

# MakeQuiz and TakeQuiz

The Presidents Quiz app in Chapter 8 can be customized to build any quiz, but the customization is restricted to App Inventor programmers. Only you, as the programmer, can modify the questions and answers; there is no way for parents, teachers, or other app users to create their own quizzes or change the quiz questions (unless they too want to learn how to use App Inventor!).

In this chapter, you'll build a MakeQuiz app that lets a "teacher" create quizzes using an input form. The quiz questions and answers will be stored in a web database so that "students" can access a separate TakeQuiz app and take the test. While building these two apps, you'll make yet another significant conceptual leap and learn how to create apps with user-generated data that is shared across apps and among users.

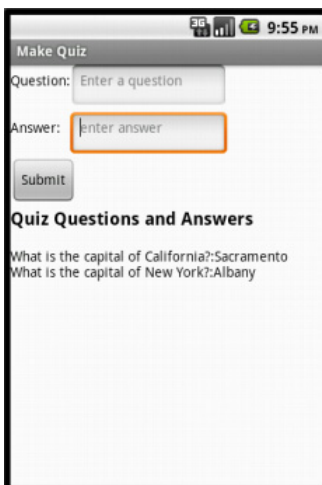


Figure 10-1. The MakeQuiz app

MakeQuiz and TakeQuiz are two apps that work in tandem and allow a "teacher" to create quizzes for a "student." Parents can create fun trivia apps for their children during a long road trip, grade-school teachers can build "Math Blaster" quizzes, and college students can build quizzes to help their study groups prepare for a final. This chapter builds on the Presidents Quiz in Chapter 8, so if you haven't completed that app, you should do so before continuing here.

You'll design two apps, MakeQuiz for the "teacher" (see Figure 10-1) and TakeQuiz for the "student." With MakeQuiz:

- The user enters questions and answers in an input form.
- The entered question-answer pairs are displayed.

- The quiz questions and answers are stored in a database.

TakeQuiz will work similarly to the Presidents Quiz app you've already built. In fact, you'll create it using that app as a starting point. TakeQuiz will differ in that the questions asked will be those that were entered into the database using MakeQuiz.

## What You'll Learn

The Presidents Quiz was an example of an app with *static data*: no matter how many times you take the quiz, the questions are always the same because they are written as part of the app (also known as *hardcoded*). News apps, blogs, and social networking apps like Facebook and Twitter work with *dynamic data*, meaning it can change over time. Often, this dynamic information is *user-generated*—the app allows users to enter, modify, and share information. With MakeQuiz and TakeQuiz, you'll learn how to build an app that handles user-generated data.

If you completed the Xylophone app (Chapter 9), you've already been introduced to dynamic lists; in that app, the musical notes the user plays are recorded in lists. Apps with such user-generated data are more complex, and the blocks are more abstract because they don't rely on predefined, static data. You define list variables, but you define them without specific items. As you program your app, you need to envision the lists being populated with data entered by the end user.

This tutorial covers the following App Inventor concepts:

- Input forms for allowing the user to enter information.
- Displaying items from multiple lists.
- Persistent data—MakeQuiz will save the quiz questions and answers in a web database, and TakeQuiz will load them in from the same database.
- Data sharing—you'll store the data in a web database using the TinyWebDB component (instead of the TinyDB component used in previous chapters).

## Getting Started

Connect to the App Inventor website and start a new project. Name it "MakeQuiz" and set the screen's title to "Make Quiz". Open the Blocks Editor and connect to your phone.

## Designing the Components

Use the Component Designer to create the interface for MakeQuiz. When you finish, it should look something like Figure 10-2 (there are also more detailed instructions after the snapshot).

You can build the user interface shown in Figure 10-2 by dragging out the components listed in Table 10-1. Drag each component from the Palette into the Viewer and name it as specified in the table. Note that you can leave the header label names (Label1 – Label4) as their defaults (you won't use them in the Blocks Editor anyway).

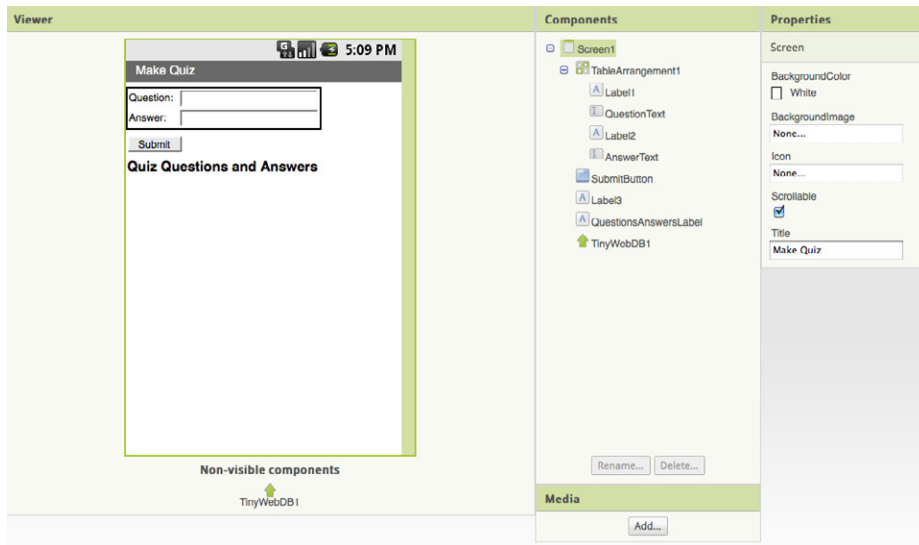


Figure 10-2. MakeQuiz in the Component Designer

Table 10-1. All the components for the MakeQuiz app

Component type	Palette group	What you'll name it	Purpose
TableArrangement	Screen Arrangement	TableArrangement1	Format the form, including the question and answer.
Label	Basic	Label1	The "Question:" prompt.
TextBox	Basic	QuestionText	The user enters questions here.
Label	Basic	Label2	The "Answer:" prompt.
TextBox	Basic	AnswerText	The user enters answers here.
Button	Basic	SubmitButton	The user clicks this to submit a QA pair.
Label	Basic	Label3	Display "Quiz Questions and Answers."
Label	Basic	QuestionsAnswersLabel	Display previously entered QA pairs.
TinyWebDB	Not ready for prime time	TinyWebDB1	Store data to and retrieve data from the database.

Set the properties of the components in the following way:

1. Set the Text of Label1 to “Question”, the Text of Label2 to “Answer”, and the text of Label3 to “Quiz Questions and Answers”.
2. Set the FontSize of Label3 to 18 and check the FontBold box.
3. Set the Hint of QuestionText to “Enter a question” and the Hint of AnswerText to “Enter an answer”.
4. Set the Text of SubmitButton to “Submit”.
5. Set the Text of QuestionsAnswersLabel to “Questions and Answers”.
6. Move the QuestionText, AnswerText, and their associated labels into TableArrangement1.

## Adding Behaviors to the Components

As with the Presidents Quiz app, you’ll first define some *global variables* for the QuestionList and AnswerList, but this time you won’t provide fixed questions and answers. Table 10-2 lists the blocks you’ll need to define the lists.

Table 10-2. Blocks for defining the question and answer lists

Block type	Drawer	Purpose
<b>def variable</b> (“QuestionList”)	Definitions	Define the QuestionList variable (rename it).
<b>def variable</b> (“AnswerList”)	Definitions	Define the AnswerList variable (rename it).
<b>make a list</b>	Lists	Set up the QuestionList for new items.
<b>make a list</b>	Lists	Set up the AnswerList for new items.

The blocks should look as shown in Figure 10-3.

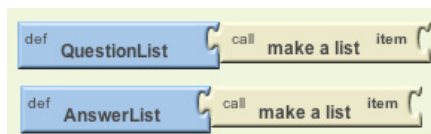


Figure 10-3. The lists for MakeQuiz

Note that, unlike the Presidents Quiz app, the lists are defined without items in the slots. This is because with MakeQuiz and TakeQuiz, all data will be created by the app user (it is *dynamic, user-generated* data).

## Recording the User's Entries

The first behavior you'll build is for handling the user's input. Specifically, when the user enters a question and answer and clicks Submit, you'll use **add item to list** blocks to update the `QuestionList` and `AnswerList`. Table 10-3 lists the blocks you'll need.

Table 10-3. Blocks for recording the user's entries

Block type	Drawer	Purpose
<b>SubmitButton.Click</b>	SubmitButton	Triggered when the user clicks this button.
<b>add items to list (2)</b>	Lists	Add the data the user enters to the lists.
<b>global QuestionList</b>	My Definitions	Plug this into the "list" slot of the first <b>add items to list</b> block.
<b>QuestionText.Text</b>	QuestionText	User's entry; plug this into the "item" slot of the first <b>add items to list</b> block.
<b>global AnswerList</b>	My Definitions	Plug this into the "list" slot of the second <b>add items to list</b> block.
<b>AnswerText.Text</b>	AnswerText	User's entry; plug this into the "item" slot of the second <b>add items to list</b> block.
<b>set QuestionsAnswers Label.Text to</b>	QuestionsAnswersLabel	Display the updated lists.
<b>make text</b>	Text	Build a text object with both lists.
<b>global QuestionList</b>	My Definitions	The questions.
<b>text (:)</b>	Text	Place a colon between lists.
<b>global AnswerList</b>	My Definitions	The answers.

### How the blocks work

The **add items to list** block *appends*, or adds, each item to the end of a list. As shown in Figure 10-4, the app takes the text the user has entered in the `QuestionText` and `AnswerText` text boxes and appends each to the corresponding list.

The **add items to list** blocks update the `QuestionList` and `AnswerList` variables, but these changes are not yet shown to the user. The third row of blocks displays these lists by concatenating them (**make text**) with a colon in between. By default, App Inventor displays lists with surrounding parentheses and spaces between items like this: (item1 item2 item3). Of course, this is not the ideal way to display the lists, but it will allow you to test the app's behavior for now. Later, you'll create a more sophisticated method of displaying the lists that shows each question-answer pair on a separate line.

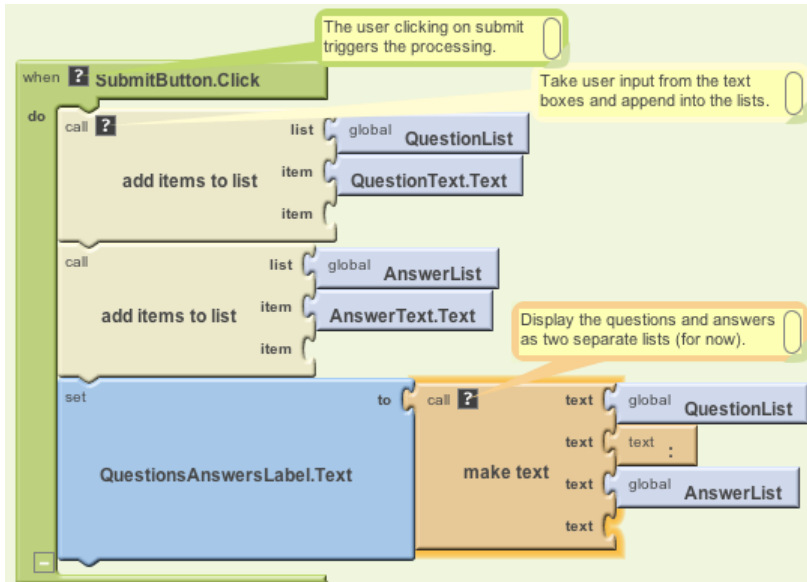


Figure 10-4. Adding the new entries to the lists



**Test your app.** On the phone, enter a question and answer and click the `SubmitButton`. The app should display the single entry in the `QuestionList`, a colon, and then the single entry in the `AnswerList`. Add a second question and answer to make sure the lists are being created correctly.

## Blanking Out the Question and Answer

As you'll recall from the Presidents Quiz app, when you moved on to the next question in the list, you needed to blank out the answer results from the previous question. In this app, when a user submits a question-answer pair, you'll want to clear the `QuestionText` and `AnswerText` text boxes so they're ready for a new entry instead of showing the previous one. To do this, add the blocks listed in Table 10-4 at the bottom of the `SubmitButton.Click` event handler.

Table 10-4. Blocks for blanking out the question and answer text boxes

Block type	Drawer	Purpose
<code>set QuestionText.Text to</code>	<code>QuestionText</code>	Blank out the question.
<code>set AnswerText.Text to</code>	<code>AnswerText</code>	Blank out the answer.
<code>text</code> (two blank ones)	<code>Text</code>	Replace <code>QuestionText</code> and <code>AnswerText</code> .

## How the blocks work

When the user submits a new question and answer, they are added to their respective lists and displayed. At that point, the text in the `QuestionText` and `AnswerText` is blanked out with empty text blocks, as shown in Figure 10-5. Note that you can create an empty text block by clicking on the text within the block and pressing Delete.

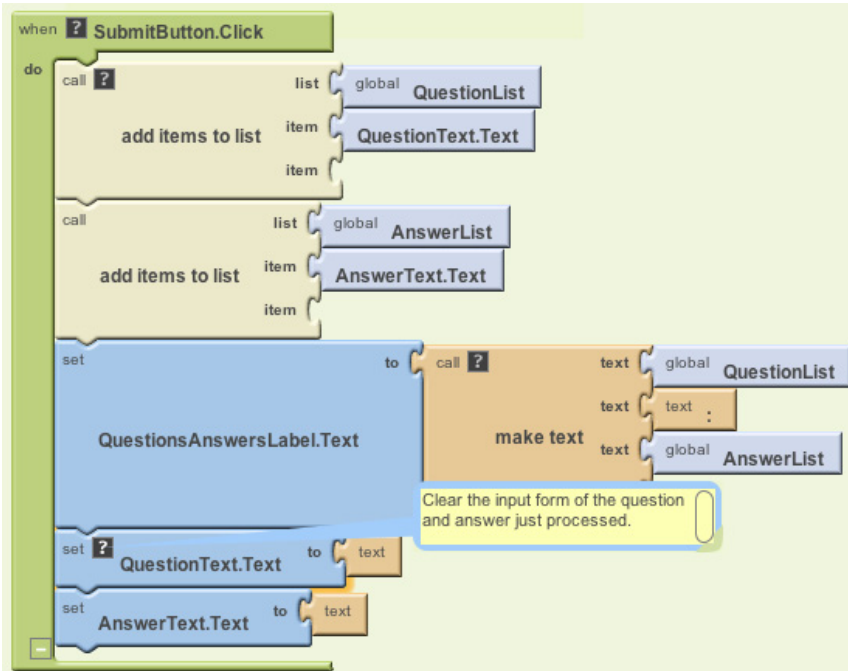


Figure 10-5. Blanking out the question and answer text boxes after submission



**Test your app.** Add some questions and answers. Each time you submit a pair, the `QuestionText` and `AnswerText` should be cleared so that only the hint appears (e.g., “Enter a question”).

## Displaying Question-Answer Pairs on Multiple Lines

In the app you’ve built so far, the question and answer lists are displayed separately and with the default list display format for App Inventor. So, if you were making a quiz on state capitals and had entered two pairs of questions and answers, it might appear like so:

(What is the capital of California? What is the capital of New York? Sacramento Albany)

As you can imagine, if someone is creating a fairly long quiz, that could get pretty messy. A better display would show each question with its corresponding answer, with one question-answer pair per line like this:

```
What is the capital of California?: Sacramento
What is the capital of New York?: Albany
```

The technique for displaying a single list with each item on a separate line is described in Chapter 20—you may want to read that chapter before going on.

The task here is a bit more complicated, as you're dealing with two lists. Because of its complexity, you'll put the blocks for it in a procedure named `displayQAs`, and call that procedure from the `SubmitButton.Click` event handler.

To display question-answer pairs on separate lines, you'll need to do the following:

- Use a **foreach** block to iterate through each question in the `QuestionList`.
- Use a variable `answerIndex` so that you can grab each answer as you iterate through the questions.
- Use **make text** to build a text object with each question and answer pair, and a newline character (`\n`) separating each pair.

You'll need the blocks listed in Table 10-5.

Table 10-5. Blocks for displaying the question-answer pairs on separate lines

Block type	Drawer	Purpose
<b>to procedure</b> ("displayQAs")	Definition	This is a procedure block enclosing all other blocks.
<b>def var</b> ("answer")	Definition	Temporarily store each answer.
<b>def var</b> ("answerIndex")	Definition	Keep track of which answer (and question) the user is on.
<b>text</b> ("text")	Text	Initialize the variable <b>answer</b> to <b>text</b> .
<b>number</b> (1)	Math	Initialize the variable <code>answerIndex</code> to 1.
<b>set QuestionsAnswers Label.Text to</b>	My Definitions	Initialize the label to empty.
<b>text</b> ("")	Text	Plug this into <b>set QuestionsAnswers Label.Text to</b> .
<b>set global answerIndex to</b>	My Definitions	Reinitialize <code>answerIndex</code> each time <b>displayQAs</b> is called.
<b>number</b> (1)	Math	Reinitialize <code>answerIndex</code> to 1.
<b>foreach</b>	Control	Loop through the <code>QuestionList</code> .



Table 10-5. Blocks for displaying the question-answer pairs on separate lines (continued)

Block type	Drawer	Purpose
<b>name question</b>	(Appears as an argument of <b>foreach</b> , default name is <code>var.</code> )	Rename the <b>foreach</b> placeholder variable to <b>question</b> .
<b>global QuestionList</b>	My Definitions	Plug this into in the “list” slot of <b>foreach</b> .
<b>set answer to</b>	My Definitions	Set this variable each time in the <b>foreach</b> .
<b>select list item</b>	Lists	Select from the list <code>AnswerList</code> .
<b>global AnswerList</b>	My Definitions	Plug this into the “list” slot of <b>select list item</b> .
<b>global answerIndex</b>	My Definitions	Plug this into the “index” slot of <b>select list item</b> .
<b>set global answerIndex to</b>	My Definitions	Increment the index on each iteration through the loop.
<b>+</b>	Math	Increment <code>answerIndex</code> .
<b>global answerIndex</b>	My Definitions	Plug this into <b>+</b> .
<b>number (1)</b>	Math	Plug this into <b>+</b> .
<b>set QuestionsAnswers Label.Text to</b>	QuestionsAnswersLabel	Display the QAs.
<b>make text</b>	Text	Build each QA pair.
<b>QuestionsAnswers Label.Text</b>	QuestionsAnswersLabel	As we iterate, add each new pair to the previous ones.
<b>text (“\n”)</b>	Text	Place a newline between pairs.
<b>value question</b>	My Definitions	This is the placeholder of the <b>foreach</b> ; it’s the current question we’re processing.
<b>text (":")</b>	Text	Place a colon between the question and answer.
<b>global answer</b>	My Definitions	The current answer.

### How the blocks work

The **displayQAs** block encapsulates all of the blocks for displaying the data, as shown in Figure 10-6. By using a procedure, we won’t have to have the display blocks more than once in the app, and we can just call **displayQAs** when we need to display the lists.

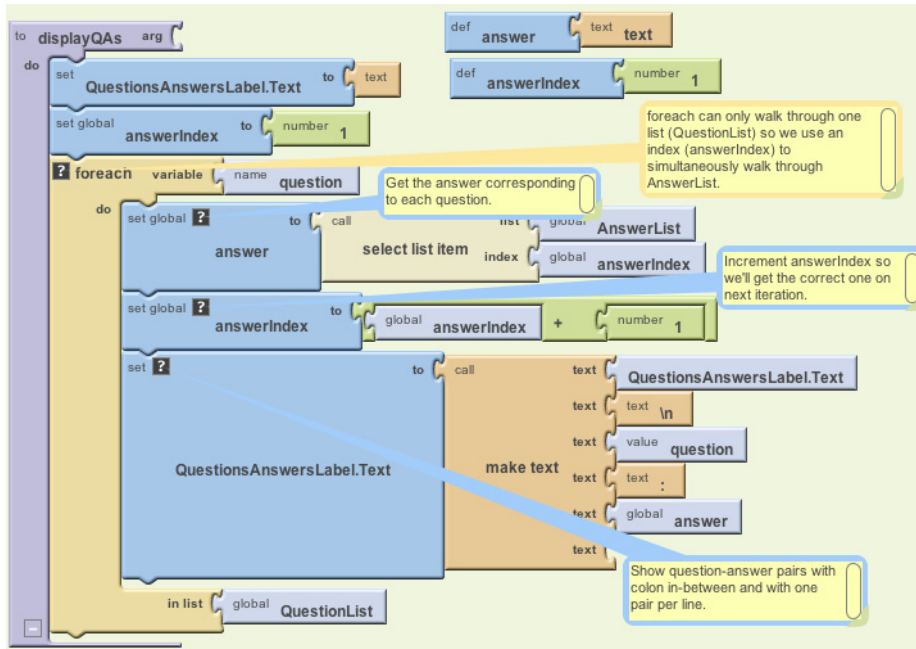


Figure 10-6. The `displayQAs` procedure

The **foreach** only allows you to iterate through one list. In this case, there are two lists, and you need to select each answer as you proceed through the questions. To accomplish this, we'll use an index variable, as we did with the `currentQuestionIndex` in the Presidents Quiz tutorial in Chapter 8. In this case, the index variable, `answerIndex`, is used to track the position in the `AnswerList` as the **foreach** goes through the `QuestionList`.

`answerIndex` is set to 1 before the **foreach** begins. Within the **foreach**, `answerIndex` selects the current answer from the `AnswerList`, and then it is incremented. On each iteration of the **foreach**, the current question and answer are concatenated to the end of the `QuestionsAnswersLabel.Text` property, with a colon between them.

### Calling the new procedure

You now have a procedure for displaying the question-answer pairs, but it won't help unless you call it when you need it. Modify the **SubmitButton.Click** event handler by calling **displayQAs** instead of displaying the lists with the simple **set QuestionsAnswersLabel.Text to** block. The updated blocks should appear as shown in Figure 10-7.

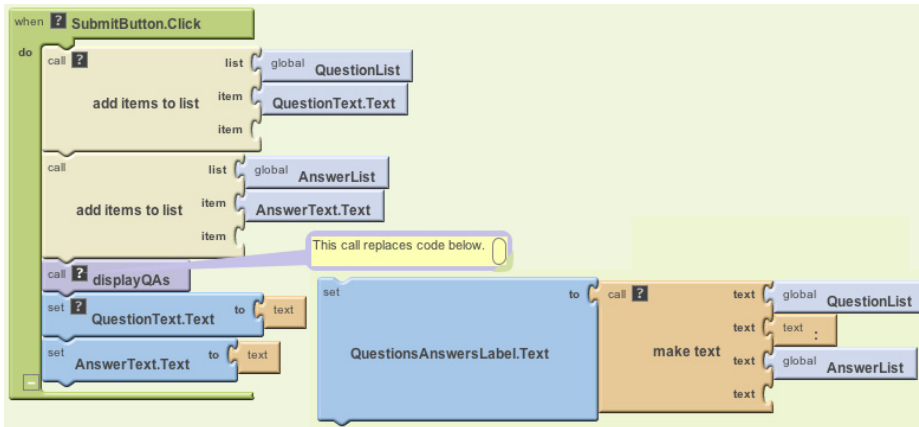


Figure 10-7. Calling the `displayQAs` procedure from `SubmitButton.Click`



**Test your app.** On the phone, add some more question-answer pairs. The display should now show each question with its corresponding answer, with each question-answer pair on a separate line.

## Storing the Questions and Answers in a Database

So far, you’ve created an app that puts the entered questions and answers into a list. But what happens if the quiz maker closes the app? If you’ve completed the “No Texting While Driving” app (Chapter 4) or the “Android, Where’s My Car?” app (Chapter 7), you know that if you don’t store the data in a database, it won’t be there when the user closes and reopens the app. Storing the data *persistently* will allow the quiz maker to view or edit the latest update of the quiz each time the app is opened. Persistent storage is also necessary because the `TakeQuiz` app needs access to the data as well.

You’re already familiar with using the `TinyDB` component to store and retrieve data in a database. But in this case, you’ll use the `TinyWebDB` component instead. Whereas `TinyDB` stores information directly on a phone, `TinyWebDB` stores data in databases that live on the Web.

What about your app design would merit using an online database instead of one stored on a person’s phone? The key issue here is that you’re building two apps that both need access to the same data—if the quiz maker stores the questions and answers on her phone, the quiz takers won’t have any way of getting to the data for

their quiz! Because TinyWebDB stores data on the Web, the quiz taker can access the quiz questions and answers on a different device than the quiz maker's. (Online data storage is often referred to as *the cloud*.)

Here's the general scheme for making list data—like the questions and answers—persistent:

- Store a list to the database each time a new item is added to it.
- When the app launches, load the list from the database into a variable.

Start by storing the `QuestionList` and `AnswerList` in the database each time the user enters a new pair. You'll add the blocks shown in Table 10-6 to the **SubmitButton.Click** event handler.

Table 10-6. The blocks for storing the data to the database

Block type	Drawer	Purpose
<b>TinyWebDB1.StoreValue</b>	TinyWebDB1	Store questions in the database.
<b>text</b> ("questions")	Text	Plug in "questions" as the tag of <b>StoreValue</b> .
<b>global QuestionList</b>	My Definitions	Plug this into the "value" slot of <b>StoreValue</b> .
<b>TinyWebDB1.StoreValue</b>	TinyWebDB1	Store answers in the database.
<b>text</b> ("answers")	Text	Plug in "answers" as the tag of <b>StoreValue</b> .
<b>global AnswerList</b>	My Definitions	Plug this into the "value" slot of <b>StoreValue</b> .

## How the blocks work

The **TinyWebDB1.StoreValue** blocks store data in a web database. **StoreValue** has two arguments: the tag that identifies the data and the value that is the actual data you want to store. As shown in Figure 10-8, the `QuestionList` is stored with a tag of "questions" while the `AnswerList` is stored with a tag of "answers."

However, for your app, you should use tags that are more distinctive than "questions" and "answers" (e.g., "DavesQuestions" and "DavesAnswers"). This is important because you're using the default web database for App Inventor, so your data (the list of questions and answers) can be overwritten by others, including other people following this tutorial.

Note that the default web service is shared among programmers and apps, so it is intended only for testing. When you're ready to deploy your app with real users, you'll want to set up your own private database service. Fortunately, doing so is straightforward and requires no programming (see Chapter 22).

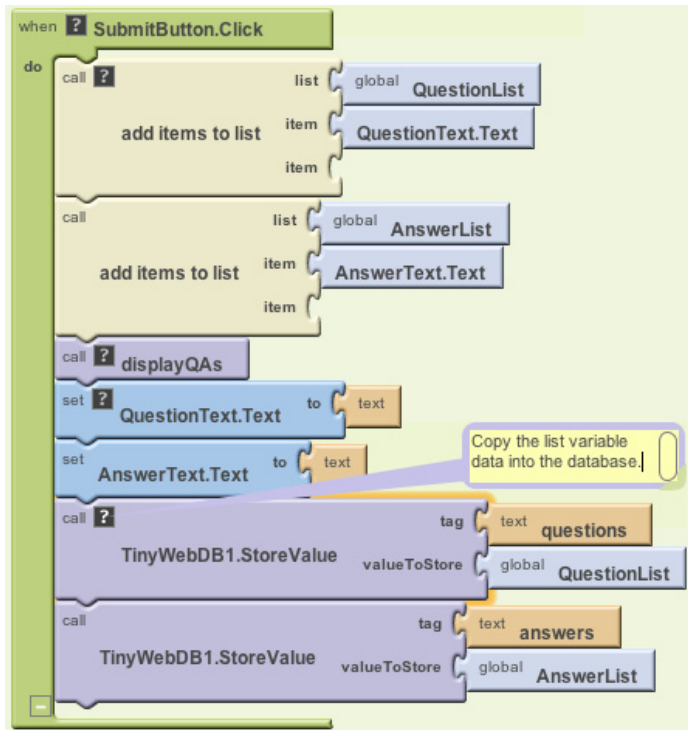


Figure 10-8. Storing the questions and answers in the database



**Test your app.** Enter a question and answer and click Submit. To check if your data was stored in the database as desired, open a browser and enter the URL <http://appintinywebdb.appspot.com> in the address bar. The page that appears is the administrative interface to the database and includes a table of tag-value pairs. If you search for the tag you used in the **StoreValue** blocks (e.g., “questions”), you can check the value stored with it. You can also click on the “/getvalue” link and enter your tag to find its value. Does your data appear?

## Loading Data from the Database

One reason we need to store the questions and answers in a database is so the person creating the quiz can close the app and relaunch it at a later time without losing the questions and answers previously entered. (We also do it so the quiz taker can access the questions, but we'll cover that later.) Let's program the blocks for loading the lists back into the app from the web database each time the app is restarted.

As we've covered in earlier chapters, to specify what should happen when an app launches, you program the **Screen.Initialize** event handler. In this case, the app needs to request two lists from the TinyWebDB web database—the questions and the answers—so the **Screen1.Initialize** will make two calls to **TinyWebDB.GetValue**.

You'll need the blocks listed in Table 10-7.

Table 10-7. *Screen.Initialize* blocks for retrieving database data

Block type	Drawer	Purpose
<b>Screen1.Initialize</b>	Screen1	Triggered when the app begins.
<b>TinyWebDB.GetValue</b> (2)	TinyWebDB	Request the stored QuestionList and AnswerList.
<b>text</b> ("questions")	Text	Instead of "questions," use the tag you used to store the questions.
<b>text</b> ("answers")	Text	Instead of "answers," use the tag you used to store the questions.

### How the blocks work

The **TinyWebDB.GetValue** blocks, shown in Figure 10-9, work differently than **TinyDB.GetValue**, which returns a value immediately. **TinyWebDB.GetValue** only *requests* the data from the web database; it doesn't immediately receive a value. Instead, when the data arrives from the web database, a **TinyWebDB.GotValue** event is triggered. You must also program another event handler to process the data that is returned.

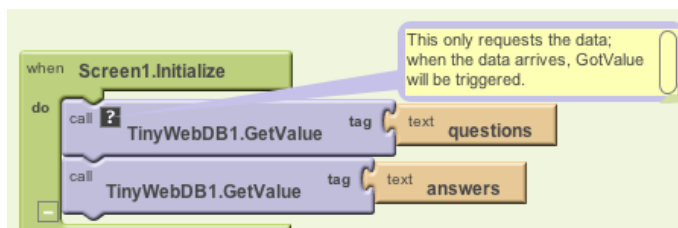


Figure 10-9. Requesting the lists from the database when the app opens

When the **TinyWebDB.GotValue** event occurs, the data requested is contained in an argument named `valueFromWebDB`. The tag you requested is contained in the argument `tagFromWebDB`.

In this app, since two different requests are made for the questions and answers, **GotValue** will be triggered twice. To avoid putting questions in your `AnswerList` or vice versa, your app needs to check the tag to see which request has arrived, and then put the value returned from the database into the corresponding list (`QuestionList` or `AnswerList`). Now you're probably realizing how useful those tags really are!

You'll need the blocks listed in Table 10-8 for the **GotValue** event handler.

Table 10-8. Blocks for `TinyWebDB.GotValue`

Block type	Drawer	Purpose
<b>TinyWebDB.GotValue</b>	TinyWebDB	Triggered when the data arrives.
<b>if</b>	Control	Check if the database has any data.
<b>is a list?</b>	List	If data is a list, it's non-empty.
<b>value valueFrom WebDB</b>	My Definitions	The argument holding the data returned from the database.
<b>ifelse</b>	Control	Ask which <code>GetValue</code> request arrived.
<b>=</b>	Math	Compare <code>tagFromWebDB</code> to "questions."
<b>text</b> ("questions")	Text	This is the tag that was used to store <code>QuestionList</code> .
<b>value tagFromWebDB</b>	My Definitions	An argument of <b>GotValue</b> ; specifies which request.
<b>set global Question List to</b>	My Definitions	If <code>tagFromWebDB</code> is "questions," this list will be set.
<b>set global Answer List to</b>	My Definitions	If <code>tagFromWebDB</code> is not "questions," this list will be set.
<b>value valueFrom WebDB (2)</b>	My Definitions	Hold the value returned from the database.
<b>if</b>	Control	Check if both the lists are loaded before displaying.
<b>=</b>	Math	Compare the lengths of the lists.
<b>length of list (2)</b>	Lists	Check if the lengths of the lists are the same.
<b>global QuestionList</b>	My Definitions	Plug this into one of the <b>length of list</b> blocks.
<b>global AnswerList</b>	My Definitions	Plug this into the other <b>length of list</b> block.
<b>call displayQAs</b>	My Definitions	Display the newly loaded questions and answers.

### How the blocks work

The app calls **TinyWebDB1.GetValue** twice: once to request the stored `QuestionList` and once to request the stored `AnswerList`. When the data arrives from the web database from either request, the **TinyWebDB1.GotValue** event is triggered, as shown in Figure 10-10.

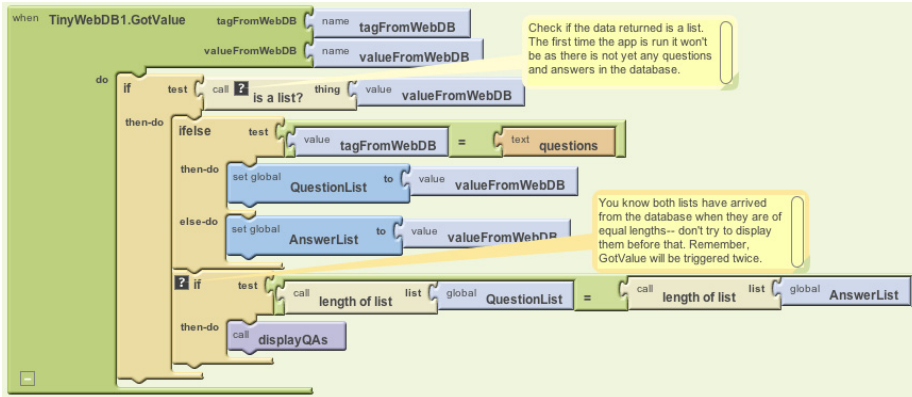


Figure 10-10. *GotValue* is triggered when the data arrives from the Web

The `valueFromWebDB` argument of **GotValue** holds the data returned from the database request. We need the outer **if** block in the event handler because the database will return an empty text ("" in `valueFromWebDB` if it's the first time the app has been used and there aren't yet questions and answers. By asking if the `valueFromWebDB` **is a list?**, you're making sure there is some data actually returned. If there isn't any data, you'll bypass the blocks for processing it.

If data is returned (**is a list?** is true), the blocks go on to check which request has arrived. The tag identifying the data is in `tagFromWebDB`: it will be either "questions" or "answers." If the tag is "questions," the `valueFromWebDB` is put into the variable `QuestionList`. Otherwise (else), it is placed in the `AnswerList`. (If you used tags other than "questions" and "answers," check for those instead.)

We only want to display the lists after both have arrived (**GotValue** has been triggered twice). Can you think of how you'd know for sure that you have both lists loaded in from the database? These blocks use an **if** test to check if the lengths of the lists are the same, as this can only be true if both have been returned. If they are, the handy **displayQAs** procedure you wrote earlier is called to display the loaded data.



**Test your app.** Restart the app by clicking "Connect to Device..." in the Blocks Editor. When the app initializes, it should display the previously entered questions and answers. If you close the app and restart, the previous quiz should still appear.





## TakeQuiz: An App for Taking the Quiz in the Database

You now have a MakeQuiz app that will store a quiz in a web database. Building TakeQuiz, the app that dynamically loads the quiz, is simpler. It can be built with a few modifications to the Presidents Quiz you completed in Chapter 8 (if you have not completed that tutorial, do so now before continuing).

Begin by opening your Presidents Quiz app, choosing **Save As**, and naming the new project “TakeQuiz”. This will leave your Presidents Quiz app unmodified but allow you to use its blocks as the basis for TakeQuiz.

Then make the following changes in the Designer:

1. This version of MakeQuiz/TakeQuiz does not display images with each question, so first remove the references to images from the TakeQuiz app. In the Component Designer, choose each image from the Media palette and delete it. Then delete the Image1 component, which will remove all references to it from the Blocks Editor.
2. Since TakeQuiz will work with database data, drag a TinyWebDB component into the app.
3. Because you don’t want the user to answer or click the NextButton until the questions are loaded, uncheck the Enabled property of the AnswerButton and NextButton.

## TakeQuiz: Modifying the Blocks to Load the Quiz from the Database

Now modify the blocks so that the quiz given to the user is loaded from the database. First, since there are no fixed questions and answers, remove all the actual question and answer text blocks from the **make a list** blocks within the QuestionList and AnswerList. The resulting blocks should appear as shown in Figure 10-12.



Figure 10-12. The question and answer lists now start empty

You can also completely delete the PictureList; this app won’t deal with images. Now modify your **Screen1.Initialize** so that it calls **TinyWebDB.GetValue** twice to load the lists, just as you did in MakeQuiz. The blocks should look as they do in Figure 10-13.

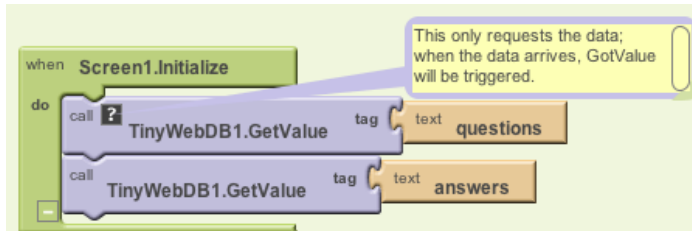


Figure 10-13. Requesting the questions and answers from the web database

Finally, drag out a **TinyWebDB.GotValue** event handler. This event handler should look similar to the one used in *MakeQuiz*, but here you want to show only the first question and none of the answers. Try making these changes yourself first, and then take a look at the blocks in Figure 10-14 to see if they match your solution.

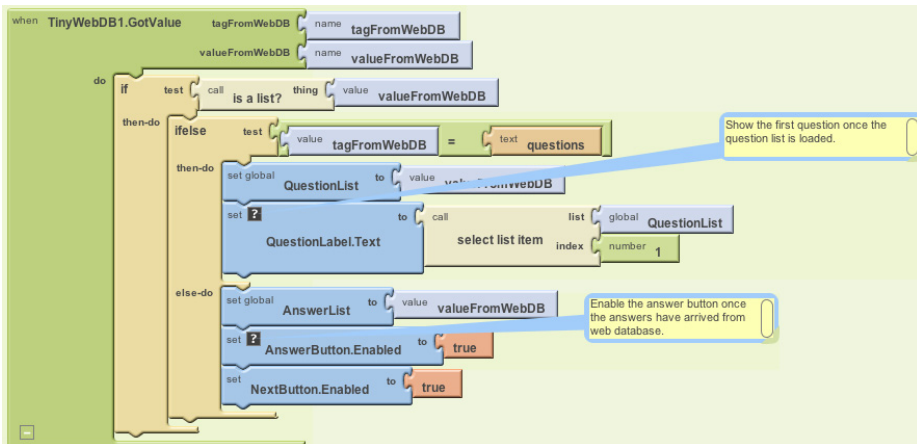


Figure 10-14. *GotValue* handles the data that arrives from the Web

## How the Blocks Work

When the app begins, **Screen1.Initialize** is triggered and the app requests the questions and answers from the web database. When each request arrives, the **TinyWebDB.GotValue** event handler is triggered. The app first checks if there is indeed data in `valueFromWebDB` using **is a list?** If it finds data, the app asks which request has come in, using `tagFromWebDB`, and places the `valueFromWebDB` into the appropriate list. If the `QuestionList` is being loaded, the first question is selected from `QuestionList` and displayed. If the `AnswerList` is being loaded, the `AnswerButton` and `NextButton` are enabled so the user can begin taking the test.



**Test your app.** Restart the app by clicking “Connect to Device...” in the Blocks Editor. Does the first question from your MakeQuiz quiz appear? Can you take a quiz just as you did with the Presidents Quiz (except for the pictures)?

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## The Complete App: TakeQuiz

Figure 10-15 illustrates the final blocks for TakeQuiz.

### Variations

Once you get MakeQuiz and TakeQuiz working, you might want to explore some variations. For example:

- Allow the quiz maker to specify an image for each question. Of course, you (the app developer) can't preload these images, and there is currently no way for an app user to do it. So the images will need to be URLs from the Web, and the quiz maker will need to enter these URLs as a third item in the MakeQuiz form. Note that you can set the `Picture` property of an `Image` component to a URL.
- Allow the quiz maker to delete items from the questions and answers. You can let the user choose a question using the `ListPicker` component, and you can remove an item with the **remove list item** block (remember to remove from both lists and update the database). For help with `ListPicker` and list deletion, see Chapter 19.
- Let the quiz maker name the quiz. You'll need to store the quiz name under a different tag in the database, and you'll need to load the name along with the quiz in `TakeQuiz`. Once you've loaded the name, use it to set the `Screen.Title` property so that it appears when the user takes a quiz.
- Allow multiple, named quizzes to be created. You'll need a list of quizzes, and you can use each quiz name as (part of) the tag for storing its questions and answers.

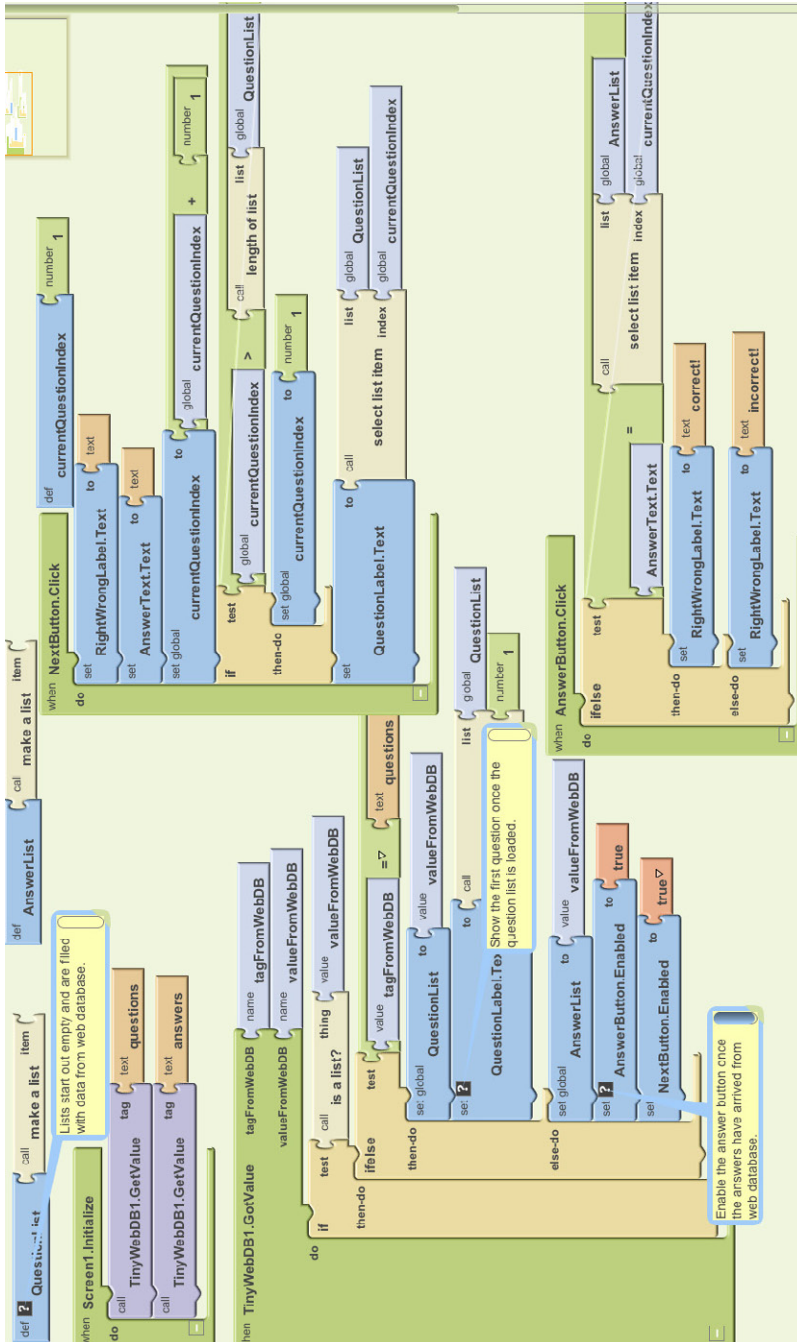


Figure 10-15. The blocks for TakeQuiz

## Summary

Here are some of the concepts we've covered in this chapter:

- Dynamic data is information input by the app's user or loaded in from a database. A program that works with dynamic data is more abstract. For more information, see Chapter 19.
- You can store data persistently in a web database with the TinyWebDB component.
- You retrieve data from a TinyWebDB database by requesting it with **TinyWebDB.GetValue**. When the web database returns the data, the **TinyWebDB.GotValue** event is triggered. In the **TinyWebDB.GotValue** event handler, you can put the data in a list or process it in some way.
- TinyWebDB data can be shared among multiple phones and apps. For more information on (web) databases, see Chapter 22.