computing advances, governments can be more thorough in detecting and punishing crimes. Consider the following law enforcement tools.

- Phones, computers, and cars routinely have cameras and GPS sensors. Algorithms can identify and track people as they move between cameras (Hodson 2013).
- Computers now routinely process images and issue speeding tickets without human involvement (IIHS 2014).
- The National Security Administration routinely searches email for keywords. Phone conversations are transcribed to text and searched for keywords (FAS 2010).
- Databases of DNA profiles can increasingly identify people by flakes of skin they leave behind (Dodd 2013).
- Technology is even able to read minds (Singer 2008).

In George Orwell's novel *1984*, the Thought Police arrest people just for disagreeing with the government. Giving people a reasonable chance of getting away with crime is one way to prevent a government from enforcing unreasonable laws. The following statement is a variation of the statement from the previous step.

"Because technology makes it too easy for the government to enforce unreasonable laws, searches should be permitted less now than 50 years ago."

In your group, argue for or against this statement.

7. Consider the statement, *"Searches should be permitted less now than 50 years ago."* Individually, write a brief essay in which you agree or disagree with this statement and support your position in writing.

8. Computing strengthens law enforcement, and computing can also strengthen liberty. Dissidents* can more easily inform the public about government abuses. Networking and encryption make it easier for dissidents to communicate and organize. China has had a difficult time restricting its citizens' access to the uncensored Internet. Computing innovations are often credited with the Arab Spring in which governments of Tunisia, Egypt, Libya, and Yemen were overthrown (Sturm 2013).

Brainstorm as a whole class why computing might make it more difficult for governments to be oppressive.

9. Read the following sections from Chapter 2 in *Blown to Bits,* pages 48-72:

- *Big Brother, Abroad and in the U.S.*
- *Beyond Privacy*
  - As a class, brainstorm a list of decision makers who determine what data are collected about you based on your Google searches and how long those data are retained about you.
  - As a class, brainstorm a list of the stakeholders that are affected by the decision to mine Google search data.
  - With your group of four, consider and discuss the collection and retention of data about all of your purchases. Who makes the decisions about the collection and retention of that data? Who are the stakeholders affected?

10. Read the following sections from Chapter 5 in *Blown to Bits* pages 187-193 and answer the

questions below.
- *Cryptography for Everyone*
- *Cryptography Unsettled*
  - Is email commonly encrypted?
  - Who determines whether most email is encrypted?
  - Who are the stakeholders affected by whether email is encrypted?

11. Computing can affect democracy by making government both more accessible and more accountable to people. The **Open Data Movement** argues that making raw data available in standardized formats is especially powerful because third parties can create applications that use the data. As directed by your teacher, complete one of the following two tasks:

    - Citizens can more easily participate in decision making because of networked computing. The status of bills being considered by the legislature is posted on the U.S. Legislature's site, **congress.gov**, and on private sites like **govtrack.us**. Use one of these websites to identify and describe a bill currently being considered by the legislature.
    - Citizens can more easily get the data that inform government decisions. The website **http://catalog.data.gov/dataset** serves as a clearinghouse of government-collected data. Identify and describe one data set.

12. Does the average citizen know enough to make the decisions that are made by government? Or should the job of policy-making be left to informed representatives elected by the population? When people vote directly on a policy, it is called a referendum*. When people only vote on candidates for office, and the elected representatives then vote on policies, it is called representative democracy*. Which is better: democracy by referendum or democracy by representation? This question has been debated since the American Revolution.

    Modern availability of information allows democracy by direct referendum more frequently than was previously possible.

    - Discuss the above statement as a whole class.
    - In your group of four, create one or more stick-figure cartoon strips which agree or disagree with the above statement.

13. For the AP CS Principles *Explore* Performance Task you must find three recent, credible sources of information about a computing innovation that:

    - Has or could benefit and harm society, economy, or culture
    - Consumes, produces, or transforms data
    - Raises a storage, privacy, or security concern regarding data.

    In each unit of this course, you will investigate particular impacts of computing innovations on society. In this activity, find one or more articles referenced in the ACM TechNews archive, **http://technews.acm.org/archives.cfm**, about the impact of a computing innovation on:

    law enforcement, privacy, or democracy.

    Other topics may be explored at the discretion of your teacher. Find relevant summaries of news article from the ACM TechNews and read the original articles being summarized. Complete some portions of the *Explore* task described below as directed by your teacher.

Task part 1. Create an audio, video, or visual artifact that illustrates, represents, or explains the computing innovation's purpose, function, or effect. (3 page/1 minute/30MB max)

Task part 2. Essays

- Name the innovation and its purpose and function. Describe how your artifact illustrates, represents, or explains the computing innovation's purpose, function, or effect. (Approximately 100 words.)
- Describe the tools, technique, and process you used to produce the artifact. (Approximately 100 words.)
- Explain the beneficial AND harmful effect(s) the innovation has or could have on society, economy, or culture. (Approximately 250 words.)
- Describe the data; the consumption, production, or transformation of data; and the storage, privacy, or security concern(s) directly related to the innovation. (Approximately 250 words.)
- Use APA-style citations to correctly reference the article(s).

Note: This step is adapted from the official College Board Explore Performance Task but it does not duplicate the content of College Board Task or Rubric. The task provided here contains elements that are different than the College Board Performance Task and Rubric. Please reference official College Board materials.

Conclusion

1. Reflect on the group and class discussions in this activity. Some comments were probably thought-provoking and made the discussion lively, while other comments tended to shut down the discussion. When a person spoke up, what characteristics of their comments or style engaged people? Why? What characteristics led people to disengage? Why?
2. Review an essay and an artifact from Step 13. Describe what you learned or took away from each one. Describe the questions each of them raised for you.
3. How will computing increase our liberty? How will computing increase the rule of law and order?

* Civics Key Terms

Term	Definition
Dissident	A person who disagrees with the government.
Democracy by Referendum	Citizens vote directly on proposals; proposals become law if the majority of voters vote yes.
Representative Democracy	Citizens vote for politicians who then represent the citizens on a legislature; proposals are approved by the legislature to become law.

Project 2.3.4

The Heist

Introduction

Can hackers get into your system without being detected? The best defense is played by those who understand the offense.

Materials

- Computer with Internet connection

Procedure

Hacking is figuring out ways to use a program that were not intended, so there are never directions. Ethical hackers understand computers and are able to improve computer security by identifying and closing vulnerabilities in hardware and software. **Script kiddies** use existing programs that automate the work of identifying and exploiting vulnerabilities.

> Refer to your downloadable resources for this material. Interactive content may not be available in the PDF edition of this course.

1. Explain each of the following true statements.

   - Script kiddies do not necessarily understand much about computers.
   - Script kiddies do not act ethically.
   - Script kiddies and white-hat penetration testers use the same tools to identify and exploit vulnerabilities, but these two groups have the opposite effect of each other on computer security.
   - Script kiddies are not hackers under the definition of hacking.

Many high school competitions exist for cybersecurity teams. You will explore one "Capture The Flag" (CTF) competition called picoCTF.

2. Form teams of 3–5 as directed by your teacher.

3. Meet or greet each other to practice professional skills. Set team norms.

4. Learn about picoCTF at **https://picoctf.com** and **https://picoctf.com/about**

   Note: Your teacher may have you register and play the picoCTF 2017 or a newer version if one is available. The game should be fully functional for versions, even if the competition date has expired.

   Rules:

   ○ Do not post keys on the Internet. It spoils the fun for others.
   ○ Do not attempt to hack into the game server or interfere with the game infrastructure.
   ○ Do not provide or receive help from anyone outside your team that leads *directly* to the key.

Switch to the basic problem viewer
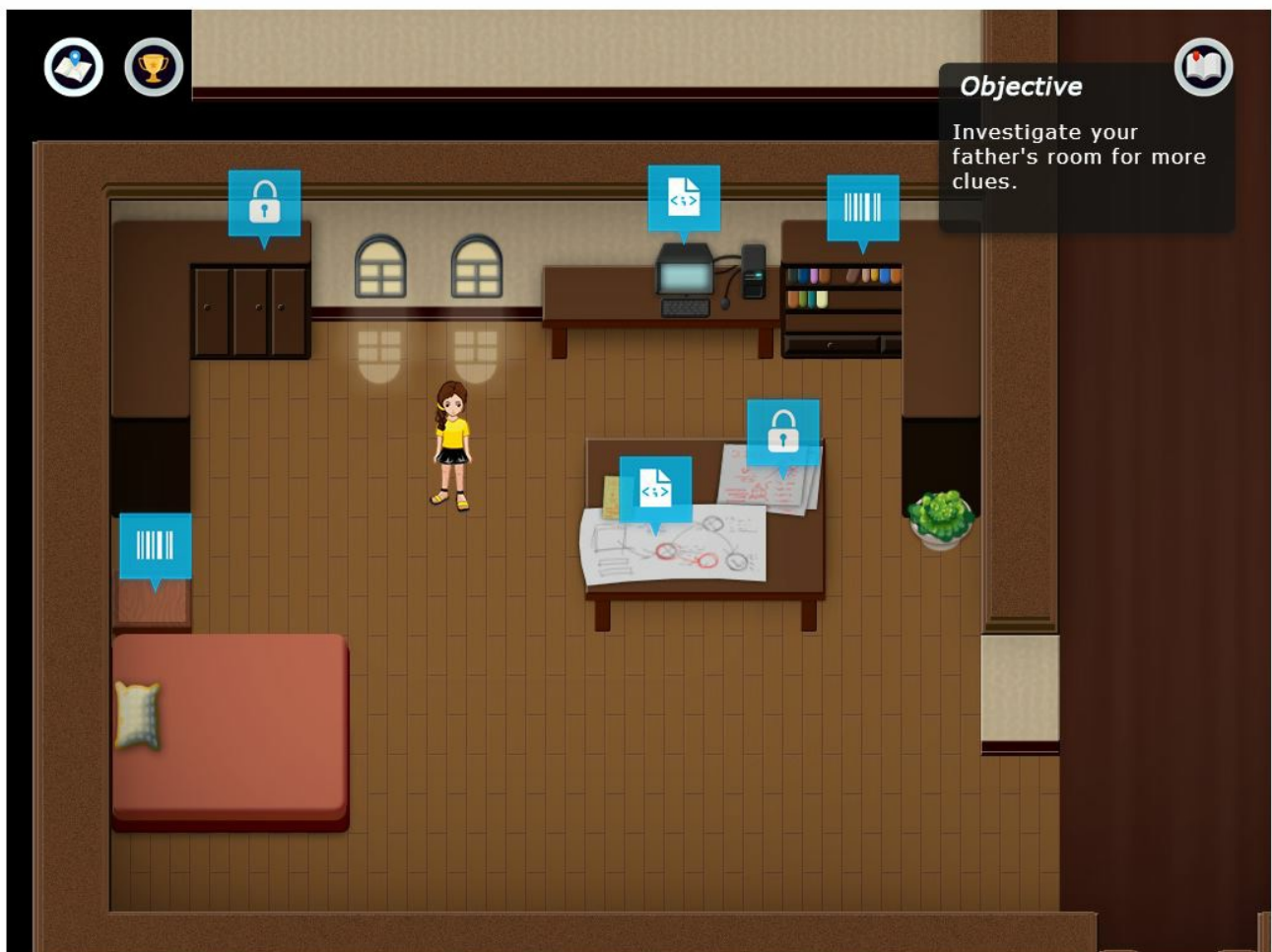
5. Register your team at **https://picoctf.com/get_started**.

6. Document the method used to solve each problem. If anyone on your team solves a problem, the problem is considered solved for everyone on your team on the scoreboard. However, your teacher will credit your team with the solution only if everyone on your team provides their own explanation of the solution.

Your teacher may instruct you to do one task from each category, all tasks listed, or other more challenging tasks in the picoCTF game.

picoCTF 2017 Level 1 Tasks

- Binary Exploitation
    - Bash Loop
    - Just No

- Cryptography
    - Keyz
    - Substitute
    - Hash 101
    - Compute AES
    - Compute RSA

- Forensics
    - Digital camoflage
    - Special agent user

- Reverse Engineering
    - Hex2Raw
    - Raw2Hex

- Web Exploitation
    - What is Web

- Miscellaneous
    - Internet Kitties
    - Piazza
    - Leaf of the Tree
    - Looooong
    - Leaf of the forest
    - WordChat

Conclusion

1. In the PicoCTF storyline, characters' actions raise ethical questions. Several CSP course objectives* require consideration of such ethical issues. Work with a group as directed by your teacher to decide on a policy or protocol regarding one or more of the following ethical concerns.
    - When it is okay for a person to search another person's belongings?
    - When is it okay to refuse to answer questions from the police?

    - When is it okay to lie to the police?

2. Penetration testers attempt to access computing power and data without being detected. Some aim to improve a company's cybersecurity, while others aim to steal data. Even with good intent, however, a penetration tester is unethical if they lack written permission from the system's owner. Why is it unethical and often illegal to attempt to access a system without permission if your intent is to help improve the system's security?

3. Reconsider the sentence from the introduction, "The best defense is played by those who understand the offense." Does a programmer have to know how to exploit vulnerabilities to avoid creating vulnerabilities? Why or why not?

4. Reconsider the five areas of cybersecurity readiness from **2.3.1 Cyberhygiene** presentation: Identify, Protect, Detect, Respond, and Recover. Describe your personal readiness in these five areas.