QMPlus Quizzes Q&A

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1 Your homework for the session

Before the Q&A session, please create a quiz to work with. Instructions for this are at `https://elearning.qmul.ac.uk/guide/how-to-create-manage-a-quiz/`. These are out of date regarding what the QMPlus interface looks like, unfortunately.

Look through the list of question types at `https://docs.moodle.org/38/en/Question_types`. Select a few which you expect to be useful in your module, and try creating a specimen of each.

QMPlus has some third-party question types installed that are not on that list, but they are underdocumented so I don't recommend them for your first go. Other question types you may *not* want to start with are

- *Random short-answer matching*: you need to create a "category" for this.
- *Embedded answers*: this uses a fiddly syntax for writing the interactive components.
- *Calculated* and *Calculated multichoice*: do experiment with these, but I suggest trying *Calculated simple* first. These three types are similar. The creation interface for *Calculated simple* is all on one page, whereas the other two split it across three pages so it's easier to get lost during the creation process.

Don't hesitate to try out question types that belong to a different assessment than the one you're notionally designing. Your effort won't be wasted: if you create a useful question you can delete it from this quiz and it will remain in the module's "question bank", ready to be added to the correct quiz later. See `https://docs.moodle.org/38/en/Question_bank`.

If your module is of a theoretical bent, and thus heavy on definitions, proofs, etc., think about how you might assess these in an open-book, automatically marked way. To repeat an example of Mark W's, one can ask "which of the following is a valid definition of . . . ?", where none of the given options is verbatim the definition given in lectures. In my alternative assessment for Introduction to Algebra, I included a short proof using the ring axioms using the *Drag and drop into text* question type: I provided the skeleton of a proof, and students had to drag and drop a valid sequence of equations forming the steps of a proof, as well as which ring axiom justified each deduction. The *Essay* question type is for students to submit text to be marked by hand, should you have the resources to do so.

2 Randomisation

I know three ways to randomise the content of a QMPlus quiz.

- The three *Calculated* question types allow an arbitrary number of numeric random variables, values chosen separately for each student. Question text and answers can contain functions of these variables. This is probably the most useful for us.
- If you create a question category `https://docs.moodle.org/38/en/Question_categories` and some questions inside it, you can have each student be given a random selection of questions from that category by choosing "a random question" from the "Add" menu. (You can use "tags" for finer control over the selection; ask me if interested.)
- The *Random short-answer matching* question type achieves a similar purpose to "Add a random question", but the correct answer for each question appears as a distractor answer in the others. In other words, it's like a *Matching* question with some subitems randomly removed.

There are also shuffling features, which can help frustrate the more trivial attempts by students to give their answers to others.

- Most questions can randomise the order of their answer choices, and will do so by default. This can be disabled for an individual question (in the question creation interface, untick the "Shuffle the choices?" box), or for the whole quiz (go to the "Edit settings" page, expand the "Question behaviour" section, and set "Shuffle within questions" to "No").
- The questions within the quiz can be shuffled: on the "Edit quiz" page, tick the "Shuffle" box. This is all or nothing. If you want shuffling within subsections of a quiz, you may be able to emulate that with the "Add" > "a random question" option, by putting the questions in your subsection in a category and then adding every question in the category (in a random order).

3 Display and entry of mathematics

This is where QMPlus quizzes can get a little hinky.

The text of questions, and any other text entered in the rich text editor (the one with rows of buttons for bold and italic and so forth on top), can contain LaTeX. Sections of LaTeX are delimited by `\( \)`.

The random variables in *Calculated* questions work inside of LaTeX sections. But I know of no good way to make standard simplifications of notation: if the

question text contains `\( x + {a} \)` and the value of random variable `a` is -1, the text will simply display as $x + -1$.

The *Calculated* question types are designed with numerical computations in mind: e.g. they have facilities for significant figures displayed and for the tolerance accepted in marking numerical answers. For Introduction to Algebra, where any computations we do are exact, I only used integers, i.e. 0 decimal places everywhere. I set the answer tolerance to 0.49, nominal, for the following reason. QMPlus considers it to be an error condition if the displayed correct answer, with rounding applied, is not within the specified tolerance of the computed true answer, and prevents saving the question if this error is happening; this is frustrating to fix. But its default is to generate random variables with one decimal place, so if you set a narrow tolerance and don't vigilantly change that default it's easy to get into this error state.

If you want students to be able to enter answers without having to evaluate them as decimals, the *Algebra* question type allows this. *Algebra* questions present students with a textbox in which they can type formulas containing standard plain-ASCII surrogates for maths notation like "`sin()`", "`sqrt()`", "`pi`", and a "Display response" button that typesets what they have entered, so they can see if they've entered it correctly. (Known bug: if the student types in 0, the "Display response" button displays an empty space.) The same ASCII notation is used when you are entering the answers to check against.

The *Algebra* question type can also handle expressions containing variables. It compares a student's answer to yours by evaluating both at several random real values of the variables (by default; other methods are available but I've never had a reason to use them). In fact, the question type *expects* variables and will complain if no answer contains one, so if you want to use it for a question whose answer is a constant, to take advantage of its notation handling, a workaround is needed. If the correct answer is $\sqrt{2}$ I would create a variable, say `x`, and specify

> Answer 1: `sqrt(2)`, Grade: 100%
> Answer 2: `x`, Grade: None

Unfortunately, we have no question type that combines *Algebra*'s intelligent input format with the random variables from the *Calculated* types.

Mathematical objects other than real functions and numbers can sometimes be handled as text with the *Short answer* question type, with care. For example, suppose a question asks for the subset of $\{1, 2, 3, 4\}$ satisfying some conditions, and the answer is $\{1, 2\}$. I might code that as

> Answer 1: `{1, 2}`, Grade: 100%
> Answer 2: `*3*`, Grade: None
> Answer 3: `*4*`, Grade: None
> Answer 4: `*{*1*,*2*}*`, Grade: 100%
> Answer 5: `*{*2*,*1*}*`, Grade: 100%

When the student is reviewing their marked answers against the correct answers after submitting a quiz, QMPlus picks the first correct answer to show them; this is the function of Answer 1. The student's answer is compared against the given list top to bottom, in order, until a match is found, and an asterisk matches any sequence of characters, so Answers 2 and 3 have the function of marking wrong any submission containing `3` or `4`. The asterisks in Answers 4 and 5 are there so that it doesn't matter where students type spaces and how many. They also mean that an answer like "`{2,10}`" would be marked correct, but given that the question asks explicitly for a subset of $\{1, 2, 3, 4\}$ I find this an acceptable false positive. In practice – and this is a good rule to keep in mind throughout – students who engage with the quizzes are actually trying to provide the correct answer, rather than submitting weird clearly wrong answers in the hope of uncovering an edge case.

4 Two last tips

It's possible to export and import quiz questions to and from plain text, or share them using the "Sharing Cart" `https://elearning.qmul.ac.uk/guide/moving-content-around-with-the-sharing-cart/`. So if you've seen a question of mine or someone else's that you'd like to play with, I or they can give you a copy.

If you're doing a web search for more help on some aspect of QMPlus quizzes, remember that QMPlus is our branded version of Moodle, i.e. a search for "Moodle xyz" rather than "QMPlus xyz" will turn up more results.