

INTCK and INTNX: Two lesser functions for computing intervals between dates in SAS

By [Rick Wicklin](#) on [The DO Loop](#) | May 15, 2017



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Last week I showed [a timeline of living US presidents](#). The number of living presidents is computed from the number of inaugurations and deaths of presidents. The data was taken from a Wikipedia table (shown below) and the number of days between events. This article shows how you can use the INTCK and INTNX functions to compute these events in this format. In particular, I use two little-known options to these functions that make



Number of presidents alive at each moment in United States history <small>[hide]</small>					
1 Order of service (linked)		+ Increases (inaugurations)		- Decreases (deaths)	
Starting and ending events			Living presidents		Time span
From: Apr 30, 1789	1st inauguration of George Washington	+ 1	1		7 years, 308 days
To: Mar 4, 1797	Inauguration of John Adams	+ 2			
From: Mar 4, 1797	Inauguration of John Adams	+ 2	2		2 years, 285 days
To: Dec 14, 1799	Death of George Washington	- 1			
From: Dec 14, 1799	Death of George Washington	- 1	1		1 year, 80 days
To: Mar 4, 1801	1st inauguration of Thomas Jefferson	+ 3			
From: Mar 4, 1801	1st inauguration of Thomas Jefferson	+ 3	2		8 years, 0 days
To: Mar 4, 1809	1st inauguration of James Madison	+ 4			
From: Mar 4, 1809	1st inauguration of James Madison	+ 4	3		8 years, 0 days
To: Mar 4, 1817	1st inauguration of James Monroe	+ 5			

Intervals between dates

If you are computing the interval between two dates (a start date and an end date) there are two things you must know about.

- **The INTCK function** returns the number of time units between two dates. For the time units, you can specify years, weeks, days, and more. For example, in my previous article I used the INTCK function to compute the number of days between two dates.
- **The INTNX function** returns a SAS date that is a specified number of time units away from a start date. You can use the INTNX function to compute the date that is 308 days in the future from a start date.

These two functions complement each other: one computes the difference between two dates, and the other returns a date value to a date value.

By default, these functions use the number of "calendar boundaries" between the dates, such as years, weeks, days, and more. For example, if you choose to measure year intervals, the INTCK function counts how many years occur between the dates, and the INTNX function returns a future 01JAN date. Similarly, if you measure months, the INTCK function counts how many first-of-the-months occur between two dates, and the INTNX function returns a future 01FEB date.

Options to compute anniversary dates

Both functions support many options to modify the default behavior. If you want to count full years between two dates and to compute the date of a future anniversary. You can use the 'CONTINUED' option for the INTCK function and the 'SAME' option for the INTNX function, as follows:



- The 'CONTINUOUS' option in the INTCK function enables you to count the number of prior to a second date. For example, the statement
`Years = intck('year', '30APR1789'd, '04MAR1797'd, 'continuous');`
returns the value 7 because there are 7 full years (anniversaries of 30APR) between the two dates. If you use the 'CONTINUOUS' option, the function returns 8 because 01JAN occurs 8 times between the two dates.
- The statement
`Anniv = intnx('year', '30APR1789'd, 7, 'same');`
returns the 7th anniversary of the date 30APR1789. In other words, it returns the date 30APR1796.

The beauty of these functions is that *they automatically handle leap years!* If you request the INTCK function includes leap days in the result. If an event occurs on a leap day, and you ask for the anniversary of that event, you will get 28FEB of the next year, which is the most common convention for leap day.

An algorithm to compute years and days between events

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The following algorithm computes the number of years and days between dates in SAS:

- Use the INTCK function with the 'CONTINUOUS' option to compute the number of complete years between the start and end dates.
- Use the INTNX function to find a third date (the anniversary date) which is the same number of years after the start date as the end date is. (The anniversary of a leap day is either 28FEB or 01MAR, depending on whether the anniversary occurs in a leap year.)
- Use the INTCK function to compute the number of days between the anniversary date and the end date.

The following DATA step computes the time interval in years and days between the first few deaths. The resulting Year and Day variables contain the same information as is displayed in the following table.

```
data YearDays;
format Date prevDate anniv Date9.;
input @1 Date anydtdte12.
      @13 Event $26.;
prevDate = lag(Date);
if _N_=1 then do;                                /* when _N_=1, lag(Date)=. */
  Years=.; Days=.; return;                        /* set years & days, go to next obs */
end;
Years = intck('year', prevDate, Date, 'continuous'); /* num complete years */
Anniv = intnx('year', prevDate, Years, 'same');      /* most recent anniv */
Days = intck('day', anniv, Date);                    /* days since anniv */
```



```

datalines;
Apr 30, 1789 Washington Inaug
Mar 4, 1797 J Adams Inaug
Dec 14, 1799 Washington Death
Mar 4, 1801 Jefferson Inaug
Mar 4, 1809 Madison Inaug
Mar 4, 1817 Monroe Inaug
Mar 4, 1825 JQ Adams Inaug
Jul 4, 1826 Jefferson Death
Jul 4, 1826 J Adams Death
run;

proc print data=YearDays;
var Event prevDate Date Anniv Years Days;
run;

```

Obs	Event	prevDate	Date	anniv	Years	Days
1	Washington Inaug	.	30APR1789	.	.	.
2	J Adams Inaug	30APR1789	04MAR1797	30APR1796	7	308
3	Washington Death	04MAR1797	14DEC1799	04MAR1799	2	285
4	Jefferson Inaug	14DEC1799	04MAR1801	14DEC1800	1	80
5	Madison Inaug	04MAR1801	04MAR1809	04MAR1809	8	0
6	Monroe Inaug	04MAR1809	04MAR1817	04MAR1817	8	0
7	JQ Adams Inaug	04MAR1817	04MAR1825	04MAR1825	8	0
8	Jefferson Death	04MAR1825	04JUL1826	04MAR1826	1	122
9	J Adams Death	04JUL1826	04JUL1826	04JUL1826	0	0

Summary and references

In summary, the INTCK and INTNX functions are essential for computing intervals between little-known options: the 'CONTINUOUS' option in INTCK and the 'SAME' option in INTNX. I compute the number of anniversaries between dates and the most recent anniversary. Thus between two dates.

There have been countless articles and papers written about SAS dates and finding interval following articles:

- A brief introduction to SAS date and time functions is Andrew Karp (2003) "[Working w](#) Unfortunately, this paper was written before the 'CONTINUOUS' and 'SAME' options v

- I learned about the 'SAME' from a short paper by Bruce Gilson (2006) "[Improve Your I Value SAMEDAY.](#)"
- A more advanced paper with many examples, including examples of the 'CONTINUOI (2015) "[Demystifying Date and Time Intervals.](#)" Derek also wrote the book [The Essen](#) (Second Edition, 2014)

Lastly, do you know what the acronyms INTCK and INTNX stand for? Obviously the 'INT' p consensus is that 'INTCK' stands for 'Interval Check' and 'INTNX' stands for "Interval Next."

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Rick Wicklin, PhD, is a distinguished researcher in computational statistics at SA IML and SAS/IML Studio. His areas of expertise include computational statistics, modern methods in statistical data analysis. Rick is author of the books [Statistica](#) and [Simulating Data with SAS](#).

26 COMMENTS

[Michelle Homes](#) on May 15, 2017 6:04 am



LOVE LOVE LOVE the INTCK and INTNX functions! I've found them extremely useful specifying the shift-index option to shift the start of the calendar year to the fiscal year <http://support.sas.com/documentation/cdl/en/lefunctionsref/69762/HTML/default/view> And as a reminder if you are wanting to calculate an age, then the YRDIF function with outlined in Chris Hemedingers post, <http://blogs.sas.com/content/sasdummy/2011/07/>

And with regards to what CK and NX stand for... I've always thought what you've suggested if it is something else.

[Rick Wicklin](#) on May 15, 2017 6:09 am

I share your affection. And thanks for mentioning YRDIF. You can also use YRC use extra logic to handle leap years, whereas INTCK handles them automatically

[Michelle Homes](#) on May 15, 2017 6:18 am

From the documentation, it seems that using the "AGE" option in YRDIF <http://support.sas.com/documentation/cdl/en/lefunctionsref/63354/HTML> However, as discussed in Chris' blog post comments it depends on the type

[Rick Wicklin](#) on May 15, 2017 7:50 am

Yes, the INTEGER portion of YRDIF is fine. The special handling to work with the FRACTIONAL portion to find the next anniversary date

[Raks](#) on May 25, 2017 7:09 am

Hi Rick,

If I wanted to count the number of rows between intervals of weeks starting from a point best method of doing so? I've been looking all over the internet, but can only seem to between days, weeks, months, etc.



For examples, if I wanted to count the number of bananas purchased in fortnightly intervals of this, what would be the best way to go about it?

If you could help me out with trying to resolve this issue, it'd be much appreciated.

[Rick Wicklin](#) on May 25, 2017 8:47 am

This sort of question gets asked and answered frequently on the [SAS Support](#) forum. I'll post your own question along with some sample data.

Ron Cody on May 30, 2017 4:40 pm

This is the first time I have heard what INTCK and INTNX stand for. Of course, I have also. Because our guesses agree, it must be so!

[Juan Vidal](#) on February 7, 2018 4:21 pm

Hi,

Is it possible to use intck with a 'user calendar', a dataset calendar in which you have data for every date??

Thanks

Tammy Jackson on February 7, 2018 5:06 pm

Juan,

Yes. You can create your own calendar. In this code, I create a custom interval so happen to coincide with the weekday interval WEEKDAY167W. This describes a calendar conducted on Sunday(1), Friday(6), or Saturday(7). I did this for testing purposes; you should use WEEKDAY167W. However, custom intervals can accommodate other calendars. Using the custom interval 'MyBusDay', INTNX is able to calculate 3 business days.



```
data mybusinessdays;  
do BEGIN = '01JAN2016'D to '31DEC2020'D;  
if ( WEEKDAY(BEGIN) GE 2 and WEEKDAY(BEGIN) LE 5 ) then output;  
end;  
format BEGIN DATE.;  
run;
```

```
options intervals=(MyBusDay=mybusinessdays);
```

```
data ship;  
do date = '01FEB2017'D to '28FEB2017'D;  
ship_date1 = INTNX('MyBusDay',date,3);  
ship_date2 = INTNX('WEEKDAY167W',date,3);  
output;  
end;  
format date ship_date1 ship_date2 DATE.;  
run;  
title 'Shipping Days for 3 day shipping';  
proc print;run;  
title 'Error Check';  
proc print data=ship(where=(ship_date1 NE ship_date2));  
run;
```

[Juan Vidal](#) on February 8, 2018 3:18 am

Thanks for your help Tammy, very useful

[jim](#) on July 18, 2018 5:20 am

hi guys,

i have an xls file, imported by sas successfully, i have formatted the dates and also ways to calculate number of days between the two dates given and was not successful the dates...i need to compute days between two dates..my program is as follows

```
PROC IMPORT OUT= WORK.DATE123
```

```
DATAFILE= "C:\Users\Administrator\Desktop\IFAD\DATAANALYSES\
```

```
datenew2.xls" out= dayno
```




```
DBMS=EXCEL5 REPLACE;  
GETNAMES=YES;  
RUN;  
looking for help...  
proc print data =dayno;  
format mdy1 mdy2 date9.;  
run;
```

[Rick Wicklin](#) on July 18, 2018 5:24 am

You can post questions like this to the [SAS Support Community](#). The site enables attachments, and more.

[jim](#) on July 18, 2018 6:25 am

the output file of sas is as follows:

```
260 FAY 3 5 18 09AUG2000 08AUG2001  
261 FAY 3 5 16.1 02FEB2001 01FEB2002  
262 FAY 3 5 17.9 09DEC2000 08DEC2001  
263 FAY 3 5 16.8 30DEC2000 .  
264 FAY 3 5 16.3 09AUG2000 08AUG2001  
265 FAY 3 5 18.5 02FEB2001 01FEB2002  
266 FAY 3 5 16.4 09DEC2000 08DEC2001  
267 FAY 3 5 15.8 02FEB2001 01FEB2002  
268 FAY 3 5 17.5 09DEC2000 08DEC2001  
269 FAY 3 5 17 30DEC2000 29DEC2001
```

[Rick Wicklin](#) on July 18, 2018 6:39 am

I am confident that the experts on the SAS Support Community will be able to help you.

Preeti Jain on October 8, 2018 5:34 pm



I have a question, if my dataset contains only year variable (like manufacturing year) : between manufacturing year and a year in which the data was calculated, then how s can apply for the same,

[Rick Wicklin](#) on October 8, 2018 5:45 pm

If only the year is known (not a day within the year), then just subtract the years
 $\text{Diff} = \text{ManufactYear} - \text{DataYear};$
If you have day information, use INTCK.

surya on December 1, 2018 6:06 am

can anyone suggest code of SAS for Balaam Design to get 90% Confidence interval 1 Reference and Test vs Test

Thanks in advance..

[Rick Wicklin](#) on December 1, 2018 7:07 am

You can ask SAS programming questions at communities.sas.com.


Bijay Adhikari on February 1, 2019 11:17 am

Can someone help on this,
I would like to create week number starting Dec 30 to Jan 5 as week#1, Jan 6 to 12 a called 'admit_date',

What SAS code should I use?

[Rick Wicklin](#) on February 1, 2019 11:34 am

You can ask SAS programming questions on the [SAS Support Communities](#). T
the [WEEK](#) function.



Nelly Selitser on April 2, 2019 10:40 am

I need help please,

I have multiple dates in my data.

My first query is selecting the MAX date for each person/account, the next query shows month back and so on.

How I can define the number of months to jump?

For example, this is my first query:

```
proc sql;
select count(ACCT_ID) as Total_count, SEG, TM_ID, PRD_CD
from CUST_DATA
where OBSVTN_DT=(select max(OBSVTN_DT) from CUST_DATA)
group by TM_ID, SEG, PRD_CD
order by PRD_CD, SEG;
quit;
```

Rick Wicklin on April 2, 2019 10:44 am

You can ask SAS programming questions, post data, and share code on [the SAS Community](#). There are many experts there who can help with questions like this one.

Idowu on October 15, 2019 6:05 pm

This is very helpful. Thanks.

I have a question though. I am trying to use the INTNX function to get the first and last day of the month. Can this be written? I need to use this in a where clause on DI Studio.

The SQL code is "where fac.VALID_FROM_DTTM between DATEADD(m,-1,DATEADD(m,1,EOMONTH(dateadd(month,-1,getdate())))) and DATEADD(m,1,EOMONTH(dateadd(month,-1,getdate()))))"

Rick Wicklin on October 16, 2019 10:03 am



The first day of the current month is
FirstDayMonth = intnx('month', Date, 0);
Therefore, the last day of the previous month is
LastDayPrevMonth = intnx('month', Date, 0) - 1;

Similarly, the first day of the previous month is
FirstDayPrevMonth = intnx('month', Date, -1);

Pingback: [Compute the first or last day of a month or year - The DO Loop](#)

[rohit aggarwal](#) on November 27, 2019 12:05 pm

Thank you blogs.sas for giving me wonderful information



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