


If is it 18,613 This Must Be TASS



Peter Eberhardt
Fernwood Consulting Group Inc.
Toronto Area SAS Society
17 Dec 2010

If It Is 18,613 This Must be TASS




17 December 2010

18 December 2010

16 December 2010

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS




17 December 2010

18 December 2010

16 December 2010

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS




17 December 2010 **AD**

18 December 2010 **AD**

16 December 2010 **AD**

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS




17 December **AD** 2010

18 December **AD** 2010

16 December **AD** 2010

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS




Thursday 4 October 1582

Friday 15 October 1582

1582						
October						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3	4	5	6
17	18	19	20	21	22	23

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS



Pope Gregory XIII in the Papal bull
Inter gravissimas
reformed the calendar giving us what is known
as the Gregorian Calendar.

This replaced the Julian Calendar which had
been in effect since 45 BC.

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS

What is a SAS date variable?

- 17 December 2010

```

1  data _null_;
2  toDay = "17DEC2010"d;
3  put toDay= /
4  toDay= yymmdd10. /
5  toDay= worddate23.;
6  run;

```

← Date Constant
← Date Display

```

toDay=18613
toDay=2010-12-17
toDay=December 17, 2010

```

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS

What is a SAS date variable?

- 17 December 2010
 - The underlying data representation (**18613**) is independent of its visual representation (**2010-12-17**, **December 17, 2010**, etc).
 - **What is 18613?**
 - The number of days from January 1, 1960

1960-01-01	==	0
1960-01-02	==	1
1960-01-03	==	2
...		
2010-12-17	==	18613

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS

What is a SAS date variable?

- 17 December 2010
 - The underlying data representation (**18613**) is independent of its visual representation (**2010-12-17**, **December 17, 2010**, etc).
 - **What is 18613?**
 - The number of days from January 1, 1960

1960-01-01	==	0
1959-12-31	==	-1
1959-12-30	==	-2
...		
1592-10-15	==	-137774
1592-10-04	==	-137785

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS

What is a SAS datetime variable?

- 17 December 2010 @ 9:30 am

```

7  data _null_;
8  toDay = "17DEC2010:9:30:0"dt;
9  put toDay= /
10     toDay= datetime. /
11     toDay= datetime18.3 /;
12  toDay = "17DEC2010:9:30:0.5"dt;
13  put toDay= /
14     toDay= datetime. /
15     toDay= datetime18.3;
16  run;

```

Annotations: Blue arrows point from "Datetime Constant" to line 8 and "Datetime Display" to lines 10-11.

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS

What is a SAS datetime variable?

- 17 December 2010 @ 9:30 am

toDay=1608197400 toDay=17DEC10:09:30:00 toDay=17DEC10:09:30:00.0	<pre> put toDay= / toDay= datetime. / toDay= datetime18.3 /; </pre>
toDay=1608197400.5 toDay=17DEC10:09:30:01 toDay=17DEC10:09:30:00.5	<pre> put toDay= / toDay= datetime. / toDay= datetime18.3; </pre>

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS

What is a SAS datetime variable?

- 17 December 2010 @ 9:30 am
 - **What is 1608197400?**
 - The number of seconds since January 1, 1960 @ midnight
 - Datetime variables are floating point numbers (can contain partial seconds)

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS

What is a SAS time variable?

- 9:30

```

17 data _null_;
18   morning = "9:30*t";
19   put morning= /
20     morning= time. /
21     morning= timeampm. /;
22   morning = "9:30:00.6 PM*t";
23   put morning= /
24     morning= time. /
25     morning= timeampm12.3 /;
26 run;

```

← Time Constant
← Time Display

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS

What is a SAS time variable?

- 9:30

```

morning=34200
morning=9:30:00
morning=9:30:00 AM

```

```

put morning= /
morning= time. /
morning= timeampm. /;

```

```

morning=77400.6
morning=21:30:01
morning=9:30:00.6 PM

```

```

put morning= /
morning= time. /
morning= timeampm12.3 /;

```

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.


If It Is 18,613 This Must be TASS

What is a SAS time variable?

- 9:30
 - **What is 34200?**
 - The number of seconds since midnight
 - Time variables are floating point numbers (can contain partial seconds)

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS



The underlying data representation


- 18613
- 1608197400
- 34200

is independent of its visual representation

- 2010-12-17, December 17, 2010
- 17DEC10:09:30:00, 17DEC10:09:30:00.0
- 9:30:00, 9:30:00 AM

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS




SAS Formats

Visual representation of SAS date, datetime, and time variables is controlled through SAS formats

- Numerous built-in SAS formats for dates
- Fewer built-in SAS formats for datetime and time variables
- PROC format
 - Create custom formats


Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS




SAS Informats

- “mirror image” of formats
 - Turn a visual representation into the underlying data representation



Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS



SAS Informat

```


data _null_;
  input toDay      yymmdd10.  +1
        tomorrow   date9.     +1
        toDayDT    datetime16. +1
        morning    time5.;
  put toDay= tomorrow= toDayDT= morning=;
datalines;
2010-12-17 18dec2010 17DEC10:09:30:00 09:30
2010-12-18 19dec2010 17DEC10:19:30:00 21:30
;;
run;

```

- toDay=18613 tomorrow=18614 toDayDT=1608197400 morning=34200
- toDay=18614 tomorrow=18615 toDayDT=1608233400 morning=77400

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS



Functions

- date()/today()
 - Returns the current date


```

data _null_;
  td = today();
  dt = date();
run;

```

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS



Functions

- date()/today()
 - Useful to capture the run date for a report

```


38 %let titledate = %sysfunc(today(),yymmdd10.);
39 %put titleDate= &titledate;
titleDate= 2010-12-17

footnote1 "Produced on &titledate";

```

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS




Functions

- `time()`
 - Returns the current time

```
data _null_;
  now = time();
run;
```

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS



Functions


- `time()`
 - Returns the current time

```
40 %let titledate = %sysfunc(date(),date9.);
41 %let titletime = %sysfunc(time(), timeampm.);
42 %put titleDate= &titledate titletime= &titletime;
titleDate= 17DEC2010 titletime= 9:30:34 PM

footnote1 "Produced on &titledate at &titletime";
```

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS




Functions

- `datepart()`
 - Returns the datepart of a datetime variable

```
data fromSQLServer;
  set sql.dataTable;
  sasDate = datepart(sqlDate);
  drop sqlDate;
  format sasDate yymmdd10.;
run;
```

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS




Functions

- **timepart()**
 - Returns the time part of a datetime variable

```
data fromSQLServer;
  set sql.dataTable;
  sasTime = timepart(sqlDate);
  drop sqlDate;
  format sasTime timeAMPM.;
run;
```

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS




Functions

- **day(dateVar)**
 - Returns the day (1 – 31) of a SAS date variable
- **month(dateVar)**
 - Returns the month (1 – 12) of a SAS date variable
- **year(dateVar)**
 - Returns the year of a SAS date variable
- **qtr(dateVar)**
 - Returns the quarter (1 – 4) of a SAS date variable

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS




Functions

- **mdy(mm, dd, yy)**
 - Returns a SAS date from the three integer variables for month (mm), day (dd), and year (yy) input
- **hms(hh, mm, ss)**
 - Returns a SAS time variable for the three variables hour (hh), minute (mm), and second (ss). The seconds input can be floating point
- **dhms(date, hh, mm, ss)**
 - Returns a SAS date time variable from the four variables for date, hour, minute, and second

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS




Functions

- **intck()**
 - Returns the count of the number of interval boundaries between two dates, two times, or two datetime values
- **intnx()**
 - Increments a date, time, or datetime value by a given time interval, and returns a date, time, or datetime value.

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS




Functions

- **Interval**
 - Character value
 - Common values are (not case sensitive):
 - 'day'
 - 'week'
 - 'month'
 - 'year'
 - 'qtr'

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS




Functions

- **Boundary**
 - starting point for each interval
 - 'day'
 - 'week' sundays
 - 'month' first of the month
 - 'year' Jan 1
 - 'qtr' Jan 1, Apr 1, Jul 1, Oct 1

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS




Functions

- intck('interval', start, end)
 - start: can be date, time, or datetime
 - end: must be same type as start

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS



Functions

- intck('interval', start, end)

```


43 data _null_;
44     start = '01jan2010'd;
45     end = '01jul2010'd;
46     days1 = end - start;
47     days2 = intck('day', start, end);
48     weeks = intck('WEEK', start, end);
49     months = intck('month', start, end);
50     year = intck('year', start, end);
51     put days1= days2= weeks= months= year=;
52 run;

```

days1=181 days2=181 weeks=26 months=6 year=0

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS



Functions

- intck('interval', start, end)

```

53 data _null_;
54     start = '01jan2010'd;
55     end = '30jun2010'd;
56     days1 = end - start;
57     days2 = intck('day', start, end);
58     weeks = intck('WEEK', start, end);
59     months = intck('month', start, end);
60     year = intck('year', start, end);
61     put days1= days2= weeks= months= year=;
62 run;

```

days1=180 days2=180 weeks=26 months=5 year=0

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS

Functions

- `intck('interval', start, end)`

```

63 data _null_;
64   start = '01jan2010'd;
65   end = '31dec2010'd;
66   days1 = end - start;
67   days2 = intck('day', start, end);
68   weeks = intck('WEEK', start, end);
69   months = intck('month', start, end);
70   year = intck('year', start, end);
71   put days1= days2= weeks= months= year=;
72   run;

```

`days1=364 days2=364 weeks=52 months=11 year=0`

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS

Functions

- `intck('interval', start, end)`

```

73 data _null_;
74   start = '31dec2010'd;
75   end = '01jan2011'd;
76   days1 = end - start;
77   days2 = intck('day', start, end);
78   weeks = intck('WEEK', start, end);
79   months = intck('month', start, end);
80   year = intck('year', start, end);
81   put days1= days2= weeks= months= year=;
82   run;

```

`days1=1 days2=1 weeks=0 months=1 year=1`

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.


If It Is 18,613 This Must be TASS

Functions

- `intnx('interval', start, increment <, 'align'>)`
 - Increment: is number of intervals to add
 - Can be negative
 - 'align': controls position of the resultant date within the interval. Optional
 - 'beginning' ('b')
 - This is the default
 - 'middle' ('m')
 - 'end' ('e')
 - 'same' ('s')

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS




Functions

```
intnx('interval', start, increment <, 'align'>)
83  data _null_;
84      start = '01jan2010'd;
85      weeks = intnx('week', start, 1);
86      weeksE = intnx('week', start, 1, 'e');
87      weeksS = intnx('week', start, 1, 's');
88      weeksM = intnx('week', start, 1, 'M');
89      put weeks= yymmdd10. weeksE= yymmdd10. weeksS=
      yymmdd10. weeksM= yymmdd10.;
90  run;
```

weeks=2010-01-03 weeksE=2010-01-09 weeksS=2010-01-08
weeksM=2010-01-06

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS




Functions

```
intnx('interval', start, increment <, 'align'>)
start =2010-01-01      increment=1
weeks =2010-01-03
weeksE=2010-01-09
weeksS=2010-01-08
weeksM=2010-01-06
```

2010						
January						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
						1 2
3	4	5	6	7	8	9
10	11	12	13	14	15	16

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS




Functions

```
intnx('interval', start, increment <, 'align'>)
- Determine first/last day of the month
91  data _null_;
92      start = '11jan2010'd;
93      monthStart = intnx('month', start, 0, 'b');
94      monthEnd = intnx('month', start, 0, 'e');
95      put monthStart= yymmdd10. monthEnd= yymmdd10.;
96  run;
```

monthStart=2010-01-01 monthEnd=2010-01-31

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS




Functions

`intnx('interval', start, increment <, 'align'>)`

- 'interval' can be compound
 - 'year.10': 1 year interval where October is the start
 - 'year.2.4': 2 year interval where April is the start

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS



Functions

`intnx('interval', start, increment <, 'align'>)`

- Fiscal years


```

97 data _null_;
98 start = '11JUN2010'd;
99 yearStart = intnx('year', start, 0, 'b');
100 fiscalStartApr= intnx('year.4', start, 1, 'b');
101 fiscalStartOct= intnx('year.10', start, 1, 'b');
102 fiscalEndApr = intnx('year.4', start, 1, 'e');
103 fiscalEndOct = intnx('year.10', start, 1, 'e');
104 put yearStart= yymmdd10. /
105 fiscalStartApr= yymmdd10. fiscalEndApr= yymmdd10. /
106 fiscalStartOct= yymmdd10. fiscalEndOct= yymmdd10.;
107 run;

```

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS



Functions

`intnx('interval', start, increment <, 'align'>)`

- Fiscal years

```

start = '11JUN2010'd;

yearStart=2010-01-01
fiscalStartApr=2011-04-01 fiscalEndApr=2012-03-31
fiscalStartOct=2010-10-01 fiscalEndOct=2011-09-30

```

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS

There and Back Again

The underlying data representation

- 18613
- 1608197400
- 34200

is independant of its visual representation

- 2010-12-17, December 17, 2010
- 17DEC10:09:30:00, 17DEC10:09:30:00.0
- 9:30:00, 9:30:00 AM

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS

There and Back Again

Converting data representation to visual representation is controlled by FORMATS

Converting visual representation to data representation is controlled by INFORMATS

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

If It Is 18,613 This Must be TASS

There and Back Again

SAS Functions can do it all

Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.


If it is 18,613 This Must be TASS

Time is the thing that keeps everything happening at once



Copyright © 2010, Fernwood Consulting Group Inc. All rights reserved. Peter Eberhardt, Fernwood Consulting Group Inc.

Questions



Peter Eberhardt
peter@fernwood.ca
