PLTW COMPUTER SCIENCE

Activity 1.2.2

Introducing App Inventor

Introduction

As computers advanced during the 1960s, they were the size of a car and were only used by computer specialists. One of the first computer languages, COBOL, was created by computer scientist Grace Hopper in 1959. She wanted non-specialists to be able to create their own programs to harness the new power of computers. Still, there were few people who imagined that the average person would one day program their own computer.

Steve Wozniak took the computing industry by surprise when he created the Apple computer for the hobbyist. Revealed by Wozniak in 1976 at a meeting of Silicon Valley's Homebrew Computer Club, the device allowed non-professionals to program in unprecedented masses.

Have you ever wished your phone or tablet had an app that doesn't seem to exist yet? Maybe it's time to brew one yourself!

en.wikipedia.org/wiki/File:Pdp7-oslo-2005.jpeg

en.wikipedia.org/wiki/File:Apple_I.jpg

MATERIALS

- Android device or emulator
- Computer with Google Chrome™

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Resources

[1.2.2 sourceFiles.zip]

Procedure

Part 1: Create an app

1. Form pairs as directed by your teacher. Practice professional skills by greeting your partner and establishing team norms

2. You will be developing an Android app in this activity. You will be provided with starter code, and you will complete the code for the app. Review the starter and complete versions of the app, either by experimenting with them on an Android device, observing your teacher demonstrate them, or watching videos.

   Color Chooser: Starter App

   Refer to your downloadable resources for this video.

   Color Chooser: Completed App

   Refer to your downloadable resources for this video.

3. Launch App Inventor 2 as follows. Each team member can do this individually.

   - Use Google Chrome to browse to http://ai2.appinventor.mit.edu

   - The App Inventor website will redirect you to a secure Google webpage to sign in to your Google account. If you do not have a Google account, your teacher will have you create one. (Make sure you sign out before leaving your computer.) Before providing your Google email address and Gmail password, verify the following to protect your identity, using the image below to guide you.

     - Check the protocol in the web address (known as a **URL**). The protocol is the procedure for retrieving the web page.It is specified at the beginning of the URL before the double slash “//”.

       The protocol should be “https”. The “s” in that acronym stands for “secure” and indicates your password will be sent with encryption**.** Encryption is protection by secret code known only to the website owners.

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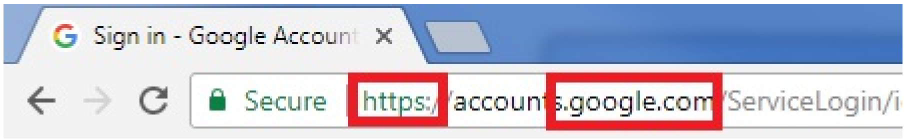
    - Check the domain name, which is shown in the second part of the URL, after the double slash in “https://” and before the next slash. The domain name should end with “google.com”. This is an assurance that the secure connection is with Google and not an imposter.

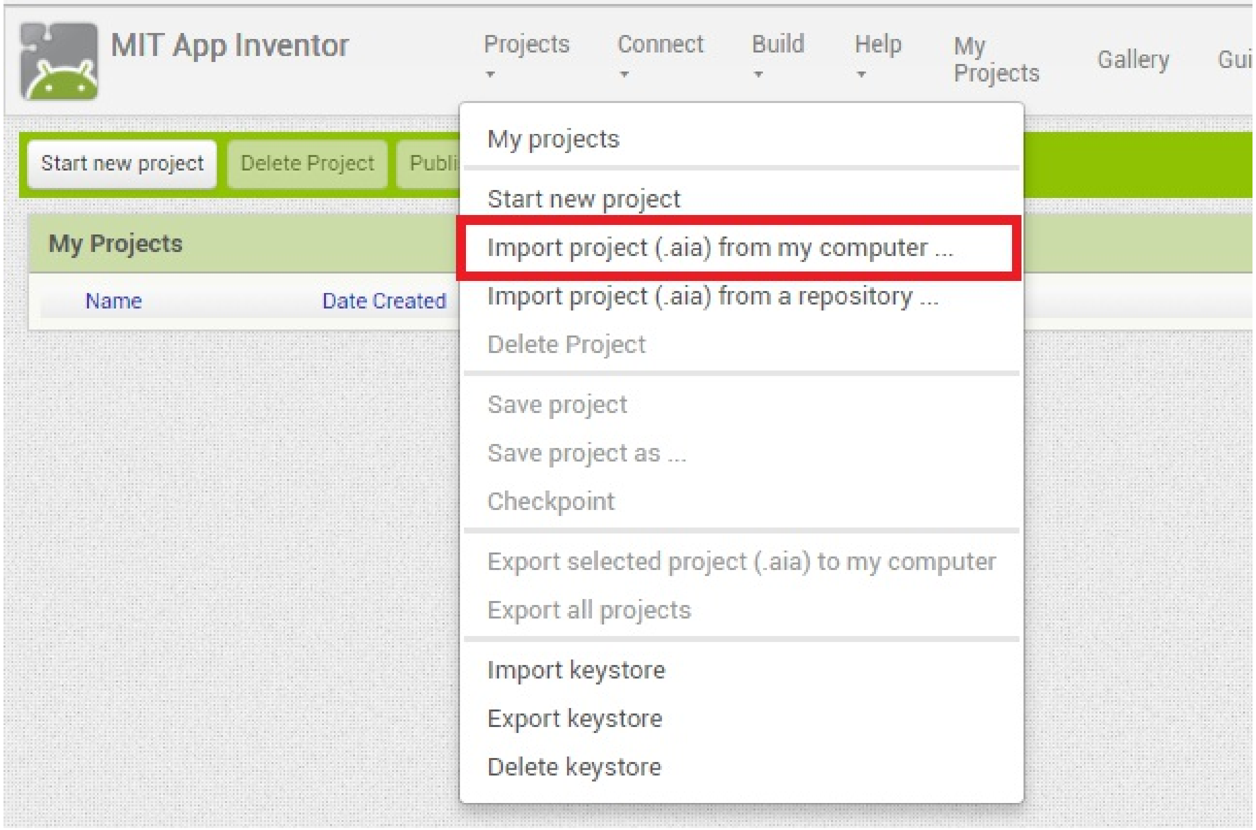


- After you provide your account credentials, your browser will be redirected to the AppInventor website. A splash screen will appear, offering setup options. Unless directed otherwise by your teacher, click **Continue** on the splash screen.

4. The starting screen for App Inventor is called “My Projects,” shown below at left. To start the project, you will upload some code as follows.

- Download the starter code from the resource file and extract the file(s); be sure to note where you extracted the zip file.

- In the browser's page for App Inventor, choose **Project >Import project (.aia) from my computer …** as shown at right.



- Click **Choose File**. In the Windows Explorer dialog box that opens, browse to the file `color_chooser_stage1.aia` that you extracted in Part a of this step. Select the file

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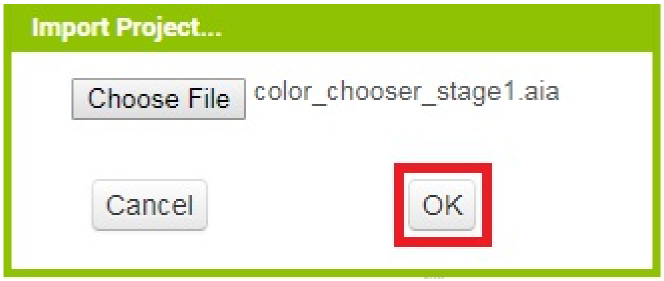
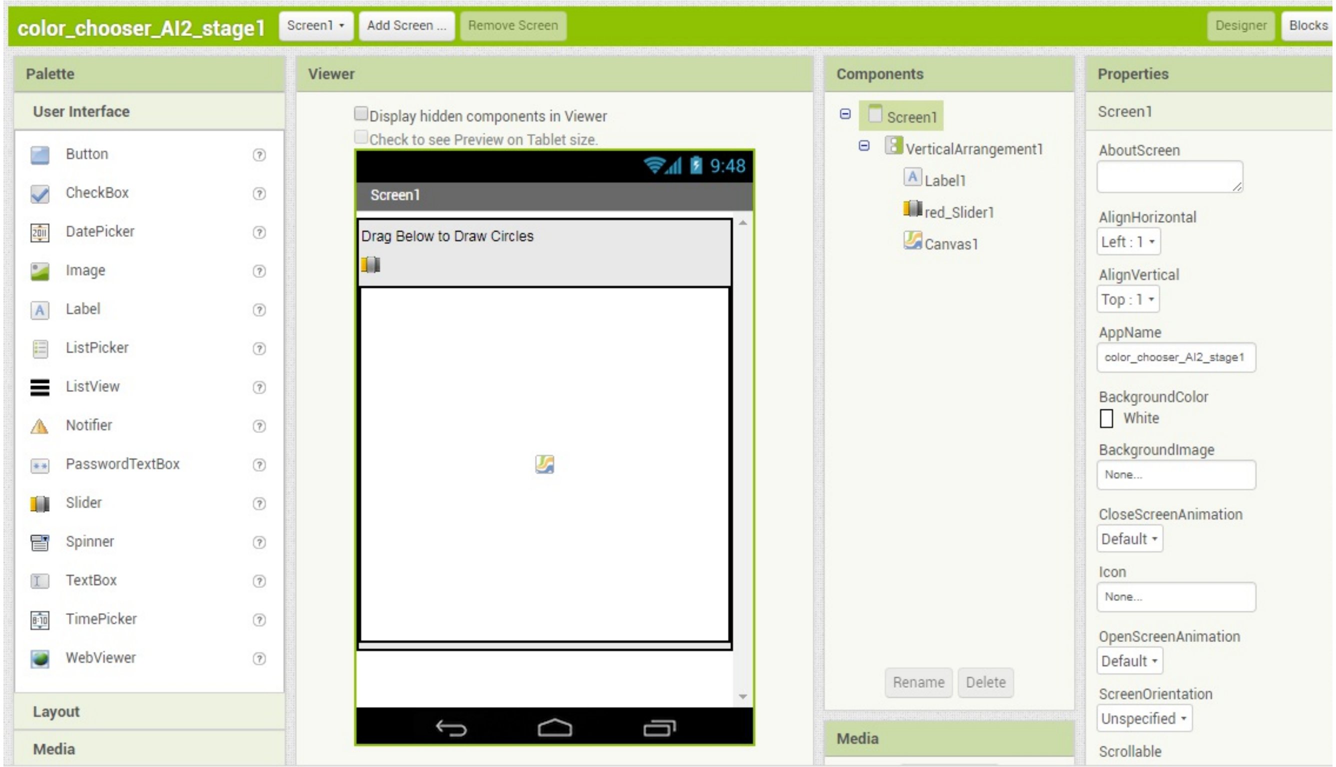
and click **Open** as shown below on the left.In the web browser, select **OK** as shown below on the right.



5. Once the file has uploaded, App Inventor should take you directly to the color_chooser_stage1 project, and you will be looking at App Inventor's GUI Designer screen. This screen shows the components you can add to your GUI. There are already four components that have been added to this app's GUI. Three of them (a label, a slider, and a canvas component) are placed within the fourth component (a vertical arrangement component).



6. In the components panel, click on the Label 1 component as shown below on the left. The properties panel will show all the properties of that Label1 component. The Background Color property, for example, has a value of None, as shown below on the right.

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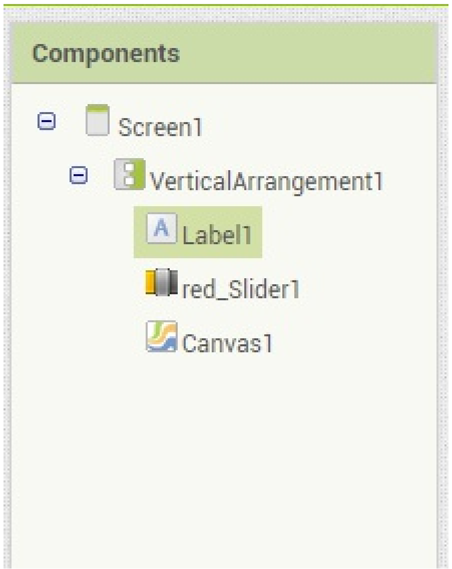
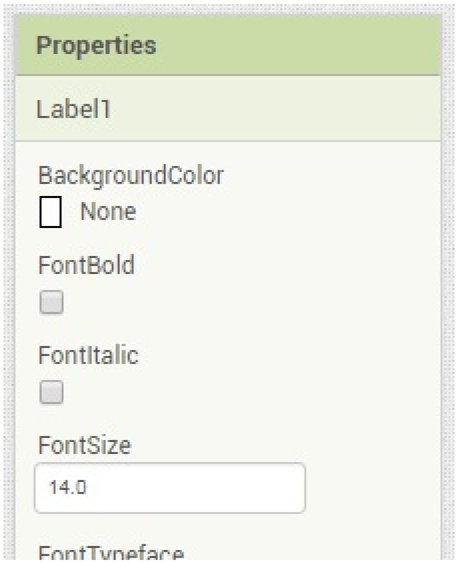


Components

Screen1
VerticalArrangement1
Label1
red_Slider1
Canvas1



Properties

Label1

BackgroundColor
□ None

FontBold
□

FontItalic
□

FontSize
14.0

FontTypeface

- What is the value of the Text property of the Label component?
- What is the value for each property of the red_Slider1 component? Fill in the table below with the values and your guesses as to what they might mean.

  Properties of the slider component red_Slider1

Property	Value	Meaning
ColorLeft		
ColorRight		
MaxValue		
MinValue		
ThumbPosition		the current slider position
Visible		
Width		

7. Click on **Blocks** to move to the Blocks editor. The Blocks editor is the third screen of App Inventor's three views. This is where you program the components. Note that you can navigate among the three screens by clicking on either the **Designer** or **Blocks** button at right or by

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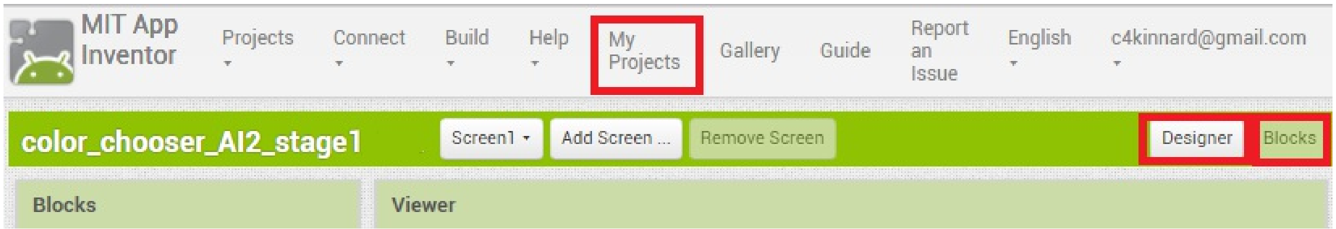
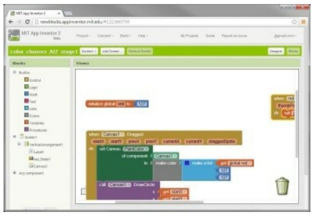
selecting **My Projects**.



The purpose of the three screens is as follows.

	The **My Projects** screen shows all of the apps that you've worked on.
	The GUI **Designer** screen allows you to place components into your GUI and manipulate their starting properties.
	The **Blocks** editor is where you program components to respond to events.

8. In App Inventor, a program is described partly in the GUI Designer and partly in the Blocks editor. Explore the Blocks editor as follows.

   - The Blocks panel shows many categories for the blocks. There are eight built-in categories and one category for each component that you have placed in your app in the GUI Designer. Name two of the categories:
   - To see the palette of blocks in a category, click the category. Name a block in the Variables category:
   - Click each category and scroll through the blocks available in each category. Some documentation may be made available by holding the mouse over a block. If you click the block, it will place the block in the scripts Viewer. You can use the delete key on your keyboard to delete a block from the scripts Viewer. Hover over a block that looks unfamiliar and read its documentation. Describe what the block does:
   - Some blocks have drop down menus, as shown here. Name a block with a drop down menu.

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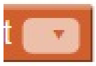
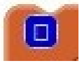


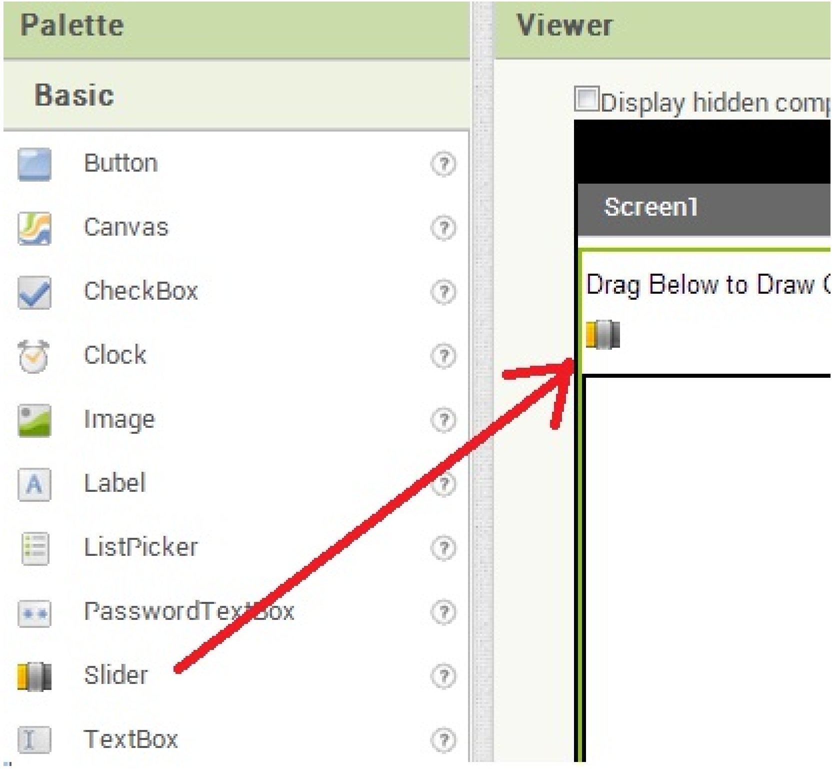
- Some blocks have mutators, as shown here. You will use block mutators in the next activity. For now, just find a block with a mutator. What block did you find?



9. Consider all three screens available in App Inventor. In what ways do you notice that this environment is similar to Scratch™ programming language?

10. To modify the code for the app so that the user can control the green content of the circles with a second slideras demonstrated in the final stage, add a slider component and program it as follows.

    - Click on Designer to return to the GUI Designer view.
    - Drag a slider from the Palette to the Viewer. Place it just below the red_Slider1.



    - Click **Rename** in the Components panel. Change the slider's name to green_Slider1. We will always insert a descriptive name for a component, but keep the old part of the name as well. We do this because it makes it easy to see what types of components are in the component list.

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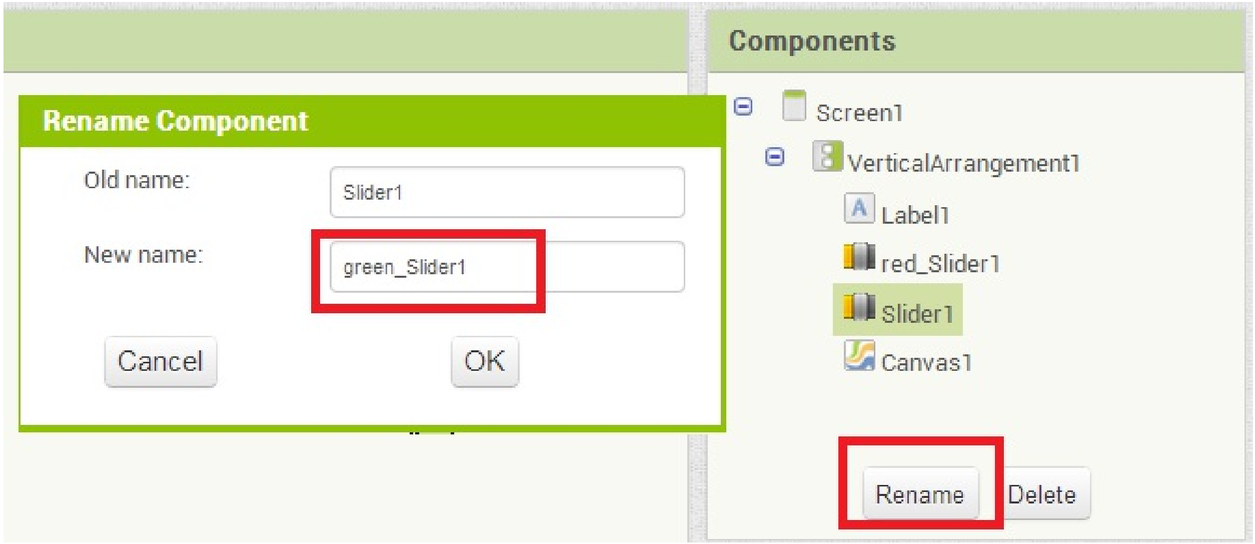


Rename Component

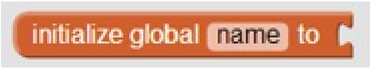
Old name: Slider1

New name: green_Slider1

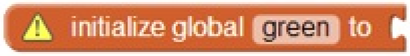
- In the Properties panel, set the properties of the green-Slider1 component as follows:

  ColorLeft = Green
  ColorRight = Black
  MaxValue = 255
  MinValue = 0
  ThumbPosition = 127
  Visible = Showing
  Width = Fill parent…

- In the Blocks editor,choose the Variables category and select the “initialize global” block shown below on the left. Rename the variable to green as shown below on the right. When the app is launched, this pair of blocks will create a global variable named “green”. A global variable is one that can be used in any part of the program.

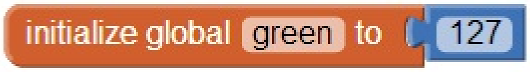


initialize global name to



initialize global green to

- From the Math category, select the “0” block. Change its value to 127 and attach it to the block from step e. The result is pictured below.



initialize global green to 127

- Find the blocks pictured below. This chunk of blocks sets the canvas component's paint color.

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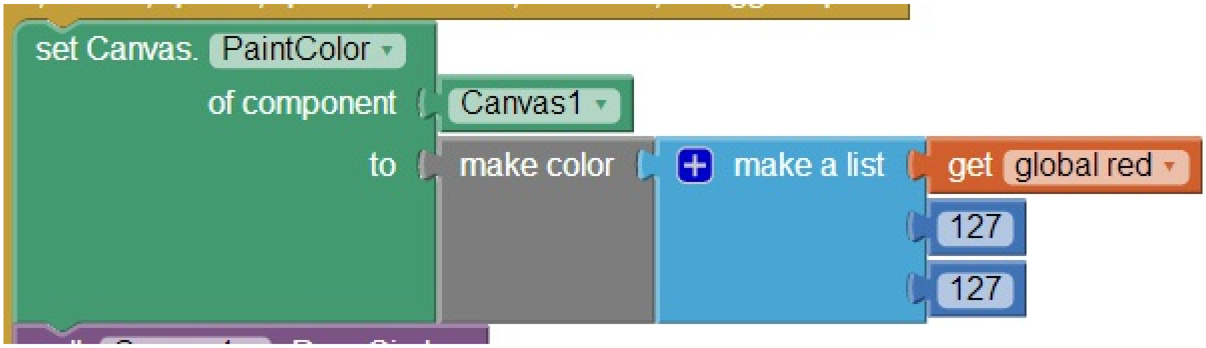
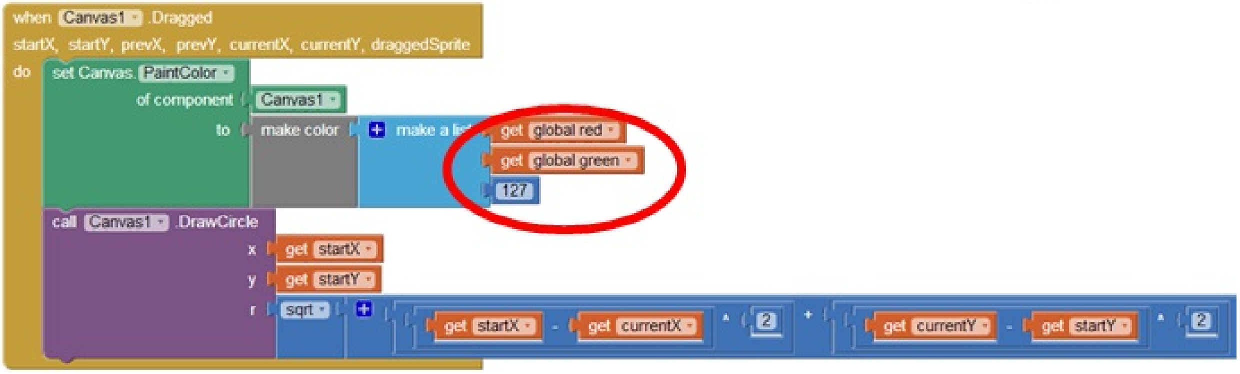


```
set Canvas. PaintColor
      of component  Canvas1
                to  make color  make a list  get global red
                                             127
                                             127
```

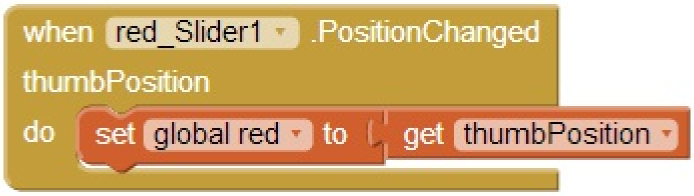
What do you think the three elements in the list are used for?

- From the variables category, select the "get" block. Change the variable to "global green". You will use this value as the second item in the list pictured in the previous step. Delete the "127" block that comes loose by selecting it and pressing delete. The result is pictured below.



```
when Canvas1 .Dragged
startX, startY, prevX, prevY, currentX, currentY, draggedSprite
do  set Canvas. PaintColor
          of component  Canvas1
                    to  make color  make a li  get global red
                                               get global green
                                               127
    call Canvas1 .DrawCircle
                   x  get startX
                   y  get startY
                   r  sqrt  ( ( get startX - get currentX ) ^ 2 + ( get currentY - get startY ) ^ 2 )
```

- In the blocks area, find the "when red_Slider1.PositionChanged" event handler shown below. What do you think the function of this event handler is?



```
when red_Slider1 .PositionChanged
thumbPosition
do  set global red to  get thumbPosition
```

- Create a similar event handler for the green Slider as follows.
  - Use Ctrl-C to copy it and Ctrl-V to paste a duplicate copy of the red Slider event handler pictured in the previous step.
  - Use one of the dropdown menus on the copy of the event handler to change the component from red_Slider1 to green_Slider1.
  - Use the dropdown menu of the "set" block to change the variable being set to "global green". The result is shown below.

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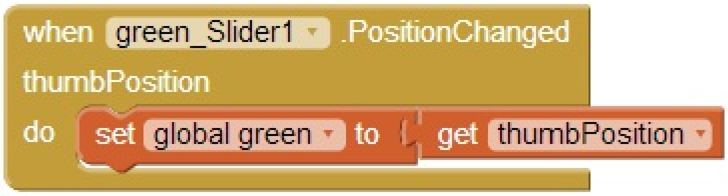
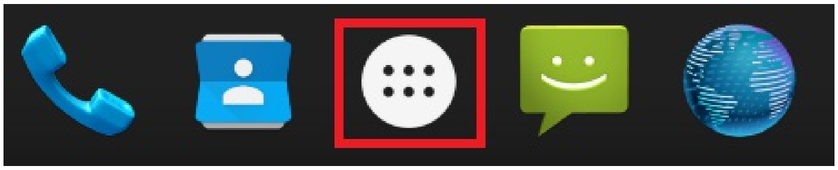


```
when green_Slider1 .PositionChanged
thumbPosition
do  set global green to  get thumbPosition
```

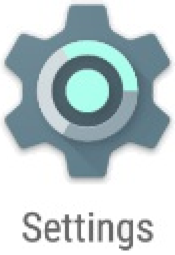
Part 2: Install and Run your app

11. It is now time to run your app on a device and test it. Before you are allowed to run your app on your device, you need to allow installation of apps from sources other than Google Play Store™ as follows.

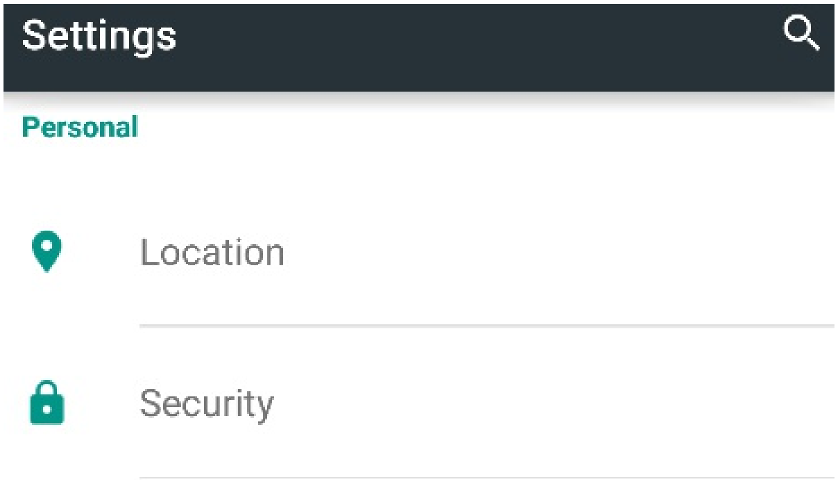
    - From the Home screen, select the Apps button to go to the Apps screen.



    - On the Apps screen, select **Settings**.



    - Under **Personal**, select **Security**.



    - Under **Device administration**, turn **Unknown Sources** on, enabling you to install apps

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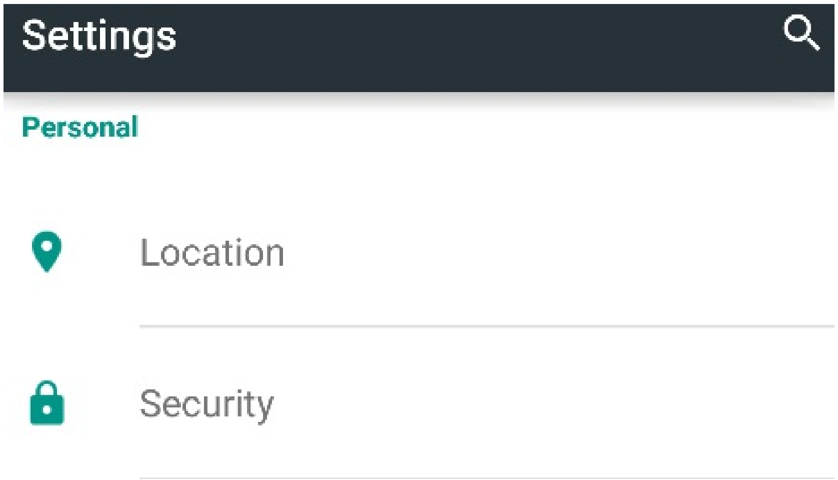
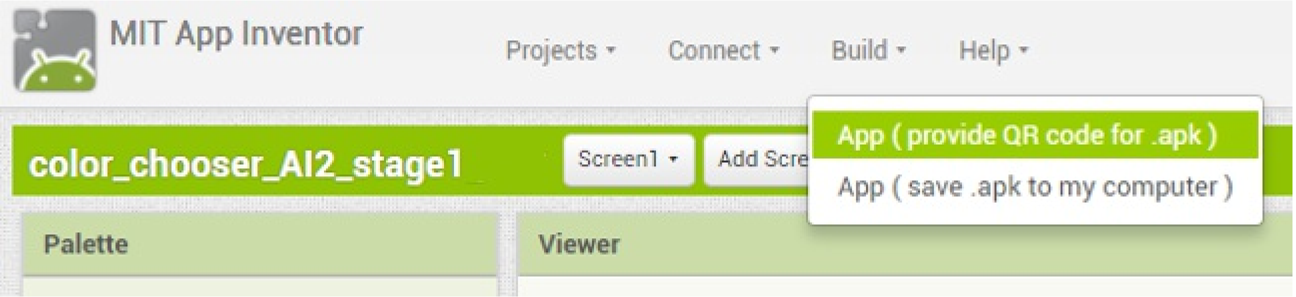
from your computer.



12. As instructed by your teacher, transfer your program from the AppInventor website to your Android device. Details of each step follow, but here is a brief summary of your installation options.

Option 1: Create and scan a QR code (step 13)	For all other installation methods, create an .apk file (step 14). Then do *one* of the following: ○ Option 2: Install the app on an emulator (step 15), *or* ○ Option 3: Use a USB cable to sideload your app onto a device (step 16), *or* ○ Option 4: Use an email attachment to transfer your app to a device (step 17)
Run the installed app (step 18)	

13. *Option 1: Use a QR Code*
If you are using the QR code method to transfer your app, select **App (provide QR code for .apk)** from AppInventor's **Build** menu.



On your device, open the **MIT AI2 Companion** app. Select the **Scan QR code** button. Point the device's camera at the QR code on your computer's screen and install the app. *Skip to Step 18.*

14. *Options 2- 4: Create .apk file*

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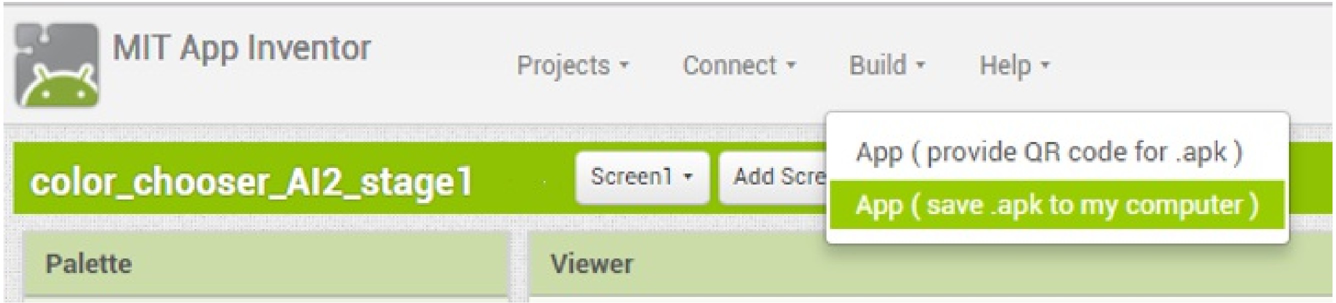
If you are *not* using a QR code to transfer your app to your device, you will need to create an .apk file. In AppInventor, choose **Build > App (save .apk to my computer)**.



A file with an .apk extension is created in your Downloads folder. For this app, the file is called `color_chooser_AI2_stage1.apk`

15. *Option 2: Use an emulator*
    If you are using an emulator, drag-and-drop the .apk file onto the emulator's screen to install it. *Skip to Step 18.*

16. *Option 3: Sideload the app*
    If you are sideloading your app with a USB cable,

    - Connect your device to your computer with the USB cable. When the device displays the **Allow access to device data** message. select **Allow.**
    - On your computer, open a Files Explorer window and navigate to your .apk file. In another Files Explorer window, navigate to the *device's* Download folder. Drag-and-drop the .apk file from your computer to the device's Download folder.
    - On your device, open the Download folder and select the .apk file to install it.

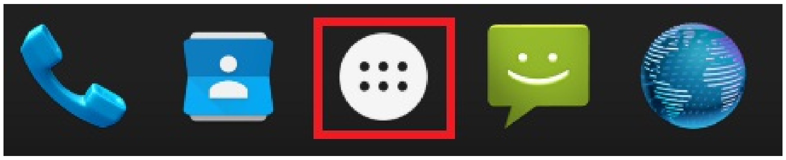
    Skip to Step 18.

17. *Option 4: Email the app*
    If you are using email to transfer your file you will need to email the .apk file to yourself and also create an account on your device.

    - Use another tab in the browser to email yourself and attach the .apk file to the email.

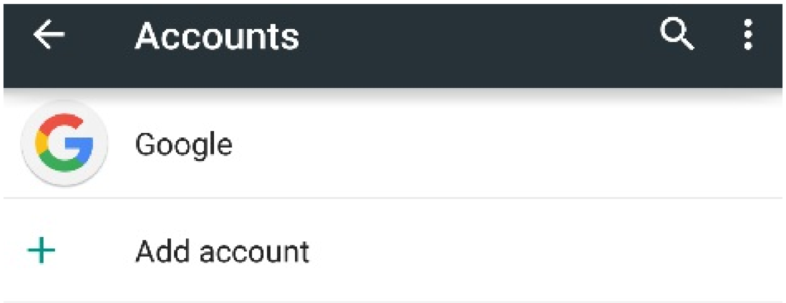
    - On the Android device, create an email account.

        - From the Home screen on your device, select the Apps button to see all installed apps.

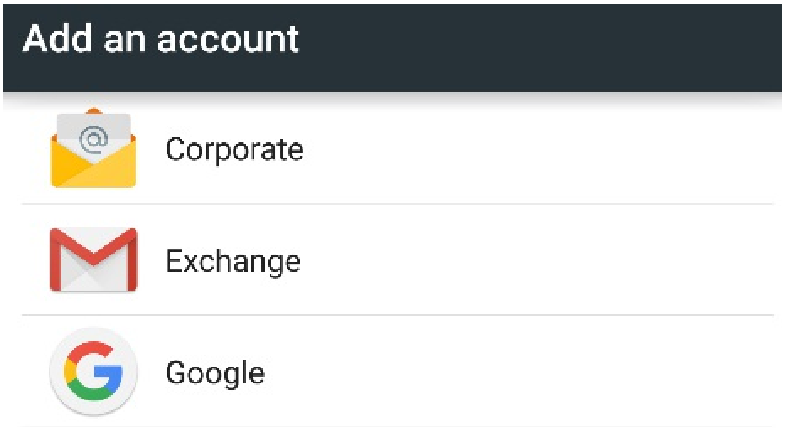


        - On Apps screen, select **Settings**.

- Select **Accounts** and then **Add account.**



- Choose **Google** and sign in with your Google credentials. Accept the Terms of Service and Privacy Policy.



- When you are asked to Back-up or Sync your device, un-check or deselect this option. Since this device is shared throughout your classroom, you do not want to share your personal information!

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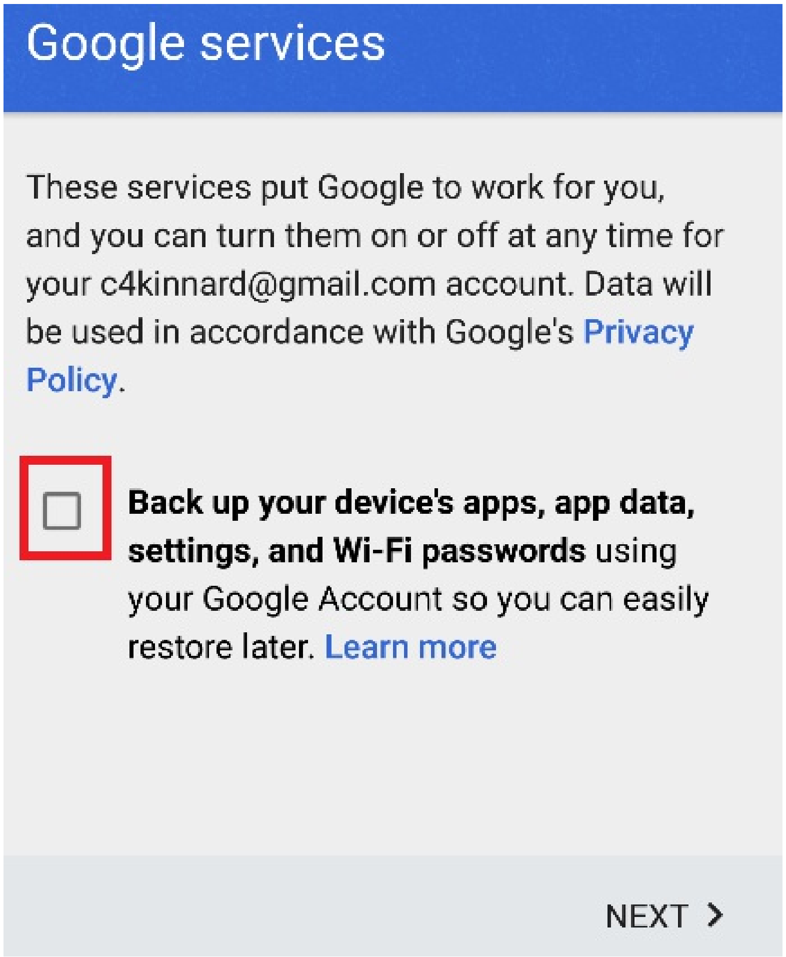
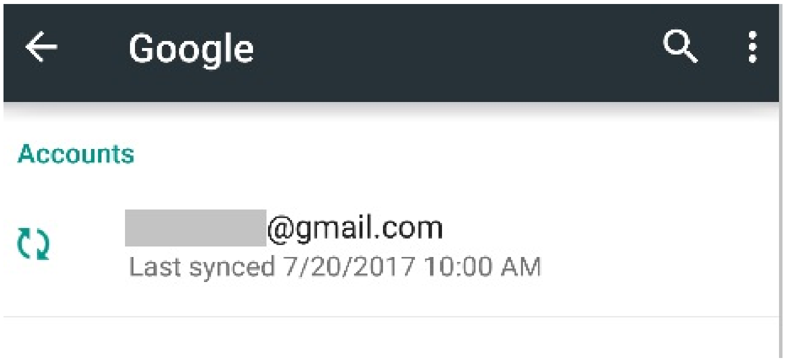


Google services

These services put Google to work for you, and you can turn them on or off at any time for your c4kinnard@gmail.com account. Data will be used in accordance with Google's Privacy Policy.

□ **Back up your device's apps, app data, settings, and Wi-Fi passwords** using your Google Account so you can easily restore later. Learn more

- You should be returned to the **Accounts** screen, select **Google**. You will need to change Sync options for your account on this device, so select your account.



Accounts

[redacted]@gmail.com
Last synced 7/20/2017 10:00 AM

- On the Sync screen, un-check or deselect all options. Again, this device is shared throughout your classroom, you do not want to share your personal information.

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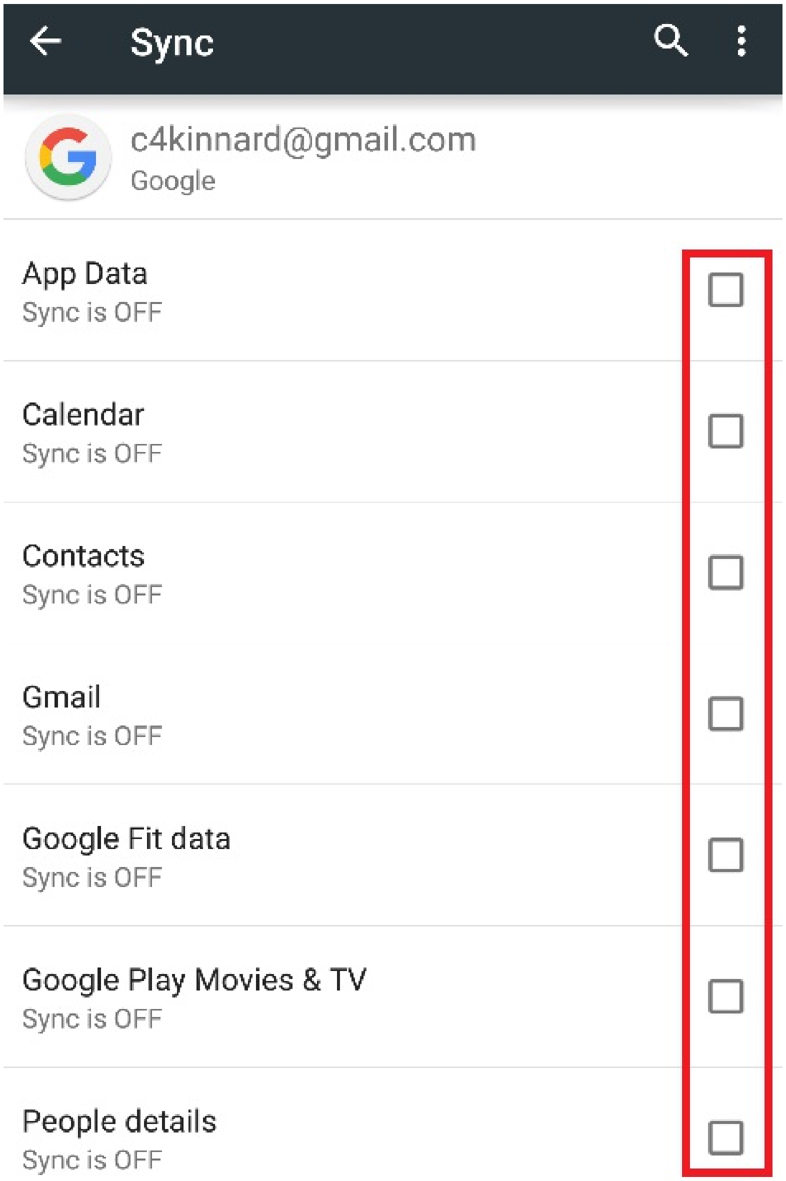

Sync

c4kinnard@gmail.com
Google

App Data
Sync is OFF □

Calendar
Sync is OFF □

Contacts
Sync is OFF □

Gmail
Sync is OFF □

Google Fit data
Sync is OFF □

Google Play Movies & TV
Sync is OFF □

People details
Sync is OFF □

- Add your Gmail account to the Android device as follows. **Be certain to follow the steps for removing your account from the Android device at the end of this activity.**
- Now you will be able to open the attachment on the Android device.
    - In the Apps screen, select email.
    - Open the email containing the app attachment.
    - Click the attachment at the bottom of the email message.
    - Click Install.

18. Open / run your newly installed app.

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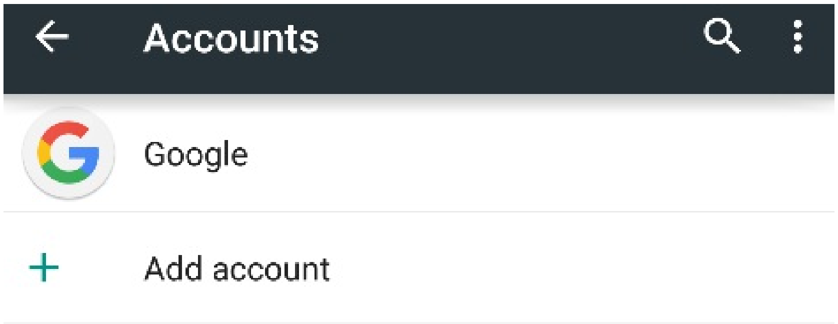
19. Test your app. After establishing that the additional slider for green content works, add a slider for blue coloring. To test new versions of your app, you will need to reinstall. Follow your specific installation steps, referring back to the detailed steps, if necessary.

Option 1: Create and scan a QR code (step 13)	For all other installation methods, create an .apk file (step 14). Then do *one* of the following: ○ Option 2: Install the app on an emulator (step 15), *or* ○ Option 3: Use a USB cable to sideload your app onto a device (step 16), *or* ○ Option 4: Use an email attachment to transfer your app to a device (step 17)
Run the installed app (step 18)	

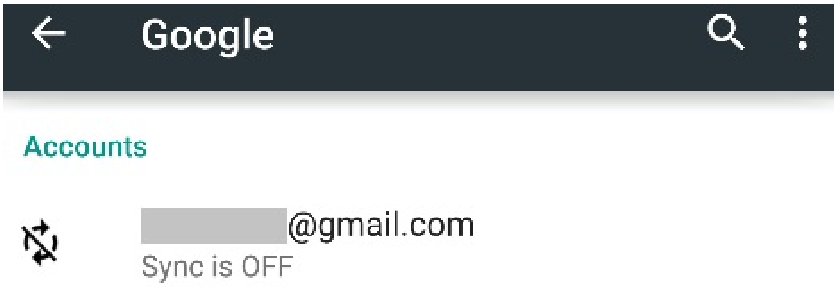
20. Continue improving your app. Add a Button component to clear the canvas. To do so will require you to add a new component and set its initial properties in the GUI Designer, and then create an event handler for when the button is pressed in the Blocks editor. Before beginning, discuss your strategy with your partner and agree on expectations for driver/navigator roles.

21. Before returning the Android device to your teacher, be certain to remove your Gmail account from the device as follows:

- In the Apps menu, select **Settings**.
- Select **Accounts** – **Google**.



- Select your Google account.



[redacted]@gmail.com
Sync is OFF

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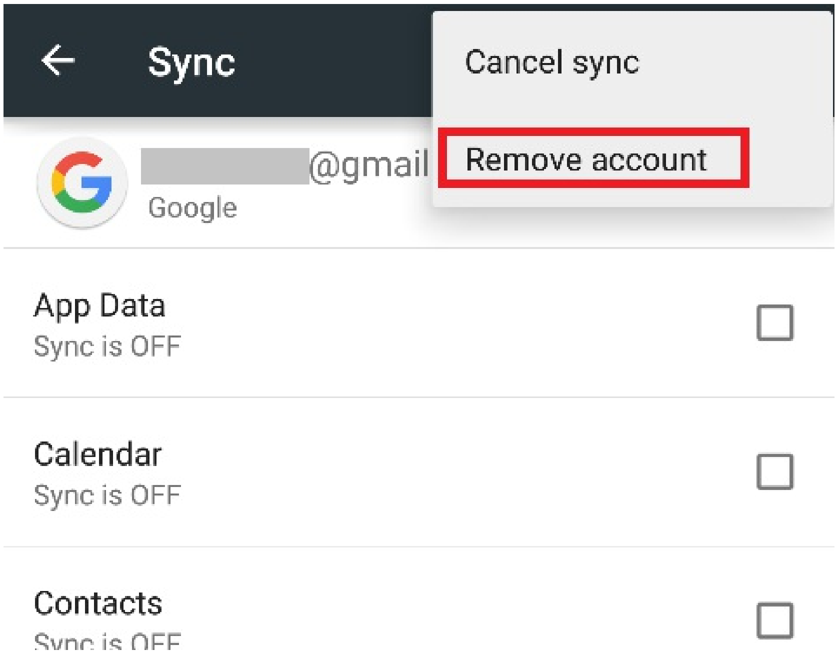
- Select the options menu in the upper right corner of your screen (the stack of three squares or dots) and then select **Remove account** and confirm **Remove account**.



[redacted]@gmail
Google

App Data
Sync is OFF □

Calendar
Sync is OFF □

Contacts
Sync is OFF □

Conclusion

1. Step 8 mentions, “In App Inventor, a program is described partly in the GUI Designer and partly in the Blocks Editor.” How is this similar to Scratch? What information about a program in Scratch is not shown in Scratch's scripts area? Where is it shown?

2. The lead creator of the App Inventor programming environment is Hal Abelson. Abelson says that we are entering a new era of personal mobile computing in which the average person can program their own mobile device. Abelson asserts that “personal mobile computing” is an important stage beyond the era of “personal computing” that was initiated by Apple's Steve Jobs and Steve Wozniak in 1976.

   In what ways will mobile devices and the opportunity for the average person to program them change society?

   Do some pre-writing in which you collect your thoughts on this question. Pre-writing is written evidence of brainstorming and outlining that precedes a first draft.

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