

## Alternative proposed disposition on GR-0008 and other date issues

This proposal deals with comments AU-0016, BR-0046, CA-0044, CA-0071, CH-0006, CH-0007, CH-0017, CL-0013, CL-0015, CL-0147, CL-00172, CO-0035, CO-0154, CO-0155, CO-0156, CZ-0009, DE-0030, DE-0031, DE-0032, DE-0072, DE-0073, DK-0033, DK-0136, DK-0137, DK-0153, FI-0013, FR-0182, FR-0183, FR-0351, FR-0352, GB-0300, GB-0301, GB-0304, GB-0305, GB-0363, GB-0364, GH-0002, GR-0003, GR-0004, GR-0005, GR-0006, GR-0007, GR-0008, IE-0002, IN-0007, IN-0057, IN-0058, IN-0061, IN-0062, IN-0080, IR-0001, IR-0002, KE-0054, KE-0055, MX-0005, PE-0002, PE-0003, PH-0005, PT-0085, SG-0002, US-0130, US-0131, US-0134, UY-0003, VE-0011, VE-0060, ZA-0014.

The proposal is that timestamps and durations are stored in XSD dateTime and XSD duration (which are elaborations of ISO 8601), including recommendations that applications automatically treat them as numbers whenever required for compatibility reasons. Applications may work in compatibility mode, where such transparent conversion of a date to a real number is possible, but should warn users against compatibility mode and prefer strict mode, where an error will occur in such cases.

More explanation and illustrations are provided in an informative Annex on page 32.

### Part 4, §3.17.2.1, page 2,509, line 21:

#### 3.17.2.1 Constants

A *constant* is a predefined value that is not calculated, and, therefore, does not change. A constant has the following form:

*constant*:

*error-constant*  
*logical-constant*  
*numerical-constant*  
*string-constant*  
*array-constant*  
[\*datetime-constant\*](#)  
[\*duration-constant\*](#)

*error-constant*:

#DIV/0! | #N/A | #NAME? | #NULL! | #NUM! | #REF! | #VALUE!

*logical-constant*:

FALSE  
TRUE

*numerical-constant*:

*whole-number-part* [ . ] [ *exponent-part* ]  
. *fractional-part* [ *exponent-part* ]  
*whole-number-part* . *fractional-part* [ *exponent-part* ]

*whole-number-part*:

*digit-sequence*

*fractional-part*:

*digit-sequence*

*exponent-part*:

e [ *sign* ] *digit-sequence*  
E [ *sign* ] *digit-sequence*

*sign:*

+  
-

*digit-sequence:*

a series of one or more decimal digits

*string-constant:*

" [ *string-chars* ] "

*string-chars*

*string-char*

*string-chars string-char*

*string-char*

""

any character except "

[\*datetime-constant\*](#)

[any XSD date, time, or dateTime format, where the year is positive](#)

[\*duration-constant\*](#)

[any XSD duration format](#)

To include a double-quote character (") in *string-chars*, precede it with another double-quote character. [*Example:* "ab"cd" contains the characters ab"cd, and ""abcd"" contains the characters "abcd". *end example*]

An *array constant* is a list of one or more constants organized in one or two dimensions, and delimited by braces. An array constant has the following form:

*array-constant:*

{ *constant-list-rows* }

*constant-list-rows:*

*constant-list-row*

*constant-list-rows ; constant-list-row*

*constant-list-row:*

*constant*

*constant-list-row , constant*

An *array-constant* shall not contain

- An *array-constant*.
- Columns or rows of unequal length.

Any *numerical-constant* in an *array-constant* can be preceded immediately by a *prefix-operator*.

The *constants* in an *array-constant* can have different types.

[*Guidance* An implementation is encouraged to not unnecessarily limit the number of rows and columns in an *array-constant*. *end guidance*]

[*Example:* {1, 3.5, TRUE, "Hello"} is a 1x4 array of constants.

To represent the values 10, 20, 30, and 40, as a 1x4 array, use {10, 20, 30, 40}.

To represent the values 10, 20, 30, and 40 in the first row, and 50, 60, 70, and 80 in the second row, use the following 2x4 array constant: {10, 20, 30, 40; 50, 60, 70, 80}. *end example*]

*error-constant* is described in [§3.17.2.7](#).

Each *constant* has a corresponding type ([§3.17.2.6](#)), as follows:

Constant Form	Type
<i>array-constant</i>	array
<i>error-constant</i>	error
<i>logical-constant</i>	logical
<i>numerical-constant</i>	number
<i>string-constant</i>	text
<a href="#"><i>datetime-constant</i></a>	<a href="#">datetime</a>
<a href="#"><i>duration-constant</i></a>	<a href="#">duration</a>

In the context of cell formulas and values in SpreadsheetML, the following definition of precision shall apply:

By default, default representation of precision shall be as defined by the XML schema `double` type <http://www.w3.org/TR/xmlschema-2/#double>. The default is therefore 53-bits of mantissa precision.

An application that uses XML schema `double` can optionally state the precision in the Additional Characteristics part by writing out the number of bits in the mantissa and exponent.

A compliant consumer shall parse numbers of arbitrary precision without error.

#### **Part 4, §3.17.2.6, page 2,519, line 13:**

##### **3.17.2.6 Types and Values**

Each *expression* has a type. SpreadsheetML formulas support the following types: array, error, logical, number, [datetime](#), [duration](#), and text.

An array value or constant represents a collection of one or more elements, whose values can have any type (i.e., the elements of an array need not all have the same type).

An error value ([§3.17.2.7](#)) or constant represents an error, and can have any value defined for *error-constant* ([§3.17.2.1](#)).

A logical value or constant represents a truth value, and can have any value defined for *logical-constant* ([§3.17.2.1](#)).

A numeric value or constant represents a real number, and can have any value defined for *numeric-constant* ([§3.17.2.1](#)). The term "number" is used as a generic name for any expression of type *number*.

[A datetime value or constant represents a date, a time, or a date and time, and can have any value defined for \*datetime-constant\* \(§3.17.2.1\).](#)

[A duration value or constant represents a time duration, and can have any value defined for \*duration-constant\* \(§3.17.2.1\).](#)

A text value or constant represents arbitrary text, and can have any value defined for *string-constant* (§3.17.2.1). The term "string" is used as a generic name for any expression of type *text*.

Some legacy spreadsheet applications have been storing dates/times and durations as real numbers. Microsoft Excel and Lotus 1-2-3, in particular, have been storing dates and times as the number of days since the beginning of 1900 or 1904, and durations as a number of days. In order to be compatible with legacy spreadsheets or familiar to users of legacy applications, an application may work in a compatibility mode that transparently converts datetimes and durations to numbers when asked to add them to real numbers or perform other operations that make sense with real number operands but not with datetimes and durations. Likewise, numbers may also be transparently converted to datetimes or durations as needed. In addition, when working in compatibility mode, the nonexistent date of 29 February 1900 is allowed. However, applications should also have a strict mode of operation that prohibits such legacy operations, and should discourage users from working in compatibility mode. The *dateCompatibility* attribute (§3.2.28) describes how datetimes are converted into numbers when applications work in compatibility mode.

An implementation is permitted to provide an implicit conversion from *string-constant* to number. However, the rules by which such conversions take place are implementation-defined. [Example: An implementation might choose to accept "123"+10 by converting the string "123" to the number 123. Such conversions might be locale-specific in that a *string-constant* such as "10,56" might be converted to 10.56 in some locales, but not in others, depending on the radix point character. end example]

[Guidance An implementation is encouraged to support strings at least as long as 32,767 characters. end guidance]

A complex number is represented as a string in one of two equivalent text formats:  $x + yi$  or  $x + yj$ , where  $x$  is the real part, and  $y$  is the imaginary part. [Example: "3+4i" and "-2.5-34.6j" end example]

## Part 4, §3.17.4, page 2,522, line 5:

### 3.17.4 Dates and Times

~~Each unique instant in SpreadsheetML time is represented as a distinct non-negative numeric serial value, which is made up of an integer date component and a fractional time component. As dates and times are numeric values, they can take part in arithmetic operations.~~

~~Numerous functions take as arguments one or more serial values or strings representing dates and/or times. Functions that care only about the date shall ignore any time information that is provided. Functions that care only about the time shall ignore any date information that is provided.~~

#### 3.17.4.1 Date Representation

~~Going forward in time, the date component of a serial value increases by 1 each day.~~

~~There are two different bases for serial values:~~

- ~~• In the 1900 date base system, the lower limit is January 1, 1900, which has serial value 1. The upper limit is December 31, 9999, which has serial value 2,958,465.~~
- ~~• In the 1904 date base system, the lower limit is January 1, 1904, which has serial value 0. The upper limit is December 31, 9999, which has serial value 2,957,003.~~

~~A serial value outside of the range for its date base system is ill-formed.~~

~~As to which date base system an implementation uses by default or whether it allows its users to switch between date base systems, is unspecified. See §3.17.6.7 for XML-related details. [Note: As the XML allows either date base system to be used, an implementation must be able to deal with both systems. end note]~~

~~For legacy reasons, an implementation using the 1900 date base system shall treat 1900 as though it was a leap year. [Note: That is, serial value 59 corresponds to February 28, and serial value 61 corresponds to March 1, the next day, allowing the (non-existent) date February 29 to have the serial value 60. end note] A consequence of this is that for dates between January 1 and February 28, WEEKDAY shall return a value for the day immediately prior to the correct day, so that the (non-existent) date February 29 has a day-of-the-week that immediately follows that of February 28, and immediately precedes that of March 1.~~

~~[Example: For the 1900 date base system:~~

~~DATEVALUE("01-Jan-1900") results in the serial value 1.0000000...  
DATEVALUE("03-Feb-1910") results in the serial value 3687.0000000...  
DATEVALUE("01-Feb-2006") results in the serial value 38749.0000000...  
DATEVALUE("31-Dec-9999") results in the serial value 2958465.0000000...~~

~~For the 1904 date base system:~~

~~DATEVALUE("01-Jan-1904") results in the serial value 0.0000000...  
DATEVALUE("03-Feb-1910") results in the serial value 2225.0000000...  
DATEVALUE("01-Feb-2006") results in the serial value 37287.0000000...  
DATEVALUE("31-Dec-9999") results in the serial value 2957003.0000000...~~

~~end-example]~~

### **3.17.4.2 Time Representation**

~~The time component of a serial value ranges in value from 0–0.99999999, and represents times from 0:00:00 (12:00:00 AM) to 23:59:59 (11:59:59 P.M.), respectively.~~

~~Going forward in time, the time component of a serial value increases by 1/86,400 each second. [Note: As such, the time 12:00 has a serial value time component of 0.5. end-note]~~

~~[Example:~~

~~TIMEVALUE("00:00:00") results in the serial value 0.0000000...  
TIMEVALUE("00:00:01") results in the serial value 0.0000115...  
TIMEVALUE("10:05:54") results in the serial value 0.4207639...  
TIMEVALUE("12:00:00") results in the serial value 0.5000000...  
TIMEVALUE("23:59:59") results in the serial value 0.9999884...~~

~~end-example]~~

### **3.17.4.3 Combined Date and Time Representation**

~~Any date component can be added to any time component to produce a serial value for that date/time combination.~~

~~[Example: For the 1900 date base system:~~

~~DATE(1910,2,3)+TIME(10,5,54) results in the serial value 3687.4207639...~~  
~~DATE(1900,1,1)+TIME(12,0,0) results in the serial value 1.5000000...~~  
~~DATE(9999,12,31)+TIME(23,59,59) results in the serial value 2958465.9999884...~~

~~For the 1904 date base system:~~

~~DATE(1910,2,3)+TIME(10,5,54) results in the serial value 2225.4207639...~~  
~~DATE(1904,1,1)+TIME(12,0,0) results in the serial value 0.5000000...~~  
~~DATE(9999,12,31)+TIME(23,59,59) results in the serial value 2957003.9999884...~~

~~end example}~~

**Part 4, §3.2.27, page 1,908, line 26:**

- Properties: the workbook has several property collection that store basic workbook settings, such as the ~~date system to use~~, file protection settings, calculation settings, and smart tag behaviors.
- Names: represent descriptive that represent cells, ranges of cells, formulas, or constant values.

[Example:

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<workbook
xmlns="http://schemas.openxmlformats.org/spreadsheetml/2006/5/main"
mlns:r="http://schemas.openxmlformats.org/officeDocument/2006/relationships"
">
  <fileVersion lastEdited="4" lowestEdited="4" rupBuild="4017"/>
  <workbookPr date1904="1" vbName="ThisWorkbook"
defaultThemeVersion="123820"/>
```

**Part 4, §3.2.28, page 1,911, line 1:**

[Example:

```
<workbookPr date1904="1" showObjects="none"
saveExternalLinkValues="0"
defaultThemeVersion="123820"/>
```

~~end example]~~

**Part 4, §3.3, page 1,926, line 22:**

Worksheet cells can contain text, numbers, dates/[times/durations](#), and formulas.

**Part 4, §3.2.28, page 1,912:**

Attributes	Description
<del>date1904 (Date 1904)</del>	<del>Specifies a boolean value that indicates whether the date systems used in the workbook starts in 1904.</del> <del>A value of on, 1, or true indicates the date system starts in 1904.</del> <del>A value of off, 0, or false indicates the workbook uses the 1900 date system, where 1/1/1900 is the first day in the system.</del> <del>The default value for this attribute is false.</del> <del>The possible values for this attribute are defined by the XML Schema boolean datatype.</del>

<a href="#">dateCompatibility (Date operations in compatibility mode)</a>	<p><a href="#">Specifies how datetimes and durations are converted to real numbers when working in date compatibility mode.</a></p> <p><a href="#">A value of "1900" indicates that if the consumer has a date compatibility mode, it should enable it, and that when asked to perform operations with datetimes and/or durations that do not make sense unless the datetimes and/or durations are converted to numbers, then the consumer should attempt to convert durations to number of days and datetimes to number of days since 1899-12-31, making, in addition, the assumption that 1900 was a leap year. Conversely, the consumer should attempt to convert numbers to datetimes or durations as needed; for example, when a number is used as an argument to a spreadsheet function accepting a date.</a></p> <p><a href="#">A value of "1904" indicates that if the consumer has a date compatibility mode, it should enable it, and that when asked to perform operations with datetimes and/or durations that do not make sense unless the datetimes and/or durations are converted to numbers, then the consumer should attempt to convert durations to number of days and datetimes to number of days since 1904-01-01. Conversely, the consumer should attempt to convert numbers to datetimes or durations as needed.</a></p> <p><a href="#">If the attribute is missing or is an empty string, the consumer should disable the date compatibility mode.</a></p> <p><a href="#">Consumers that do not have a date compatibility mode should warn the user if the attribute is present and non-empty, but shall otherwise ignore it.</a></p>
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**Part 4, §3.2.28, page 1,915, line 3:**

The following XML Schema fragment defines the contents of this element:

```
<complexType name="CT_WorkbookPr">
  <attribute name="date1904" type="xsd:boolean" use="optional" default="false"/>
  <attribute name="dateCompatibility" type="xsd:string" use="optional" default="" />
  <attribute name="showObjects" type="ST_Objects" use="optional" default="all"/>
  <attribute name="showBorderUnselectedTables" type="xsd:boolean" use="optional"
    default="true"/>
  <attribute name="filterPrivacy" type="xsd:boolean" use="optional" default="false"/>
  <attribute name="promptedSolutions" type="xsd:boolean" use="optional" default="false"/>
  <attribute name="showInkAnnotation" type="xsd:boolean" use="optional" default="true"/>
  <attribute name="backupFile" type="xsd:boolean" use="optional" default="false"/>
  <attribute name="saveExternalLinkValues" type="xsd:boolean" use="optional"
    default="true"/>
  <attribute name="updateLinks" type="ST_UpdateLinks" use="optional" default="userSet"/>
  <attribute name="codeName" type="xsd:string" use="optional"/>
  <attribute name="hidePivotFieldList" type="xsd:boolean" use="optional" default="false"/>
  <attribute name="showPivotChartFilter" type="xsd:boolean" default="false"/>
  <attribute name="allowRefreshQuery" type="xsd:boolean" use="optional" default="false"/>
  <attribute name="publishItems" type="xsd:boolean" use="optional" default="false"/>
  <attribute name="checkCompatibility" type="xsd:boolean" use="optional" default="false"/>
  <attribute name="autoCompressPictures" type="xsd:boolean" use="optional" default="true"/>
  <attribute name="refreshAllConnections" type="xsd:boolean" use="optional"
    default="false"/>
  <attribute name="defaultThemeVersion" type="xsd:unsignedInt" use="optional"/>
</complexType>
```

**Part 4, §3.8.31, page 2,140, line 10:**

To display	As	Use this code
Years	<del>1900</del> 0001-9999	yyyy

**Part 4, §3.8.31, page 2,140, line 12:**

~~See §3.17.4.1 for special handling of certain days in the year 1900.~~

**Part 4, §3.17.6.7, page 2,529, line 27:**

**~~3.17.6.7 Dates and Times~~**

~~As a date and/or time is represented by a number, a date/time serial value shall be stored in XML as the unformatted text form of that number, as accurately as possible.~~

~~The date base system is recorded in the Workbook part's XML by the presence or absence of the date1904 attribute of the workbookPr element. A value of 1 for this attribute indicates 1904. [Example:~~

~~—1900: <workbookPr showObjects="all"/>  
—1904: <workbookPr date1904="1" showObjects="all"/>  
end example]~~

**Part 4, §3.17.7.2, page 2,534, line 6:**

- ~~● *issue, first interest, or settlement* is out of range for the current date base value, #NUM! is returned~~

**Part 4, §3.17.7.3, page 2,535, line 16:**

- ~~● *issue or settlement* is out of range for the current date base value, #NUM! is returned~~

**Part 4, §3.17.7.7, page 2,539, line 5:**

- ~~● *date purchased or first period* is out of range for the current date base value, #NUM! is returned.~~

**Part 4, §3.17.7.8, page 2,541, line 1:**

- ~~● *date purchased or first period* is out of range for the current date base value, #NUM! is returned.~~

**Part 4, §3.17.7.57, page 2,583, line 6:**

- ~~● *settlement or maturity* is out of range for the current date base value, #NUM! is returned.~~

**Part 4, §3.17.7.58, page 2,584, line 5:**

- ~~● *settlement or maturity* is out of range for the current date base value, #NUM! is returned.~~

**Part 4, §3.17.7.59, page 2,586, line 6:**

- ~~settlement or maturity is out of range for the current date base value, #NUM! is returned.~~

**Part 4, §3.17.7.60, page 2,586, line 6:**

- ~~settlement or maturity is out of range for the current date base value, #NUM! is returned.~~

**Part 4, §3.17.7.61, page 2,587, line 7:**

- ~~settlement or maturity is out of range for the current date base value, #NUM! is returned.~~

**Part 4, §3.17.7.62, page 2,588, line 6:**

- ~~settlement or maturity is out of range for the current date base value, #NUM! is returned.~~

**Part 4, §3.17.7.74, page 2,600, line 11:**

**3.17.7.74 DATE**

**Syntax:**

DATE ( year , month , day [ , add1900 ] )

**Description:** ~~Computes the serial value for the given date~~ Constructs a datetime.

**Arguments:**

Name	Type	Description
<i>year</i>	number	A year, truncated to integer, that together with month number and day specifies the date value <del>whose serial value is to be computed to be constructed.</del> <del>For the 1900 date base system:</del> <ul style="list-style-type: none"><li>● <del>If year is in the range 0-1899, inclusive, the year shall be interpreted as year + 1900.</del></li><li>● <del>If year is in the range 1900-9999, inclusive, the year shall be interpreted as year.</del></li></ul> <del>For the 1904 date base system:</del> <ul style="list-style-type: none"><li>● <del>If year is in the range 4-1899, inclusive, the year shall be interpreted as year + 1900.</del></li><li>● <del>If year is in the range 1904-9999, inclusive, the year shall be interpreted as year.</del></li></ul>
<i>month</i>	number	A month, truncated to integer, that together with year number and day specifies the date <del>whose serial value is to be computed to be constructed.</del> <u>month shall be interpreted as the number of months.</u>

Name	Type	Description
		<p>relative to the final month of the year prior to the specified year.</p> <p>If <i>month</i> is in the range 1–12, the month shall be interpreted as <i>month</i>. If <i>month</i> is less than 1 or greater than 12, the month shall be interpreted as the normalized value (see below) of <i>month</i>, and the year shall be adjusted accordingly.</p>
<i>day</i>	number	<p>A day, truncated to integer, that together with month and number year specifies the date <del>whose serial value is to be computed to be constructed</del>. <i>day</i> shall be interpreted as the number of days relative to the last day of the month (and its associated year) prior to the month (and its associated year) as determined from <i>month</i> and <i>year</i> (see below).</p> <p>If <i>day</i> is in the allowable range of days for the month, the day shall be interpreted as <i>day</i>. If <i>day</i> is less than 1 or greater than the number of days in the given month, the day shall be interpreted as the normalized value (see below) of <i>day</i>, and the year and month shall be adjusted</p>
<i>add1900</i>	logical	<p>If true, it specifies that the year is to be interpreted as <i>year</i>+1900 if <i>year</i> is in less than 1900, and as <i>year</i> if it is greater than or equal to 1900. The default value for this parameter is false.</p>

The value of *month* or *day* in a *year-month-day* argument triplet can be out of range. *month* is simply an instance of counting a given number of months, minus one, relative to January of the year specified, using the Gregorian calendar [ISO 8601]. This calendar defines that there are 12 months in a year, and that when counting forward, the month following December of one year is January of the following year, and when counting backward, the month preceding January of one year is December of the previous year. Likewise, *day* is simply an instance of counting a given number of days, minus one, relative to the first day of the adjusted month, using the Gregorian calendar. This calendar defines the number of days in each month, and that when counting forward, the day following the final day of one month is the first day of the following month, and when counting backward, the day preceding the first day of one month is the final day of the previous month. [Example: The *year-month-day* argument triplets (2007,12,32), (2007,13,1), and (2008,1,1) all result in the same date. end example]

**Return Type and Value:** ~~number~~—~~The serial value for the given date.~~ *datetime* – The *datetime* that corresponds to the specified parameters.

If *year* is greater than 9999, or less than 1 with *add1900*=false, or less than 0 with *add1900*=true, or if the arguments would result in a date greater than 9999-12-31, #NUM! is returned.

When the dateCompatibility attribute has a value of “1900”, a consumer may consider 1900 to be a leap year. In such a case, DATE(1900, 2, 29) will return 1900-02-29, rather than the correct value of 1900-03-01.

However, if

- ~~year is less than 0 or is greater than or equal to 10000, and the 1900 date base system is being used, #NUM! is returned.~~
- ~~year is less than 4, is greater than or equal to 10000, is in the range 1900–1903, inclusive, and the 1904 date base system is being used, #NUM! is returned.~~

~~{Example: For the 1900 date base system:~~

~~DATE(0,1,1) results in a serial value of 1~~

~~DATE(1899,1,1) results in a serial value of 693598~~

~~DATE(1900,1,1) results in a serial value of 1~~

~~DATE(9999,12,31) results in a serial value of 2958465~~

~~For the 1904 date base system:~~

~~DATE(4,1,1) results in a serial value of 0~~

~~DATE(1899,1,1) results in a serial value of 692136~~

~~DATE(1904,1,1) results in a serial value of 0~~

~~DATE(9999,12,31) results in a serial value of 2957003~~

~~end-example}~~

**Part 4, §3.17.7.75, page 2,601, line 29:**

**3.17.7.75 DATEDIF**

**Syntax:**

DATEDIF ( start-date , end-date [ , unit ] )

**Description:** Calculates the ~~number of days, months, or years~~ difference between two dates.

**Arguments:**

Name	Type	Description										
<i>start-date</i>	<u>datetime</u> <del>number</del>	The first date in the period, <del>truncated to integer</del> .										
<i>end-date</i>	<u>datetime</u> <del>number</del>	The last date in the period, <del>truncated to integer</del> .										
<i>unit</i>	text	The <del>count</del> <u>type of result</u> to be returned. <u>If omitted, returns the difference as a duration. Otherwise, returns a number that depends on unit</u> , as follows: <table border="1" data-bbox="534 1534 1396 1915"> <thead> <tr> <th>Value</th> <th>Day Count Basis</th> </tr> </thead> <tbody> <tr> <td>"Y"</td> <td>The number of complete years in the period.</td> </tr> <tr> <td>"M"</td> <td>The number of complete months in the period.</td> </tr> <tr> <td>"D"</td> <td>The number of days in the period.</td> </tr> <tr> <td>"MD"</td> <td>The difference between the days in <i>start-date</i> and</td> </tr> </tbody> </table>	Value	Day Count Basis	"Y"	The number of complete years in the period.	"M"	The number of complete months in the period.	"D"	The number of days in the period.	"MD"	The difference between the days in <i>start-date</i> and
Value	Day Count Basis											
"Y"	The number of complete years in the period.											
"M"	The number of complete months in the period.											
"D"	The number of days in the period.											
"MD"	The difference between the days in <i>start-date</i> and											

Name	Type	Description
		<i>end-date</i> . The months and years of the dates are ignored.
	"YM"	The difference between the months in <i>start-date</i> and <i>end-date</i> . The days and years of the dates are ignored.
	"YD"	The difference between the days of <i>start-date</i> and <i>end-date</i> . The years of the dates are ignored.

**Return Type and Value:** number [or duration](#) -- The number of days, months, or years between two dates, depending on the value of *unit*, [or the duration between the two dates, if unit is omitted](#).

However, if

- ~~start-date or end-date is out of range for the current date base value, #NUM! is returned.~~
- *start-date* ≥ *end-date* #NUM! is returned.
- *unit* is any value other than those shown in the table above, #NUM! is returned.

[Example:

DATEDIF (DATE (2001, 1, 1) , DATE (2003, 1, 1) , "Y") results in 2 complete years  
DATEDIF (DATE (2001, 6, 1) , DATE (2002, 8, 15) , "D") results in 440 days  
DATEDIF (DATE (2001, 6, 1) , DATE (2002, 8, 15) , "YD") results in 75 days  
DATEDIF (DATE (2001, 6, 1) , DATE (2002, 8, 15) , "MD") results in 14 days

*end example]*

**Part 4, §3.17.7.75, page 2,601, line 29:**

**3.17.7.76 DATEVALUE**

**Syntax:**

DATEVALUE ( date-time-string )

**Description:** [Determines](#) ~~Computes the serial value of~~ the date ~~and/or time~~ represented by [a string](#)~~the string date time string, taking into account the current date base value.~~

**Arguments:**

Name	Type	Description
<i>date-</i>	text	The <del>date and/or time whose serial value is</del> <a href="#">string representing the</a>

<i>time-string</i>		<a href="#">date</a> to be computed. <i>date-time-string</i> can have any valid date <del>and/or time</del> format. If the year portion of <i>date-time-string</i> is omitted, the current year is used. Any time information in <i>date-time-string</i> shall be ignored.
--------------------	--	--

**Return Type and Value:** ~~number~~ [datetime](#) -- The ~~serial value of the~~ date ~~and/or time~~ represented by the string *date-time-string*.

However, if

- ~~date-time-string is out of range for the current date base value, #VALUE! is returned.~~
- date-time-string* does not represent a date, #VALUE! is returned.

[*Example:* When the current year is 2006,

```
DATEVALUE ("2/1/2006")
DATEVALUE ("01-Feb-2006 10:06 AM")
DATEVALUE ("2006/2/1")
DATEVALUE ("2006-2-1")
DATEVALUE ("1-Feb")
```

all result in [2006-02-01](#)~~38749 for the 1900 date base system, or 37287 for the 1904 date base system.~~ *end example*]

#### Part 4, §3.17.7.78, page 2,605, line 11:

### 3.17.7.78 DAY

#### Syntax:

DAY ( date-value )

**Description:** Computes the numeric Gregorian day for the date and/or time having the given *date-value*, ~~taking into account the current date base value.~~

#### Arguments:

Name	Type	Description
<i>date-value</i>	<del>number</del> <a href="#">datetime</a> , text	The date <del>and/or time</del> whose day is to be computed. That date and/or time shall be expressed either as a <del>serial</del> <a href="#">datetime</a> value, <del>in which case, its fractional part is ignored,</del> or as a <i>string-constant</i> having any valid date and/or time <del>format,</del> <del>in which case, a</del> <a href="#">Any</a> time information shall be ignored.

**Return Type and Value:** number -- The Gregorian day for the date and/or time having the given *date-value*. The returned value shall be in the range 1--31.

~~However, if date-value is out of range for the current date base value, #NUM! is returned.~~

[*Example:*

DAY (DATE (2006, 1, 2)) results in 2  
 DAY (DATE (2006, 0, 2)) results in 31  
 DAY ("2006/1/2 10:45 AM") results in 2  
~~DAY(3000) results in 18 for the 1900 date base system, or 19 for the 1904 date base system~~

*end example]*

**Part 4, §3.17.7.79, page 2,606, line 16:**

**3.17.7.79 DAYS360**

**Syntax:**

DAYS360 ( start-date , end-date [ , method-flag ] )

**Description:** Computes the signed number of days between two dates based on a 360-day year (twelve 30-day months).

**Arguments:**

Name	Type	Description						
<i>start-date</i>	<a href="#">datetime</a> <del>number</del>	<i>start-date</i> and <i>end-date</i> are the dates for which the difference is to be computed. <i>start-date</i> can be earlier than, the same as, or later than <i>end-date</i> .						
<i>start-date</i>	<a href="#">datetime</a> <del>number</del>							
<i>method-flag</i>	logical	Specifies whether to use the U.S. or European method in the calculation, as follows: <table border="1" data-bbox="523 1352 1385 1865"> <thead> <tr> <th data-bbox="529 1361 676 1451">Value</th> <th data-bbox="676 1361 1378 1451">Meaning</th> </tr> </thead> <tbody> <tr> <td data-bbox="529 1451 676 1771">FALSE OR omitted</td> <td data-bbox="676 1451 1378 1771">U.S. (NASD) method: If the <i>start-date</i> is the 31st day of a month, it is changed to the 30th day of that same month. If the <i>end-date</i> is the 31st day of a month and the <i>start-date</i> is earlier than the 30th day of a month, the <i>end-date</i> is changed to the 1st day of the following month; otherwise the <i>end-date</i> is changed to the 30th day of the same month.</td> </tr> <tr> <td data-bbox="529 1771 676 1854">TRUE</td> <td data-bbox="676 1771 1378 1854">European method: <i>start-dates</i> and <i>end-dates</i> that occur on the 31st day of a month are changed to</td> </tr> </tbody> </table>	Value	Meaning	FALSE OR omitted	U.S. (NASD) method: If the <i>start-date</i> is the 31st day of a month, it is changed to the 30th day of that same month. If the <i>end-date</i> is the 31st day of a month and the <i>start-date</i> is earlier than the 30th day of a month, the <i>end-date</i> is changed to the 1st day of the following month; otherwise the <i>end-date</i> is changed to the 30th day of the same month.	TRUE	European method: <i>start-dates</i> and <i>end-dates</i> that occur on the 31st day of a month are changed to
Value	Meaning							
FALSE OR omitted	U.S. (NASD) method: If the <i>start-date</i> is the 31st day of a month, it is changed to the 30th day of that same month. If the <i>end-date</i> is the 31st day of a month and the <i>start-date</i> is earlier than the 30th day of a month, the <i>end-date</i> is changed to the 1st day of the following month; otherwise the <i>end-date</i> is changed to the 30th day of the same month.							
TRUE	European method: <i>start-dates</i> and <i>end-dates</i> that occur on the 31st day of a month are changed to							

			the 30th day of the same month.
--	--	--	---------------------------------

**Return Type and Value:** number -- The signed number of days between two dates based on a 360-day year (12 30-day months). If *start-date* is later than *end-date*, the return value shall be negative, and the magnitude shall be the difference in days.

~~However, if start-date or end-date is out of range for the current date base value, #NUM! is returned.~~

[Example:

DAYS360 (DATE (2002, 2, 3) , DATE (2005, 5, 31)) results in 1198  
DAYS360 (DATE (2005, 5, 31) , DATE (2002, 2, 3)) results in -1197  
DAYS360 (DATE (2002, 2, 3) , DATE (2005, 5, 31) , FALSE) results in 1198  
DAYS360 (DATE (2002, 2, 3) , DATE (2005, 5, 31) , TRUE) results in 1197

| end example]

**Part 4, §3.17.7.91, page 2,617, line 5:**

- ~~settlement or maturity is out of range for the current date base value, #NUM! is returned.~~

**Part 4, §3.17.7.101, page 2,624, line 5:**

- ~~settlement or maturity is out of range for the current date base value, #NUM! is returned.~~

**Part 4, §3.17.7.104, page 2,626, line 7:**

**3.17.7.104 EDATE**

**Syntax:**

EDATE ( start-date , month-offset )

**Description:** ~~Computes the serial value of~~ **Determines** the date that is *month-offset* months from the date specified by the date *date-string start-date*, ~~taking into account the current date base value.~~

**Arguments:**

Name	Type	Description
<i>start-date</i>	<del>number</del> <a href="#">datetime</a>	The start date.
<i>month-offset</i>	number	The number of months before or after <i>start-date</i> , truncated to integer. A positive value yields a <del>future</del> -date <a href="#">after start-date</a> ; a

		negative value yields a <b>past</b> date <a href="#">before start-date</a> ; a zero value yields the date <i>start-date</i> .
--	--	---

**Return Type and Value:** [datetime](#) -- The ~~serial value of the~~ date that is *month-offset* months from the date specified by the date ~~date-string~~ [start-date](#), ~~as a whole number~~.

However, if

- ~~start value is out of range for the current date base value, #NUM! is returned.~~
- ~~start value plus month-offset is out of range for the current date base value, #NUM! is returned.~~

[Example: ~~For the 1900 date base system:~~

~~EDATE(DATE(2006,1,31),5) results in a serial value of 38898~~ [2006-06-30](#)  
~~EDATE(DATE(2004,2,29),12) results in a serial value of 38411~~ [2005-02-28](#)  
~~EDATE(DATE(2004,2,28),12) results in a serial value of 38411~~ [2005-02-28](#)  
~~EDATE(DATE(2004,1,15),-23) results in a serial value of 37302~~ [2002-02-15](#)

~~For the 1904 date base system:~~

~~EDATE(DATE(2006,1,31),5) results in a serial value of 37436~~  
~~EDATE(DATE(2004,2,29),12) results in a serial value of 36949~~  
~~EDATE(DATE(2004,2,28),12) results in a serial value of 36949~~  
~~EDATE(DATE(2004,1,15),-23) results in a serial value of 35840~~

end example]

**Part 4, §3.17.7.106, page 2,627, line 22:**

**3.17.7.106 EOMONTH**

**Syntax:**

EOMONTH ( *start-date* , *month-offset* )

**Description:** ~~Computes the serial value~~ [Determines the date](#) of the last day of the month for the date that is *month-offset* months from ~~the date specified by the date~~ *start-date*, ~~taking into account the current date base value~~.

**Arguments:**

Name	Type	Description
<i>start-date</i>	<del>number</del> <a href="#">datetime</a>	The start date.
<i>month-offset</i>	number	The number of months before or after <i>start-date</i> , truncated to integer. A positive value yields a <b>future</b> date <a href="#">after start-date</a> ; a negative value yields a <b>past</b> date <a href="#">before start-date</a> ; a zero value yields the date <i>start-date</i> .

**Return Type and Value:** ~~number~~—~~The serial value~~ [datetime](#) – ~~The date~~ of the last day of the month ~~for the date~~ that is *month-offset* months from the date specified by ~~the date~~ *start-date*, ~~as a whole number~~.

However, if

- ~~start-date is not a valid date, #NUM! is returned.~~
- ~~start-date plus month-offset yields an invalid date, #NUM! is returned.~~

[~~Example: For the 1900 date base system:~~

~~EOMONTH (DATE (2006, 1, 31) , 5) results in a serial value of 38898~~ [2006-06-30](#)  
~~EOMONTH (DATE (2004, 2, 29) , 12) results in a serial value of 38411~~ [2005-02-28](#)  
~~EOMONTH (DATE (2004, 2, 28) , 12) results in a serial value of 38411~~ [2005-02-28](#)  
~~EOMONTH (DATE (2004, 1, 15) , -23) results in a serial value of 37315~~ [2002-02-28](#)

~~For the 1904 date base system:~~

~~EOMONTH (DATE (2006, 1, 31), 5) results in a serial value of 37436~~  
~~EOMONTH (DATE (2004, 2, 29), 12) results in a serial value of 36949~~  
~~EOMONTH (DATE (2004, 2, 28), 12) results in a serial value of 36949~~  
~~EOMONTH (DATE (2004, 1, 15), -23) results in a serial value of 35853~~

*end example]*

**Part 4, §3.17.7.136, page 2,650, line 10:**

Field names and names for items other than dates/times (~~which shall be expressed as numbers~~) and numbers shall be enclosed in quotation marks.

**Part 4, §3.17.7.143, page 2,658, line 4:**

**3.17.7.143 HOUR**

**Syntax:**

HOUR ( time-value )

**Description:** ~~Computes~~ [Determines](#) the hour for the date and/or time ~~having the~~ given ~~time-value~~.

**Arguments:**

Name	Type	Description
<i>time-value</i>	<del>number</del> <a href="#">datetime</a> , <a href="#">string</a>	The date and/or time whose hour is to be <del>computed</del> <a href="#">determined</a> . That date and/or time shall be expressed either as a <del>serial-value</del> <a href="#">datetime</a> , <del>in which case, its integer part is ignored</del> , or as a <i>string-constant</i> having any valid date and/or time format, <del>in which case</del> <a href="#">In both cases</a> , any date information shall be ignored.

**Return Type and Value:** number -- The hour for the date and/or time ~~having the~~ given ~~time-value~~. The returned value shall be in the range 0--~~59~~[24](#).

~~However, if time-value is out of range for the current date base value, #NUM! is returned.~~

[Example:

HOUR (DATE (2006, 2, 26) + TIME (2, 10, 20)) results in 2  
HOUR (TIME (22, 56, 34)) results in 22  
~~HOUR(0) results in 0, since serial value 0 represents 00:00:00~~  
~~HOUR(10.5) results in 12, since serial value .5 represents 12:00:00~~  
HOUR ("22-Oct-2001 10:53:12") results in 10  
HOUR ("10:53:12 pm") results in 22  
HOUR ("22:53:12") results in 22

end example]

**Part 4, §3.17.7.170, page 2,681, line 5:**

- ~~settlement or maturity is out of range for the current date base value, #NUM! is returned.~~

**Part 4, §3.17.7.206, page 2,709, line 4:**

- ~~settlement or maturity is out of range for the current date base value, #NUM! is returned.~~

**Part 4, §3.17.7.212, page 2,713, line 15:**

**3.17.7.212 MINUTE**

**Syntax:**

MINUTE ( time-value )

**Description:** Computes the minute for the date and/or time ~~having the~~ given *time-value*.

**Arguments:**

Name	Type	Description
<i>time-value</i>	number	The date and/or time whose minute is to be computed. That date and/or time shall be expressed either as a <del>serial value, in which case, its integer part is ignored</del> <a href="#">datetime</a> , or as a <i>string-constant</i> having any valid date and/or time format, <del>in which case,</del> <a href="#">. In both cases</a> , any date information shall be ignored.

**Return Type and Value:** number -- The minute for the date and/or time ~~having the~~ given *time-value*. The returned value shall be in the range 0--59.

~~However, if time-value is out of range for the current date base value, #NUM! is returned.~~

[Example:

MINUTE (DATE (2006, 2, 26) + TIME (2, 10, 20)) results in 10  
MINUTE (TIME (22, 56, 34)) results in 56  
~~MINUTE(0) results in 0, since serial value 0 represents 00:00:00~~  
~~MINUTE(10.5) results in 0, since serial value .5 represents 12:00:00~~

MINUTE("22-Oct-2001 10:53:12") results in 53  
 MINUTE("10:53:12 pm") results in 53  
 MINUTE("22:53:12") results in 53

*end example]*

**Part 4, §3.17.7.218, page 2,717, line 23:**

**3.17.7.218 MONTH**

**Syntax:**

MONTH ( date-value )

**Description:** ~~Computes~~ Determines the numeric Gregorian month for the date and/or time ~~having the given *date-value*, taking into account the current date base value.~~ That date and/or time shall be expressed either as a ~~serial value, in which case, its fractional part is ignored~~ datetime, or as a *string-constant* having any valid date and/or time format, ~~in which case,~~ In both cases, any time information shall be ignored.

**Arguments:**

Name	Type	Description
<i>date-value</i>	<del>number</del> <u>dateTime</u> , text	The date and/or time whose month is to be <del>computed</del> <u>determined</u> . That date and/or time shall be expressed either as a <del>serial value, in which case, its fractional part is ignored</del> <u>datetime</u> , or as a <i>string-constant</i> having any valid date and/or time format, <del>in which case,</del> <u>In both cases</u> , any time information shall be ignored.

**Return Type and Value:** number -- The Gregorian month for the date and/or time ~~having the given *date-value*, in the range 1900–9999~~ 1-12.

~~However, if date-value is out of range for the current date base value, #NUM! is returned.~~

[*Example:*

MONTH (DATE (2006, 1, 2)) results in 1  
 MONTH (DATE (2006, 0, 2)) results in 12  
 MONTH ("2006/1/2 10:45 AM") results in 1  
~~MONTH(30000) results in 2 for both the 1900 and 1904 date base systems~~

*end example]*

**Part 4, §3.17.7.224, page 2,722, line 9:**

**3.17.7.224 NETWORKDAYS**

**Syntax:**

NETWORKDAYS ( start-date , end-date [ , holidays ] )

**Description:** Computes the number of whole working days between *start-date* and *end-date*. Weekend days and any holidays specified by *holidays* are not considered as working days.

**Arguments:**

Name	Type	Description
<i>start-date</i>	<del>number</del> <a href="#">datetime</a>	The dates for which the difference is to be computed. <i>start-date</i> can be earlier than, the same as, or later than <i>end-date</i> .
<i>end-date</i>	<del>number</del> <a href="#">datetime</a>	
<i>holidays</i>	reference, array	An optional set of one or more dates that are to be excluded from the working day calendar. <i>holidays</i> shall be a range of cells that contain the dates, or an array constant of <del>the serial values that represent</del> those dates. The ordering of dates <del>or serial values</del> in <i>holidays</i> can be arbitrary.

**Return Type and Value:** number -- The number of whole working days between *start-date* and *end-date*, excluding the specified holidays. If *start-date* is later than *end-date*, the return value shall be negative, and the magnitude shall be the number of whole working days.

~~However, if~~

- ~~start-date is out of range for the current date base value, #NUM! is returned.~~
- ~~end-date is out of range for the current date base value, #NUM! is returned.~~

[Example:

```
NETWORKDAYS (DATE (2006, 1, 1) , DATE (2006, 1, 31)) results in 23
NETWORKDAYS (DATE (2006, 1, 31) , DATE (2006, 1, 1)) results in -23
NETWORKDAYS (DATE (2006, 1, 1) , DATE (2006, 2, 1) , {"2006/1/2", "2006/1/16"}) results in 21
```

end example]

**Part 4, §3.17.7.231, page 2,727, line 9:**

**3.17.7.231 NOW**

**Syntax:**

NOW ( )

**Description:** ~~Computes~~ [Returns](#) the ~~serial value of the~~ current date and time, ~~taking into account the current date base value.~~

**Arguments:** None.

**Return Type and Value:** ~~number~~datetime -- The ~~serial value of the~~ current date and time.

~~[Example: On February 26, 2006, between 23:01 and 23:02, NOW() resulted in 38774.95958611110 for the 1900 date base system. On February 26, 2006, between 23:02 and 23:03, NOW() resulted in 37312.95982569440 for the 1904 date base system. end example]~~

**Part 4, §3.17.7.238, page 2,735, line 6:**

- ~~settlement, maturity, issue, or first coupon is out of range for the current date base value, #NUM! is returned.~~

**Part 4, §3.17.7.240, page 2,738, line 4:**

- ~~settlement, maturity, or last interest is out of range for the current date base value, #NUM! is returned.~~

**Part 4, §3.17.7.241, page 2,736, line 10:**

- ~~settlement, maturity, issue, or first coupon is out of range for the current date base value, #NUM! is returned.~~

**Part 4, §3.17.7.239, page 2,739, line 9:**

- ~~settlement, maturity, or last interest is out of range for the current date base value, #NUM! is returned.~~

**Part 4, §3.17.7.254, page 2,750, line 8:**

- ~~settlement or maturity is out of range for the current date base value, #NUM! is returned.~~

**Part 4, §3.17.7.255, page 2,751, line 17:**

- ~~settlement or maturity is out of range for the current date base value, #NUM! is returned.~~

**Part 4, §3.17.7.256, page 2,753, line 5:**

- ~~settlement, maturity, or issue is out of range for the current date base value, #NUM! is returned.~~

**Part 4, §3.17.7.268, page 2,762, line 5:**

- ~~settlement or maturity is out of range for the current date base value, #NUM! is returned.~~

**Part 4, §3.17.7.284, page 2,775, line 10:**

**3.17.7.284 SECOND**

**Syntax:**

SECOND ( time-value )

**Description:** ~~Computes~~ Determines the second for the date and/or time ~~having the~~ given ~~time-value~~.

**Arguments:**

Name	Type	Description
<i>time-value</i>	<del>number</del> <u>datetime,</u> <u>string</u>	The date and/or time whose second is to be <del>computed</del> <u>determined</u> . That date and/or time shall be expressed either as a <del>serial value, in which case, its integer part is ignored</del> <u>datetime</u> , or as a <i>string-constant</i> having any valid date and/or time format, <del>in which case.</del> <u>In both cases</u> , any date information shall be ignored.

**Return Type and Value:** number -- The second for the date and/or time ~~having the~~ given ~~time-value~~.

~~However, if time-value is out of range for the current date base value, #NUM! is returned.~~

[*Example:*

SECOND (DATE (2006, 2, 26) + TIME (2, 10, 20)) results in 20  
SECOND (TIME (22, 56, 34)) results in 34  
~~SECOND(0) results in 0, since serial value 0 represents 00:00:00~~  
~~SECOND(10.5) results in 0, since serial value .5 represents 12:00:00~~  
SECOND ("22-Oct-2001 10:53:12") results in 12  
SECOND ("10:53:12 pm") results in 12  
SECOND ("22:53:12") results in 12

*end example]*

**Part 4, §3.17.7.315, page 2,799, line 5:**

- ~~settlement or maturity is out of range for the current date base value, #NUM! is returned.~~

**Part 4, §3.17.7.316, page 2,800, line 4:**

- ~~settlement or maturity is out of range for the current date base value, #NUM! is returned.~~

**Part 4, §3.17.7.317, page 2,801, line 3:**

- ~~settlement or maturity is out of range for the current date base value, #NUM! is returned.~~

**Part 4, §3.17.7.319, page 2,802, line 19:**

~~TEXT(1234.567, "YYYY MM-DD HH:MM:SS") results in 1903-05-18 13:36:29 in the 1900-date base system.~~

[TEXT\(1964-02-29T13:46, "MM/DD/YYYY HH:MM"\)](#) results in 29/02/1964 13:46)

**Part 4, §3.17.7.320, page 2,802, line 23:**

**3.17.7.320 TIME**

**Syntax:**

TIME ( hour , minute , second )

**Description:** ~~Computes the serial value for the given~~ [Constructs a](#) time.

**Arguments:**

Name	Type	Description
<i>hour</i>	number	A number in the range 0--32767, inclusive, truncated to integer, that represents the hour. Any value greater than 23 shall be divided by 24 and the remainder shall be treated as the hour value.
<i>minute</i>	number	A number in the range 0--32767, inclusive, truncated to integer, that represents the minute. Any value greater than 59 shall be converted to the corresponding number of hours and minutes.
<i>second</i>	number	A number in the range 0--32767, inclusive, truncated to integer, that represents the second. Any value greater than 59 shall be converted to the corresponding number of hours, minutes, and seconds.

**Return Type and Value:** ~~number~~ [datetime](#) -- The ~~serial time~~ value for the given ~~arguments~~ [time](#), as a value greater than or equal to 0 and less than or equal to 1.

However, if *hour*, *minute*, or *second* are out of range, #NUM! is returned.

~~[Example: The following serial values are displayed with 16 decimal places:~~

~~TIME(0,0,0) results in a serial value of 0.0000000000000000  
TIME(0,0,1) results in a serial value of 0.0000115740740741  
TIME(0,0,2) results in a serial value of 0.0000231481481481  
TIME(0,0,20) results in a serial value of 0.0002314814814815  
TIME(2,3,20) results in a serial value of 0.0856481481481481  
TIME(12,0,0) results in a serial value of 0.5000000000000000  
TIME(23,59,59) results in a serial value of 0.9999884259259260  
TIME(26,120,240) results in a serial value of 0.16944444444444450~~

~~end example]~~

**Part 4, §3.17.7.321, page 2,803, line 17:**

**3.17.7.321 TIMEVALUE**

**Syntax:**

TIMEVALUE ( date-time-string )

**Description:** ~~Computes the serial value of~~ Determines the ~~date and/or~~ time represented by the string *date-time-string*.

**Arguments:**

Name	Type	Description
<i>date-time-string</i>	text	<del>The date and/or time whose serial value is to be computed.</del> <i>date-time-string</i> can have any valid date and/or time format. Any date information in <i>date-time-string</i> shall be ignored.

**Return Type and Value:** ~~number~~ datetime -- The ~~serial value of the date and/or~~ time represented by the string *date-time-string*.

However, if *date-time-string* is ill-formed, #VALUE! is returned.

[~~Example: The following serial values are displayed with 16 decimal places:~~

TIMEVALUE ("10:02:34 ") results in ~~0.4184490740740740~~10:02:34

TIMEVALUE ("01-Feb-2006 10:15:29 AM") results in ~~0.4274189814823330~~10:15:29

TIMEVALUE ("22:02") results in ~~0.9180555555555560~~22:02:00

*end example*]

**Part 4, §3.17.7.323, page 2,805, line 3:**

**3.17.7.323 TODAY**

**Syntax:**

TODAY ( )

**Description:** ~~Computes the serial value of~~ Returns the current date, ~~taking into account the current date base value.~~

**Arguments:** None.

**Return Type and Value:** ~~number~~ datetime -- The ~~serial value of the~~ current date.

[~~Example:~~

On February 25, 2006, TODAY () results in ~~38773 for the 1900 date base system, or 37311 for the 1904 date base system~~ 2006-02-25.

*end example*]

**Part 4, §3.17.7.331, page 2,810, line 5:**

**3.17.7.331 TYPE**

**Syntax:**

TYPE ( value )

**Description:** Computes the type of *value* or, if *value* is a reference to a single cell, the type of the value in that cell.

**Arguments:**

Name	Type	Description
<i>value</i>	any	The value whose type is to be determined. No conversion shall take place on an argument passed to this function.

**Return Type and Value:** number -- An integer that indicates the type of *value* or, if *value* is a reference to a single cell, the type of the value in that cell, as follows:

Type of <i>value</i>	Value Returned
number	1
text	2
logical	4
<a href="#">datetime</a>	<a href="#">8</a>
error value	16
<a href="#">duration</a>	<a href="#">32</a>
array of any kind	64

[When running in date compatibility mode \(§3.2.28\), an application may choose to return 1 instead of 8 or 32 when the argument is a datetime or duration.](#)

**[Example:**

TYPE (10.5) results in 1  
TYPE (A10) results in 1, when A10 contains a number  
TYPE ("ABC") results in 2  
TYPE (A10) results in 2, when A10 contains a string  
TYPE (TRUE) results in 4  
TYPE (A10) results in 4, when A10 contains a logical value  
  
TYPE (5/0) results in 16  
TYPE (A10) results in 16, when A10 contains any error value  
TYPE ({1, 2, 3}) results in 64

TYPE ({TRUE, 2.5, #N/A}) results in 64  
 TYPE (IF (10>5, "Yes", 20)) results in 2  
 TYPE (IF (10<5, "Yes", 20)) results in 1

*end example]*

**Part 4, §3.17.7.334, page 2,812, line 11:**

**3.17.7.334 VALUE**

**Syntax:**

VALUE ( string )

**Description:** Converts *string* to a number.

**Arguments:**

Name	Type	Description
<i>string</i>	text	Designates a string that contains a number formatted using any number, <del>or</del> currency <a href="#">format</a> , <del>or a date and/or time in any</del> <del>date, or</del> <del>time</del> format. (See <a href="#">§3.8.31</a> for the set of formats.) <del>Date and time strings are converted to their equivalent serial value.</del>

**Return Type and Value:** number, [datetime](#) -- The number [or date/time](#) represented by *string*.

[*Example:*

VALUE ("123.456") results in 123.456  
 VALUE ("\$1,000") results in 1000  
 VALUE ("23-Mar-2002") results in [2002-03-23](#)~~the corresponding serial value~~  
 VALUE ("16:48:00") - VALUE ("12:17:12") results in ~~0.188056~~ [P4H30M48S](#)

*end example]*

**Part 4, §3.17.7.341, page 2,818, line 16:**

**3.17.7.341 WEEKDAY**

**Syntax:**

WEEKDAY ( ~~serial value~~[date](#) [ , weekday-start-flag ] )

**Description:** Computes the weekday number for the date ~~having the~~ given ~~serial value~~, taking into account ~~the current date base value and~~ *weekday-start-flag*, if present. See [§3.17.4.1](#) ~~for special handling of certain days in 1900.~~

**Arguments:**

Name	Type	Description								
<i>serial-value-date</i>	<i>number-datetime</i>	The date whose weekday number is to be computed. <del>The value of serial-value is truncated to an integer.</del> <u>Any time information is ignored.</u>								
<i>weekday-start-flag</i>	number	When truncated to integer, indicates the weekday numbering convention to be used, as follows: <table border="1" data-bbox="592 607 1265 891"> <thead> <tr> <th>Value</th> <th>Meaning</th> </tr> </thead> <tbody> <tr> <td>1 or omitted</td> <td>1 (Sunday) through 7 (Saturday)</td> </tr> <tr> <td>2</td> <td>1 (Monday) through 7 (Sunday)</td> </tr> <tr> <td>3</td> <td>0 (Monday) through 6 (Sunday)</td> </tr> </tbody> </table>	Value	Meaning	1 or omitted	1 (Sunday) through 7 (Saturday)	2	1 (Monday) through 7 (Sunday)	3	0 (Monday) through 6 (Sunday)
Value	Meaning									
1 or omitted	1 (Sunday) through 7 (Saturday)									
2	1 (Monday) through 7 (Sunday)									
3	0 (Monday) through 6 (Sunday)									

**Return Type and Value:** number -- The weekday number for the date ~~having the~~ given ~~serial value~~.

However, if

- ~~serial-value is out of range for the current date base value, #NUM! is returned.~~
- *weekday-start-flag* is out of the range specified in the table above, #NUM! is returned.

[Example:

WEEKDAY (DATE (2006, 2, 1) ) results in 4 (Wednesday)  
WEEKDAY (DATE (2006, 2, 1) , 1) results in 4 (Wednesday)  
WEEKDAY (DATE (2006, 2, 1) , 2) results in 3 (Wednesday)  
WEEKDAY (DATE (2006, 2, 1) , 3) results in 2 (Wednesday)

*end example]*

**Part 4, §3.17.7.342, page 2,819, line 19:**

**3.17.7.342 WEEKNUM**

**Syntax:**

WEEKNUM ( ~~serial-value~~date [ , weekday-start-flag ] )

**Description:** Computes the week number of the date ~~given~~corresponding to serial-value. The week containing January 1 is the first week of the year, and is numbered week 1.

**Arguments:**

Name	Type	Description						
<del>serial-value-date</del>	<del>number-datetime</del>	The date whose week number is to be computed. <del>The value of serial-value is truncated to an integer. Any time information is ignored.</del>						
<i>weekday-start-flag</i>	number	When truncated to integer, indicates the weekday on which the week begins, as follows: <table border="1" data-bbox="584 607 1283 792"> <thead> <tr> <th>weekday-start-flag</th> <th>Meaning</th> </tr> </thead> <tbody> <tr> <td>1 or omitted</td> <td>Week begins on Sunday.</td> </tr> <tr> <td>2</td> <td>Week begins on Monday.</td> </tr> </tbody> </table>	weekday-start-flag	Meaning	1 or omitted	Week begins on Sunday.	2	Week begins on Monday.
weekday-start-flag	Meaning							
1 or omitted	Week begins on Sunday.							
2	Week begins on Monday.							

**Return Type and Value:** number -- The week number of the date given ~~corresponding to serial-value.~~

However, if

- ~~serial-value is out of range for the current date base value, #NUM! is returned.~~
- *weekday-start-flag* is out of the range specified in the table above, #NUM! is returned.

[Example:

WEEKNUM (DATE (2006, 1, 1) ) results in 1  
WEEKNUM (DATE (2006, 1, 1) , 1) results in 1  
WEEKNUM (DATE (2006, 2, 1) , 1) results in 5  
WEEKNUM (DATE (2006, 2, 1) , 2) results in 6

*end example]*

**Part 4, §3.17.7.344, page 2,821, line 17:**

**3.17.7.344 WORKDAY**

**Syntax:**

WORKDAY ( start-date , day-offset [ , holidays ] )

**Description:** Computes the ~~serial-value of the~~ date that is *day-offset* working days offset from *start-date*. Weekend days and any holidays specified by *holidays* are not considered as working days.

**Arguments:**

Name	Type	Description
<i>start-date</i>	<del>number</del> <a href="#">datetime</a>	The start date, <del>truncated to integer</del> . <a href="#">Any time information is ignored</a> .
<i>day-offset</i>	number	The number of working days before or after <i>start-date</i> . A positive value yields a future date; a negative value yields a past date; a zero value yields the date <i>start-date</i> . <i>day-offset</i> is truncated to an integer.
<i>holidays</i>	reference, array	An optional set of one or more dates that are to be excluded from the working day calendar. <i>holidays</i> shall be a range of cells that contain the dates, or an array constant of <del>the serial values that represent</del> those dates. The ordering of dates <del>or serial values</del> in <i>holidays</i> can be arbitrary.

**Return Type and Value:** ~~number~~ [datetime](#) -- The ~~serial value of the~~ date that is *day-offset* working days offset from *start-date*, excluding the specified holidays.

However, if

- ~~start-date is out of range for the current date base value, #NUM! is returned.~~
- ~~Any date in holidays is out of range for the current date base value, #NUM! is returned.~~
- *start-date* plus *day-offset* yields an invalid date, #NUM! is returned.

[Example:

WORKDAY (DATE (2006, 1, 1), 0) results in ~~a serial value corresponding to 1-Jan-2006~~  
[2006-01-01](#)

WORKDAY (DATE (2006, 1, 1), 10) results in ~~a serial value corresponding to 13-Jan-2006~~  
[2006-01-13](#)

WORKDAY (DATE (2006, 1, 1), -10) results in ~~a serial value corresponding to 19-Dec-2005~~  
[2005-12-19](#)

WORKDAY (DATE (2006, 1, 1), 20, {"2006/1/2", "2006/1/16"}) results in ~~a serial value corresponding to 31-Jan-2006~~  
[2006-01-31](#)

*end example]*

**Part 4, §3.17.7.345, page 2,823, line 11:**

- ~~Any date in dates is out of range for the current date base value, #NUM! is returned.~~

**Part 4, §3.17.7.346, page 2,824, line 17:**

- ~~Any date in dates is out of range for the current date base value, #NUM! is returned.~~

**Part 4, §3.17.7.347, page 2,825, line 8:**

**3.17.7.347 YEAR**

**Syntax:**

YEAR ( date-value )

**Description:** Computes the numeric Gregorian year for the date and/or time ~~having the given *date-value*, taking into account the current date base value.~~ That date and/or time shall be expressed either as a ~~datetime~~serial value, in which case, its fractional part is ignored, or as a *string-constant* having any valid date and/or time format, ~~in which case,~~ ~~a~~Any time information shall be ignored.

**Arguments:**

Name	Type	Description
<i>date-value</i>	number, text	The date and/or time whose year is to be computed. That date and/or time shall be expressed either as a <del>datetime</del> serial value, in which case, its fractional part is ignored, or as a <i>string-constant</i> having any valid date and/or time format, <del>in which case,</del> <del>a</del> Any time information shall be ignored.

**Return Type and Value:** number -- The Gregorian year for the date and/or time ~~having the given *date-value*.~~ For the 1900 date base system, the returned value shall be in the range 1900–9999. For the 1904 date base system, the returned value shall be in the range 1904–9999.

~~However, if date-value is out of range for the current date base value, #NUM! is returned.~~

[*Example:*

YEAR (DATE (2006, 1, 2)) results in 2006  
YEAR (DATE (2006, 0, 2)) results in 2005  
YEAR ("2006/1/2 10:45 AM") results in 2006

~~YEAR(30000) results in 1982 for the 1900 date base system, or 1986 for the 1904 date base system~~

*end example]*

**Part 4, §3.17.7.349, page 2,829, line 5:**

- ~~settlement or maturity is out of range for the current date base value, #NUM! is returned.~~

**Part 4, §3.17.7.350, page 2,829, line 5:**

- ~~settlement or maturity is out of range for the current date base value, #NUM! is returned.~~

**Part 4, §3.17.7.351, page 2,830, line 5:**

- ~~settlement, maturity or issue is out of range for the current date base value, #NUM! is returned.~~

**Part 4, §3.18.13, page 2,842:**

timePeriod (Time Period)	This conditional formatting rule highlights cells containing dates in the specified time period. The underlying value of the cell is evaluated, therefore the cell does not need to be formatted as a date to be evaluated. For example, with a cell containing the value 38913 <a href="#">when dateCompatibility="1900" (§3.2.28)</a> , the conditional format shall be applied if the rule requires a value of <del>7/14/2006</del> <a href="#">2006-07-14</a> .
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## **Annex: Problem description and overview of the solution**

The entire problem stems from the fact that legacy applications, namely Microsoft Excel, which in turn reproduces behaviour from Lotus 1-2-3, have no notion of timestamps and durations as separate data types, and merely store them as real numbers. Excel has no underlying understanding of a date; to Excel, a date is merely a way of displaying a real number.

Despite the fact that, after several decades of usage, users now find it natural, it is important to understand that a timestamp is not a real number, and attempting to make operations such as adding 3.14 to the timestamp of 2008-02-03T12:31 makes no sense. You can add 3.14 days, or 3.14 minutes, or 3.14 years, or any kind of duration, but you can't add a pure real number to a timestamp any more than you can add an apple to an orange.

Therefore, the correct way to handle timestamps and durations is for the spreadsheet to inherently support them as distinct data types. However, converting legacy spreadsheets poses a problem: whenever the converter encounters a real number, it does not always know whether a real number per se is intended, or a date. The problem is illustrated in Figure 1.

Ecma has proposed that new spreadsheets also store timestamps as real numbers. Although this achieves compatible conversion from legacy spreadsheets, it perpetuates the problem. Rather than condemn us to carry the errors of the past for decades into the future, it is better to do a little more effort to correct them now. We proceed to propose a way, which actually greatly simplifies Ecma-376. The way is illustrated in Figure 2.

The way to address the problem is similar to what has been done in OpenOffice and Open Document Format (ODF). ODF dictates that timestamps are stored as timestamps, leaving it to the application to handle legacy conversions. While OpenOffice Calc apparently treats timestamps in the same way as Microsoft Excel, in fact it includes underlying conversions so that it properly stores timestamps as required by ODF.

Similarly, our proposal is that Ecma-376 store timestamps and durations in ISO 8601 format, including recommendations that applications automatically treat them as numbers whenever required for compatibility reasons. Applications may work in compatibility mode, where such automatic treating of a date as a real number is possible, but should warn users against compatibility mode and prefer strict mode, where an error will occur in such cases.

**Figure 1:** The problem with migration of dates

**The problem when migrating dates**

Dates and numbers are different things, as are apples and oranges, and they should be stored as different data types. Let's suppose that the new format stores dates as dates, whereas the legacy format stores them as numbers. What happens when we try to migrate?

**A legacy spreadsheet:**

Stored content:

	A	B
1	61.5	=A1*8
2	=523.2*SIN(PI()/4)	=A2*13.7

Stored properties:

	A	B
1	Display as date	Display as number
2	Display as number	Display as date

**How a legacy spreadsheet application displays it:**

	A	B
1	1900-03-01 12:00	492
2	369.96	1913-11-15 10:16

**What happens when a converter migrates to the new format:**

In the legacy format, A1 contains a real number, displayed as a date. The converter decides that a date was meant, and stores a date in the new format.

In B1, the converter encounters a formula, and it stores it as is in the new format.

Stored content:

	A	B
1	1900-03-01T12:00	=A1*8
2	=523.2*SIN(PI()/4)	=A2*13.7

Stored properties:

	A	B
1	Display as date	Display as number
2	Display as number	Display as date

A2 contains a formula whose result is a real number. The converter stores it in the new format.

So does B2, but the legacy version requests that it be displayed as a date. The best thing the converter can do is leave everything as it is.

**How the application displays the converted spreadsheet:**

When the spreadsheet application attempts to display B1, it can't evaluate "=A1\*8", because A1 is a date.

	A	B
1	1900-03-01 12:00	#VALUE!
2	369.96	5068.43

When the spreadsheet application attempts to display B2, it needs to display a number as a date. But a number is a number and a date is a date, so how can you display the one as the other?

**Ecma's conclusion:**

Numbers and dates are fundamentally different; but since legacy spreadsheets store both of them as real numbers, there is nothing you can do to migrate them other than continue this false assumption into the future. The problem must be perpetuated and future spreadsheets must be burdened with the errors of the past.

**Figure 2:** The solution to the date migration problem

**The solution to the date migration problem**

**A legacy spreadsheet (same as above):**

Stored content:

	A	B
1	61.5	=A1*8
2	=523.2*SIN(PI()/4)	=A2*13.7

Stored properties:

	A	B
1	Display as date	Display as number
2	Display as number	Display as date

**How a legacy spreadsheet application displays it (same as above):**

	A	B
1	1900-03-01 12:00	492
2	369.96	1913-11-15 10:16

**What happens when the converter migrates to the new format:**

Stored content:

	A	B
1	1900-03-01T12:00	=A1*8
2	=523.2*SIN(PI()/4)	=A2*13.7

Stored properties:

	A	B
1	Display as date	Display as number
2	Display as number	Display as date

*dateCompatibility="1900"*

The converter does the same thing as in the example of Figure 1; however, it also sets the dateCompatibility attribute of the file to "1900", so that the application knows that it was converted from a legacy format.

**How the application displays the converted spreadsheet:**

**This used to be an old file and I'm not sure how you want to handle it**

The spreadsheet you are trying to open was converted from a legacy spreadsheet, and may contain real numbers in places of dates. You must decide whether you want to run in compatible mode or not.

I want to run in compatible mode. I fully understand that it sucks, because a date has as much to do with a real number as an apple with an orange. But I really don't have the time to do my work correctly. I promise not to do it again.

I want to run in strict mode. I understand that this may break some things, but I am prepared to fix things rather than use this backwards compatibility crap. I want to work correctly even if it means putting some effort in it.

In this example, the user chooses the backwards compatible option.

	A	B
1	1900-03-01 12:00	492
2	369.96	1913-11-15 10:16

When it attempts to display B2, it needs to display a number as a date, and it does it according to the 1900 date base system rules.

When the application attempts to display B1, it needs to evaluate "=A1\*8", where A1 is a date. Because it runs in compatible mode, it transparently converts the date to a number in order to perform the operation. The conversion is done by using the 1900 date base system.

**Our conclusion:**

We have found a way to be backwards compatible and, at the same time, set the foundation for correcting the problem in the future.