Calculated Formula Questions

Calculated Formula questions present students with a question that requires them to make a calculation and respond with a numeric answer. The numbers in the question change with each user and are pulled from a range that you set. The correct answer is a specific value or a range of values. You may grant partial credit for answers falling within a range. Calculated Formula questions are graded automatically.

In this example, the numbers 6 and 9 are randomly generated from a range of values set by an instructor.

An instructor created this question by typing the following question text:

If a small glass can hold \([x]\) ounces of water, and a large glass can hold \([y]\) ounces of water, what is the total number of ounces in 4 large and 3 small glasses of water?

When a student views the question, the variables \([x]\) and \([y]\) are replaced with values that are generated randomly from number ranges that an instructor specifies.

Before You Begin

The process for adding a calculated question to an assessment has three steps:

• Create the question and formula
• Define the values for the variables
• Confirm the variables and answers

How to Create the Question and Formula

1. Access a test, survey, or pool. To learn more, see Tests, Surveys, and Pools.
2. On the action bar, point to Create Question and select Calculated Formula.
3. The Question Text must contain at least one variable. Surround variables with square brackets. Variables are replaced by values when shown to students.

Variables can be letters, digits (0-9), periods (.), underscores (_) and hyphens (-). Variables cannot contain the letters "e," "i" and "pi" because they are reserved. You cannot reuse variable names. Variables can contain more than one character, such as [ab] or [cd]. All other occurrences of the opening rectangular bracket ("["") should be preceded by the backslash ("\")

4. The Answer Formula is the mathematical expression used to find the correct answer. Choose operators from the buttons across the top of the Answer Formula box. In the example, the formula is \(4y+3x\).
The formula is not visible to students—it is used by the system to determine the correct answer to the question.

![Create/Edit Calculated Formula Question](image)

The answer formula tool is written by WIRIS. To learn more, see the WIRIS manual [PDF].

5. In the Options area, leave the Answer Range at zero if the answer must be exact. Alternatively, set a range for correct answers. You can also Allow Partial Credit and select Units Required.

To learn more, see How to Set Answer Options.

6. Click Next to proceed.

How to Define the Variables

Use the next page in the process to define the question’s variables and select options for the automatically generated set of answers.

1. In the Define Variables section, provide the Minimum Value and Maximum Value for each variable. When the question is presented to a student, Blackboard Learn replaces the variable with a value that is randomly selected from the range you defined. You can use scientific notation in the value boxes. Select the number of Decimal Places for each variable’s value.

![Define Variables Table](image)

Note: The number of decimal places you select can affect the minimum and maximum values of a variable. For example, you set the minimum value as 0.0000004 and the maximum value as 1, and you choose 2 decimal places. The system rounds both numbers to 2 decimal places, therefore the system generates variables in the answer sets with values between 0.00 and 1.00.

2. In the Answer Set Options section, use the Calculate Answers To drop-down list to select the number of Decimals or Significant Figures for the generated correct answers. Type the number of Answer Sets, which is the number of possible variations of the question. Select whether the Correct Answer Format is normal or exponential.
3. Click **Next** to view the answer sets generated by the system.

### How to Edit the Answer Sets

The last page in the process displays the answer sets that were generated by the system. Each set represents one of the possible variations of the question that can be presented to students.

1. You can change the values of the variables in each answer set by typing in the boxes. Click **Calculate** to update the calculated answers and save your changes **before** submitting.

2. Click **Remove** in an answer set's row to delete it and have the system automatically replace it with another set. If you want to reduce the number of sets, click **Go Back** and change the number of answer sets under **Answer Set Options**.

3. Optionally, type feedback for correct and incorrect answers and add metadata. To learn more, see **Question Metadata**. You must enable the options for feedback and metadata on the **Question Settings** page for those options to appear in individual questions.

4. Click **Submit** -OR- **Submit and Create Another** to add the question to the test.

### How to Set Answer Options

On the first page of question creation, you can select **Allow Partial Credit** or **Units Required**. After you select the check box, more options appear.

In the preceding example:

- An answer that is within plus or minus 4 is awarded 100% of the point total.
• An answer that is within the partial credit range of plus or minus 5 to 8 is awarded 50% of the point total.

The available options are:

• **Answer Range:** The range of answers that are awarded full credit. Select whether it is a **Numeric** range or a **Percentage** range. If the answer must be exact, type zero for the range.

• **Allow Partial Credit:** Allow partial credit on a less accurate range of answers. Set the **Partial Credit Points Percentage** to be awarded if the student’s answer is within the partial credit range.

• **Units Required:** The unit of measurement must be provided in the student’s answer. Type the **Answer Units** and **Units Points Percentage** to be awarded if the units are entered correctly.

**Examples**

The following examples use variables in equations. You can see how the instructor crafted the question text and the resulting student view of the question.

**Example 1**

![Example 1 Image]

**Example 2**

![Example 2 Image]
Creating a Calculated Formula Question (Flash video | 3m 19s)