

How to Read, Write, and Manipulate SAS® Dates

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ABSTRACT

No matter how long you've been programming in SAS, using and manipulating dates still seems to require effort. Learn all about SAS dates, the different ways they can be presented, and how to make them useful. This paper includes excellent examples in dealing with raw input dates, functions to manage dates, and outputting SAS dates into other formats. Included are all the date information you will need: date and time functions, Informats, formats, and arithmetic operations.

WHAT IS A SAS DATE?

A date is unique within SAS programming. It is neither a character value nor a typical numeric. It is a special case of a numeric variable. In other words, a SAS date is a special representation of a calendar date.

Unlike dates in many other languages, SAS has a specific numeric value assigned to each day. The starting point for all SAS dates is January 1st, 1960 and is represented as day zero (0). All previous and subsequent dates are represented with numeric values plus (+) or minus (-) from this starting point. The simplicity of the approach is there will never be a point in the past or future that can not be represented by a number.

December 30, 1959	↔	-2
December 31, 1959	↔	-1
January 1, 1960	↔	0
January 2, 1960	↔	1
January 3, 1960	↔	2

January 23, 1963	↔	1118
Today Nov 5, 2007	↔	17475

How to Test a Date

There will be times you may want to test a date to see what date we know and its corresponding SAS date.

```
Data _null_;  
    Today = date();  
    Testdate = '23jan63'd;  
    firstdate = '01jan1960'd;  
    Put 'Log shows: ' today testdate firstdate;  
    Run;  
Log shows: 17475 1118 0
```

Assigning and setting a date is done by one of the 2 methods above. Either a 2 digit year or a 4 digit year are acceptable. The main point is the quote marks followed immediately by a **d**. This notation allows SAS to know the contents inside the quotes are a **date**.

CONVERTING A TEXT DATE TO SAS DATE - INFORMATS

Often the dates we'll be using in our programming comes to us in the form of a character value from a text field. There are several ways to let SAS know the value is really a date and allow SAS to convert it into true SAS date. Utilizing SAS **informats** is the method that is used.

***Raw data as Input;**

```
data my_birthday;
  infile cards;
  input var1 mmddyy10.;
  cards;
01/23/1963
;
run;
```

***Character data as Input;**

```
data _null_; set my_birthday
  sas_date = input(var1,mmddyy10.);
run;
```

These examples work for all versions of SAS. It takes the information from text and tells SAS the information is a date in a month-month, day-day, year-year format for a length of 10. SAS assumes the slashes (/), or other acceptable separation character, is included in the length of 10.

SAS INFORMATS

Below are some of the more common SAS date Informats and the text values they will convert. These informats are valid for all SAS versions.

<u>INPUT</u>		<u>INFORMAT</u>
01/23/1963	↔	mmddyy10.
1/23/1963	↔	mmddyy10.
01/23/63	↔	mmddyy8.
1/23/63	↔	mmddyy8.
January 23,1963	↔	worddate20.
jan 23, 1963	↔	worddate12.
23jan1963	↔	date9.
23jan63	↔	date7.
23-jan-1963	↔	date11.
01-23-63	↔	mmddyy8.
19630123	↔	ymmdd8.

In V9 of SAS, all the above date text values can be converted to SAS utilizing just one Informat: **anydtdte15.**

SYSTEMS DATES

There are many situations where a date needs to be dynamic. SAS provides several opportunities to extract a date from the system you are running. Below are a few of the system dates.

```
data _null_;
  a = date();
  b = today();
  c = "&sysdate"d;
  d = "&sysdate9"d;
  put 'Log shows: ' a b c d;
run;

Log shows: 17475 17475 17475 17475
```

As you can see, each returns the same results. Although, **&sysdate** and **&sysdate9** return the date the session started, not necessarily the current date. The system dates are treated as macro variables and require residing between double quotes with the **d** designation. Now you have a variable with a valid SAS date.

Date Functions

Because date variables are unique within SAS, they have their own set of functions. It may be you want to extract something specific from a date while still maintaining it being a SAS date value. Such a situation would be if you were interested in what day of the week a specific date occurred on. Below are a handful of date functions and what results from utilizing them would produce.

```
data _null_;
  my_birthday = '23jan63'd;
  date1 = day(my_birthday);
  date2 = month(my_birthday);
  date3 = year(my_birthday);
  date4 = qtr(my_birthday);
  date5 = weekday(my_birthday);
  put date1 date2 date3 date4 date5;
run;

Log shows:
23 1 1963 1 4
```

As you can see from the example above, the **day function** returns the day of the month, **month function** returns the month of the year and the **year function** returns the 4 digit year. The **qtr function** returns the quarter of the year where January - March are quarter 1, etc. The **weekday function** returns values 1 through 7 where day 1 is Sunday and so on representing the 7 days of the week.

Date Functions and Date Arithmetic

Being able to determine additional information from dates also is endeavored using special SAS date functions. You may use them to determine the time between to intervals, alter a point in time by a duration of time, or and subtract time intervals. Below are a few of them.

```
data _null_;
    date = date();
    my_birthday = '23jan63'd;
    datedif2 = intck('month',my_birthday,date);      * intck('interval', from, to );
    datedif3 = sum(date,-my_birthday);               * sum(to,-from);
    datedif1 = datdif(my_birthday,date,'act/act');    * datdif(from,to,'act/act')
                                                    or '30/360';

    put 'Log shows: ' datedif1 datedif2 datedif3;
run;

Log shows: 538 16357 16357
```

The **intck function** returns the number of “intervals” from one date to another. In this case, with the interval of Month, it is the number of months from Nov 5th, 2007 to my birth.

The **sum function**, while very valid with other forms of numeric's, also works with dates. As expected, it returns the number of days between one date interval and another.

The **datdif function**, in this example using 'act/act' (actual/actual), returns the number of days between one point in time and another point in time. The result here is the number of days from my birth to Nov 5th, 2007.

The **intck function** can be a very handy function while working on dates. Looking into this function further, below is a handful of “intervals” and they're returned results.

```
data _null_;
    my_birthday = '23jan1963'd;
    years = intck('year',my_birthday,date());
    quarters = intck('qtr',my_birthday,date());
    months = intck('month',my_birthday,date());
    weeks = intck('week',my_birthday,date());
    days = intck('day',my_birthday,date());
    put 'Log shows: ' years quarters months weeks days;
run;

Log shows: 44 176 529 2299 16092
```

The results from the previous data step shows, in order, how many years, how many quarters, how many months, how many weeks and how many days old I am. All of this with using just the one date function and altering the "interval".

Date Formats

Outputting dates from SAS is yet another ability of SAS to manipulate dates. Most people don't know what today's date is in SAS. People need to be able to visualize what date is represented in one of the normal and acceptable forms. Date formats are used to control the look and results of dates that are currently in SAS form. You can presents dates in data fields, in report titles or labels. There are quite a few date formats. They may be easily located in SAS Help and other SAS Documentation. Below are a few to give you a feel of how to use them.

```
data dates;
    my_birthday = '23jan1963'd;          * SAS date 1118;
    date1 = put(my_birthday,mmddyy8.);
    date2 = put(my_birthday,worddate15.);
    date3 = put(my_birthday,monyy7.);
    date4 = put(my_birthday,julian5.);
    put date1  date2  date3 date4;
run;
```

Log Shows:

01/23/63	Jan 23, 1963	JAN1963	63023
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The formats above clearly control the look of a SAS date. Even though the date being used above is the SAS date 1118, it is output in a form familiar to us all.

Warning signs of bad dates

There are always times when SAS dates aren't manipulated properly. Signs of such occasions are null values (.) or the occurrence of too many January 1st, 1960 values, meaning the date really returned a zero.

A listing of most SAS Date Functions, Informats and Formats – All in one place!

Date and Time Functions

DATDIF returns the number of days between two dates

DATE returns the current date as a SAS date value

DATEJUL converts a Julian date to a SAS date value
DATEPART extracts the date from a SAS datetime value

DATETIME returns the current date and time of day as a SAS datetime value

DAY returns the day of the month from a SAS date value

DHMS returns a SAS datetime value from date, hour, minute, and seconds

HMS returns a SAS time value from hour, minute, and seconds

HOUR returns the hour from a SAS time or datetime value

INTCK returns the integer number of time intervals in a given time span

INTNX advances a date, time, or datetime value by a given interval, and returns a date, time, or datetime value
JUL

DATE returns the Julian date from a SAS date value

JULDATE7 returns a seven-digit Julian date from a SAS date value

MDY returns a SAS date value from month, day, and year values

MINUTE returns the minute from a SAS time or datetime value

MONTH returns the month from a SAS date value

QTR returns the quarter of the year from a SAS date value

SECOND returns the second from a SAS time or datetime value

TIME returns the current time of day
TIMEPART extracts a time value from a SAS datetime value

TODAY returns the current date as a SAS date value
WEEKDAY returns the day of the week from a SAS date value

WEEKDAY returns an integer that represents the day of the week, where 1=Sunday, 2=Monday, ..., 7=Saturday

YEAR returns the year from a SAS date value
YRDIF returns the difference in years between two dates

YYQ returns a SAS date value from the year and quarter

Date Informats

DATE*w.* day, month abbreviation, and year:

17oct91 *ddMONyy*

DATETIME*w.d* date and time:

ddMONyy:hh:mm:ss

17oct91:14:45:32

DDMMYY*w.* day, month, year: *ddmmyy*,
dd/mm/yy,

17/10/91 *dd-mm-yy*, or *dd mm yy*

JULIAN*w.* year and day of year (Julian dates): *yyddd*

91290

MMDDYY*w.* month, day, year: *mmddy*,
mm/dd/yy,

10/17/91 *mm-dd-yy*, or *mm dd yy*

MONYY*w.* month abbreviation and year

Oct91

TIME*w.* *dh* hours, minutes, seconds:

hh:mm:ss

14:45:32or hours, minutes: *hh:mm*.

YYMMDD*w.* year, month, day: *yyymmdd*,
yy/mm/dd,

91/10/17 *yy-mm-dd*, or *yy mm dd*

YYQ*w.* year and quarter of year:

yyQq

91Q4

Date Formats

<p>DATEw. day,month abbreviation,year: <i>ddMONyy</i></p> <p>17oct91</p> <p>DAYw. day of month</p> <p>17</p> <p>DDMMYYw. day,month,year: <i>dd/mm/yy</i></p> <p>17/10/91</p> <p>DOWNAMEw. name of day of the week</p> <p>Thursday</p> <p>JULDAYw. day of year</p> <p>290</p> <p>JULIANw. year and day of year: <i>yyddd</i></p> <p>91290</p> <p>MMDDYYw. month, day, year: <i>mm/dd/yy</i></p> <p>10/17/91</p> <p>MMYYw. month and year: <i>mmMyy</i></p> <p>10M1991</p> <p>MMYYCw. month and year: <i>mm:yy</i></p> <p>10:1991</p> <p>MMYYDw. month and year: <i>mm-yy</i></p> <p>10-1991</p> <p>MMYYPw. month and year: <i>mm.yy</i></p> <p>10.1991</p> <p>MMYYSw. month and year: <i>mm/yy</i></p> <p>10/1991</p> <p>MMYYNw. month and year: <i>mmyy</i></p> <p>101991</p> <p>MONNAMEw. name of month</p> <p>October</p> <p>MONTHw. month of year</p> <p>10</p>	<p>MONYYw. month abbreviation and year:</p> <p>OCT91</p> <p>MONyyQTRw. quarter of year</p> <p>4</p> <p>QTRw. quarter of year</p> <p>4</p> <p>QTRRw. quarter in Roman numerals</p> <p>IV</p> <p>WEEKDATEw. <i>day-of-week, month-name dd,yy</i></p> <p>Thursday, October 17, 1991</p> <p>WEEKDATXw. <i>day-of-week, dd month-name yy</i></p> <p>Thursday, 17 October 1991</p> <p>WEEKDAYw. day of week</p> <p>5</p> <p>WORDDATEw. <i>month-name dd, yy</i></p> <p>October 17, 1991</p> <p>WORDDATXw. <i>dd month-name yy</i></p> <p>17 October 1991</p> <p>YEARw. year</p> <p>1991</p> <p>YYMMw. year and month: <i>yyMmm</i></p> <p>1991M10</p> <p>YYMMCw. year and month: <i>yy:mm</i></p> <p>1991:10</p> <p>YYMMDw. year and month: <i>yy- mm</i></p> <p>1991-10</p> <p>YYMMPw. year and month: <i>yy.mm</i></p> <p>1991.10</p> <p>YEARw. year</p> <p>1991</p>
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<p>YYMMw. year and month: <i>yy/mm</i></p> <p>1991M10</p> <p>YYMMCw. year and month: <i>yy:mm</i></p> <p>1991:10</p> <p>YYMMDw. year and month: <i>yy- mm</i></p> <p>1991-10</p> <p>YYMMPw. year and month: <i>yy.mm</i></p> <p>1991.10</p> <p>YYMMSw. year and month: <i>yy/mm</i></p> <p>1991/10</p> <p>YYMMNw. year and month: <i>yymm</i></p> <p>199110</p> <p>YYMONw. year and month abbreviation:</p> <p>1991OCT</p> <p>YYMDDw. year, month, day: <i>yy/mm/dd</i></p> <p>91/10/17</p> <p>YYQw. year and quarter: <i>yyQq</i></p> <p>91Q4</p> <p>YYQCw. year and quarter: <i>yy:q</i></p> <p>1991:4</p>	<p>YYQDw. year and quarter: <i>yy-q</i></p> <p>1991-4</p> <p>YYQPw. year and quarter: <i>yy.q</i></p> <p>1991.4</p> <p>YYQSw. year and quarter: <i>yy/q</i></p> <p>1991/4</p> <p>YYQNw. year and quarter: <i>yyq</i></p> <p>19914</p> <p>YQRw. Yyear and quarter in Roman</p> <p>1991</p> <p>QIVnumerals: <i>yyQrr</i></p> <p>YYQRCw. year and quarter in Roman</p> <p>1991:IV numerals: <i>yy:rr</i></p> <p>YYQRDw. year and quarter in Roman</p> <p>1991-IV numerals: <i>yy-rr</i></p> <p>YYQRPw. year and quarter in Roman</p> <p>1991.IV numerals: <i>yy.rr</i></p> <p>YYQRSw. year and quarter in Roman</p> <p>1991/IV numerals: <i>yy/rr</i></p> <p>YYQRNw. year and quarter in Roman</p> <p>1991IV numerals: <i>yyrr</i></p>
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CONCLUSION

Presented here are the most common tools used while working with dates in SAS programming. Quite frequently, there is more than one valid method to working with dates. It is best to understand dates and how to manipulate them. They are part of nearly all programming efforts in one capacity or another.

REFERENCES

SASS 9.1.3 Help and Documentation "Your Complete Guide to Syntax, How To, Examples, Procedures, Concepts, What's New, and Tutorials."

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