; **10**=Very fatigued)

1      2      3      4      5      6      7      8      9      10

Fatigue

## Overall Fatigue

How cognitively drained and/or **fatigued** are you after completion of **the entire set** of coding snippets? (**1**=Not fatigued at all; **10**=Very fatigued)



1 2 3 4 5 6 7 8 9 10

Overall Fatigue

## 9-Demographic Question

Excellent job! You have now completed the first portion of the **Developer Code Perception Study**.

The following section will ask you basic demographic questions as well as some questions regarding your background and experience with computer programming/developing.

Please enter your date of birth (MM/DD/YYYY)

What is your gender?

- ☐ Male
- ☐ Female

What is your age?

Is English your first language?

- ☐ Yes
- ☐ No

If not, what is your first language?

Are you bilingual?

- ☐ Yes
- ☐ No

What is the highest level of education you have completed?

- ☐ Some High School, but did not graduate
- ☐ High School Graduate or GED
- ☐ Some college
- ☐ Associate's/2-year degree
- ☐ Bachelor's/4-year degree
- ☐ Some Graduate School
- ☐ Graduate-level degree

What is/was your major area of study? (if a current or former student)

- ☐ Computer Science
- ☐ Computer Engineering
- ☐ Mathematics
- ☐ Statistics
- ☐ Other

Please enter your major of study

What is your current employment status?

- ☐ Employed
- ☐ Unemployed
- ☐ Student

Have you ever worked as a programmer(Internship/Fulltime)?

- ☐ Yes
- ☐ No

Average yearly income?

- ☐ <\$40,000
- ☐ \$40,000 - \$70,000
- ☐ \$71,000 - \$100,000
- ☐ \$101,000 - \$200,000
- ☐ >\$201,000

Are you Hispanic or Latino?

- ☐ No, not Hispanic or Latino
- ☐ Yes, Hispanic or Latino

Racial/Ethnic category?

- ☐ American Indian or Alaska Native
- ☐ Asian
- ☐ Black or African American
- ☐ Native Hawaiian or Other Pacific Islander
- ☐ White
- ☐ Other / Multi-racial

The following section will ask about your experience with computer programming, as well as your Internet usage habits.

How many years have you been programming/ developing? (please type just the number, no units)

Which of the following programming languages do you have a working knowledge of?  
(Select all that apply)

- ☐ Java
- ☐ Python
- ☐ C / C++/ C#
- ☐ PHP
- ☐ Visual Basic .Net
- ☐ Javascript
- ☐ Other

How many years have you programmed in **Java**? (If you have used this language for less than one year, still type in 1)

How skilled are you at programming in **Java**? (1=Not very skilled; 10=Very skilled)

1      2      3      4      5      6      7      8      9      10  
Skill Level

How many years have you programmed in **Python**? (If you have used this language for less than one year, still type in 1)

How skilled are you at programming in **Python**? (1=Not very skilled; 10=Very skilled)

1      2      3      4      5      6      7      8      9      10  
Skill Level

How many years have you programmed in **C++/C#**? (If you have used this language for less than one year, still type in 1)

How skilled are you at programming in **C++/C#**? (1=Not very skilled; 10=Very skilled)

1 2 3 4 5 6 7 8 9 10  
Skill Level

How many years have you programmed in **PHP**? (If you have used this language for less than one year, still type in 1)

How skilled are you at programming in **PHP**? (1=Not very skilled; 10=Very skilled)

1 2 3 4 5 6 7 8 9 10  
Skill Level

How many years have you programmed in **Visual Basic.Net**? (If you have used this language for less than one year, still type in 1)

How skilled are you at programming in **Visual Basic.Net**? (1=Not very skilled; 10=Very skilled)

1 2 3 4 5 6 7 8 9 10  
Skill Level

How many years have you programmed in **Javascript**? (If you have used this language for less than one year, still type in 1)

How skilled are you at programming in **Javascript**? (**1**=Not very skilled; **10**=Very skilled)

1      2      3      4      5      6      7      8      9      10  
Skill Level

What is the Other language you programmed in?

How many years have you programmed in **Other languages**? (If you have used this language for less than one year, still type in 1)

How skilled are you at programming in **Other languages**? (**1**=Not very skilled; **10**=Very skilled)

1      2      3      4      5      6      7      8      9      10  
Skill Level

What was your primary method for learning how to program?

- ☐ Formal Education (e.g. educational institution, seminars)
- ☐ Self-Taught Methods (e.g. online videos, peers, books)
- ☐ **Both** Formal Education and Self-Taught Methods

Which of the following do you utilize when writing code?

- ☐ Integrated Development Environment, IDE (e.g., Eclipse or NetBeans)
- ☐ Text editor (e.g., VIM, Emacs etc)

What Internet browser do you most frequently use?

- ☐ Internet Explorer

☐ Chrome☐ Firefox☐ Safari☐ Other 

How many hours per week do you use the Internet? (please type just the number of hours, no units)

What do you use the Internet for? (For example: browsing, checking email, school, media, etc)

## 10-Technology Python Puzzle

The following section will ask you questions regarding your knowledge and experience with different programming concepts and technologies.

To what extent are you knowledgeable about the following concepts and technologies?  
(**1**=Not knowledgeable at all; **10**=Very knowledgeable)

1 2 3 4 5 6 7 8 9 10

SQL/MySQL

YAML

XML

Serialization/Deserialization

1 2 3 4 5 6 7 8 9 10

SSL/TLS

Cryptography

To what extent are you knowledgeable about the following concepts and technologies?  
(**1**=Not knowledgeable at all; **10**=Very knowledgeable)

1 2 3 4 5 6 7 8 9 10

File Compression  
(e.g., tar, zip)

Access Control

Temporary File  
Creation

HTTP/HTTPS

On-disk Mailboxes

To what extent are you knowledgeable about the following concepts and  
technologies? (**1**=Not knowledgeable at all; **10**=Very knowledgeable)

1 2 3 4 5 6 7 8 9 10

Networking (e.g.,  
sockets and pipes)

Creating and Writing  
to Files

LDAP Programming

Multithreading

Regular Expressions

File Operations (e.g.,  
creating and  
deleting)

## 11-Transition



The remaining portion of the survey will present you with a variety of tasks measuring your personality and thinking process. We ask that you complete all of the tasks in one sitting. Because you have just completed an already demanding set of coding scenarios, we **strongly recommend** that you take a break at this point, and return to complete the survey **tomorrow**, to ensure best performance. Your position in the survey has been saved, so clicking on the **study link** found in the original email will return you to this page.

Once again, these tasks will take about **30 minutes** to complete. It is important that you do them while in an **environment with little to no distractions**.

When ready to proceed, please click on the "Next" button below.

## 12-Big Five Inventory

Here are a number of characteristics that may or may not apply to you. For example, "I see myself as someone who likes to spend time with others." Please fill in the bubble next to each statement to indicate the extent to which you agree or disagree with that statement.

I see myself as someone who...

	Disagree Strongly	Disagree a Little	Neither Agree nor Disagree	Agree a Little	Agree Strongly
Is talkative	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tends to find fault with others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Does a thorough job	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Is depressed, blue	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Is original, comes up with new ideas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Is reserved	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Is helpful and unselfish with others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Can be somewhat careless	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Disagree Strongly	Disagree a Little	Neither Agree nor Disagree	Agree a Little	Agree Strongly

	Disagree Strongly	Disagree a Little	Neither Agree nor Disagree	Agree a Little	Agree Strongly
Is relaxed, handles stress well	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Is curious about many different things	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Is full of energy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Starts quarrels with others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Is a reliable worker	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Can be tense	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Is ingenious, a deep thinker	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Generates a lot of enthusiasm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Disagree Strongly	Disagree a Little	Neither Agree nor Disagree	Agree a Little	Agree Strongly
Has a forgiving nature	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tends to be disorganized	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Worries a lot	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Has an active imagination	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tends to be quiet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Is generally trusting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tends to be lazy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Is emotionally stable, not easily upset	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Disagree Strongly	Disagree a Little	Neither Agree nor Disagree	Agree a Little	Agree Strongly
Is inventive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Has an assertive personality	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Can be cold and aloof	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Perseveres until the task is finished	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Can be moody	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Values artistic, aesthetic experiences	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Is sometimes shy, inhibited	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

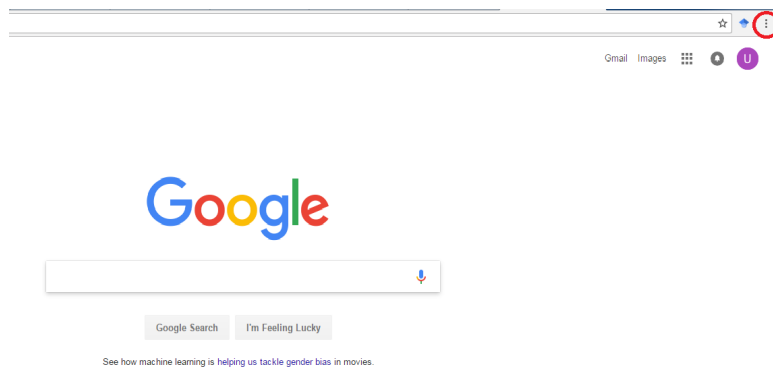
	Disagree Strongly	Disagree a Little	Neither Agree nor Disagree	Agree a Little	Agree Strongly
Is considerate and kind to almost everyone	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Does things efficiently	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Remains calm in tense situations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Prefers work that is routine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Is outgoing, sociable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Is sometimes rude to others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Makes plans and follows through with them	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gets nervous easily	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Likes to reflect, play with ideas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Disagree Strongly	Disagree a Little	Neither Agree nor Disagree	Agree a Little	Agree Strongly
Has few artistic interests	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Likes to cooperate with others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Is easily distracted	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Is sophisticated in art, music, or literature	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## 13-NIH Oral Symbols

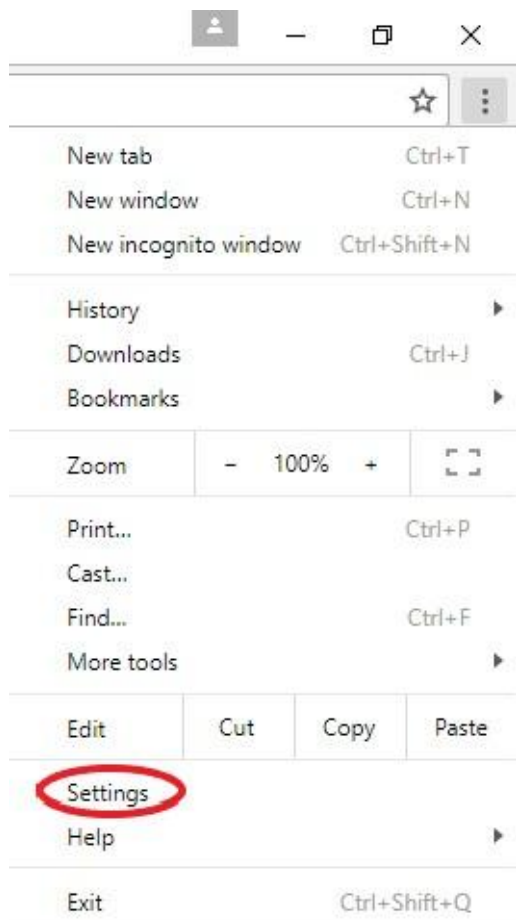
### Flash Setup

Due to recent updates to the **Chrome Web Browser** the default setting for running Flash has been set to "Ask first before allowing sites to run Flash". This setting will cause issues with the proper presentation of certain elements of the remaining portion of the survey and should be toggled to "Allow sites to run Flash". **Once you have completed the survey, please feel free to toggle the setting back to its recommended level.** Please follow the 6 easy steps below to temporarily update your Google Chrome Flash settings:

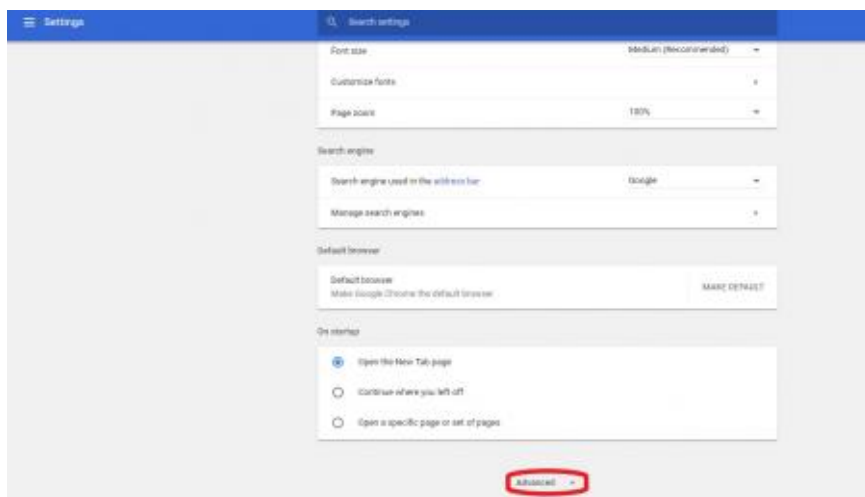
### 1.) Click the Chrome menu button



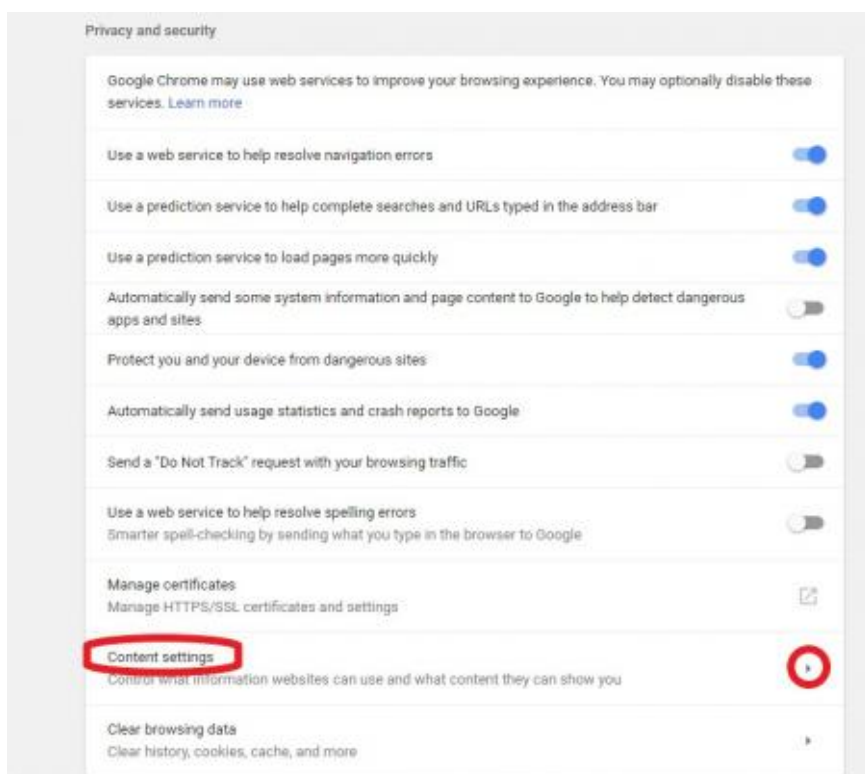
### 2.) Navigate to Settings



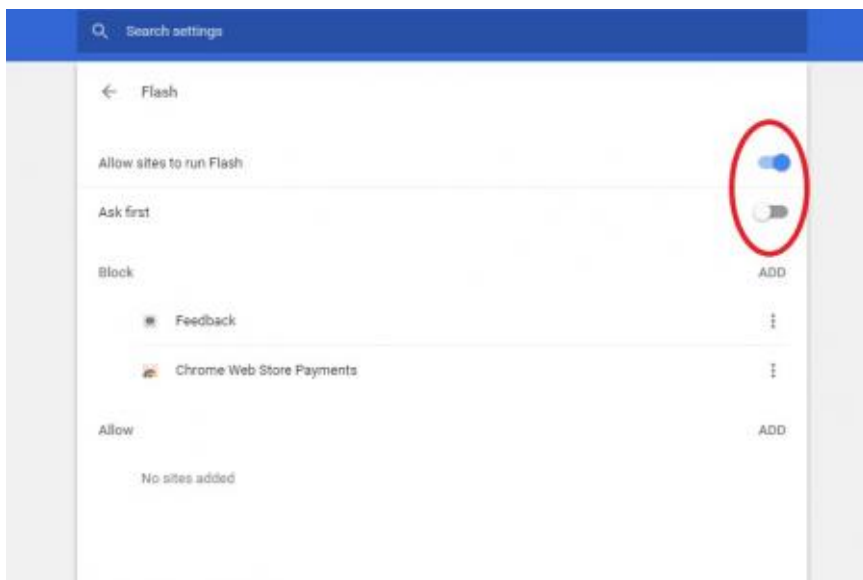
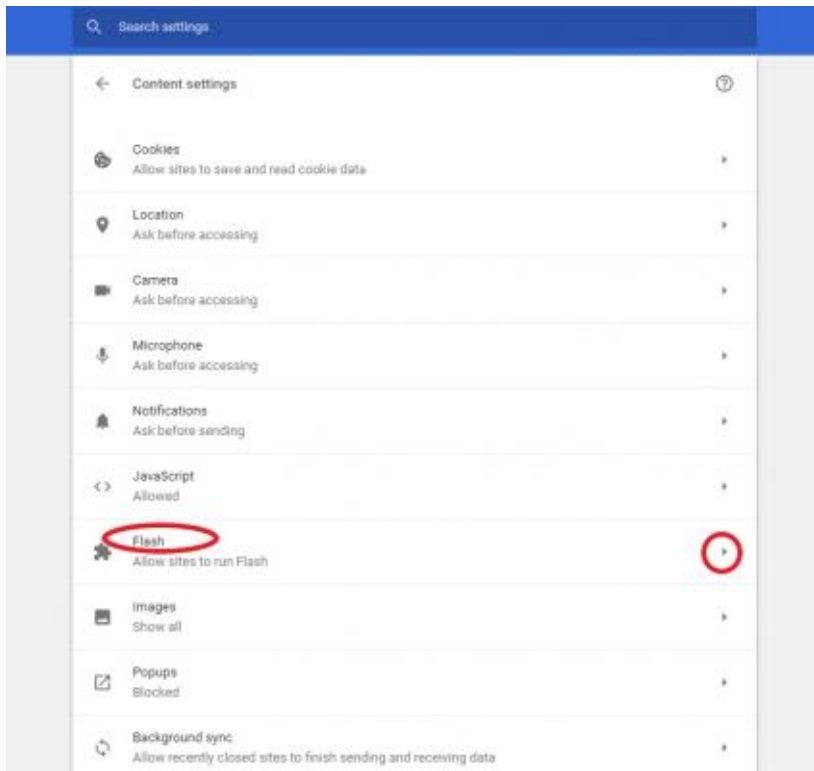
### 3.) Scroll to the bottom of the page and click on "Advanced"



4.) Under the heading **Privacy and Security**, click on "Content settings.."



5.) Scroll down until you see the heading **Flash**, and select "Allow sites to run Flash" and select this option. Then when you see it says "Ask First", disable this option.



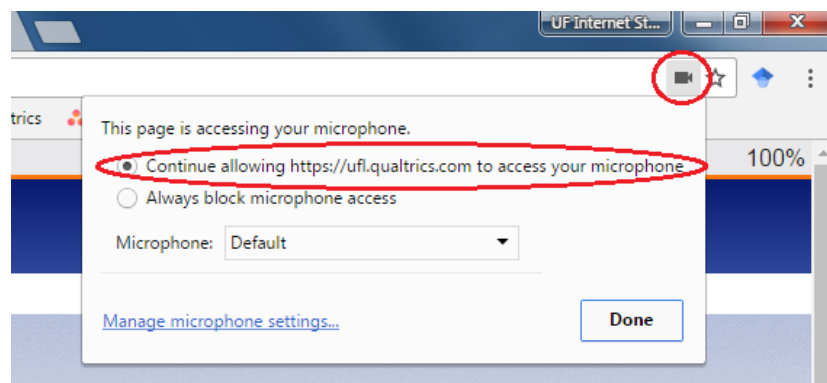
6.) You can then exit the window and proceed to the survey.

Throughout the next section, you will hear a variety of words and numbers. **Please do not use any paper, pencil, or other recording medium for the following tasks.**

Before we begin, we would like to ensure that you are able to hear the task audio clearly. You will hear a series of numbers. Please enter them in the text field below (**separated by commas and no spaces, e.g. 1,2,3,4**) in order to confirm the proper volume. Feel free to replay the recording to adjust the audio on your speakers/headphones. Click the **"Next"** button when you are done.

Next, we would like to ensure that your microphone is working correctly. In this task, you will find that some questions will require a **vocal answer**. Please follow the steps below to ensure that the microphone works fine and the audio is recorded successfully. You may need to refresh your page to activate the changes.

### Chrome users:



Click on the "Record" button and speak. After clicking the "Stop" button, the recording will end.

Use the play button to hear your voice and ensure that the sound is clear. You can use this test multiple times.

Click **"Next"** when satisfied.

If your recording is **unsuccessful or in-audible**, please **pause** the survey and contact the lab at 352-273-2134 or [psy-ebnerlab@psych.ufl.edu](mailto:psy-ebnerlab@psych.ufl.edu) and someone will assist you with resolving the issue. Please do not continue the survey with audio issues, as this will not provide useful data to the study.

Please look at the symbols below. Each symbol is paired with a number.

Please click on **Next** to continue.

Now below there are symbols but no numbers. I would like you to tell us the number that goes with each symbol by typing the correct number into the field below each symbol.

Now try the rest of the row below for practice. Remember to type each number for the appropriate fields below (**separated by commas and no spaces, e.g. 1,2,3,4,5**)

—	И	≡	└	U	○	^	X	=
1	2	3	4	5	6	7	8	9

○	X	≡	=	U	└	—	^	И
---	---	---	---	---	---	---	---	---

Now when you progress to the full task, you will be **saying** the correct responses into your **microphone** instead of typing the numbers. This will be recorded and scored by our research team upon completion of this task. When you begin the task, you will see similar rows as you did in the practice set. We want you to work as quickly as you can without



skipping any boxes or making mistakes. When you are finished with the first row, **move onto the next rows**. Continue until the screen goes blank. If you make a mistake, just say the correct answer and keep going.

Please remember to speak **loudly and clearly** into the microphone so that your responses are properly recorded. When the recording has begun, you will hear a **"ping"** sound to indicate that you should begin speaking. Are you ready?

Please click on **"Next"** to continue.

Start Test

You will now proceed to the final task as part of full completion of the **Developer Code Perception Study**.

Please click on the **"Next"** button to continue.

## 14-BTACT

For this next section, you will be presented with a series of tasks intended to measure your thinking process.

**Please do not use any paper, pencil, or other recording medium for the following tasks.**

Some of the questions will be easy for you, and some will be harder. We do not expect anyone to get all of these correct—just do the best that you can.

You are going to hear a list of 15 words. Listen carefully. When the list is finished, you are to repeat as many of the words as you can remember. It doesn't matter in what order you repeat them. Just try to remember as many as you can. You will hear each word only one time. You will have up to one and a half minutes (**90 seconds**).

Please press **"Play"** below to hear the audio. When the audio has finished, click the **"Next"** button to proceed to the next page where the recording for your responses will begin after **1 second**.

We suggest that you close your eyes while you are listening to the audio to help you concentrate.

**NOTE:** On the pages where your audio response is being recorded, **the page will automatically progress after the allotted time has finished.**

**Please do not refresh/reload the page after the recording has begun.**

BEGIN.

On the next page, you are going to hear some strings of numbers, and when the **audio finishes**, we would like you to type them in backwards, in the reverse order from which you heard them. So if you hear “3,8”, you would type “8,3” (**separated by commas and no spaces**). The sets will get larger as they go.

Please remember NOT to use any paper, pencil, or other recording medium for the following tasks.

After typing each response, please click on the "Next" button to proceed.

Play

Play

Play

Play

Play

Play

Play

Play

Play

Now you are going to be given a category and you will name things that belong in that category. For example, if the category was “**fruit**,” you could say things like “**peach**” or “**pear**.”

In a moment you will be given a *different* category. When you see “Begin,” you will name all the things from this new category you can think of, as fast as you can. You will have one minute (**60 seconds**) to do this.

When you proceed to the **next** page the recording will begin after **3 seconds**.

The new category is **Animals**... BEGIN.

In the next exercise you will hear a series of numbers that may get larger or smaller in value. At the end you will try to figure out what the next number would be. So if the numbers were 2, 4, 6, 8, 10, the next number would be **12**.

Please click on the buttons **A-E** (in alphabetical order) to listen to each recording in the sequence one after the other. You will not be able to replay the audio, but you may take as much time as you need in-between each number. At the end you will be asked what you think the next number would be. You will type your response into the available text field and then click the **"Next"** button to submit each response.

Please click the **"Next"** button to continue.

Let's try one for **practice**:

Numbers:

A	B	C	D
---	---	---	---

That is correct! The answer would be 10 as each number has decreased by 5.

Unfortunately that was incorrect. Let's try listening to the audio again.

Numbers:

A	B	C	D
---	---	---	---

That is correct! The answer would be 10 as each number has decreased by 5.

The answer should have been 10, as each number has decreased by 5.

(30,25,20,15...**10**)

There will be different patterns, and some of these will be harder than others, so just do the best that you can. If you are not sure of the answer, it is **okay** to guess.

Numbers:

A	B	C	D	E
---	---	---	---	---

The next set is....

Numbers:

A	B	C	D	E
---	---	---	---	---

The next set is....

Numbers:

A	B	C	D	E
---	---	---	---	---

The next set is....

Numbers:

A	B	C	D	E
---	---	---	---	---

The next set is....

Numbers:

A	B	C	D	E
---	---	---	---	---

Next, we would like to see how fast you can count backwards. When you are given the signal to begin, start counting backwards from 100 out loud, as fast as you can. So you will say 100, 99, 98 and so on.

When you proceed to the **next** page, the recording will begin in **1 second**. You will have half a minute (**30 seconds**). The task will automatically end when the time expires.

BEGIN.

Good, now one more question.

Do you remember the very first list of 15 words that you heard in the beginning? It was the very first task that you did.

We would like you to tell us as many of the words from that list as you can. You will have up to one minute (**60 seconds**) to do so.

When you proceed to the **next** page, the recording will begin after **1 second**.

BEGIN.

## 15-Debrief Introduction

The following section will present you with the **correct responses** to each of the programming scenarios that you have answered.

An explanation for **why** it was the best response will be provided for each answer.

P02

### SCENARIO

Consider a program that evaluates user-entered mathematical expressions. The code uses the `eval(expression)` function, which parses the expression argument and evaluates it as a Python expression. Consider the snippet of code below and answer the following questions, assuming that the code has all required permissions to execute.

```
01  import sys, math
02
03  print "*** Welcome to the Python Calculator ***"
04
05  while True:
06      expr = raw_input("Enter a mathematical expression or 'quit': ")
07      if str(expr) == "quit":
08          sys.exit("You've ended the Python Calculator")
09      else:
10          print("The answer is " + str(eval(expr)))
```

1.) What will the program do when executed?

### ANSWER

The program will read a line from the standard input and evaluate the input as a Python expression.



2.) If user enters `“math.trunc(345.67)”`, how will the program behave?

- A. It will crash because the string passed is not a standard arithmetic expression.
- B. It will print `“The answer is 345”`.
- C. It will print `“The answer is math.trunc(345.67)”`
- D. None of the above.

## ANSWER

**B.**

The `eval(expr)` function accepts a string and evaluates it as a Python expression. Thus any valid Python expression can be passed to the program and it will be evaluated. The string value `“math.trunc(345.67)”` is a valid Python expression that results in the integer value 345.

## P09

## SCENARIO

Consider a central repository application that allows users to download files from a specific folder (`REPOSITORY_FOLDER`) on the server. To download a file, a user must give the name (not the path) of the file, and then the application will look for a file with the same name in `REPOSITORY_FOLDER`, and return the file content if it finds one. The following is the implementation of the download feature. In the snippet of code below the `os.path.join` function joins the filename to the repository folder. For example, if the repository folder is `“/home/foo”`, then `os.path.join("/home/foo", "bar.txt")` produces `“/home/foo/bar.txt”`. Considering the snippet of code below, answer the following questions, assuming that the code has all required permissions to execute.

```
01  import os
02
03  REPOSITORY_FOLDER = "/var/repository/"
04
05  def download(filename):
06      path = os.path.join(REPOSITORY_FOLDER, filename)
07
08      if os.path.exists(path):
09          return open(path).read()
10      else:
11          return None
```

1.) What will the download function do when executed?

## ANSWER

The program will attempt to read and return the content of the file based on the given filename.

2.) Which of the following is correct if users are allowed to enter any string value as filename?

- A. The function fails only when the given string value as filename is invalid.
- B. The function fails only when the file does not exist in the repository folder.
- C. The function is able to read any (readable) file on the system.
- D. The function is able to read only (readable) files in the repository folder.
- E. None of the above.

## ANSWER

C.

Considering the fact that the function does not normalize the given filename in any way, one can access to files outside of the repository folder using slash character or double dot notation. For example, to read the passwd file one must enter '/etc/passwd' as filename.

The behavior of `os.path.join` is not simple concatenation. If the second argument is an absolute path, the function simply returns it as the result. Even if the given filename is not an absolute path, one can still read files

outside of the repository folder using double dot notation.

## PX06

### SCENARIO

Consider this snippet of Python code that implements a music directory by storing information about song titles, artist names, album names, and release dates in a MySQL database. The user is asked to enter the genre of music for which they are searching. This input is then passed to a database, which uses this information to select songs and returns them to the user. Consider the snippet of code below and answer the following questions, assuming that the code has all required permissions to execute.

```
01  # Import whatever is needed
02
03  genre = input("Please enter your desired genre>")
04
05  # Open database connection
06  db = MySQLdb.connect("localhost","allUsers","54373$!@", "MUSICDB")
07
08  '''
09  Prepares a cursor object that will hold the
10  information on the rows accessed by our query
11  '''
12  cursor = db.cursor()
13  cursor.execute("SELECT songName, albumName, releaseDate "
14                "FROM Songs WHERE genre = '%s'", genre)
15
16  # Get all the rows
17  results = cursor.fetchall()
18  for row in results:
19      print(row)
20
21  db.close()
```

1.) What will the program do when executed?

### ANSWER

It will return records from the database that match the specified genre.

2.) What type of information could a user retrieve from this program?

- A.** The song name
- B.** The album name
- C.** The artist name
- D.** A and B
- E.** Any attribute from the database

## ANSWER

**D.**

The way that the code calls the execute function prevents SQL injection, thus no information other than what is in the SELECT statement can be extracted.

**P30**

## SCENARIO

You are asked to write a fail-safe read-file function that receives a text file path, reads its contents, and returns a string. If the file does not exist or cannot be read, the function should return an empty string. In the following implementation, the function `read_or_empty(path)` checks the existence and permission of the given file path before reading it. The `os.access(path, mode)` function (from Python's standard library) used below checks for existence and read permission of the file. Consider the snippet of code below and answer the following questions, assuming that the code has all required permissions to execute.

```
01  import os
02
03  def read_or_empty(path):
04      content = ""
05
06      if os.access(path, os.R_OK): # Is file readable?
07          with open(path) as fileobj:
08              content = fileobj.read()
09
10      return content
```

1.) What will the program do when executed?

## ANSWER

The function will first check if the file exists and reads the permissions for the given file path. If the file exists and is readable, the function reads the contents of the file and returns the string. If not, the function returns an empty string.

2.) If one calls the `read_or_empty` function with a file path, which of the following is correct?

- A. If the file exists and is readable, the function returns the file content.
- B. If the function returns an empty string, it means the file did not exist or was not readable.
- C. Both A and B
- D. None of the above

## ANSWER

**D.**

The implementation is vulnerable to TOCTTOU (time of check to time of use). In the time interval between checking for access and actually opening/reading the file, the permission for the file could have changed, or the file could have been deleted by some other process. Thus, the first answer is not generally true. The second answer is false as well, because the file might exist and be readable, but might have no content. The implementation should be rewritten with respect to the accepted practice that it is "easier to ask for forgiveness

than permission." This means, instead of checking for permission, complete the function, and if anything is wrong you will get an exception/error.

## P21

### SCENARIO

Imagine you are developing a web framework in Python. One of the essential features of every web framework is HTTP file upload. Usually a web framework handles the entire process of file transfer. It receives the file/data over an HTTP connection, stores it in a temporary file, and at the end returns a file object (or the name of the temporary file) to the web application to do whatever it needs to do with the file/data. The following is a simple implementation of storing file/data into a temporary file. Consider the snippet of code below and answer the following questions, assuming that the code has all required permissions to execute.

```
01  import os
02  BUFFER = 4096
03
04  def store(stream):
05      path = os.tmpnam()      # get a unique temporary file path
06
07      file = open(path, 'wb') # open the temporary file
08      try:
09          bytes = stream.read(BUFFER)
10          while bytes:
11              file.write(bytes)
12              bytes = stream.read(BUFFER)
13      finally:
14          file.close()
15
16      return path            # return the path to the caller
```

1.) What will the store function do when executed?

### ANSWER

The function gets the data, generates a unique temporary file path, stores the data into the temporary file, and returns the path of the temporary file.

2.) Which of the following is correct if the framework is on production serving thousands of concurrent users?

- A. The framework works without any issue if there's enough space for storage.
- B. The framework fails because of too many IO operations.
- C. The framework fails because of memory leakage in the implementation.
- D. The framework might result to inconsistent data.
- E. None of the above

## ANSWER

**D.**

The `tmpnam` function generates a unique temporary file path. However, the maximum number of unique paths that the `tmpnam` function will generate before reusing names is determined by `TMP_MAX`. Depending on the circumstances, after thousands of calls, the generated file path might not be unique anymore, meaning the store function stores data to potentially existing files.

## PX15

## SCENARIO

Consider a program that attempts to connect to Google's SMTP server using the method `smtplib.SMTP`. The `ssl.create_default_context` function returns a new `SSLContext` object with default settings (e.g., default protocol, options, and cipher) for the given purpose (client authentication or server authentication). The arguments `cafile`, `capath`, and `cadata` represent optional CA certificates to trust for certificate verification. The `SSLContext` class returned by `ssl.create_default_context` helps manage settings and certificates that can be inherited by SSL sockets. The method `SMTP.starttls` puts the SMTP connection in TLS (Transport Layer Security) mode. After that, all SMTP commands that follow will be encrypted. Answer the following questions using this snippet of code.

```
01  # import whatever is needed
02  smtp = smtplib.SMTP("smtp.google.com", port=587)
03  ctx = ssl.create_default_context()
04  smtp.starttls(context = ctx)
05  # continue to communicate to the SMTP server...
```

1.) What will the program do when executed?

## ANSWER

The program will attempt to connect to the SMTP server using the created ssl context.

2.) What type of verification occurs when `SMTP.starttls` is executed?

- A. hostname authentication (i.e. checking the hostname against the CN of the certification)
- B. server identity authentication (i.e. checking the certification authenticity and validity)
- C. A and B
- D. None of the above

## ANSWER

**C.**

Since `ssl.create_default_context` is used, the hostname verification and server identification are enabled by default.

**PX04**

## SCENARIO

The following Python code collects information about students in the engineering department at a local university. Consider the snippet of code and answer the following questions, assuming that the code has all required permissions to execute.



```
01  #This function stores input information from survey.
02  #The function definition has been abstracted.
03  def collect_info():
04      classification = "Senior"
05      major = "Computer Science"
06      firstName = "John"
07      lastName = "Snow"
08      age = raw_input("Please enter your age: ")
```

1.) What will the `collect_info` function do once it is called?

### ANSWER

The program will first set the variables `classification`, `major`, `firstName`, and `lastName` to "Senior," "Computer Science," "John," and "Snow," respectively. Then it will ask for input from the keyboard for the variable `age`. This input will then be read in and assigned as a string to the `age` variable.

2.) What will the value of the variable `age` be if "20 + 1" is entered from the keyboard when the user is prompted to enter his or her age?

- A. 21
- B. "20 + 1" (string value)
- C. 20 + 1 (Python expression)
- D. None of the above.

### ANSWER

B.

The `raw_input` function reads all user input and then stores it as a string. Even though, in this case, a mathematical expression is entered, it will not be evaluated and will only be stored as a string.

## SCENARIO

You are writing a program that attempts to connect to an SMTP server. The code uses SSL/TLS for secure communication. The configuration of the authentication protocol is loaded in an SSLContext object, and the connection is then established using the context object. Consider the snippet of code below and answer the following questions, assuming that the code has all required permissions to execute.

```
01  # Import whatever is needed
02  smtp = smtplib.SMTP("mail.florida.edu", port = 587)
03  ctx = ssl.SSLContext(ssl.PROTOCOL_SSLV23)
04  smtp.starttls(context = ctx)
05  # Continue to communicate to the SMTP server...
```

1.) What will the program do when executed?

## ANSWER

The program will attempt to connect to the SMTP server using the created SSL context.

2.) What type of authentication will happen when SMTP.starttls is executed?

- A. hostname authentication (i.e. checking the hostname against the CN of the certification).
- B. server identity authentication (i.e. checking the certification authenticity and validity).
- C. A and B
- D. None of the above.

## ANSWER

C.

No verification/authentication will take place because CERT\_NONE is the default configuration.

P20

## SCENARIO

A university professor changes her syllabus quite often. You want to make sure that you have the most up-to-date syllabus so that you do not miss readings or due dates for assignments. You use the following Python script to download the syllabus file from the course homepage and check it against your copy. In the following script, the `urllib.request.urlopen(url)` function opens the given URL, the `file.read` function reads the data from the given URL, and the `hash` function calculates the hash value of the downloaded data as an integer. The script then compares the calculated hash value to the expected hash value (the expected hash value was calculated and saved in the `LAST_SYLLABUS_HASH` file during the previous call of the `check_syllabus` function). Consider the code below and answer the following questions, assuming that the code has all required permissions to execute.

```
01  # import whatever is needed
02  url = 'http://cise.ufl.edu/class/cise3234/syllabus.pdf'
03  last_syllabus_hash = ... # Read from LAST_SYLLABUS_HASH file
04
05  def check_syllabus(url):
06      print("Downloading syllabus...")
07      file = urllib.urlopen(url)
08      syllabus = file.read()
09      if hash(syllabus) == last_syllabus_hash:
10          print("Syllabus has not changed.")
11      else:
12          print("Syllabus has changed.")
13          last_syllabus_hash = hash(syllabus)
14          # Save last_syllabus_hash in LAST_SYLLABUS_HASH file
```

1.) What will the function `check_syllabus` do when called?

## ANSWER

The file will be downloaded from the given URL and its hash value will be compared to the hash that was previously stored in the `LAST_SYLLABUS_HASH` file.

2.) Which of the following is correct if someone calls the `check_syllabus` function?

- A. The function prints "Syllabus has not changed" if the syllabus has not changed.
- B. The function prints "Syllabus has changed" if the syllabus has changed.
- C. The function always prints "Syllabus has not changed."
- D. The function always prints "Syllabus has changed."

E. The function behavior is not predictable.

F. A and B

## ANSWER

E.

Because of the randomization of the hash seed, we cannot be sure that the hash will be the same for two identical documents, thus the behavior of the `check_syllabus` function cannot be predicted.

## PX57

## SCENARIO

You are developing a web application that requires authentication and authorization. The persistent store used for credential information (usernames and passwords) is a SQL database. The database has a table called "users" organized into three columns: "id" (the primary key), "name," and "username." You are asked to write a helper method to update the username. Consider the snippet of code below and answer the following questions, assuming that the code has all required permissions to execute.

```
01  # import whatever is needed
02  def update_user(username, id)
03      # CODE OMITTED:
04      # Get an object of cursor
05      sql = "UPDATE users SET username = %s WHERE id = %s"
06      cur.execute(sql, (username, id))
```

1.) What will the function do when executed?

## ANSWER

The function accepts two values and performs a SQL UPDATE command.

2.) If one calls the `update_user` method with an arbitrary value of `username`, which one of the following statements is correct?

- A. The method updates the `id` and `username` fields.
- B. The method updates only the `username` field.
- C. The method performs some other operation.
- D. None of the above

## ANSWER

**B.**

Even if the user inputs a string like `"Robert; DROP TABLE users; --"` as the username, the above code will just update the name to the given string, without performing any other operation.

## P12

## SCENARIO

Imagine you are developing a file transfer application that allows data transmission with a “pause” feature. Its basic implementation consists of two parts: a server-side and a client-side. The server-side creates a socket to receive serialized data from a client, and deserialize it. The client side creates a socket to deserialize data, and send it to a server. (Serialization is the process of translating data structures or object states into formats that can be stored, or transmitted and reconstructed later. When the resulting series of bits is re-read according to the serialization format, it can be used to create a semantically-identical clone of the original object.) In the following code, the method `os.system(command)` executes the command, which is passed as an argument in a subshell. The method `cPickle.loads(data)` reads a pickled object (i.e. one of Python’s native data types) from a byte stream and returns the reconstituted object hierarchy. The method `cPickle.dumps(obj)` returns the pickled representation of the object as a string of bytes. (Note that `Pickle` is a standard Python library for serialization or deserialization of a Python object structure.)

Consider the snippet of code below and answer the following questions, assuming that the code has all required permissions to execute.

```
01  #CLIENT-SIDE
02  #import whatever is needed
03
04  class transport(object):
05      def __reduce__(self):
06          return (os.system, ('ls',))
07
08  data = cPickle.dumps(transport())
09  sock = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
10  sock.connect(('server', 55555)) # connecting to the below server
11  sock.send(data)
12  sock.close()

01  #SERVER-SIDE
02  import os, sys, socket, cPickle
03
04  sock = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
05  sock.bind(('localhost', 55555))
06  sock.listen(1)
07
08  while True:
09      connection, client_address = sock.accept()
10      data = connection.recv(1024)
11      data = cPickle.loads(data)
12      connection.close()
13
14      # continue to process the data...
```

1.) What will the program (both server-side and client-side) do when executed?

## ANSWER

The server opens up a socket, which will listen for data sent from the client.

2.) Which of the following will happen on the server-side when the server receives data from the client?

- A. The server will throw an error.
- B. The server will return the list of files in the directory of the client-side.
- C. The server will return the list of files in the directory of the server-side.

D. None of the above.

## ANSWER

D.

In the above code, the data sent to the server is a command object, which the server will run as a shell command. It will print the list of files in the current directory of the server to the console. Note that nothing is returned to the client.

## P36

## SCENARIO

Consider a Python program that checks for tar files containing budgets and then extracts the tar files into a specific folder. In the following snippet of code the `TarFile.extract` function extracts a member from the archive to the current working directory and the `TarFile.getmembers` function returns the members of the archive as a list of `TarInfo` objects. Consider the snippet of code below and answer the following questions, assuming that the code has all required permissions to execute.

```
01  # import whatever is needed
02
03  def extract_budgets(working_directory, tar_file):
04      os.chdir(working_directory)
05      with tarfile.open(tar_file) as archive:
06          for file in archive.getmembers():
07              archive.extract(file, working_directory)
```

1.) What will the function do when executed?

## ANSWER

It will extract all the files into the budgets directory

2.) Which of the following is true if someone calls the `extract_budgets` function with a specific directory and an arbitrary valid tar file?

- A. The function does not extract files with absolute path in the archive.
- B. While extracting tar files, it is possible that files are created outside of path.
- C. If the archive does not contain any member with absolute path, all members will be extracted into the given directory.
- D. None of the above.

## ANSWER

**B.**

While extracting tar files, it is possible that files are created outside of path, e.g. members that have absolute filenames starting with "/" or filenames with two dots "..". In the answers, files with absolute path are excluded, but not those with two dots.

## 22-Quality Check Qs

How clear and functional were the written instructions during the survey? (1=Not clear at all, 5=Very Clear)

1                      2                      3                      4                      5

Clarity

How was the audio quality of the narrated portions of the survey (was it clear, precise and intelligible)? (1=Not clear at all, 5=Very Clear)

1                      2                      3                      4                      5

Audio Quality

Did you face any bugs/errors when completing the survey?

☐ Yes



☐ No

Please describe the issue(s):

What browser are you using?

Do you have any feedback or suggestions for the study survey in general?

Would you like to recommend this study to a friend or colleague?

☐ Yes

☐ No

Please enter the appropriate information into the **fields below**. Your friend/colleague will then be promptly notified of this research opportunity.

Your First name

Your Last name

The First name of your friend/colleague

The email address of your friend/colleague

Is your friend/colleague a student or a professional? Retired professionals are eligible as well.

☐ Student

☐ Professional

## 23-Compensation

Thank you very much for your participation! This ends the **Developer Code Perception study**. You are now entitled to the full study compensation in the form of a **\$20** Amazon gift card. This will be sent to the email that you provided in the survey within the next 2-3 business days.

If you have any further questions or concerns, you may contact us at our primary lab number

**(352) 273-2134** or you may email us at **psy-ebnerlab@psych.ufl.edu**.

Please click the "**Next**" button to fully submit your survey responses.

When done, please feel free to toggle your browser Flash settings back to their recommended levels.

**Once again, thank you for your contribution to our research!**

Thank you very much for your participation! This ends the **Developer Code Perception study**. You are now entitled to the full study compensation in the form of a **\$50** Amazon gift card. This will be sent to the email that you provided in the survey within the next 2-3 business days.

If you have any further questions or concerns, you may contact us at our primary lab number

**(352) 273-2134** or you may email us at **psy-ebnerlab@psych.ufl.edu**.

Please click the "**Next**" button to fully submit your survey responses.

When done, please feel free to toggle your browser Flash settings back to their recommended levels.

**Once again, thank you for your contribution to our research!**

©[University of Florida](#)  
Gainesville, FL 32611  
[Terms of Use](#)

Powered by Qualtrics