

## Accounting Questions User Manual

Fred Neumann, 15.07.2019 00:33:00

### Changes

#### Version 1.7.2 (ILIAS 5.3) and 1.8.1 (ILIAS 5.4)

- Definition of variables and their use in question texts, bookings and feedback
- Definition of precision when comparing values

#### Version 1.3 (ILIAS 5)

- The Flash component is entirely replaced by HTML5. The result calculation is now done in ILIAS and allows an evaluation in the preview of a question. As a consequence, the settings **bestanden\_ab** and **debug** are no longer supported.
- **Multiple booking records per table are no longer supported.** The Interface will not show a switch for the beginning of a new booking record. Please use question parts instead. As a consequence the settings **bonus\_reihe** und **malus\_anzahl** are no longer supported for the question type 'booking records'.

### Basics

The question type „accounting question“ provides financial booking tables for t-accounts and booking records that have to be filled out by students and are compared with predefined bookings. These are configured by XML.

For each exercise a list of accounts is defined and according to a textual question (e.g. description of a business case) and one or more booking tables are shown.

### Usage in ILIAS in ILIAS

The question type can be installed as a plugin for ILIAS. It has to be stored with the following path in an ILIAS installation:

Customizing\global\plugins\Modules\TestQuestionPool\Questions\assAccountingQuestion

Afterwards the plugin can be activated and refreshed under *Administration > Plugins*.

Then the accounting question can be used like any other question types. When an accounting question is created the following properties have to be set:

- Title
- Author
- Textual Question (e.g. description of a business case to be booked)
- XML Definition or upload of a list of accounts. An example can be found as **kontenrahmen.xml** in the sub folder *examples* of the plugin.
- XML Definition or upload of booking tables for booking records or t-accounts. An example can be found as **buchungen.xml** or **buchungen\_konto.xml** in the sub folder *flash* of the plugin.

Optionally, variables can be defined in XML, which get their values by random selection. They can be used in question texts, bookings or feedback.

The question type allows to define more than one booking tables for a separate sub questions. Each sub question can be shown with a textual intro.

### *XML Structure of the Accounts Definition*

The accounts definition has the same structure for both question types (T-accounts or booking records). It defines which account numbers and names are available in the select fields of a booking table:

```
<?xml version="1.0" encoding="utf-8" ?>
<konten anzeige=" beide">
    <konto nummer= "800"    titel="AB" />
    <konto nummer= "801"    titel="SB" />
    <konto nummer= "300"    titel="Bank" />
    ...
</konten>
```

Each element **konto** has the attributes **nummer** for an accounts number and **titel** for an accounts title. Both should be unique.

There must be a surrounding element **konten** that contains various elements of type **konto**. Its attribute **anzeige** defines what should be shown in the select fields:

- **nummer**            only the accounts number
- **titel**             only the accounts title
- **beide**            both in format „number: title”

### *XML Structure of Bookings*

The root element of the XML definition determines the type of bookings:

```
<konto>                →        T-Account
<buchungssätze>      →        booking records
```

### *Import of XML files*

The XML definitions of accounts or bookings can be edited directly in the question or can be imported from an XML file. An XML file must be UTF-8 encoded and should have a 2-byte UTF-8 signature at file start. Then it is recognized as UTF-8 when opened in a text editor (e.g. Notepad) and the German special characters are encoded correctly. The sample files in the *examples* subfolder are encoded this way.

## Question Types

### *T-Accounts*

Questions for T-Accounts have the following structure:

Debit	Account title		Credit
[Select account ▼]	[Enter balance]	[Select account ▼]	[Enter balance]
...	...	...	...
	Show sum		Show sum

The student has to select accounts and enter their balances on the debit and credit side. The sides are evaluated independently but the sums should be equal.

## XML Definition of T-Accounts

The file buchungen.xml defines the presets, correct solution and given points for the booking question. For T-accounts it has the following structure:

```
<?xml version="1.0" encoding="utf-8" ?>
<konto    links="Debit"
          mitte="Account title"
          rechts="Credit"
          zeilen="10"
          summen_zeigen="1"
          bonus_reihe_links="0"
          bonus_reihe_rechts="0"
          malus_anzahl_links="0"
          malus_anzahl_rechts="0"
          malus_summen="0"
>
    <links    konto="800"    betrag="100"    punkte="1" />
    ...
    <rechts    konto="801"    betrag="200"    punkte="1" />
    ...
</konto>
```

There must be a surrounding Element **konto** that contains various sub elements (**links**, **rechts**) for the left and the right side. The element **konto** has the following attributes:

<b>links</b>	Title for the left columns, e.g. „Debit“ or „Assets“
<b>mitte</b>	Center title above the table, normally the account name
<b>rechts</b>	Title for the right column, e.g. “Credit” or “Liabilities”
<b>zeilen</b>	Number of input rows that should be generated
<b>summen_zeigen</b>	Sets whether the calculated sums should be shown in an extra row below the table („0“ or „1“).
<b>bonus_reihe_links</b>	Bonus points for the correct order of correct bookings on the left side (if this side has at least two correct bookings).
<b>bonus_reihe_rechts</b>	Bonus points for the correct order of correct bookings on the right side (if this side has at least two correct bookings).

<b>malus_anzahl_links</b>	Malus points for an exceeded number of accounts on the left side. However, at maximum the reachable points for this side (including Bonus) will be cut, so that the result for this side is not negative.
<b>malus_anzahl_rechts</b>	Malus points for an exceeded number of accounts on the right side. However, at maximum the reachable points for this side (including Bonus) will be cut, so that the result for this side is not negative.
<b>malus_summen</b>	Malus for non-equal sums on the left and the right side (even if one of them is correct). However, at maximum the total points reached so far will be cut, so the final result is not negative.

The account bookings are defined with the elements **links** and **rechts**. These have the following attributes:

<b>konto</b>	Number or title of an account.
<b>betrag</b>	Balance of the account. Cent values have to be separated by comma. Dots (used in Germany for separating thousands) will be ignored.
<b>punkte</b>	Number of points for a correct booking.

### Booking records

Questions for booking records have the following structure:

from	Title			to
[Select account ▼]	[Enter value]		[Select account ▼]	[Enter value]
...	...		...	...
	Show sum			Show sum

### XML Structure of Booking Records

The file buchungen.xml defines the presets, correct solution and given points for the booking question. For booking records it has the following structure:

```
<?xml version="1.0" encoding="utf-8" ?>
<buchungsaetze links="from"
               mitte="Records"
               rechts="to"
               zeilen="10"
               summen_zeigen="1"
               bonus_reihe="0"
               malus_anzahl ="0"
               bestanden_ab="2"
               debug="1"
               >
  <satz malus_anzahl_von="0"
        malus_anzahl_an="0"
```

```

        malus_summen="0"
    >
        <von konto="800"        betrag="100"        punkte="1" />
        ...
        <an  konto="801"        betrag="200"        punkte="1" />
        ...
    </satz>
<satz>
    ...
</satz>
</buchungsaetze>

```

There must be a surrounding element **buchungsaetze** that defines the display of the table. It has the following attributes:

<b>links</b>	Title for the left column, normally „from“.
<b>mitte</b>	Center title above the table, normally "Records".
<b>rechts</b>	Title for the right column, normally „to“.
<b>zeilen</b>	Number of input rows that should be generated
<b>summen_zeigen</b>	Sets whether the calculated sums should be shown in an extra row below the table („0“ or „1“).

Each booking record is defined with *exactly one* element **satz** surrounding its bookings. The element **satz** may have the following attributes:

<b>malus_anzahl_von</b>	Malus points for an exceeded number of bookings on the left side ('von').
<b>malus_anzahl_an</b>	Malus points for an exceeded number of bookings on the right side ('to').
<b>malus_summen</b>	Malus for non-equal sums on the left and the right side of this single booking record (even if one of them is correct).

In contrast to the T-Accounts the malus points of booking records are calculated after the sum of points of both sides. They will be subtracted in the order above preventing that each intermediate result gets not negative.

The bookings of a booking record are defined with sub elements **von** ('from') and **an** ('to'). These have the following attributes:

<b>konto</b>	Number or title of the account.
<b>betrag</b>	Correct amount. Cent values have to be separated by comma. Dots (used in Germany for separating thousands) will be ignored.
<b>punkte</b>	Number of points given for a correct booking.

## Variables

Variables can be used to randomly create variants of a question. There are basic variables that determine values by random selection, conditional variables that select their value from other variables, and calculated variables that calculate their value from other variables using a formula.

## XML Definition of Variables

Variables are defined in a text field via XML, analogous to the chart of accounts. Each variable is given a unique name with which it can be used. The names may consist of alphabetical characters and numbers.

```
<?xml version="1.0" encoding="utf-8" ?>
<variables >
    <var name="var1" ... />
    <var name="var2" ... />
</variables>
```

### Basic Variables

Variables of type **range** are used to select any number from a range of values. With "step" you can define a step size, the default value is 1.

```
<var name="var1" type="range" min="10" max="100" step="10" />
```

Variables of type **select** are used to randomly select one of several options. The content can be a text for the question or a number for further calculation.

```
<var name="var2" type="select">
    <val>800</val>
    <val>900</val>
</var>
```

### Conditional Variables

Variables of type **switch** allow you to determine their value from the value of another variable. For example, texts in the description of the booking case can be made more realistic depending on variables, for example, 'sells socks' or 'sells a suit', depending on the random price.

The cases are processed from top to bottom. If the variable corresponds to the condition, the content of the case is taken and processing is terminated. In addition to text, the content can also be a numerical value for further calculations.

```
<var name="var3" type="switch" check="{var2}">
    <case value="{var1}">Text A</case>
    <case max="50">Text B</case>
    <case max="150">Text B</case>
    <default>{var2}</default>
</var>
```

The attribute *value* tests for a certain value, the attribute *max* tests for an upper limit. In both cases, the value is compared as a number.

### Calculated Variables

Calculated variables of type **eval** allow the application of a formula.

```
<var name="calc1" type="eval">
    {var1}*({var2}+{var4})
</var>
```

In the formula, the placeholders of the variables are first recognized and replaced by their curly brackets. Placeholders for variables that are not defined are assigned the value 0.

The formula is then evaluated as in the ILIAS formula question. Round brackets of expressions are allowed, the mathematical operators + (addition), - (subtraction), \* (multiplication), / (division), ^ (raising to power), the use of the constant 'pi' for the number Pi and 'e' for the Euler number, as well as the mathematical functions 'sin', 'sinh', 'arcsin', 'asin', 'arcsinh', 'asinh', 'cos', 'cosh', 'arccos', 'acos', 'arccosh', 'acosh', 'tan', 'tanh', 'arctan', 'atan', 'arctanh', 'atanh', 'sqrt', 'abs', 'ln', 'log'.

A variable may not be used in a calculation itself, not even indirectly via other variables.

### Variable Usage

To use a variable, its name must always be specified in curly brackets as a placeholder. Variables can be used in the following places in the task:

- in the question text
- in the text of a subquestion
- In a feedback text
- in the check attribute of a conditional variable. Here its value is compared as a number.
- in the value or max attribute of a conditional variable. Here its value is compared as a number.
- in the value of the case or default option of a conditional variable
- in the formula of a calculated variable. Here its value is compared as a number.
- as attributes account or amount in the XML definition of postings. For accounts their text value is used, for amounts their numerical value.

If variables with a text value are **required as a number**, the system automatically converts as many characters as can be interpreted as a number. "10,50 EUR" results in 10,50, "Company X" results in 0.

As with amounts in bookings, decimal places are separated by commas. As with amounts in entries, decimal places are separated by commas. Thousands of points are ignored.

### Behavior in Preview and Test

As with the formula question, the variable values are calculated and saved for the user when the question is first displayed in the preview or in a test run. They keep their values in the preview until you click on "Reset preview". They keep their values in the test until a new test run is started.

### Input

When the question is displayed in the preview or in a test, the user can navigate with [Tab] and [Shift]+[Tab] between the input fields.

The select fields for **accounts** allow a direct entry of the numeric account number or a selection from a drop-down list. The drop-down can be closed with [ESC].

The input fields for money values allow the entry of digits and a comma “,” to separate the decimal places.

## Evaluation

The **calculation of points** gives the defined points for each booking that has a corresponding definition with matching account and value.

A bonus for the correct order of bookings on one side of a t-account is only given when at least two correct bookings exist on that side and when all correct bookings are in the correct order.

A **malus** can be subtracted from the when the number of bookings on one side exceeds the defined number of bookings.

- In **T-Accounts** the malus is subtracted separately for the sum of points including bonus on each side. It won't be higher than the points reached on the side, preventing a negative result on this side.
- In **Booking Records** the points for each side are first added and then the malus for left side and right side is subtracted. It won't be higher than the points calculated so far, preventing a negative intermediate result for each subtraction.

A **malus for different sums** on both sides can be subtracted at the end of the calculation. It won't be higher than the points calculated so far, preventing a final result.

## Calculation Tolerance

The precision when comparing values is entered in a new input field in the form of the number of decimal places. Two values must match at these decimal places to be considered equal. This applies to the check for conditional variables and the amount comparisons in bookings.

## Feedback

The feedback given for a user input may show the partial given points. This depends on the situation and the user permissions:

- The preview of a question in a question pool or test will show the partial points in the feedback.
- The result review for a test participant (without editing permission) won't show the partial points. The display of total points given to a question depends on the test settings.
- The result review for a test author (with writing permission) will show the partial points and notice that these are only shown to him.