

BizMathica™ User Guide

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Chapter 1: Installation

Requirements

BizMathica requires BlackBerry® Desktop Manager and Device Operating System 3.6 or higher.

Instructions

For installation, purchase and registration instructions see the [Installation Guide](#).

Chapter 2: Getting Started

Starting BizMathica

To start BizMathica select the application icon on the BlackBerry main screen and press the **ENTER** key or trackwheel to run it. You can also just press the letter “Z” to run BizMathica while the BlackBerry Home Screen is displayed (only if the Phone application is not configured to allow dialing from the Home Screen).



Important BizMathica Configuration

After running BizMathica for the first time or at any time after that you should configure the BizMathica Global Parameters appropriately so that formulas that depend on them will be computed correctly.

For example, for the **tip** formulas to be computed correctly it is important that you set the **TipPercent** and **TaxPercent** global parameters correctly. Similarly, for the exchange rate related

GETTING STARTED

formulas to be computed correctly you must set the **ExchgRateToHome** and **ExchgRateToOther** global parameters correctly.

See “Main BizMathica Menu” and “Specifying Global Parameter Values” for information on how to display and edit the current value of a Global Parameter.

```
Global Parameters
Q = 0
ExchgRateToHome = 1.0000
ExchgRateToOther = 1.0000
TaxPercent = 15
TipPercent = 15

Description: Q = Last result
```

Some Definitions

Input Expressions

Input Expressions (or sometimes referred to as just Expressions) consist of numbers, operators, functions and parameters (global and input parameters) and represent the mathematical expression you want BizMathica to evaluate.

Operators

Operators are one of:

- $+$, $-$, $*$, $/$
- $^$
- $\%$
- $()$
- E

For an explanation of each operator see “Table 5: Operators supported in Input Expressions and Operators Assistant”.

Functions

Functions are named built-in mathematical operations supported by BizMathica that take either a fixed or variable number of parameters (global, input or numeric parameters) and return a value. Function names are case-insensitive.

For a complete list of functions see the section “Functions”.

Global Parameters

Global Parameters are named variables representing a particular numeric value that can be referenced in expressions. Global Parameter names are case-insensitive.

Global Parameters can be created, modified or deleted. For more information see the section “Specifying Global Parameter Values”.

For a complete list of predefined BizMathica Global Parameters see the section “Global Parameters”.

Last Result Global Parameter (@)

The special built-in Global Parameter named $@$ represents the unformatted (i.e. without digit group symbols) numeric value corresponding to the last computed BizMathica result. Using $@$ in an expression allows you to easily chain calculations together.

Input Parameters

Input Parameters are named, unassigned variables that are referenced in an expression.

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During evaluation of an expression the user is prompted to specify numeric values to use for each input parameter.

Input Parameters names that end with “?” are special in that they can take “?” as a value – see the sections “Solver Functions”, “Solver Parameter (?)” and “Solver Formulas” for more information regarding this special value.

Solver Functions

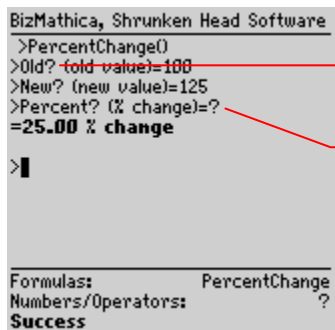
Solver Functions are similar to regular Functions except their names end with “?” and the result to be computed is represented by the Input Parameter whose value is specified as “?”. Exactly one parameter can have a value of “?”. Only Input Parameters whose names end with “?” (i.e. a Solver Parameter) may take a value of “?”. Solver Function names are case-insensitive.

For an example, see the **tvm?** Function in the section “Formulas”.

Solver Parameter (?)

A Solver Parameter is similar to a regular Input Parameter except its name ends with “?” and its value can be specified as “?”.

Solver Parameters are used with Solver Functions and Solver Formulas to indicate which parameter to compute as the result.



The screenshot shows the BizMathica interface with the following text:

```
BizMathica, Shrunk Head Software
>PercentChange()
>Old? (old value)=100
>New? (new value)=125
>Percent? (% change)=?
=25.00 % change
>|
```

Below the input area, the status bar shows:

```
Formulas: PercentChange
Numbers/Operators: ?
Success
```

Two red lines with labels point to the input area:

- The first line points to the text “>Old? (old value)=100” and is labeled “Solver Parameter”.
- The second line points to the text “>Percent? (% change)=?” and is labeled “Parameter to solve for (indicated by ? as parameter value)”.

Formulas

A Formula is a named entity representing a specific expression. A Formula can be thought of as a shorthand for specifying an expression and can be referenced in the Input Area to tell BizMathica what expression to calculate. A Formula cannot be combined with any other entity. Formula names are case-insensitive.

A Formula can be created, modified or deleted. For more information see the section “Creating Formulas”.

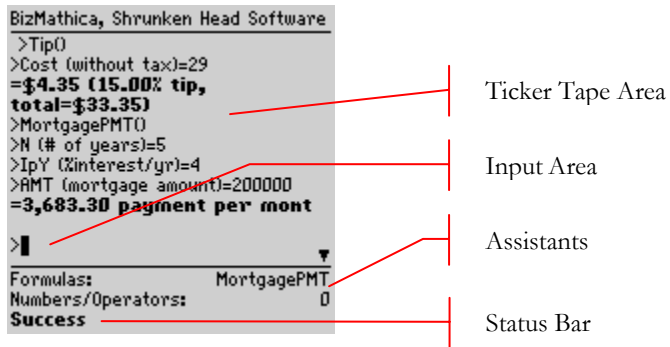
For a complete list of predefined BizMathica Formulas see the section “Formulas”.

Solver Formulas

A Solver Formula is a Formula that contains a reference to at least one Solver Function. See the sections “Formulas” and “Solver Functions” for more information.

For a complete list of predefined BizMathica Formulas see the section “Formulas”.

Guide to the BizMathica User Interface



Ticker Tape Area

The Ticker Tape Area is located at the top of the main BizMathica screen. The Ticker Tape Area displays the results of previous calculations evaluated during your current BizMathica session. See “Scroll Arrows” below for information on how to navigate the Ticker Tape Area.

Input Area

The Input Area is just below the Ticker Tape Area and just above the Assistants. As its name implies, the input area is where you specify what you want BizMathica to calculate.

Assistants

Assistants are located at the bottom of the main BizMathica screen. You can configure which Assistants are displayed using the Options menu item (see “BizMathica Options” for more information).

It is important to understand how to use the Assistants as they are a highly efficient way of specifying what you want to calculate with a minimum number of keystrokes.

For information on how to work with each Assistant, see the section “Using the BizMathica Assistants”.

Status Bar

The Status Bar is located at the bottom of the main BizMathica screen. It shows the status (**Success**, **Working**, **Error**, or **Cancelled**) of the currently in-progress or last completed calculation. The status bar also shows the first line of the result for a successful calculation.

Scroll Arrows

Small Scroll Arrows (or triangles) appear as needed on the right side of the main BizMathica screen toward the top and bottom of the display. Scroll arrows are displayed to indicate that accessible text has scrolled off the top or bottom of the screen. By rolling the trackwheel up or down you can scroll the offscreen text back into view. A scroll arrow is displayed as long as there is offscreen text in the direction the scroll arrow is pointing.

Main BizMathica Menu

The main BizMathica menu is displayed by pressing the trackwheel while the main BizMathica screen is displayed. The following menu items are displayed:

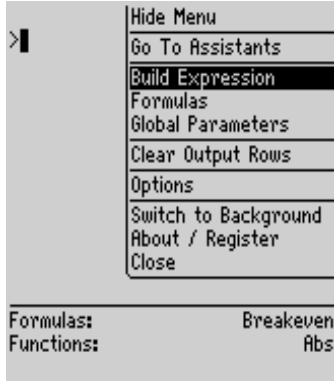


Table 1: Main BizMathica Menu Items

Menu Item	Purpose
Go To Assistants	<p>OPTIONAL: Only displayed when cursor is in the Input Area.</p> <p>Jumps the cursor to the Assistant Area without changing the Input Area insertion point. This makes it easy to insert text in the middle of an Input Area expression.</p>
Build Expression	<p>Helps you build an expression to be evaluated.</p> <p>See “Building Expressions” for more information.</p>
Formulas	<p>Allows you to view the currently defined formulas and select one to be evaluated.</p> <p>Also allows you to create, edit or delete a formula.</p> <p>See the section “Creating Formulas” for more information.</p>
Global Parameters	<p>Allows you to view the currently defined global parameters and select one to be inserted into the Input Area.</p> <p>Also allows you to create, modify the value of,</p>

Menu Item	Purpose
	<p>or delete a global parameter.</p> <p>See the section “Specifying Global Parameter Values” for more information.</p>
Clear Output Rows	Clears the contents of the Ticker Tape Area.
Options	<p>Display the current values of the configurable options and allows you to change them.</p> <p>See the section “BizMathica Options” for more information.</p>
Switch to Background	<p>Select this item to switch from BizMathica to the Home Screen while BizMathica remains loaded. From the Home Screen you can start another application.</p> <p>You can switch back to BizMathica at any time by running it from the Home Screen.</p>
About / Register	<p>Displays the About Screen, License Agreement and License Information.</p> <p>The About Screen displays the application name and version number, copyright notice, and the web site and support addresses.</p>
Close	Exits the application.
Change Option	<p>OPTIONAL: Only displayed when the cursor is on an Assistant.</p> <p>Allows you to change the Assistant’s displayed item.</p>
Copy To >	<p>OPTIONAL: Only displayed when the cursor is on an Assistant.</p> <p>Allows you to copy the Assistant’s displayed item to the Input Area.</p>
Select	<p>OPTIONAL: Only displayed when the cursor is in the Ticker Tape Area or the Input Area and there is text available to select.</p> <p>Allows you to select text to copy to the</p>

Menu Item	Purpose
	BlackBerry clipboard for a subsequent paste. Selecting this item results in other related menu items appearing in the BizMathica main menu (e.g. Copy, Cut, Paste, Cancel Selection) as appropriate.
Clear Field	OPTIONAL: Only displayed when the cursor is in the Input Area and there is text present. Clears the contents of the Input Area.
Cancel	OPTIONAL: Only displayed when a calculation is in progress (i.e. status is Working). Cancels the in progress calculation.

Specifying what you want to calculate

To specify what you want to calculate you need to enter either a Formula or Expression in the Input Area and press **ENTER**. A highly efficient way to do this is to use the BizMathica Assistants. For information on using the Assistants see the section “Using the BizMathica Assistants”.

A BizMathica input expression is similar to a mathematical expression as you were taught in school and follows the same rules for order of evaluation.

Table 2: Input Expression Order of Evaluation

Order of Evaluation	Operator	Purpose
First	(,)	Subexpressions enclosed in braces are evaluated first. If braced subexpressions are nested (i.e. one braced subexpression contained in another) then they are evaluated in the order of nesting with the innermost braced subexpression evaluated first.
Second	/,*	Division, Multiplication in order of appearance from left to right
Third	+, -	Addition, Subtraction in order of appearance from left to right

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Numbers can be expressed as:

- Plain integers: 3
- Floating/Fixed point numbers: 2.5
- Scientific Notation: 1E+3, 1E3 or 10.5E-2

Some example expressions follow:

- $(4 + 5) * 9$
- $2^{10} * -3$
- $2.5 * 3.45E2$

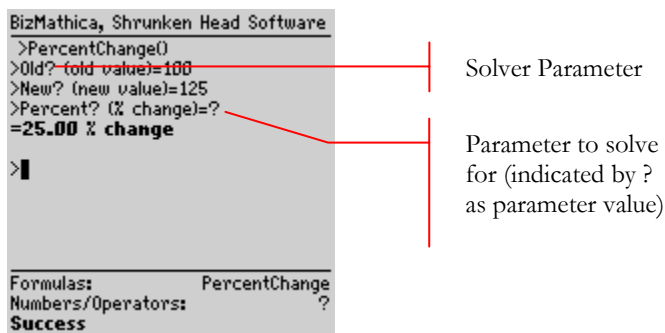
A BizMathica input expression can also contain references to Functions, as well as Input and Global Parameters. Input Parameter values will be prompted for when evaluating expressions.

Examples of such expressions follow:

- $9/5 * \text{CelsiusDegrees} + 32$
- $\text{Decimals}(\text{ExchgRateToHome} * \text{Amount}, 2)$

If a Formula or Expression contains a reference to a Solver Function then you must specify “?” as the value for exactly one of the Input Parameters whose names ends with “?” (i.e. Solver Parameter) in order to indicate what parameter you want BizMathica to calculate.

For example:



```
BizMathica, Shrunken Head Software
>PercentChange()
>Old? (old value)=100
>New? (new value)=125
>Percent? (% change)=?
=25.00 % change
>|

Formulas:      PercentChange
Numbers/Operators: ?
Success
```

The screenshot shows a terminal window with a red line pointing from the text "Solver Parameter" to the question mark in ">Percent?". Another red line points from the text "Parameter to solve for (indicated by ? as parameter value)" to the question mark in ">Percent? (% change)=?".

For some sample calculations see the section “Sample Calculations”.

For a complete list of predefined BizMathica Formulas, Functions and Global Parameters see the sections “Formulas”, “Functions” and “Global Parameters” respectively.

For a complete technical definition of the BizMathica Input Grammar see the section “Input Grammar”.

Calculator Keyboard Mode

This mode allows you to enter numbers and operators in all input expression fields without having to press the **ALT** key or switching the keyboard into **NumLock** mode.

By default, **Calculator Keyboard Mode** is enabled.

If you prefer to not use **Calculator Keyboard Mode** then you can switch the keyboard into **NumLock** mode by pressing and holding the **RIGHT SHIFT** key followed by the **ALT** key – an “N” will appear in the upper right corner of the screen. To exit from NumLock mode press and release either the **RIGHT SHIFT** or **ALT** key. See the section “BizMathica Options” for information on how to disable calculator keyboard mode.

Table 3: Calculator Keyboard Mode

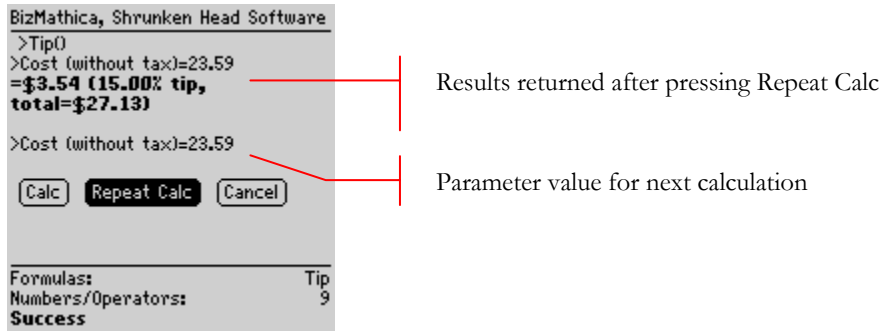
Keystrokes or Key	Operation	Example
ALT + key	Inputs unshifted value of key pressed	ALT S inputs “s”
RIGHT SHIFT + key	Inputs shifted value of key pressed	RIGHT SHIFT S inputs “S”
DEL	Normal DEL character operation	
O	Inputs “o”	O inputs “o” ALT O moves cursor left RIGHT SHIFT O inputs “O”
P	Inputs “p”	P inputs “p” ALT P moves cursor right RIGHT SHIFT P inputs “P”
Other keys	Keys operate as if the ALT key were pressed	S inputs “4” ALT S inputs “s” RIGHT SHIFT S inputs “S”

Input Parameters

If you evaluate a Formula or Expression that contains one or more Input Parameters then BizMathica will prompt for a value for each parameter. After you enter a valid value for each parameter the following buttons will be displayed:

- **Calc** – press to evaluate input using currently specified parameter values
- **Repeat Calc** – press to evaluate input using currently specified parameter values, display result in ticker tape area and allow parameter values to be specified again differently for another evaluation of the same Formula or Expression. Useful for doing “what if” analysis to see how result varies when changing one or more of the parameter values.
- **Cancel** – press to cancel calculation even while in progress

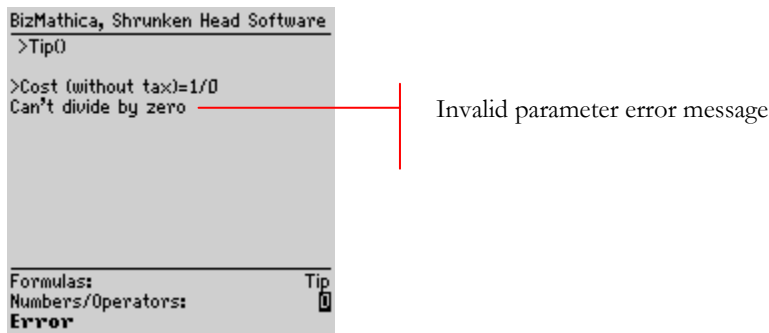
Before you press one of the calculation buttons you can scroll to any displayed parameter value and change what you have entered.



Results returned after pressing Repeat Calc

Parameter value for next calculation

If you enter an invalid parameter value then an error message will be displayed below the value; you can correct the value (the error message will be removed) and continue.



Invalid parameter error message

If the calculation results in an error then an error message will be displayed below the calculation buttons; you can correct the error (the error message will be removed) and press **Calc** or **Repeat Calc** to try again.

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```
BizMathica, Shrunken Head Software
>Root()
>number=-2
>root=3
[Calc] [Repeat Calc] [Cancel]
Can't take root of a negative
number
-----
Formulas:          Root
Numbers/Operators: 3
Error
```

Calculation error message

Canceling a Calculation

There are three ways in which you can cancel a calculation depending on the state of the calculation.

Prompt For Input Parameter - If you evaluating a formula/expression and being prompted for an Input Parameter value you can cancel the calculation by simply pressing **ENTER** in response to the prompt without entering a value for the parameter.

Calculation In Progress – To cancel a calculation that is in progress (i.e. status is **Working**) display the BizMathica menu using the trackwheel and select the **Cancel** item. The **Cancel** menu item is only available while a calculation is in progress.

Calculation Cancel Button – If the **Cancel** button is displayed you can press it to cancel either a pending calculation or a calculation that is in progress.

```
BizMathica, Shrunken Head Software
>PercentChange()
>Old? (old value)=100
>New? (new value)=125
>Percent? (% change)=?
[Calc] [Repeat Calc] [Cancel]
-----
Formulas:          PercentChange
Numbers/Operators: ?
Success
```

Using the BizMathica Assistants

To work efficiently with BizMathica it is important to master the use of the Assistants.

```
BizMathica, Shrunken Head Software
>Tip0
>Cost (without tax)=29
=$4.35 (15.00% tip,
total=$33.35)
>MortgagePMT0
>N (# of years)=5
>IpY (%interest/yr)=4
>AMT (mortgage amount)=200000
=3,683.30 payment per mont
>|
Formulas: MortgagePMT
Numbers/Operators: 0
Success
```

Assistants

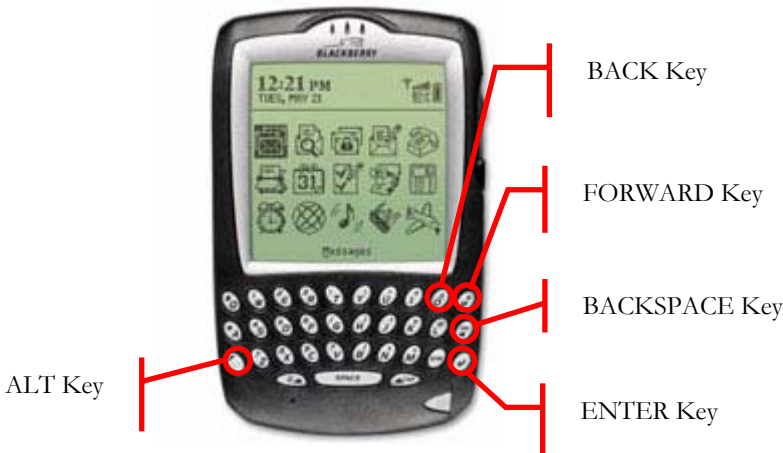
Purpose

The purpose of each assistant is to allow you to enter text into the Input Area without directly typing in the area and with a minimum number of keystrokes.

Formulas and Functions Assistants

After moving the cursor into one of these Assistants you can scroll through its values by holding **ALT** and rolling the trackwheel, or holding **ALT** and pressing the **BACK** or **FORWARD** keys. If you know the name of the Formula or Function you want to find then you can type its first letter repeatedly until it is scrolled into view. For example to find the Formula named **Tip**, type **T** repeatedly in the Formulas Assistant until **Tip** is displayed.

To paste the displayed formula/function into the Input Area press **ENTER**. In the case of a formula the input focus will be given to the Numbers/Operators assistant if it is shown. In the case of a function you will be prompted for any required parameters.



Numbers/Operators and Operators Assistants

After moving the cursor into one of these Assistants you can paste a number, special value or operator, as supported by the relevant Assistant, into the Input Area by pressing the appropriate key on the keyboard without entering shift mode by pressing the **ALT** key (e.g. press the **1** key without pressing the **ALT** key and **1** will be pasted into the Input Area). You can also paste a space character into the Input Area by pressing the **SPACE** key.

The cursor will remain in the Assistant after the item is pasted so that you can enter the next number, special value or operator.

To delete a character in the Input Area while positioned in one of these two Assistants, press the **BACKSPACE** key.

To evaluate the expression currently displayed in the Input Area while positioned in one of these two Assistants, press the **ENTER** key.

NOTE: If **Calculator Keyboard Mode** is enabled (which it is by default) then the Numbers/Operators and Operators assistants are redundant. These assistants are really only useful if **Calculator Keyboard Mode** is disabled. See the section “Calculator Keyboard Mode” for more information regarding this mode of operation.

Table 4: Numbers/Operators supported in Input Expressions and Numbers/Operators Assistant

Number/Operator	Purpose
0-9	Digits of number
+	Addition or Optional sign for positive numbers
-	Subtraction or Negative sign
.	Decimal point – used in floating/fixed point numbers
*	Multiplication
/	Division
^	Power (e.g. $2^4 = 2$ to the power of 4)
%	Percent – divide by 100
(Right brace – specifies order of operation.
)	Left brace – specifies order of operation.
@	Used in expression to reference last result

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Number/Operator	Purpose
?	Specifies that input parameter is actually the parameter to solve for. Only input parameters whose names end with “?” (e.g. PV?) are candidate solver parameters and can accept “?” as a value.

Table 5: Operators supported in Input Expressions and Operators Assistant

Operator	Operation
+	Addition or Optional sign for positive numbers
-	Subtraction or Negative sign
*	Multiplication
/	Division
^	Power (e.g. 2^4 = 2 to the power of 4)
%	Percent – divide by 100
(Right brace – specifies order of operation.
)	Left brace – specifies order of operation.
E	Exponent – exponent value for a number specified in scientific notation. For example 1E+3 represents 1×10^3 or 1000, while 1E-3 represents 1×10^{-3} or 0.001.

Sample Calculations

Simple Expression

Problem: Calculate the result of multiplying 40.5 by 9/5 and adding 32.

Input Parameters:

> 9/5*40.5+32



```
>9/5*40.5+32
=104.90
>|
```

Formulas:	Breakeven
Functions:	Abs
104.90	

Steps:

1. Press the “9” key (which is also the key marked with the letter “C” – in this step as well as all following steps there is no need to press the ALT key to get the shifted state of the key since calculator keyboard mode is on by default).
2. Press the “/” key (also the “G” key)
3. Press the “5” key (also the “D” key)
4. Press the “*” key (also the “A” key)
5. Press the “4” key (also the “S” key)
6. Press the “0” key (also the LEFT SHIFT key)
7. Press the “.” key (also the “M” key)
8. Press the “5” key (also the “D” key)
9. Press the “+” key (also the “T” key)
10. Press the “3” key (also the “R” key)
11. Press the “2” key (also the “E” key)
12. Press the ENTER key

Square the Last Result

Problem: Determine the square of the last computed result.

Input Parameters:

> @^2



Steps:

1. Press the “@” key (which is also the key marked with the letter “L” – there is no need to press the ALT key to get the shifted state of the key since calculator keyboard mode is on by default).
2. Press the “SYM” key followed by the “O” key
3. Press the “2” key (also the “E” key – no need to press the ALT key)
4. Press the ENTER key

Evaluate Function

Problem: Determine the sin of a 45 degree angle

Steps:

1. Scroll cursor to Functions assistant
2. Press & release letter "S" until the Sin function name is shown in the Functions assistant.
3. Press the ENTER key
4. Press the number keys on the keyboard to enter 45 for the "degrees" parameter (no need to press the ALT key).
5. Press the ENTER key – moves focus to the OK button
6. Press the ENTER key – closes the Sin() Parameters Screen and copies Sin(45) to “>” prompt.
7. Press the ENTER key – evaluates function and displays result

Present Value

Problem: Determine the present value of \$10,000 payable at the end of 5 years assuming an interest rate of 10% compounded semiannually.

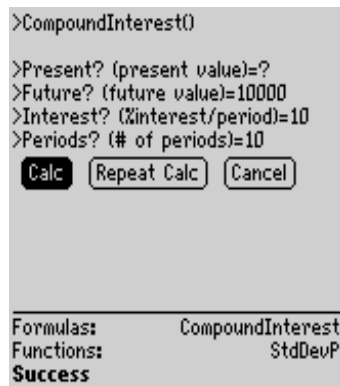
Formula & Input Parameters:

>CompoundInterest()

>Present? (present value)=?

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>Future? (future value)=10000
>Interest? (%interest/period)=10
>Periods? (# of periods)=10



Steps:

1. Scroll cursor to Formulas assistant
2. Press & release letter "C" until the CompoundInterest formula name is shown in the Formulas assistant.
3. Press the ENTER key
4. Press the "?" key on the keyboard for the "Present? (present value)" parameter (which is also the key marked with the letter "V – in this step as well as all following steps there is no need to press the ALT key to get the shifted state of the key since calculator keyboard mode is on by default).
5. Press the ENTER key
6. Press the number keys on the keyboard to enter 10000 for the "Future? (future value)" parameter.
7. Press the ENTER key
8. Enter 10 for the "Interest? (%interest/period)" parameter
9. Press the ENTER key
10. Enter 10 for the "Periods? (# of periods)" parameter
11. Press the ENTER key
12. Press the Calc button

Loan Payment Per Month

Problem: I have a \$100,000 loan payable over 60 months with an interest rate of 7.5%. What are my monthly payments?

Formula & Input Parameters:

>Tvm()
>N? (# of periods)=60
>IpY? (%interest/yr)=7.5
>PV? (present value)=100000
>PMT? (payment: -outflow, +inflow)=?
>FV? (future value)=0
>PpY (payments/yr)=12

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>CpY (compounding periods/yr)=12
>BeginPeriodPMT (Payments: 0=End-of-period PMT, 1=Beginning-of-period
>PMT)=0
=-2,003.79 payment: -outflow, +inflow

Or more simply –

>LoanPMT()
>N (# of years)=5
>IpY (%interest/yr)=7.5
>AMT (loan amount)=100000
=2,003.79 payment per month



Steps:

1. Scroll cursor to Formulas assistant
2. Press & release letter "L" until the LoanPMT formula name is shown in the Formulas assistant.
3. Press the ENTER key
4. Press the "5" key on the keyboard for the "N (# of years)" parameter (which is also the key marked with the letter "D" – in this step as well as all following steps there is no need to press the ALT key to get the shifted state of the key since calculator keyboard mode is on by default).
5. Press the ENTER key
6. Enter 7.5 for the "IpY (%interest/yr)" parameter
7. Press the ENTER key
8. Enter 100000 for the "AMT (loan amount)" parameter
9. Press the ENTER key
10. Press the Calc button

Amortization Schedule

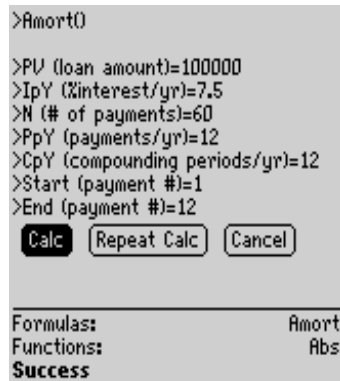
Problem: I have a \$100,000 loan payable over 60 months with an interest rate of 7.5%. Generate an amortization schedule for the first 2 years.

Formula & Input Parameters for Year 1:

>Amort()
>PV (loan amount)=100000
>IpY (%interest/yr)=7.5

GETTING STARTED

>N (# of payments)=60
>PpY (payments/yr)=12
>CpY (compounding periods/yr)=12
>Start (payment #)=1
>End (payment #)=12
=Pmt 2,003.79, Bal 82,873.75
Period 1-12 Totals:
Pmts 24,045.48
17,126.25 Prin + 6,919.23 Int



Steps for Year 1:

1. Scroll cursor to Formulas assistant
2. Press & release letter "A" until the Amort formula name is shown in the Formulas assistant.
3. Press the ENTER key
4. Press the number keys on the keyboard to enter 100000 for the "PV (loan amount)" parameter (no need to press the ALT key).
5. Press the ENTER key
6. Enter 7.5 for the "IpY (%interest/yr)" parameter
7. Press the ENTER key
8. Enter 60 for the "N (# of payments)" parameter
9. Press the ENTER key
10. Enter 12 for the "PpY (payments/yr)" parameter
11. Press the ENTER key
12. Enter 12 for the "CpY (compounding periods/yr)" parameter
13. Press the ENTER key
14. Enter 1 for the "Start (payment #)" parameter
15. Press the ENTER key
16. Enter 12 for the "End (payment #)" parameter
17. Press the ENTER key
18. Press the "Repeat Calc" button
19. Scroll up to see the complete results of the calculation

Formula & Input Parameters for Year 2 (input changes are in bold):

>PV (loan amount)=100000
>IpY (**%interest/yr**)=7.5

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>N (# of payments)=60
>PpY (payments/yr)=12
>CpY (compounding periods/yr)=12
>Start (payment #)=**13**
>End (payment #)=**24**
=Pmt 2,003.79, Bal 64,417.95
Period 1-12 Totals:
Pmts 24,045.48
18,455.80 Prin + 5,589.68 Int

Steps for Year 2:

1. Scroll down to the input parameters and change the parameter values as follows.
2. Enter 13 for the “Start (payment #)” parameter
3. Press the ENTER key
4. Enter 24 for the “End (payment #)” parameter
5. Press the ENTER key
6. Press the “Calc” button

Building Expressions

The Build Expression screen can be displayed by selecting **Build Expression** on the main BizMathica menu.

The Build Expression screen helps you build an expression to be evaluated.



The expression you are building is shown in the > field at the top of the screen. To build an expression enter numbers, operators, functions and parameters as appropriate while the cursor is in the > field.

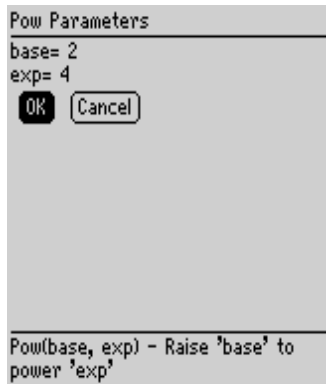
To help you insert a Function or Global Parameter in the expression you are building you can:

1. Position the cursor in the appropriate location in the > field.
2. Display the screen menu and select **Go To Add Function/Global** (this step is really only needed if the > field contains more than 1 line of text, otherwise you can just use the trackwheel to move the cursor down to the **Add Function/Global** button).
3. Press the **Add Function/Global** button to display the Function List. Using the **Show** field on the Function List screen you can change the display between the Function List and the Global Parameter List.



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4. Display the screen menu and select **Copy To >** to copy the selected Function or Global Parameter to the last cursor position in the **>** field. In the process you will be prompted to specify parameters needed by any Function you selected.



A Function parameter can be one of the following:

- A number or expression.

The Build Parameter screen helps you build a parameter expression to be evaluated. The Build Parameter screen is identical to the Build Expression screen and can be displayed by selecting **Build Parameter** on the parameter screen menu.



- Name of a Global Parameter - the Global Parameter value will be substituted for the parameter at time of expression evaluation.
- Name of an Input Parameter with an optional input prompt string – the Input Parameter value will be prompted for at time of expression evaluation. See the section “Prompting For Input” for more information.
- “?” – can only be specified if parameter name ends with a “?”. A parameter value of ? specifies the parameter for which a solver function should solve.

To save the expression you’ve built and exit the screen press the **OK** button or display the screen menu and select **Save**.

Prompting For Input

If you refer to an Input Parameter when defining an Expression, its value will be prompted for at time of evaluation. The Input Parameter name will be used to prompt for the Input Parameter. To specify a custom prompt for an Input Parameter in an Expression do the following:

```
InputParameterName {"custom prompt"}
```

For example:

```
Decimals(ExchgRateToHome * Amount{"Other Currency"}, 2)"Home Currency"
```

The above specifies a custom prompt of **Other Currency** for the Input Parameter **Amount**, which results in the following input prompt being displayed when evaluating the expression:

```
BizMathica, Shrunken Head Software
>Decimals(ExchgRateToHome *
Amount{"Other Currency"}, 2)"Home
Currency"
>Amount (Other Currency)=|
Formulas:           Breakeven
Numbers/Operators: 0
Success
```

Result Description String

By default evaluation results do not have result description strings and only the result is displayed after Expression evaluation. To specify a result description string in an Expression do the following:

```
Expression "description string"
```

For example:

```
Decimals(ExchgRateToHome * Amount{"Other Currency"}, 2)"Home Currency"
```

The above specifies a result description string of **Home Currency** which results in the following result being displayed when evaluating the expression:

```
BizMathica, Shrunken Head Software
>Decimals(ExchgRateToHome *
Amount{"Other Currency"}, 2)"Home
Currency"
>Amount (Other Currency)=2
=2.00 Home Currency
>|
Formulas:           Breakeven
Numbers/Operators: 0
Success
```

Result Value in Result Description String

A result description string can also contain an explicit reference to the result value. To include the result value in the result description string insert the following text in the result description string:

Table 6: Result Value References in Result Description String

Text	Meaning
{0}	Formatted result value - value as displayed in Ticker Tape Area; includes digit group symbol
@	Unformatted result value – can be used in further calculations
@ans	Unformatted result value – can be used in further calculations

For example:

Decimals(Percent(TipPercent) * Cost{"without tax"}, 2)"\${0} ({TipPercent}% tip, total=\${Cost + @ans})"

GETTING STARTED

Subexpressions in Result Description String

Finally a result description string can also contain one or more subexpressions to be evaluated, each in {}. These subexpressions may refer to Global/Input Parameters by name as well as to the unformatted result value.

The following specifies a result description string referring to both the unformatted result value (i.e. tip amount) as well as two subexpressions (i.e. 1. tip percentage used in calculation, 2. total amount to pay):

```
Decimals(Percent(TipPercent) * Cost{"without tax"}, 2)"${0} ({TipPercent}% tip, total=${Cost + @ans})"
```

The following result is displayed when evaluating the above expression:

```
BizMathica, Shrunken Head Software
>Decimals(Percent(TipPercent) *
Cost("without tax"),2)"${0}
({TipPercent}% tip, total=${Cost +
@ans})"
>Cost (without tax)=12.50
=$1.88 (15.00% tip,
total=$14.38)
>|
Formulas:           Breakeven
Numbers/Operators: 0
Success
```

Creating Formulas

The currently defined Formulas can be displayed by selecting **Formulas** on the main BizMathica menu.

Formulas	Hide Menu
Breakeven() = Breakeven	Calculate
CelsiusTo() = Celsius To	New
CompoundInterest() = Co	Edit
DateAdd() = Add days to	Delete
DaysBetween() = # of da	Close
DaysTo() = Days To Othe	
DaysUntil() = # of days until specifie	
Effect() = Effective annual interest	
FahrTo() = Fahrenheit to Celsius	
FootMeter() = Foot/Meter Conversio	
HomeCurrency() = Convert other to	
HoursTo() = Hours To Others	
TestCMO() = Test C...	
Description: Breakeven() =	
Breakeven Analysis	

When the Formulas screen is displayed you can display its menu and select an item to do the following:

- Evaluate the currently selected Formula.
- Create, edit or delete a Formula.

Specifying Global Parameter Values

The current Global Parameters and their values can be displayed by selecting **Global Parameters** on the main BizMathica menu.

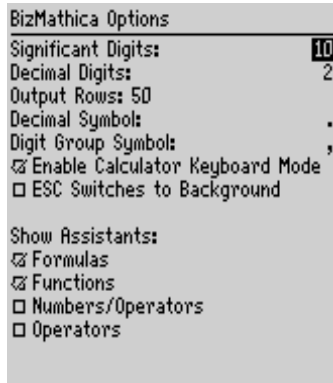


When the Global Parameter screen is displayed you can display its menu and select an item to do the following:

- Insert the currently selected Global Parameter into the Input Area.
- Create, modify the value of, or delete a Global Parameter.

BizMathica Options

The current configurable BizMathica options can be displayed by selecting **Options** on the main BizMathica menu.



The following options are available:

Option	Purpose	Possible Values	Default Value
Significant Digits	# of significant digits displayed in results.	10, 11 or 12	10
Decimal Digits	# of digits after the decimal point in results. IMPORTANT NOTE: Set this value equal to # of significant digits to specify floating point instead of fixed point results.	2, 4, 10, 11 or 12	2
Output Rows	Maximum # of rows of results available in Ticker Tape Area.	50 or above It is probably a good idea to not set this value above 200 due to memory usage considerations.	50
Decimal Symbol	Character to use as decimal “point” in results.	“.” “;”	“.”

Option	Purpose	Possible Values	Default Value
	<p>When typing a number in BizMathica you must always use “.” As the decimal point, regardless of this option setting.</p>		
Digit Group Symbol	<p>Character to use as digit group symbol in results.</p> <p>An example of a digit group symbol is the comma in “1,000”.</p> <p>When typing a number in BizMathica you must NOT specify any digit group symbols, regardless of this option setting.</p>	<p>“.”</p> <p>“,”</p> <p>“ ”</p> <p>“None”</p>	<p>“.”</p>
Enable Calculator Keyboard Mode	<p>Allows you to enter numbers and operators in all input expression fields without having to press the ALT key or switching the keyboard into NumLock mode.</p> <p>While in this mode:</p> <ul style="list-style-type: none"> • Press the ALT key to get the unshifted value when you press a key (e.g. ALT S = “s”). • Press the RIGHT SHIFT key to get the shifted value when you press a key (e.g. RIGHT 		Checked

Option	Purpose	Possible Values	Default Value
	<p>SHIFT S = “S”).</p> <ul style="list-style-type: none"> • The “DEL”, “O” and “P” keys operate as normal. • Other keys operate as if the ALT key were pressed (e.g. S key = “4”). 		
ESC Switches to Background	<p>Check this option if you’d like BizMathica to remain loaded instead of exit when ESC is pressed.</p> <p>To exit the application completely select Close on the main BizMathica menu.</p>		
Show Assistants	Assistants to display.		Formulas & Functions checked

Copy, Cut & Paste

Copy/Cut/Paste

You can copy text displayed in the Ticker Tape or Input Areas. You can cut text displayed in the Input Area. Cut/copied text can be pasted into another application or into the Input Area.

To copy/cut text:

1. Position the cursor at the start of the text you want to copy/cut.
2. Display the screen menu and choose **Select**.
3. Move the cursor to the end of the text you want to copy/cut.
4. Display the screen menu and choose **Copy** or **Cut**.

To paste text that has been cut/copied:

1. Position the cursor at the location where you want to paste the text

GETTING STARTED

2. Display the screen menu and choose **Paste**.

Fast Copy/Paste

BizMathica supports a feature that allows the user to copy text from the Ticker Tape Area and paste it into the Input Area in one operation.

To copy text from the Ticker Tape Area to the Input Area do the following:

1. Position the cursor in the Ticker Tape Area at the start of the text you want to copy.
2. Display the screen menu and choose **Select**.
3. Move the cursor to the end of the text you want to copy.
4. Press **ENTER** – the selected text will be copied to the current insertion point in the Input Area.

Switch to Background

You can switch to other applications, while BizMathica remains loaded, in the following ways:

1. Select the **Switch to Background** menu item to switch from BizMathica to the Home Screen. From the Home Screen you can start another application.
2. If the **ESC Switches to Background** setting is checked on the Options screen then you can press ESC to switch from BizMathica to the Home Screen. From the Home Screen you can start another application.
3. Press **ALT+ESC** to switch to other applications such as the Home Screen, from which you can start other applications.



You can switch back to BizMathica at any time by running it from the Home Screen or by pressing ALT+ESC again and selecting its icon.

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If ESC is configured to switch BizMathica to the background then to completely exit the application select **Close** on the main BizMathica menu.

If you shut down the handheld while BizMathica is running either in the foreground or background its state will be saved so that when the handheld is turned on again its state will be restored.

Switching to other applications while keeping BizMathica loaded is useful if you want to:

1. Run other applications without losing the contents of the Ticker Tape Area.
2. Quickly return to BizMathica later.

Chapter 3: Reference

Formula, Function, Global Parameter and Input Grammar Reference

Formulas

Table 7: Formulas Alphabetically

Formula	Purpose
Amort()	Amortization Schedule
Breakeven()	Breakeven Analysis
CelsiusTo()	Celsius to Fahrenheit conversion
CompoundInterest()	Compound Interest
DateAdd()	Add # of days to specified date
DayOfWeek()	Day of week for specified date
DaysBetween()	# of days between specified dates
DaysTo()	Convert days to years, hours, minutes and seconds
DaysUntil()	# of days until specified date
Effect()	Effective annual interest rate, given nominal rate and # of compounding periods/year
FahrTo()	Fahrenheit to Celsius conversion
FootMeter()	Foot/Meter Conversion
HomeCurrency()	Convert other currency to home currency. Set ExchgRateToHome global parameter to specify exchange rate to use.
HoursTo()	Convert hours to years, days, minutes and seconds
InchCM()	Inch/Centimeter Conversion
Inv()	Inverse of x
LoanPMT()	Loan payment per month
LoanRate()	Loan interest rate per year
Markup()	Cost-Sell-Markup
MileKM()	Mile/Kilometer Conversion
MinsTo()	Convert minutes to year, days, hours and seconds
MortgagePMT()	Mortgage payment per month
MortgageRate()	Mortgage interest rate per year
Nominal()	Nominal annual interest rate, given effective rate and # of compounding periods/year
OtherCurrency()	Convert home currency to other currency.

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Formula	Purpose
	Set ExchgRateToOther global parameter to specify exchange rate to use.
PercentChange()	Percent Change In Values
PoundKG()	Pound/Kilogram Conversion
Pow()	Raise base to power
ProfitMargin()	Profit Margin
Root()	Integer root of num
SecsTo()	Convert seconds to years, days, hours and minutes
Tip()	<p>Compute tip for good service.</p> <p>Computes tip amount, total including tax and total excluding tax (useful if item you are giving a tip for is not taxable).</p> <p>Set TipPercent global parameter to specify tip percentage to use.</p> <p>Set TaxPercent global parameter to specify tax rate percentage to use.</p>
Tip2()	<p>Compute tip for good service (prompt for tip percentage to use).</p> <p>Computes tip amount, total including tax and total excluding tax (useful if item you are giving a tip for is not taxable).</p> <p>Set TaxPercent global parameter to specify tax rate percentage to use.</p>
Tip3()	<p>Compute tip for good service (prompt for tax & tip percentages to use)</p> <p>Computes tip amount, total including tax and total excluding tax (useful if item you are giving a tip for is not taxable).</p>
TodayAdd()	Add # of days to today's date
Tvm()	Time Value of Money
UKGallonLiter()	UK Gallon/Liter Conversion
USGallonLiter()	US Gallon/Liter Conversion
YardMeter()	Yard/Meter Conversion
YearsTo()	Convert years to days, hours, minutes and seconds

REFERENCE

Table 8: Formulas By Category

Business/Financial Formulas	Purpose
Amort()	Amortization Schedule
Breakeven()	Breakeven Analysis
CompoundInterest()	Compound Interest
Effect()	Effective annual interest rate, given nominal rate and # of compounding periods/year
HomeCurrency()	Convert other currency to home currency. Set ExchgRateToHome global parameter to specify exchange rate to use.
LoanPMT()	Loan payment per month
LoanRate()	Loan interest rate per year
Markup()	Cost-Sell-Markup
MortgagePMT()	Mortgage payment per month
MortgateRate()	Mortgage interest rate per year
Nominal()	Nominal annual interest rate, given effective rate and # of compounding periods/year
OtherCurrency()	Convert home currency to other currency. Set ExchgRateToOther global parameter to specify exchange rate to use.
PercentChange()	Percent Change In Values
ProfitMargin()	Profit Margin
Tip()	Compute tip for good service. Computes tip amount, total including tax and total excluding tax (useful if item you are giving a tip for is not taxable). Set TipPercent global parameter to specify tip percentage to use. Set TaxPercent global parameter to specify tax rate percentage to use.
Tip2()	Compute tip for good service (prompt for tip percentage to use). Computes tip amount, total including tax and total excluding tax (useful if item you are giving a tip for is not taxable). Set TaxPercent global parameter to specify tax rate percentage to use.
Tip3()	Compute tip for good service (prompt for

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Business/Financial Formulas	Purpose
	tax & tip percentages to use) Computes tip amount, total including tax and total excluding tax (useful if item you are giving a tip for is not taxable).
Tvm()	Time Value of Money

Conversion Formulas	Purpose
CelsiusTo()	Celsius to Fahrenheit conversion
FahrTo()	Fahrenheit to Celsius conversion
FootMeter()	Foot/Meter Conversion
HomeCurrency()	Convert other currency to home currency
InchCM()	Inch/Centimeter Conversion
MileKM()	Mile/Kilometer Conversion
OtherCurrency()	Convert home currency to other currency
PoundKG()	Pound/Kilogram Conversion
UKGallonLiter()	UK Gallon/Liter Conversion
USGallonLiter()	US Gallon/Liter Conversion
YardMeter()	Yard/Meter Conversion

Date Formulas	Purpose
DateAdd()	Add # of days to specified date
DayOfWeek()	Day of week for specified date
DaysBetween()	# of days between specified dates
DaysTo()	Convert days to years, hours, minutes and seconds
DaysUntil()	# of days until specified date
HoursTo()	Convert hours to years, days, minutes and seconds
MinsTo()	Convert minutes to year, days, hours and seconds
SecsTo()	Convert seconds to years, days, hours and minutes
TodayAdd()	Add # of days to today's date
YearsTo()	Convert years to days, hours, minutes and seconds

Standard Formulas	Purpose
Inv()	Inverse of x

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Standard Formulas	Purpose
Pow()	Raise base to power
Root()	Integer root of num

Functions

Table 9: Functions Alphabetically

Function	Purpose
Abs(num)	Absolute value of number
Acos(num)	Inverse cosine of num; result in degrees
Acosh(num)	Inverse hyperbolic cosine of num; result in degrees
Acot(num)	Inverse cotangent of num; result in degrees
Acoth(num)	Inverse hyperbolic cotangent of num; result in degrees
Acsc(num)	Inverse cosecant of num; result in degrees
Acsch(num)	Inverse hyperbolic cosecant of num; result in degrees
Asec(num)	Inverse secant of num; result in degrees
Asech(num)	Inverse hyperbolic secant of num; result in degrees
Asin(num)	Inverse sine of num; result in degrees
Asinh(num)	Inverse hyperbolic sine of num; result in degrees
Atan(num)	Inverse tangent of num; result in degrees
Atanh(num)	Inverse hyperbolic tangent of num; result in degrees
Avg(num, ...)	Average of numbers
Breakeven?(fixedCost?, variableCost?, unitPrice?, profit?, quantity?)	Perform breakeven analysis
Cos(degrees)	Cosine of angle in degrees
Cosh(degrees)	Hyperbolic cosine of angle in degrees
Cot(degrees)	Cotangent of angle in degrees
Coth(degrees)	Hyperbolic cotangent of angle in degrees
Csc(degrees)	Cosecant of angle in degrees
Csch(degrees)	Hyperbolic cosecant of angle in degrees
DateAdd(month, day, year, days)	Add # of days to specified date (e.g. DateAdd(1, 15, 2010, 100))
DayHour?(days?, hours?)	Convert between days and hours
DayMin?(days?, mins?)	Convert between days and minutes
DaySec?(days?, secs?)	Convert between days and seconds
DaysBetween(month1, day1, year1, month2, day2, year2)	# of days between specified dates
DaysUntil(month, day, year)	# of days until specified date (e.g.

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Function	Purpose
	DaysUntil(1, 15, 2010))
Decimals(number, digitsAfterPoint)	Specify # of digits to display after decimal point
Degrees(radians)	Convert angle in radians to degrees
Div(div1, div2)	Divide div1 by div2
E(exp)	Natural antilogarithm (e to power 'exp')
FahrCelsius?(fahr?, Celsius?)	Convert between Fahrenheit and Celsius degrees
FootMeter?(feet?, meters?)	Convert between feet and meters
HourMin?(hours?, mins?)	Convert between hours and minutes
HourSec?(hours?, secs?)	Convert between hours and seconds
InchCM?(inches?, centimeters?)	Convert between inches and centimeters
Interest?(nominal%?, effect%?, periods)	Convert between nominal and effective annual interest rate for # of compounding periods/year
Inv(x)	Inverse of x (1/x)
Ln(num)	Natural logarithm of num
Log(num)	Base 10 logarithm of num
Log2(num)	Base 2 logarithm of num
Median(num, ...)	Median of numbers
MileKM?(miles?, kilometers?)	Convert between miles and kilometers
MinSec?(mins?, secs?)	Convert between minutes and seconds
Mod(num, modulus)	Modulus mod of num. = num – modulus*INT(num/modulus) where INT() = Rounds a number down to the nearest integer e.g. INT(-8.4) = -9, INT(8.9) = 8
Mul(multiplicand, ...)	Multiply parameters
Percent(num)	Divide num by 100
PercentChange?(old?, new?, change%?, periods?)	Calculate percent change, compound interest, or cost-sell-markup. Specify '1' for 'periods?' when it is not needed.
PoundKG?(pounds?, kilograms?)	Convert between pounds and kilograms
Pow(base, exp)	Raise 'base' to power 'exp'
ProfitMargin?(price?, cost?, margin%?)	Calculate profit margin variable
Radians(degrees)	Convert angle in degrees to radians
Rnd(num)	Random non-negative integer in the range 0...num-1 inclusive
Root(num, root)	Integer root of num (e.g. root(10,7)=7 th root of 10)
Sec(degrees)	Secant of angle in degrees
Sech(degrees)	Hyperbolic secant of angle in degrees

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Function	Purpose
Sin(degrees)	Sine of angle in degrees
Sinh(degrees)	Hyperbolic sine of angle in degrees
Sqrt(num)	Square root of num
StdDevP(num, ...)	Standard deviation based on entire population (“N method”, biased)
StdDevS(num, ...)	Standard deviation based on sample (“N–1 method”, unbiased)
Sum(summand, ...)	Sum parameters
Tan(degrees)	Tangent of angle in degrees
Tanh(degrees)	Hyperbolic cotangent of angle in degrees
TodayAdd(days)	Add # of days to today’s date
Tvm?(N?, IpY?, PV?, PMT?, FV?, PpY, CpY, BeginPeriodPMT)	Calculate time value of money
UKGallonLiter?(gallons?, liters?)	Convert between UK gallons and liters
USGallonLiter?(gallons?, liters?)	Convert between US gallons and liters
VarP(num, ...)	Variance based on entire population (“N method”, biased)
VarS(num, ...)	Variance based on sample (“N–1 method”, unbiased)
YardMeter?(yards?, meters?)	Convert between yards and meters
YearDay?(years?, days?)	Convert between years and days
YearHour?(years?, hours?)	Convert between years and hours
YearMin?(years?, mins?)	Convert between years and minutes
YearSec?(years?, secs?)	Convert between years and seconds

Table 10: Functions By Category

Business/Financial Functions	Purpose
Breakeven?(fixedCost?, variableCost?, unitPrice?, profit?, quantity?)	Perform breakeven analysis
Interest?(nominal%?, effect%?, periods)	Convert between nominal and effective annual interest rate for # of compounding periods/year
PercentChange?(old?, new?, change%?, periods?)	Calculate percent change, compound interest, or cost-sell-markup. Specify ‘1’ for ‘periods?’ when it is not needed.
ProfitMargin?(price?, cost?, margin%?)	Calculate profit margin variable
Tvm?(N?, IpY?, PV?, PMT?, FV?, PpY, CpY, BeginPeriodPMT)	Calculate time value of money

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Conversion Functions	Purpose
FahrCelsius?(fahr?, celsius?)	Convert between Fahrenheit and Celsius degrees
FootMeter?(feet?, meters?)	Convert between feet and meters
InchCM?(inches?, centimeters?)	Convert between inches and centimeters
MileKM?(miles?, kilometers?)	Convert between miles and kilometers
PoundKG?(pounds?, kilograms?)	Convert between pounds and kilograms
UKGallonLiter?(gallons?, liters?)	Convert between UK gallons and liters
USGallonLiter?(gallons?, liters?)	Convert between US gallons and liters
YardMeter?(yards?, meters?)	Convert between yards and meters

Date Functions	Purpose
DateAdd(month, day, year, days)	Add # of days to specified date (e.g. DateAdd(1, 15, 2010, 100))
DayHour?(days?, hours?)	Convert between days and hours
DayMin?(days?, mins?)	Convert between days and minutes
DaySec?(days?, secs?)	Convert between days and seconds
DaysBetween(month1, day1, year1, month2, day2, year2)	# of days between specified dates
DaysUntil(month, day, year)	# of days until specified date (e.g. DaysUntil(1, 15, 2010))
HourMin?(hours?, mins?)	Convert between hours and minutes
HourSec?(hours?, secs?)	Convert between hours and seconds
MinSec?(mins?, secs?)	Convert between minutes and seconds
TodayAdd(days)	Add # of days to today's date
YearDay?(years?, days?)	Convert between years and days
YearHour?(years?, hours?)	Convert between years and hours
YearMin?(years?, mins?)	Convert between years and minutes
YearSec?(years?, secs?)	Convert between years and seconds

Formatter Functions	Purpose
Decimals(number, digitsAfterPoint)	Specify # of digits to display after decimal point

Standard Functions	Purpose
Abs(num)	Absolute value of number
Div(div1, div2)	Divide div1 by div2
E(exp)	Natural antilogarithm (e to power 'exp')
Inv(x)	Inverse of x (1/x)
Ln(num)	Natural logarithm of num

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Standard Functions	Purpose
Log(num)	Base 10 logarithm of num
Log2(num)	Base 2 logarithm of num
Mod(num, modulus)	Modulus mod of num. = num – modulus*INT(num/modulus) where INT() = Rounds a number down to the nearest integer e.g. INT(-8.4) = -9, INT(8.9) = 8
Mul(multiplicand, ...)	Multiply parameters
Percent(num)	Divide num by 100
Pow(base, exp)	Raise 'base' to power 'exp'
Root(num, root)	Integer root of num (e.g. root(10,7)=7 th root of 10)
Sqrt(num)	Square root of num
Sum(summand, ...)	Sum parameters

Statistical Functions	Purpose
Avg(num, ...)	Average of numbers
Median(num, ...)	Median of numbers
Rnd(num)	Random non-negative integer in the range 0...num-1 inclusive
StdDevP(num, ...)	Standard deviation based on entire population ("N method", biased)
StdDevS(num, ...)	Standard deviation based on sample ("N-1 method", unbiased)
VarP(num, ...)	Variance based on entire population ("N method", biased)
VarS(num, ...)	Variance based on sample ("N-1 method", unbiased)

Trigonometric Functions	Purpose
Acos(num)	Inverse cosine of num; result in degrees
Acosh(num)	Inverse hyperbolic cosine of num; result in degrees
Acot(num)	Inverse cotangent of num; result in degrees
Acoth(num)	Inverse hyperbolic cotangent of num; result in degrees
Acsc(num)	Inverse cosecant of num; result in degrees
Acsch(num)	Inverse hyperbolic cosecant of num; result in degrees
Asec(num)	Inverse secant of num; result in degrees

REFERENCE

Trigonometric Functions	Purpose
Asech(num)	Inverse hyperbolic secant of num; result in degrees
Asin(num)	Inverse sine of num; result in degrees
Asinh(num)	Inverse hyperbolic sine of num; result in degrees
Atan(num)	Inverse tangent of num; result in degrees
Atanh(num)	Inverse hyperbolic tangent of num; result in degrees
Cos(degrees)	Cosine of angle in degrees
Cosh(degrees)	Hyperbolic cosine of angle in degrees
Cot(degrees)	Cotangent of angle in degrees
Coth(degrees)	Hyperbolic cotangent of angle in degrees
Csc(degrees)	Cosecant of angle in degrees
Csch(degrees)	Hyperbolic cosecant of angle in degrees
Degrees(radians)	Convert angle in radians to degrees
Radians(degrees)	Convert angle in degrees to radians
Sec(degrees)	Secant of angle in degrees
Sech(degrees)	Hyperbolic secant of angle in degrees
Sin(degrees)	Sine of angle in degrees
Sinh(degrees)	Hyperbolic sine of angle in degrees
Tan(degrees)	Tangent of angle in degrees
Tanh(degrees)	Hyperbolic cotangent of angle in degrees

Global Parameters

Table 11: Global Parameters Alphabetically

Parameter	Purpose
@	Last Result
E	Base of natural logarithms
ExchgRateToHome	Exchange rate to convert from other to home currency (default = 1.0000). Used by HomeCurrency formula.
ExchgRateToOther	Exchange rate to convert from home to other currency (default = 1.0000). Used by OtherCurrency formula.
Pi	Pi
TaxPercent	Tax Rate in percent (default = 15). Used by Tip and Tip2 formulas.
TipPercent	Percent to tip (default = 15). Used by Tip formula.

Input Grammar

Figure 1: BNF Grammar Production Rules for BizMathica Input

```

Start ::= ( SolverParam <EOF> | Formula <EOF> | Global <EOF> |
          Expression ( <STRING_LITERAL> )? <EOF> | <EOF> )
Expression ::= AdditiveExpression
AdditiveExpression ::= MultiplicativeExpression ( ( <PLUS> MultiplicativeExpression ) | (
                  <MINUS> MultiplicativeExpression ) ) *
MultiplicativeExpression ::= UnaryExpression ( ( PowerExpression ) | ( <MUL> UnaryExpression ) |
                  ( <DIV> UnaryExpression ) ) *
UnaryExpression ::= ( <PLUS> UnaryExpression )
                  | ( <MINUS> UnaryExpression )
                  | PowerExpression
PowerExpression ::= UnaryExpressionNotPlusMinus ( ( <POWER> UnaryExpression ) ) ?
UnaryExpressionNotPlusMinus ::= ( AnyConstant | ( Function | Variable ) | "(" Expression ")" ) ( (
                  <PERCENT> ) ) ?
Function ::= ( Identifier "(" Arguments ")" )
Arguments ::= ( ( Identifier | Expression ) ( "," ( Identifier | Expression ) ) * ) ?
Variable ::= ( Identifier ( "{" <STRING_LITERAL> "}" ) ? ) ?
Global ::= ( Identifier ( <STRING_LITERAL> ) ? "=" ( Expression ) ? ) ?
Formula ::= ( Identifier "()" ( <STRING_LITERAL> ) ? ( "=" ( Expression (
                  <STRING_LITERAL> ) ? ) ? ) ? ) ?
SolverParam ::= Identifier
Identifier ::= <IDENTIFIER>
AnyConstant ::= RealConstant
RealConstant ::= ( <INTEGER_LITERAL> | <FLOATING_POINT_LITERAL> )
    
```

Figure 2: BNF Grammar Tokens/Terminals

Token	Meaning
*	0 or more of
+	1 or more of
?	0 or 1 of
	Any one of (i.e. logical exclusive or)
<PLUS>	+
<MINUS>	-
<MUL>	*
<DIV>	/
<PERCENT>	%
<POWER>	^
<IDENTIFIER>	<LETTER> (<LETTER> <DIGIT>)*
<LETTER>	["_", "a"- "z", "A"- "Z", "?", "@"]
<DIGIT>	["0"- "9"]
<INTEGER_LITERAL>	["0"- "9"] (["0"- "9"]) *
<FLOATING_POINT_LITERAL>	(["0"- "9"]) + "." (["0"- "9"]) * (<EXPONENT>)?

