

Quiz System Instructions

V1.7

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Equipment Checklist

System essentials

- ☐ Raspberry Pi 400.
- ☐ Power supply with USB-C plug.
- ☐ Micro SD memory card with quiz software installed.
- ☐ Micro HDMI -> HDMI adapter.
- ☐ HDMI cable for main projector.

System extras

- ☐ Micro HDMI -> VGA adapter. For an older projector, that might be cabled in at the venue or available as a standby.
- ☐ VGA cable.
- ☐ A stand-alone Wi-Fi access point or router. E.g. a Draytek Vigor AP-810 and power supply. May be needed when laptops and tablets can't be kept close to the RPi.
- ☐ Kensington Wireless Presenter for the controller. Allows the controller to sit further away from the RPi.

Other essentials

- ☐ Scorer's laptop, with power supply.
- ☐ Quizmaster's tablet, with charger.
- ☐ 2 extension power cables.
- ☐ 2 cable cover strips, or gaffer tape.
- ☐ Printed copy of questions and answers for the quizmaster.
- ☐ Scoring sheets and pen, to save scores against system failure.
- ☐ Make sure you know how to select a new Wi-Fi network for each laptop or tablet you are using.

Other extras

- ☐ Laptops or tablets, with power supplies and video cables, if you wish to show replica displays of the main display, or a separate scoreboard.
- ☐ Projector(s) for replica displays, if not provided by the venue.

Emergency fallback equipment

- ☐ Laptop with question and answer slides on PowerPoint. Also usable as a spare for scorer or quizmaster. With charger and HDMI -> VGA adapter.
- ☐ Duplicate scoring sheet, to allowing scoring next round while quizmaster has scores from previous round.
- ☐ Portable projector, if venue doesn't provide a spare.
- ☐ If cautious: a second RPi 400 (or RPi 4 and keyboard), with memory card and power supply. With the other backup equipment, this would give full redundancy against hardware failures, at a total cost less than £100.

Raspberry Pi 400 Setup

Socket

Connect

One USB-C socket
- a small oval socket.

For power only. Use the power supply that came with the system, or a laptop USB-C power supply.

A mobile phone charger is unlikely to provide enough power. A cable plugged into a laptop's USB socket might work.

Two micro HDMI sockets
- wider at the top than the bottom.

For video. Use the micro HDMI socket next to the power supply socket.

The quiz application does not use the second socket.

Micro SD card slot.

The micro SD card stores the operating system, the quiz application and quiz data.

The SD card must stay in place while the system is running. If the system will not start, try pressing inwards to release it, and then click it back in.

One white USB2 socket
Two blue USB3 sockets.

The slower white one is fine for a Kingston Wireless Presenter or mouse. Use one of the faster blue ones for a memory stick, if needed when setting up the quiz.

Connect everything *before* switching on.

- Press **F10** or **fn+F10** to switch on the RPi.
- The RPi shows a green light (top right) when running.
- Press **fn+F10** for 2 seconds to switch off the RPi. Release the keys and wait a few seconds for the power light to turn off before unplugging the power supply.

Raspberry Pi Help

A system menu will show on a connected display. You will not normally need to use the menu, as the quiz browser will start automatically after a 30 seconds. To make changes, press a number key and then **Enter**.

| Key | Function |
|-----|--|
| 1 | Start quiz browser. Selected automatically after 30 seconds. To quit the browser: alt+F4 . |
| 2 | Reconfigure the RPI to provide a Wi-Fi network. The system will reboot before showing the menu again. This is the default mode for a new installation. |
| 3 | Reconfigure the RPi to connect to a separate Wi-Fi Access Point. The system will reboot before showing the menu again. Use this mode when a stronger Wi-Fi signal is needed. See Appendix 2 for details. |
| 4 | Show the WiFi network name and the quiz server IP address. |
| 5 | Run a Linux desktop, to use the RPi as a general purpose computer. |
| 6 | Run the system console, for maintenance changes. To restart the system menu, type: exit and wait a few seconds. |

Note

- The configuration changes made by items 2 and 3 are saved across system restarts.
- You will need a mouse to use the Linux desktop. To quit the desktop: press raspberry key, down-arrow to Shutdown, press enter key, down-arrow to Exit, press enter key.

The RPi system password is:

[**RPi password**].

Quiz Menu

The main menu items are:

- Controller: for the person stepping through the sequence of questions, answers and scores.
- Scorers: for the person entering scores.
- Displays: to select optional displays. Of these, the Quizmaster's display is the most useful. The others are intended for awkward venue layouts.
- Admin: to setup the quiz. There is also an option to monitor device connections (see Appendix 3).

Note: With no mouse, use the **tab** key to step through menu items and buttons on a display, and use the **enter** key to select an item. **shift-tab** steps backwards.

Connecting the Other Devices

The RPi provides a web server (a web site) showing the quiz app, and a Wi-Fi hub. Connect other laptops or tablets:

- To enter teams and questions before the quiz.
- For the scorers. Essential.
- For the quizmaster. Optional.
- For a replica copy of the main display, or for a separate scoreboard. Optional.

Normally you would:

- Connect the main display to the RPi, and use the RPi as the controller for the quiz. See Appendix 1 for other options.
- Use the RPi to provide a Wi-Fi Network. See Appendix 2 for other options.

To connect other devices to the RPi:

1. Connect the device to the RPi Wi-Fi network: **QUIZ-RPI**. The password is:

[Wi-Fi password 1]

2. Open a web browser, and type **quiz.home.arpa** as the website address.

On Apple devices with iCloud Private Relay on, use **192.168.4.1** as the website address instead. This works on all devices.

Note:

- Beware the audience overhearing the Wi-Fi password! There is no other protection against anyone changing scores or playing with the system.
- If you set up a separate Wi-Fi access point, as Appendix 2, the WiFi network is **QUIZ-AP** (or whatever you chose) and the website address will be the one shown by the RPi on startup.

Quiz Setup

Connection at Home

When you are setting up teams and questions before the quiz, it is simplest to run the RPi without a display, and connect your own laptop as above.

Your laptop will not have access to the internet while it is connected to the RPi, so make sure you have already downloaded to your laptop any pictures needed.

Alternatively, you could:

1. Connect the RPi to your own display, such as a TV or computer monitor, using an HDMI cable.
2. Plug in a USB mouse, or a wireless mouse with a USB dongle.
3. Setup the quiz using the RPi's keyboard and mouse.
4. Supply any pictures using a USB memory stick.

If you are familiar with RPi operation, then any usual method of connection will work, such as an Ethernet cable to your router, or Wi-Fi set via **raspi-config** (as Appendix 2) or Raspberry Pi Desktop settings. (Take care not to expose the quiz web server to the internet.)

Quiz Settings

- ☐ Select **Admin > Setup**.

Specify:

- A title for the quiz. E.g. "Primary Schools Quiz 2024".
- The organiser of the quiz. E.g. "Rotary Club of Perth".
- The number of tie-breaker rounds.
- The number of top teams shown on the scores for the final round of the quiz. E.g. "4". You might do this for dramatic effect and to avoid highlighting the teams who have the lowest scores.
- The number of rounds by which answers and scores are deferred. E.g. "1". This keeps the quiz flowing by allowing one round to be scored while the teams are working on the next round.
- The rate at which replica displays poll for updates. The default of 1 second should be fine. However if display updates are erratic it may be the Wi-Fi network or quiz server is becoming overloaded, and you should try a longer interval. Use the **Admin > Monitor Displays** page to check which devices are managing to update dependably.

Teams

Specify the team names. They will be shown in alphabetic order at the start of the quiz.

You should not add teams during the quiz. However it is possible to delete a team that has withdrawn while the quiz is running. Use the scorers laptop and choose the setup menu item.

Rounds

Specify the round names. You can reorder the rounds by changing their order numbers, but do not do this after the quiz has started.

Round formats modify the appearance of a round. Separate multiple formats by "|". E.g. "Q3|A3|I".

| Code | Effect |
|-----------|---|
| Qn | Limit the number of Q uestions per slide. E.g. "Q3" for 3 questions per slide, for long questions. |
| An | Limit the number of A nswers per slide. E.g. "A3" for 3 answers per slide, when questions have long answers. |
| Cn | C ombined questions and answers on a single page. Typically used for "sudden death" rounds. E.g. "C3". |
| E | Show E nd of quiz slide after round scores. |
| I | Show I nterval slide after round scores. |

Notes

- An interval slide is shown after the scores for that round. So for a 10 round quiz with deferred answers and an interval in the middle, set **I** on round 4, because we want questions for round 5, then answers and scores for round 4, and then the interval.
- Specify an end-of-quiz slide after the last normal round, and also after each tie-break round.
- You can change a round title during a quiz.

Questions and Answers

Specify questions and corresponding answers for each round. You can reorder the questions by changing their order numbers.

The system will shrink text size automatically to fit the whole round on a slide. However, if the questions or answers are long, it is better to change the round format to split it over multiple slides.

Questions can include pictures, sound clips or videos. Audio files can be uploaded in MP3, AAC, FLAC, or M4A format. Video files can be uploaded in MP4 or MOV format. All other file types are assumed to be pictures. JPG (or JPEG), and PNG are recommended.

You can change individual questions and answers during the quiz, for example to correct a mistake.

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Controller Help

- Select **Controller > Start**.

The controller steps through the slides of the quiz, following the lead of the quizmaster.

- Use the **spacebar** or **right-arrow** keys to advance.
- Use the **left-arrow** key to step backwards, if you have gone too far. *Do not use the browser's back button!*

The **esc** key (or **q** or **x**) terminates the quiz slides and returns to the controller's menu. Use **Resume** (instead of **Start**) to resume the quiz without resetting scores.

On a tablet or phone, touch the display to show buttons on the sides of each slide. It is also possible to swipe left and right. *Swiping is not recommended, because a swipe right from the extreme left edge of screen is the browser back action!*

You must advance to the answers slide before the quizmaster can see the scores for that round. *Don't forget to do this on a tie-break round!*

Notes

- With no mouse, use the **tab** key to step through menu items and buttons on a display, and use the **enter** key to select an item. **shift-tab** steps backwards.
- **Controller > Practice** just disables replica displays and scoreboards, so it is only useful for practicing at a venue when the controller is not connected to the main projector (as Appendix 1).

What to Expect

Blank slides are interleaved between questions, answers and scores, so that the next round is not introduced accidentally.

If questions (or answers) are wordy, there will be more than one slide.

Scores appear starting with the lowest for the round. When the last team appears, advance one more step to show the team leaderboard (i.e. scores with highest first).

If a scores slide is reached before the corresponding scores are available, it will show "Waiting for scores" and it will be updated automatically when the scores are available.

There is an interval screen (after the round 4 scores for a 10 round quiz), and an end-of-quiz screen (after the final scores).

After the final round, the top 4 teams are shown in reverse order, instead of showing the round scores. (There might be more than 4 teams if scores are tied.) Advance one more step to show the leaderboard with all teams.

Step past the end-of-quiz screen to get to the tie-break round. Only the teams taking part will appear on the scores slide. All the top teams will appear on the leaderboard.

On a sudden death round, each answer appears immediately after the question. *Take care not to show the answer too soon!*

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Quizmaster Help

- ☐ Select **Displays > Quizmaster**.

The Quizmaster's display shows two slides:

1. The scores for the current round, in ascending order.
2. The leaderboard, in descending total score.

Both slides show an indication when scores for the next round are ready. The new scores appear when the answers are started on the main display. You can start the answers before the scores are ready, if there is a delay. Slides are updated as soon as the scores are available.

- Use the **spacebar** or **right-arrow** keys to see the leaderboard.
- Use the **left-arrow** key return to the first slide.

On a tablet or phone, touch the display to show buttons on the sides of each slide. It is also possible to swipe left and right. *Beware: a swipe right from the extreme left edge of screen is the browser back action, returning to the Displays page!*

When answers for a round are shown, the display switches back from the leaderboard to the round scores automatically.

What to Expect

After the interval, round 6 questions are given before round 5 answers (assuming a 10 round quiz).

On the final round there are three slides (usually only the first one is useful):

1. The top teams in descending order, just as they will be shown to the audience.
2. The full scores for the final round - this slide will not be shown to the audience because it would reveal the result of the competition.
3. The full leaderboard.

On a tie-break round, the first slide shows the tied teams, and the second slide a leaderboard of all teams.

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Scorers Help

- ☐ Select **Scorers**.

Scoring requires two steps. First enter scores for the current round and save the scores. When scores have been checked and corrected, publish the scores. This makes them visible to the quizmaster, and then to the audience when the appropriate point in the quiz is reached.

1. Use the **Score Round** to enter scores.
2. Click **Save** to save scores. You can do this for a partial set of scores. Use the browser's back button to cancel accidental entries.
3. Use **Publish Round** when all scores have been entered and checked. On a normal round, every team must be scored (with 0 if appropriate) before the round can be published.
4. Use **Summary** to view all scores. Make a paper copy of the scores, for use if the system should fail.. You can also click the round number at the top of the page to edit the scores for a previous round. The leaderboard will be updated automatically.

On tie-break rounds, enter scores for just the teams taking part in that round. This could be e.g. teams in second place if two teams are going through to the next round.

It is recommended that a scorer keeps a record of scores on paper. That will allow the quiz to be continued should the system fail.

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Emergency Help and Fallbacks

No output from RPi to display

- Does the RPi have power - Is the power light on?
- Is the HDMI cable plugged into the correct socket - the one next to the USB-C power socket?
- Is the HDMI cable fully plugged in to the projector?
- Is the projector switched on with the correct input selected? Use the projector's remote control or switch the projector off and on while the RPi is running and wait.

RPi is not responding

- Try switching the power supply off and on again. If it works as the controller, resume the quiz as "Controller is not responding", below.
- If a spare RPi is available, move the micro SD memory card to it. Then connect the new RPi to the main display, and resume.
- Connect the spare laptop with a PowerPoint copy of the Q&A slides to the main display, and start the presentation at the current round. Use the paper sheets for scoring.

Cannot connect a device to the RPi

- If you have not connected successfully before, the problem is very likely to be a mistyped Wi-Fi passphrase.
- Try a spare device. If any other devices can connect, the problem is likely to be with the device rather than the RPi.
- If no devices can connect:
 - If the RPi is providing the Wi-Fi, switch it off and on again. Make sure there is no interference such as a mobile phone very close to the RPi. Try bringing the devices closer.
 - If the RPi is being used with a separate Wi-Fi access point, as Appendix 2, switch both the AP and the RPi off. Switch on the AP first and give it a few minutes to settle before switching on the RPi.
- When the RPi restarts, check the server's IP address and WiFi ID shown at the top of the system menu. If the address is not shown, use system menu 4. The WiFi ID is the name you must select for Wi-Fi. The server IP address is the numeric website name you must use in the web browser.

Controller is not responding

If you are using a separate device as controller (as Appendix 1, Option 2):

1. Go to the RPi (connected to the main display).
2. Press ESC to show the menu.
3. Select **Home > Controller > Resume** to resume control of the display at the current screen.
4. Continue to step through questions and answers, using the RPi keyboard.
5. Skip the scores screens, if scores are not being updated because of a network failure.

Scorer's PC is not responding

- Try a spare PC or tablet. Re-synchronisation is automatic.
- Use the paper sheets to record scores and pass them quizmaster. There should be two copies, so you can update one sheet while the quizmaster is reading the other.

Quizmaster's device is not responding

- Try a spare tablet or PC. Re-synchronisation is automatic.
- Continue to enter scores to be seen by the audience. Use the paper sheets to copy scores and pass them quizmaster. There should be two copies, so you can update one sheet while the quizmaster is reading the other.

Leaderboard display is not responding

This display is not essential. Switch it off.

Appendix 1: Using Another Device to Drive the Main Display

The venue layout may make it awkward to have the controller seated near the connection point for the main projector. In this case you may use one of these options:

1. Use a Kensington Wireless Presenter plugged in to the RPi. This is suitable for distances up to 15 metres.
2. Connect the RPi to the main projector, and use it to show a replica display. Use a laptop or tablet as the controller. In a large venue you will need to use a separate Wi-Fi Access Point to provide a stronger Wi-Fi signal. See Appendix 2.
3. Connect a laptop or tablet to the main projector and use it to show a replica display. The RPi can run without a display connected. It isn't practical to type blind on the RPi keyboard, so use a second laptop or tablet as the controller. You may need a separate Wi-Fi AP, as for option 2.

Option 3 also allows you to show multiple copies of the display, for venues where not everyone can see the main display. However it needs care to set up, which is why options 1 or 2 are preferred.

Make sure:

- Power management is set on the display device to prevent it from sleeping.
- All notifications such as antivirus updates are turned off.
- Dismiss any warnings that the device is not connected to the internet, or that the website does not provide a secure connection.

Browsers

Maximise the browser window (full-screen mode), and move the cursor to the bottom right of the display to hide it.

Not all browsers are equally good for the main display, because some show extra clutter even when the window is maximised. In order of preference:

1. Chrome (on Windows)
 - Has a full-screen mode, with nothing but the page
 - Park the cursor at lower right to make it disappear.
 - Arrow buttons only appear on screen when the cursor is moved.
2. Firefox (on Windows)
3. Safari (MacOS)
 - Has a single line address bar.
4. Chrome & Firefox (MacOS)
 - Full-screen mode has tabs and an address bar
5. Microsoft Edge (Windows)
 - Has tabs and an address bar, and intrusive warnings.
6. Safari (iPad)
 - No full-screen mode.
 - Arrow buttons shown.

Turn off Power Saving and Notifications

Settings change with software versions, so test on the actual devices that these settings work.

Windows 11 PC

Start > Settings >

- ☐ System > Power & battery > Screen and sleep :
When plugged in, turn off my screen after = Never
- ☐ System > Notifications : Notifications = Off
- ☐ Personalisation > Taskbar : Automatically hide the taskbar = checked

MacBook

System Preferences >

- ☐ Battery > Power Adapter : Turn display off after = Never
- ☐ Desktop & Screen Saver > Screen Saver :
Show screen saver after = unchecked
- ☐ Notifications & Focus > Focus : Do Not Disturb = On

iPad

Settings >

- ☐ Display & Brightness > Auto-Lock = Never
- ☐ Focus : Do Not Disturb = On

Appendix 2: Using a Separate Wi-Fi Access Point

The RPi provides a Wi-Fi access point. Because it lacks an external aerial, the range may not be enough when devices are spread across a large room, especially if there is interference from other sources. If possible, do a test at the venue and monitor operation as Appendix 3.

An alternative is to use a separate access point device, such as a Vigor AP-810. If this operation was anticipated when the quiz system was installed, the RPi may have the Wi-Fi access pre-set. If not:

1. Open the system console (system menu 5).
2. Type `sudo raspi-config`.
3. Go to System Options > Wireless LAN, and set the network SSID to **QUIZ-AP** and the password as below.

To use the AP:

1. Configure the AP to serve a Wi-Fi network with SSID **QUIZ-AP** and password as below.
2. Position the AP as high as possible, and preferably somewhere near the RPi.
3. Restart the RPi using system menu 3 (connect to separate Wi-Fi Access Point).
4. When the system restarts, make a note of its IP address. It is shown above the system menu, or use system menu 4 to show it. The address may be **192.168.1.10** or similar.
5. Connect the other devices to the the Wi-Fi network: **QUIZ-AP**, with password as below.
6. Use the noted IP address in web browsers. "quiz.darpa.home" will not work.

[Server IP address]

[Wi-Fi password 2]

If a separate AP is needed, it is best to position it as high up as possible. A low position that works when a room is empty may be blocked when the room is filled with an audience. One option is a camera tripod or lighting stand with velcro straps to attach the AP.

It is also possible to use an existing Wi-Fi network. This is not recommended at a venue such as a hotel, because:

- The system needs a configuration change to set up user names and require logins. Otherwise anyone on the network can access the quiz system.
- You have no control over the load on the network, especially when the audience is present.

Appendix 3: Monitoring Displays

The quizmaster, replica and scoreboard displays are updated automatically by polling the server. As a quick check that they are working, some slides show the current time in the top right corner, and the “:” between hours and minutes turns on and off every five seconds.

A web page is provided to monitor the displays remotely. It is compact enough to view on a mobile phone.

☐ Select **Admin > Monitor Displays**.

This function shows the performance of each device. There is a row for each active device: **C** = Controller, **Q** = Quizmaster, **R** = Replica. The leftmost column shows the current minute, with previous one minute periods to the right. Two numbers are shown:

1. The number of missing poll request detected by the server.
2. The longest continuous run of missing requests in that period.

Each period is colour coded:

| | |
|--------------|---|
| Red | A run of 20 or more missing poll requests. |
| Amber | More than 5% of poll requests missing. |
| Green | At least 95% of poll requests received by the server. |

The bottom line shows if the server is responding to the monitor once a second: red for more than 10 seconds outage and amber for more than 5 seconds outage.

Note that failures may indicate a problem with the Wi-Fi network or with individual devices:

- If the seconds count shown on the Server line is not changing, the monitor itself has stopped. Reload the web page.
- If the monitor is working but communication with the server has stopped, and you are close to the server, suspect the server. Check if the displays have actually stopped working, and if so restart the server.
- If all devices are showing intermittent polling problems, suspect the Wi-Fi network. The venue may be too large for the range of the RPi, or there may be interference from other networks. Try using a separate Wi-Fi access point (as Appendix 2).