

SWEducational

ACTIVITY PACKET

SOFTWARE ENGINEERING EDITION

WHAT IS SOFTWARE ENGINEERING?

Software engineering is engineering which designs and writes programs for computers or other electronic devices. The programs can help us learn new things, help us communicate, or help us get to where we want to go. One example of work that software engineers do is create video games. Software engineers also build apps and websites.

Do you like prizes? How about showing off your project work? The **FIRST 5** students to submit a photo of their **completed Software Engineering activity (Activity 1 or 2, or both!)** through the link below will win a gift card of their choice from the list!

PHOTO RAFFLE

Get your cameras ready and stay tuned... there will be a photo raffle in the next packet!

Gift Cards to...

- Starbucks
- XBOX
- PlayStation
- iTunes
- More!

Submit [Here!](https://forms.gle/AcEXCZkePKxmQJCJA) Or type the link below:

<https://forms.gle/AcEXCZkePKxmQJCJA>



IMPORTANT TERMS

UI - User Interface: The layout and visual design of an application

- UI Designers will decide the look of the application or website. This means they choose the colors and the button shapes on the application. I
- In this activity you will design the user interface for an app.
- How will you design your app so that people will be able to read the text in the app? Will the writing be large or small? Will the colors you choose be readable?

UX - User experience: The interaction with the application

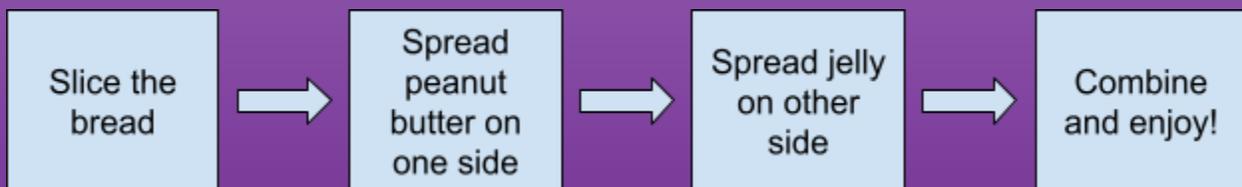
- The user experience is determined by how easy or difficult it is to navigate the application. Software engineers make sure to test their application and make changes to their application based on feedback from people.
- In this activity you can evaluate the user experience of your app by asking other people for feedback about your design.
- Before designing your app, what is something you could research about the people using your app?

Algorithm: process a computer uses to solve a problem

- If a programmer wanted the computer to add two numbers, they would create an algorithm to do so.
- In the second activity, you will practice writing an algorithm to complete a task or multiple tasks.
- What other problems could algorithms solve? (Hint: there are many types of problems that could be solved with an algorithm! A place to start would be to think about math equations.)

Flowchart: drawing of a process, often using arrows to show the order of the process

- Below would be one possible flowchart for the process of making a sandwich:



- In activity one step 5, you can see an image of a flow chart. Creating a flowchart can help you plan your app in activity 1.
- Think of a project that you worked on recently. Did you use a flowchart? If so, did it help you, and how did it help? If not, would using a flowchart have helped and how?



Program: a collection of code that controls a machine

- A printer has coding in it to tell the machine when to print in color vs. black and white, how many pages to print, and more!
- In activity 2 of this packet, you will practice creating the code behind programs. What other machines could be controlled by a program?

ACTIVITY 1 INSTRUCTIONS

Today, you are going to design an app! The part of the job of a Software Engineer is not only to create an app through coding, but also design the app - what does the screen look like, how many buttons should be there and what happens when you click them, who is going to use the app, is it going to be the elderly who prefer simple designs, is it for very young children who cannot read yet is it game or is it an app used for work; these and many more questions come up in the process of app design.

SUPPLIES

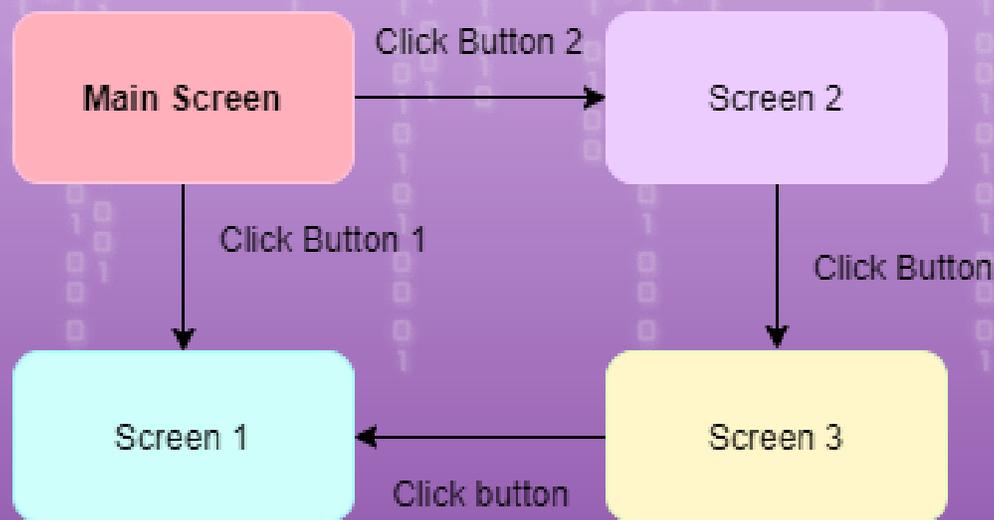
- * Paper, if you can get a print out of a few phone screens like the picture below, that would be great. If you don't have access to a printer then you can draw out some rectangles to be your screens. Make sure that the print outs of the screen or rectangle are similar in size to a real phone screen, that way it would be like designing a real app!
- Your choice of colors - markers, color pencils, crayon, etc.
- Pencils



STEPS

1. Your task is to design the user interface of a mobile app that helps a group of people in some way! So the first step is to choose the group you want to design for. Some options are your family, your school teachers, the elderly, people with disabilities, any particular profession like doctors, accountants, etc.
2. Next, try to talk to a person who belongs to this group of people about some issues they face. For example, if you have chosen school teachers, try to talk to your teacher and find out if there is anything you could design in an app that could help her. Some questions you can ask are, how is their typical day, are there tasks that are difficult or tedious, if you could have a helping feature, what would it be, do you have any ideas for an app I could design that would help your group, etc.

3. Once you have talked to one or more people of the group you are designing for, try to think of some solutions. Consider how you could help them with a task or help with keeping track of something, or create an app that would make something easier or more fun for them. Write down your ideas.
4. Look at your ideas and start thinking of how you could come up with a proper solution that could be made into an app. What should be the function of the app, will it have many buttons that lead to other screens, does the solution actually help the group you are making the app for.
5. Start planning your app, you can make flowcharts or diagrams that show which button will go to which screen. You can also include text boxes, where users enter text, pictures, videos, link to websites, buttons that sound an alarm, and many more aspects on your screens!



This is a simple flowchart to help you understand how to make them!

6. Now, you can draw out your design on the printed paper with the picture of phone screens. You can use as many screens you like, and print out more if you run out. Be as creative as you can about your design and draw out each screen from your plan. But also make sure to think about the uses of this app and how easy and fun it would be to use, this aspect of thinking about how the users interact with an app is called user experience.

ACTIVITY 2 INSTRUCTIONS

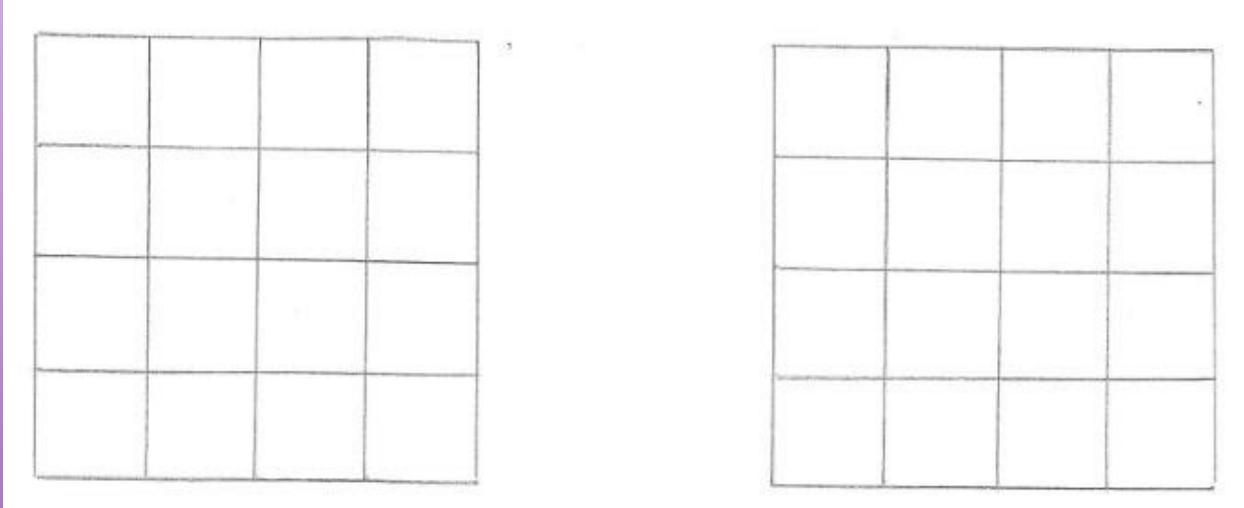
As stated in the previous activity, Software Engineers write code to create various applications or software. In this activity, you will do something similar, in that you will also be writing a set of instructions (or “code”) to draw patterns and images!

SUPPLIES

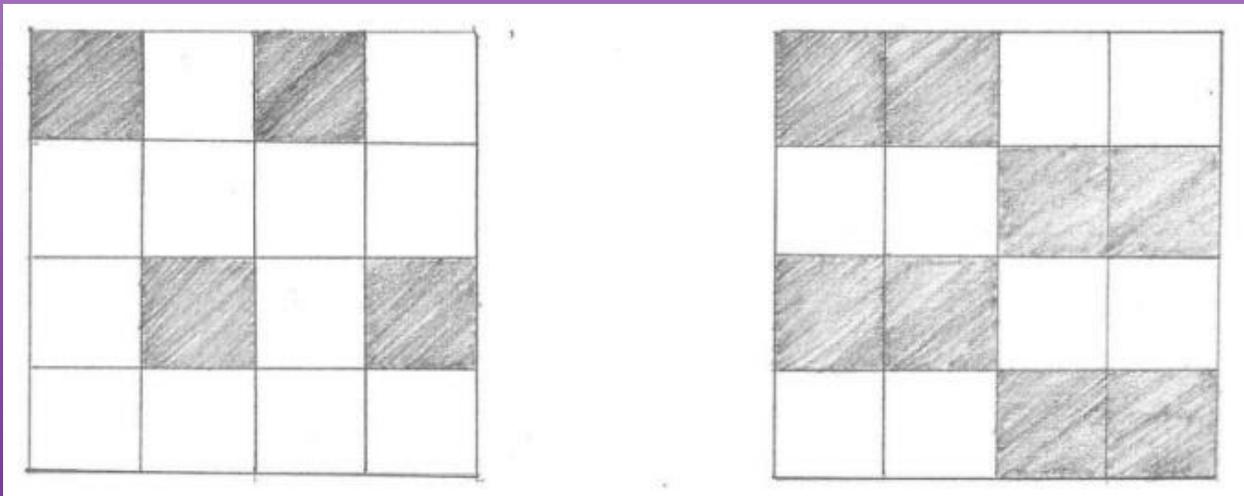
1. Paper
2. Anything you can use to draw (pencil, pen, marker, crayon, etc.)
3. Ruler

STEPS

1. On your paper, draw a square that is 2 inches on each side. Using your ruler, measure $\frac{1}{2}$ inch from one corner and mark it with your pen. From that point, measure and mark another $\frac{1}{2}$ inch. Repeat one more time. Then, draw vertical lines going across the square, starting from the points that you marked. Do the same process to draw three more horizontal lines that will cross the verticals. Repeat this step to draw at least one more grid box.



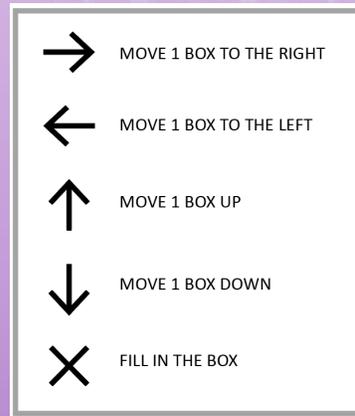
2. For this step, you will fill in some of the boxes to create an image. Copy the first example image below for your first box.



3. Then, for your remaining box, you can either copy the second example above or make your own image! If you choose to make your own, be sure to use the same color for the boxes and that they are filled in. You will see how doing so will make things a bit easier later but after your first try, feel free to do the activity again and make your image as complex as you want by changing the colors or changing the number of boxes!

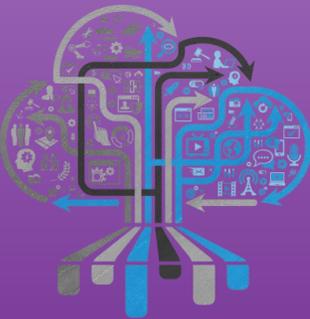
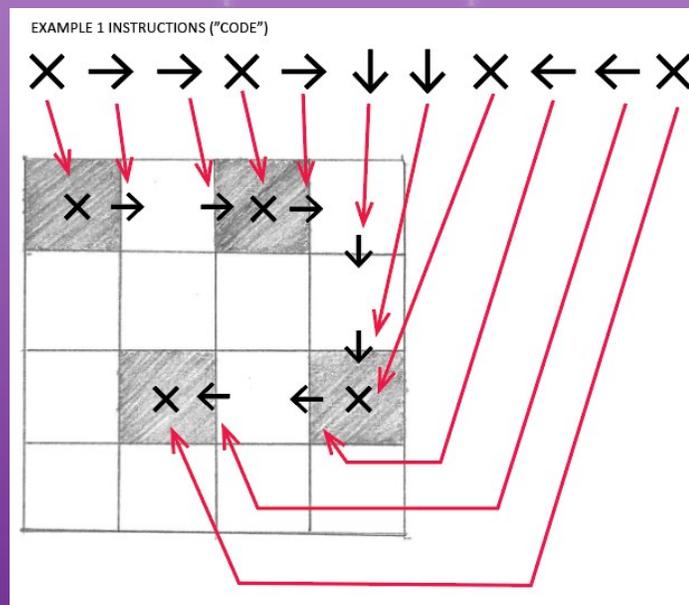


4. Now that you have your images, you will need to write instructions on how to draw each of them. Think of these as the instructions that a computer will have to read to do a task, which in this case is to draw the image in the square. It will be too long to write out instructions using words so what you will need to do is write using symbols.



- a. The top left corner of the square will be the starting point. The right and left arrows mean that you have to move one box to the left or right. Similarly, the up and down arrows mean that you need to move one box upwards or downwards. Lastly, the “x” means that you will need to fill in the box you are currently on.

See how the arrows and Xs on the square correspond to the instructions written out.



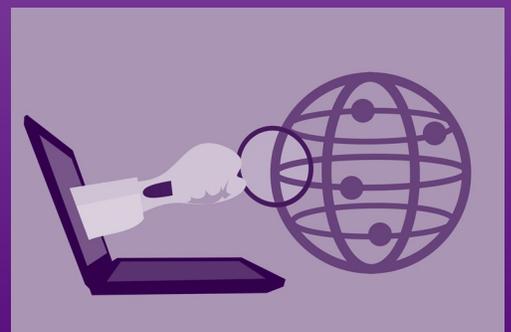
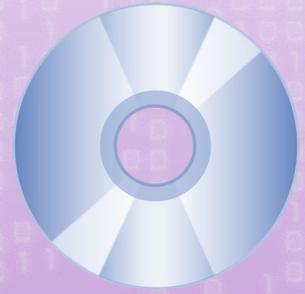
5. Now that you understand how to write the instructions, try it on your own for your remaining images. Once you finish writing the instructions, try and see if you can recreate the image just by following your instructions. You can also ask other people to draw the image by using your instructions!
- a. Were they able to draw the image correctly? If not, what part of the instructions do you need to change? Are there other ways that you could have written the instructions? How would you change your instructions if the image used different colors?

RESOURCE LINKS / VIDEOS

- [Invention of Software Programming](#)
- [What is Software Development](#)
- [Software Engineering CrashCourse](#)
- [Computer science CrashCourse Playlist](#)
- [A “real” day in the life of a software engineer: Covid Edition](#)
- [CrashCourse Engineering Playlist](#)
- Website many developers use to find colors for their Creations: <https://htmlcolorcodes.com>
- Color Palette Generator: <https://colors.co> (click space bar)
- Learn Coding: <https://www.w3schools.com>
- <https://www.khanacademy.org/computing>

Games!-

- Lots of games, videos, and other opportunities to learn: <https://code.org>
- Star Wars: <https://code.org/starwars>
- Blocks: <https://studio.code.org/s/starwarsblocks/stage/1/puzzle/1>
- Javascript (11+): <https://studio.code.org/s/starwars/stage/1/puzzle/1>
- Frozen: <https://studio.code.org/s/frozen/stage/1/puzzle/1>
- Dance Party: <https://code.org/dance>
- Make your own games and play games others have made!: <https://scratch.mit.edu>
- Code Monster Interactive: <http://www.crunchzilla.com/code-monster>
- CodeCombat Game: <https://codecombat.com>
- More Games: <https://hourofcode.com/us/learn>



CAL POLY STUDENT SPOTLIGHT



Kelsey McDonough

I love my major because of how creative I get to be with coding! Software engineering involves solving problems in your own special way. Computers are so important in the world today, and having classes that teach me all about them has helped me in so many ways. There are so many areas you can get into with this area, but I decided to focus on the combination of art and programming. Combining computer science with art has been such an amazing experience. I have gotten to make numerous games, an animated short, and even develop in virtual reality! My favorite experience has been interning with Apple, where I got to work on the Augmented Reality Kit team.

