EXCEL TIME & DATE CHEAT SHEET

*Note: Dates in these examples are formatted **dd/mm/yyyy***

DATE-TIME 101

Excel stores dates and time as a number known as date-time serial number.

Formatted date & time   1/01/2012 10:00 AM
Underlying serial number   40909.4166666667
    date   time

Dates start from January 1, 1900, and count up from there:

Date d/m/yyyy	Date Serial Number
1/01/1900	1
2/01/1900	2
1/02/1900	32
30/07/1960	22127
1/01/2017	42736
1/04/2018	43191

Times are stored as decimal fractions:

Time (text)	Displays as h:mm:ss	Time Serial Numbers
1 day or 24 hours	0:00:00	1
1 hour	1:00:00	0.041666667
5 hours	5:00:00	0.208333333
1 minute	0:01:00	0.000694444
30 seconds	0:00:30	0.000347222
1 hr 30 min 45 seconds	1:30:45	0.063020833

And together, the date is the integer and time is the decimal:

Date-Time	dd/mm/yyyy h:mm:ss	Date-time Serial Number
1st January 1900 10:00 AM	01/01/1900 10:00:00	1.41667
3rd March 1960 1:00 PM	03/03/1960 13:00:00	21978.54167
30th April 2017 11:00 PM	30/04/2017 23:00:00	42855.95833

ENTERING DATES

Excel recognises various date configurations and will convert it to a date-time serial number upon pressing ENTER.

Entered	Excel Returns	Date Serial Number
1-1-2009	1/01/2009	39814
1-1-09	1/01/2009	39814
1/1/2009	1/01/2009	39814
1/1/09	1/01/2009	39814
1-Jan-09	1-Jan-09	39814
1-Jan 09	1-Jan-09	39814
1-Jan-2009	1-Jan-09	39814
1 Jan 09	1-Jan-09	39814
1/1	1-Jan-23	44927

💡**Tip:** Dates that display ##### in a cell usually indicate that the column is simply not wide enough to display it.

However, if you make the column wider and it still displays ##### then this indicates that the date is a negative value and Excel can't display negative dates.

ENTERING TIME

Enter time as h:mm:ss or h:mm:ss AM/PM:

Entered	Excel Returns	Serial Number
9:00	9:00	0.375
1:00	1:00	0.041666667
13:00	13:00	0.541666667
12:30:45	12:30:45	0.521354167
1:00 PM	1:00 PM	0.541666667
11:15:30 AM	11:15:30 AM	0.469097222
16 : 45	0.697916667	0.697916667
4 : 45 PM	0.697916667	0.697916667

ENTERING DATE-TIME

Separate the date and time components with a space:

Entered	Excel Returns	Serial Number
01/01/2018 1:00:00 AM	1/01/2018 1:00	43101.04167
1/1/2017 2:00:30 PM	1/1/2017 14:00	42736.58368
2:00 PM 1/1/17	1/01/2017 14:00	42736.58333

DATE & TIME MATH

When dates and time are correctly stored as date-time serial numbers, math is easy.

Adding/Subtracting days from dates:

	B	C	D	E
9	Date	+/- Days	Formula	Result
10	1/01/2018	10	=B10+C10	11/01/2018
11	20/02/2018	-5	=B11+C11	15/02/2018
12	1/01/2018	365	=B12+C12	1/01/2019
13	1/01/2018	30	=B13+C13	31/01/2018

💡**Tip:** you can also add/subtract the days directly in the formula e.g. =B10+10 or =B11-5 Although, it's better to place the values you're adjusting by in their own cell or a named range.

Subtracting dates from one another:

	B	C	D	E
17	Start Date	End Date	Formula	Result (Days)
18	1/01/2018	30/01/2018	=C18-B18	29
19	1/01/2018	3/01/2018	=C19-B19	2
20	1/01/2018	31/12/2018	=C20-B20	364
21	1/01/2018	1/01/2016	=C21-B21	-731

Adding times to one another:

	B	C	D	E
25	Start Time	Add Time	Formula	Result
26	9:00:00 AM	8:00:00	=B26+C26	5:00:00 PM
27	6:30:00 AM	12:00:00	=B27+C27	6:30:00 PM
28	10:00:00 PM	4:00:00	=B28+C28	2:00:00 AM
29	10:00:00 PM	4:00:00	=B29+C29	26:00:00

Note: Times that roll over to the next day result in a time-date serial number >= 1. Cell E28 actually contains a time-serial number of 1.08333', but since the cell is formatted to display time formatted as h:mm:ss, only the time portion is visible.

If you want to show the cumulative time (like cell E29) then you need to surround the 'h' part of the time format in square brackets like so: **[h]:mm:ss**

Subtracting time from times:

	B	C	D	E
39	Time	h:mm:ss	Formula	Result
40	9:00:00 AM	5:00:00	=B40-C40	4:00:00 AM
41	1:00:00 PM	0:30:00	=B41-C41	12:30:00 PM
42	11:00:00 PM	3:00:00	=B42-C42	8:00:00 PM
43	2:00:00 AM	4:00:00	=B43-C43	##########

Notice the last result shows ###### this is because it results in a negative time and Excel can't display negative times.

Subtracting times from one another:

	B	C	D	E
47	Start Time	End Time	Formula	Result
48	9:00:00 AM	1:00:00 PM	=C48-B48	4:00:00 AM
49	1:00:00 PM	11:00:00 PM	=C49-B49	10:00:00 AM
50	6:30:00 AM	3:45:00 PM	=C50-B50	9:15:00 AM
51	11:00:00 AM	4:00:00 AM	=C51-B51	##########

Again, here the last result shows ###### because it results in a negative time.

SHORTCUTS

Action	Shortcut Key
Insert Current Date	Ctrl + ;
Insert Current Time	Ctrl + Shift + ;
Apply Date Format	Ctrl + Shift + #
Apply Time Format	Ctrl + Shift + @

FORMATTING

Even though dates and time are as a regular number known as the date-time serial number, we can make use of extensive formatting options to display them just the way we want.

We can access some quick formats from the Home tab > in the Number group:
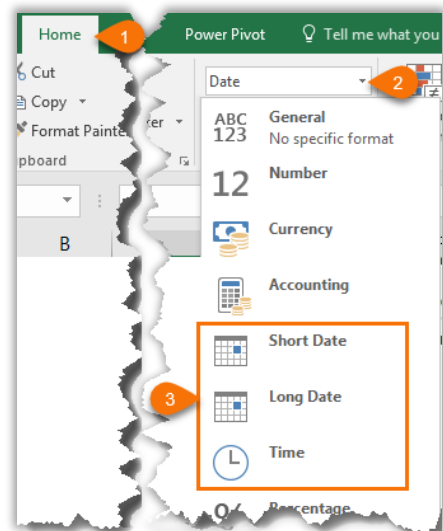
Mynda Treacy | Microsoft MVP
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CUSTOM DATE FORMATS

Excel recognises the following characters for date formatting. The 'Formatted' column displays the results when applied to the date: September 3, 2016:

Character	Explanation	Formatted
d	Displays the day as a number without a leading zero.	3
dd	Displays the day as a number with a leading zero when appropriate.	03
ddd	Displays the day as an abbreviation (Sun to Sat).	Sat
dddd	Displays the day as a full name (Sunday to Saturday).	Saturday
m	Displays the month as a number without a leading zero.	9
mm	Displays the month as a number with a leading zero when appropriate.	09
mmm	Displays the month as an abbreviation (Jan to Dec).	Sep
mmmm	Displays the month as a full name (January to December).	September
mmmmm	Displays the month as a single letter (J to D).	S
yy	Displays the year as a two-digit number.	16
yyyy	Displays the year as a four-digit number.	2016

We can bring the characters together to create our own custom formats:

Date	Custom Format	Formatted Result
30/03/2017	dddd dd mmm, yyyy	Thursday 30 Mar, 2017
30/03/2017	mmm-yy	Mar-17
30/03/2017	dd-mm-yy	30-Mar-17
30/03/2017	yyyy-mm	2017-03
30/03/2017	ddd dd	Thu 30
30/03/2017	mmm/yyyy	Mar/2017

CUSTOM TIME FORMATS

Like dates, time also has its own set of custom formatting characters:

Character	Explanation
h	Displays the hour as a number without a leading zero.
[h]	Displays elapsed time in hours. If you are working with a formula that returns a time in which the number of hours exceeds 24, use a number format that resembles [h]:mm:ss or [h]:mm
hh	Displays the hour as a number with a leading zero when appropriate. If the format contains AM or PM, the hour is based on the 12-hour clock. Otherwise, the hour is based on the 24-hour clock.
m	Displays the minute as a number without a leading zero.*
[m]	Displays elapsed time in minutes. If you are working with a formula that returns a time in which the number of minutes exceeds 60, use a number format that resembles [mm]:ss.
mm	Displays the minute as a number with a leading zero when appropriate.*
s	Displays the second as a number without a leading zero.
[s]	Displays elapsed time in seconds. If you are working with a formula that returns a time in which the number of seconds exceeds 60, use a number format that resembles [ss].
ss	Displays the second as a number with a leading zero when appropriate. If you want to display fractions of a second, use a number format that resembles h:mm:ss.00.
AM/PM, am/pm, A/P, a/p	Displays the hour using a 12-hour clock. Excel displays AM, am, A, or a for times from midnight until noon and PM, pm, P, or p for times from noon until midnight.

*Note: The m or mm code must appear immediately after the h or hh code or immediately before the ss code; otherwise, Excel displays the month instead of minutes.

And when used together we can create formats like these:

Time hh:mm:ss	Format	Formatted Result
9:35:42	h	9
9:35:42	h:mm	9:35
9:35:42	hh:mm	09:35
9:35:42	h:mm:ss	9:35:42
9:35:42	h:mm:ss.00	9:35:42.00
9:35:42	hh:mm:ss AM/PM	09:35:42 AM
9:35:42	h "hours" mm "min" ss "sec"	9 hours 35 min 42 sec

DATES ENTERED AS TEXT

Dates incorrectly entered as text cannot be used in formulas or PivotTables and don't sort as expected.

Testing if Dates are Text – Option 1:

A quick way to test if your dates are text is to change the format to 'General'. Proper date-time serial numbers will be displayed as such, whereas text dates will still appear as dates.

Testing if Dates are Text – Option 2:

Use the keyboard shortcut below to temporarily display the dates without formatting. Dates in a correct date-time serial number will display as such:

Ctrl + ~

FIXING TEXT DATES

There are a few ways to convert text dates to date serial numbers. Depending on the date, some techniques work better than others.

Option1: Use built in error checking

Option 2: Paste Special

1. In an empty cell enter 1 and copy the cell to the clipboard

2. Select the cells containing the text dates you want to convert to date serial numbers.

3. Home tab > Paste >

4. Paste Special dialog box select:
   - Values
   - Multiply (or Divide)

Option 3: DATEVALUE Function

The DATEVALUE function takes a date text string and converts it to a date serial Number. E.g. =DATEVALUE("1/1/2020")

Option 4: Power Query

Data Tab > Get Data > From Table/Range. Click on the data type icon in the column header > choose Date/Time, Date or Time as required:

CONVERTING DATE SERIAL NUMBERS TO TEXT

When referencing cells containing dates from text boxes, you first need to convert them to text to ensure they display correctly. We can use the TEXT function for this:

	B	C	D
	Date Serial Numbers	TEXT Formula Result	TEXT Formula in column C
15			
16	1/01/2017	1 Jan 17	=TEXT(B16,"d mmm yy")
17	2/01/2017	Mon 2 Jan 17	=TEXT(B17,"ddd d mmm yy")
18	3/01/2017	03- 01-2017	=TEXT(B18,"dd- mm-yyyy")
19	4/01/2017	Date: 4 Jan 17	="Date: "&TEXT(B19,"d mmm yy")
20	5/01/2017	Due: Jan 05, 17	="Due: "&TEXT(B20,"mmm dd, yy")

CONVERT MONTH NAME TO NUMBER

Convert a list of month names to month numbers with the MONTH function:

	B	C	D
6	Text Month Name	Convert to Month No.	Formula in column C
7	January	1	=MONTH(B7&1)
8	February	2	=MONTH(B8&1)
9	March	3	=MONTH(B9&1)
10	April	4	=MONTH(B10&1)
11	May	5	=MONTH(B11&1)
12	June	6	=MONTH(B12&1)
13	July	7	=MONTH(B13&1)
14	August	8	=MONTH(B14&1)
15	September	9	=MONTH(B15&1)
16	October	10	=MONTH(B16&1)
17	November	11	=MONTH(B17&1)
18	December	12	=MONTH(B18&1)

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EXTRACT DATES

Have a list of date-times and only want the dates. Use the INT function to extract the date component:

	B	C	D
9	Date-Time Serial Number	Extract the Date	Formula
10	01/01/2017 1:00:00 AM	1/01/2017	=INT(B10)
11	01/02/2017 2:00:30 PM	1/02/2017	=INT(B11)
12	03/03/2017 11:30:00 AM	3/03/2017	=INT(B12)
13	04/01/2017 12:00:00 AM	4/01/2017	=INT(B13)
14	05/10/2017 9:00:00 AM	5/10/2017	=INT(B14)

EXTRACT TIMES

Have a list of date-times and only want the times. Use the MOD function to extract the date component:

	B	C	D
17	Date-Time Serial Number	Extract the Time	Formula
18	01/01/2017 1:00:00 AM	1:00:00 AM	=MOD(B18,1)
19	01/02/2017 2:00:30 PM	2:00:30 PM	=MOD(B19,1)
20	03/03/2017 11:30:00 AM	11:30:00 AM	=MOD(B20,1)
21	04/01/2017 12:00:00 AM	12:00:00 AM	=MOD(B21,1)
22	05/10/2017 9:00:00 AM	9:00:00 AM	=MOD(B22,1)

DATE CALCULATIONS

Where column B contains the Start Date and column C contains the End Date

Calculate Age or Years of Service

Whole Years:
=YEAR(TODAY())-YEAR(B2)

Fractions of Years:
=YEARFRAC(B2,TODAY(),1)

Difference Between Dates

In days:
=C2-B2

In weeks:
=(C2-B2)/7

Whole months rounded up:
=(YEAR(C2)-YEAR(B2))*12+MONTH(C2)-MONTH(B2)

Whole months rounded down:
=IF(DAY(C2)>=DAY(B2),0,-1)+(YEAR(C2)-YEAR(B2))*12+MONTH(C2)-MONTH(B2)

Fractions of years:
=YEARFRAC(B2,C2,1)

Whole years rounded up:
=ROUNDUP(YEARFRAC(B2,C2,1),0)

Whole years rounded down:
=YEAR(C2)-YEAR(B2)

FINDING DATES

Where column B contains the date

Number of days in a month:
=DAY(EOMONTH(B2,0))

First day of month:
=EOMONTH(B2,-1)+1

Last day of month:
=EOMONTH(B48,0)

Last day of previous month:
=EOMONTH(B49,-1)

CONVERT TIME

To decimals where time is entered in h:m:s

Convert to hours – multiply by 24
Convert to minutes – multiply by 1440
Convert to seconds – multiply by 86400

Convert hours to days – divide by 24
Convert minutes to hours – divide by 60
Convert seconds to minutes – divide by 60

FUNCTIONS — TIME FUNCTIONS

DATE(year, month, day)
Combines separate year, month and day values and converts them into a date serial number formatted as a date. e.g.
=DATE(2023,01,01)
=44927 (January 1, 2023)

💡**Tip:** If the number of days added exceeds the current year, it will add the excess to the start of the following year.

TIME(hour,minute,second)
Combines separate hour, minute and second values and converts them into a time serial number. If the cell format was General before the formula is entered, the result is formatted as a date. e.g.
=TIME(10,30,15)
=0.437673611 (10:30:15 AM)

DATEVALUE(date_text)
Converts dates stored as text to a date serial number. e.g.
=DATEVALUE("01/01/2023")
=44927

TIMEVALUE(time_text)
Converts times stored as text to a date-time serial number. e.g.
=TIMEVALUE("8:50 pm")
=0.868055556

NOW()
The NOW function is unusual in that it doesn't have any arguments. It simply returns the current date and time from your computer clock.

TODAY()
The TODAY function also doesn't have any arguments. It simply returns the current date serial number from your computer clock.

HOUR(serial_number)
Returns the hour integer from a time serial number ranging from 0 to 23. e.g. referencing cell B2 containing 5:10 PM
=HOUR(B2)
=17

MINUTE(serial_number)
Returns the minute integer, ranging from 0 to 59, from a time serial number. e.g. referencing cell B2 containing 5:10 PM
=MINUTE(B2)
=10

SECOND(serial_number)
Returns the second integer from a time serial number ranging from 0 to 59. e.g. referencing cell B2 containing 5:10:15 PM
=SECOND(B2)
=15

DAY(serial_number)
Returns the day of the month between 1 and 31 from a date serial number or text. e.g.
=DAY("2023,3,15")
=15

MONTH(serial_number)
Returns the month of a date serial number between 1 and 12, representing January through December. e.g.
=MONTH(DATE(2023,3,15))
=3

YEAR(serial_number)
Returns the year from a date serial number as an integer between 1900 and 9999. e.g.
=YEAR(DATE(2023,03,15))
=2023

WEEKNUM(serial_number, [return_type])
Returns the week number (between 1 and 54) of a date serial number. e.g. 1st Jan 2023 is in week number 1 of the year.

There are two types of systems available with this function:

- **System 1** where the week containing January 1 is the first week of the year, and is numbered week 1.

- **System 2** starts with the first Thursday of the year being in week 1. This system is the methodology specified in ISO 8601, which is commonly known as the European week numbering system.

Return types:

1 - Sunday	
2 - Monday	
11 - Monday	
12 - Tuesday	
13 - Wednesday	System1
14 - Thursday	
15 - Friday	
16 - Saturday	
17 - Sunday	
21 - Monday	System 2

💡**Tip:** Return types 2 and 11 for Monday are the same as one another. Type 2 is only included for backward compatibility with earlier versions of Excel. Likewise, return type 1 for Sunday.

ISOWEEKNUM(date)
Returns the week number of a date serial number. The first week of the year is the week that contains the majority of its days in the new year. The first week of the year must have at least four days in it. e.g. for Monday, Jan 2, 2017, ISOWEEKNUM returns 1.

💡**Tip**: it also works with dates input as Text, but this could be unreliable so it's always best to work with date serial numbers.

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WEEKDAY(serial_number, [return_type])
Returns the day number of the week from a date serial number. The default return type ranges from 1 for Sunday, through to 7 for Saturday, but you can choose from a list of return types.

1 - Numbers 1 (Sunday) through 7 (Saturday)
2 - Numbers 1 (Monday) through 7 (Sunday)
3 - Numbers 0 (Monday) through 6 (Sunday)
11 - Numbers 1 (Monday) through 7 (Sunday)
12 - Numbers 1 (Tuesday) through 7 (Monday)
13 - Numbers 1 (Wednesday) through 7 (Tuesday)
14 - Numbers 1 (Thursday) through 7 (Wednesday)
15 - Numbers 1 (Friday) through 7 (Thursday)
16 - Numbers 1 (Saturday) through 7 (Friday)
17 - Numbers 1 (Sunday) through 7 (Saturday)

Tip: Return types 1 and 17 for Sunday are the same as one another. Type 1 is only included for backward compatability with earlier versions of Excel. Likewise, return type 2 and 3 for Monday.

EDATE(start_date, months)
Rolls a date serial number (ignoring any time element) forward or back based on the number of months specified in the 'months' argument. e.g.

=EDATE(DATE(2017,3,15), 1)
=42840 (April 15, 2017)

=EDATE(DATE(2017,3,15), -1)
=42781 (February 15, 2017)

EOMONTH(start_date, months)
Returns the last day of the month before or after a start date specified with a date serial number (ignoring any time element). e.g.

=EOMONTH(DATE(2017,3,15),1)
=42855 (April 30, 2017)

=EOMONTH(DATE(2017,3,15),-1)
=42794 (February 28, 2017)

WORKDAY(start_date, days, [holidays])
Returns a date serial number that is the specified number of working days before or after the start date. Working days exclude weekends and any dates identified as holidays.

start_date - a date serial number or text
days - number of non-weekend and non-holidays to add or subtract
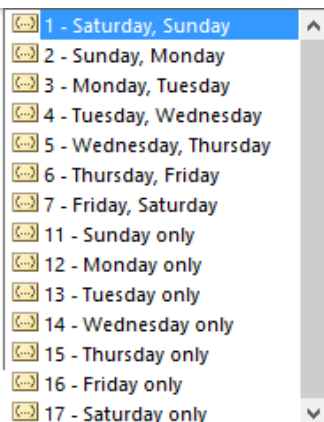**[holidays]** - Optional list of holidays to exclude

=WORKDAY(DATE(2016,12,29), 5)
=42741 (Friday, Jan 6, 2017)

Notes: only the date portion of a date-time serial number is used by WORKDAY. Any time element is ignored.

Only whole numbers are recognised by the 'days' argument. e.g. 1.7 would be rounded down to 1.

WORKDAY.INTL(start_date, days, [weekend], [holidays])
Like WORKDAY, except the 'weekend' argument also enables you to choose what days weekends fall on, from this list:

1 - Saturday, Sunday
2 - Sunday, Monday
3 - Monday, Tuesday
4 - Tuesday, Wednesday
5 - Wednesday, Thursday
6 - Thursday, Friday
7 - Friday, Saturday
11 - Sunday only
12 - Monday only
13 - Tuesday only
14 - Wednesday only
15 - Thursday only
16 - Friday only
17 - Saturday only

DAYS(end_date, start_date)
Returns the number of whole days between two date serial numbers. Ignores time portions of date-time serial numbers.

DAYS360(start_date, end_date, [method])
Returns the number of days between two date serial numbers based on a 360-day year, or twelve 30-day months. This method is used in some accounting calculations.
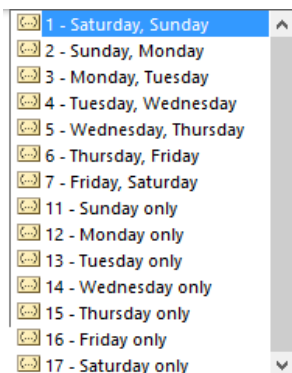
The optional *'method'* argument is a logical value (TRUE/FALSE) that specifies whether to use the U.S. (FALSE) or European method (TRUE). If omitted it is treated as FALSE.

NETWORKDAYS(start_date, end_date, [holidays])
Returns the number of whole working days between two date serial numbers, excluding weekends (Saturday & Sunday) and holidays.

NETWORKDAYS.INTL(start_date, end_date, [weekend], [holidays])
Like the NETWORKDAYS function, it returns the number of working days between two date serial numbers, excluding weekends and holidays. Weekend days can be specified.

1 - Saturday, Sunday
2 - Sunday, Monday
3 - Monday, Tuesday
4 - Tuesday, Wednesday
5 - Wednesday, Thursday
6 - Thursday, Friday
7 - Friday, Saturday
11 - Sunday only
12 - Monday only
13 - Tuesday only
14 - Wednesday only
15 - Thursday only
16 - Friday only
17 - Saturday only

YEARFRAC(start_date, end_date, [basis])
Returns the year fraction representing the number of whole days between start_date and end_date serial numbers.
[basis] is an optional argument that allows you to specify the day count method from the list of options below. If omitted, it defaults to 0.

YEARFRAC(start_date, end_date, [basis])

0 - US (NASD) 30/360
1 - Actual/actual
2 - Actual/360
3 - Actual/365
4 - European 30/360
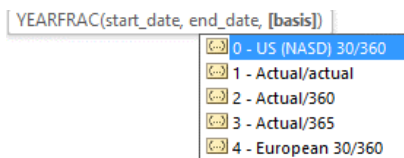
DATEDIF(start_date, end_date, unit)
CAUTION: This function is only included in Excel for backward compatibility with Lotus 1-2-3! If you try to enter the function it won't display in the auto-complete list! , you must be brave and press on, confident in the fact that when you press ENTER it will evaluate

Unit	Returns
"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 start_date and end_date. The months and years of the dates are ignored.
"YM"	The difference between the months in start_date and end_date.
"YD"	The difference between the days of start_date and end_date. The years of the dates are ignored.

Note: DATEDIF calculations do not include the start date in the resultant count, and they only return whole numbers.

Tip: when entering the Unit direct in the formula, surround it with double quotes e.g. =DATEDIF(start_date, end_date, **"M"**)

Functions with this grey background are old and available for backward compatibility only.