INTRODUCTION

For those old enough to remember, graphs, at one time, were produced with a ruler and quadrille paper. Today, sophisticated computer applications exist to produce a dizzying array of business charts. Despite all the technology, the basic purpose of producing a visual summary of data is unchanged. For time-conscious decision-makers, a good business graph is easily analyzable and interpretable.

Despite its origins in statistics, SAS/Graph® has many practical uses in the business world. It is one of the most powerful data presentation software packages in the marketplace. Initially, producing results from SAS/Graph is challenging. The product is so comprehensive, it is difficult to know where to begin. This tutorial is designed to provide new SAS/Graph users with the basics to get started. The material and examples for this presentation originated in the Introduction, SAS/Graph, Version 6 manual.

GETTING STARTED

SAS/Graph has over 80 system options to provide with you flexibility in controlling the content and quality of your business graphs. The following represents the options used for some of the charts in this presentation.

```
GOPTIONS
    DEVICE=win
    GUNIT=pct
    CBACK=white
    HTITLE=5
    HTEXT=3
    FTEXT=swissxb
    CTEXT=red ;
```

To display a list of options available at your site submit the following:

```
PROGRAM EDITOR
    Command ===>
    00001 proc goptions;
    00002
    00003
```

The SAS Institute provides drivers for various graphic devices. The GOPTIONS statement DEVICE= specifies the appropriate driver. To test the graphics capability of a device, simply submit:

```
PROGRAM EDITOR
    Command ===>
    00001 proc gtesttit; run;
    00002
    00003
```

A list of default colors is displayed. For the SAS System running under Microsoft Windows, there are 11 colors.

Printing color does not set speed records. Depending on the purpose and message of your business graph, consider using black and white with patterns and shades of gray as an alternative to color. Color presentation graphics produce subliminal messages through the emotional impact of color. It is easy to communicate an unintended message by the over-reliance of color to emphasize a point. Colors are generally classified as cool, warm and hot.
TEXT CHARTS

Graph 1: In this simple text chart, the TITLE and FOOTNOTE statements are used to display the results of the default settings.

TITLE1 'INTRODUCTION TO SAS/GRAPH';
TITLE2 'SUGI 20 - BEGINNING TUTORIAL';
TITLE3 'PRODUCING TEXT SLIDES';
PROC GSLIDE;
FOOTNOTE1 'GRAPH#1';
FOOTNOTE2 'C:\SAS\SUGI\GRAPH1';

INTRODUCTION TO SAS/GRAPH
SUGI 20 - BEGINNING TUTORIAL
PRODUCING TEXT SLIDES

Graph 2: The appearance of the text chart is altered with a little dash of color, and changing the font by utilizing some of the customization features of SAS/Graph.

TITLE1 'INTRODUCTION TO SAS/GRAPH';
TITLE2 'F=DUPLEX C=BLUE H=5
 'SUGI 20 - BEGINNING TUTORIAL';
TITLE3 'F=BRUSH C=GREEN H=5
 'CHANGING THE FONTS IN THE TITLE STATEMENT';
PROC GSLIDE;
FOOTNOTE1 'GRAPH#2';
FOOTNOTE2 'C:\SAS\SUGI\GRAPH2';

INTRODUCTION TO SAS/GRAPH
SUGI 20 - BEGINNING TUTORIAL
CHANGING THE FONTS IN THE TITLE STATEMENT

Graph 3: J= option justifies text.

TITLE1 'INTRODUCTION TO SAS/GRAPH';
TITLE2 'F=SWISSXB C=BLUE H=5 'SUGI 20 - BEGINNING TUTORIAL';
TITLE3 'F=SWISSXB C=GREEN H=5 'JUSTIFYING TEXT';
PROC GSLIDE;
FOOTNOTE1 J=L C=BLACK 'GRAPH#3'
  J=C 'SAS/WIN 6.11' J=R C=BLACK
  'C:\SAS\SUGI\GRAPH3';

BAR CHARTS

A bar chart displays exact values. Each bar is a statistical representation of a value in the data. The GCHART procedure produces charts based on six statistics:
1. frequency counts
2. cumulative frequency counts
3. percentages
4. cumulative percentages
5. sum
6. mean

Graph 4: The default bar chart shows frequency counts.

PROC GCHART DATA=SALES ;
VBAR AGENT ;
FOOTNOTE1 J=L 'GRAPH#4';
Graph 5: PATTERN statement allows you to change the appearance characteristics of the bars in your chart.

```sas
PATTERN VALUE=SOLID ;
PROC GCHART DATA=SALES ;
VBAR SALES ;
```

Graph 6: Using the DISCRETE action statement creates separate bars for each distinct value.

```sas
PATTERN VALUE=SOLID ;
PROC GCHART DATA=SALES ;
VBAR DATE/DISCRETE ;
FORMAT DATE DATE7.;
FOOTNOTE1 J=L 'GRAPH#6';
  J=R 'C:SAS\SUGI\GRAPH6';
```

Graph 7: To create a stacked bar chart, use the SUBGROUP action statement.

```sas
PATTERN1 VALUE=SOLID C=GRAY ;
PATTERN2 VALUE=X3 C=BLACK ;
PATTERN3 VALUE=L3 C=BLACK ;
PROC GCHART DATA=SALES ;
VBAR DATE /DISCRETE SUBGROUP=PARTNUM ;
FORMAT DATE DATE7.;
FOOTNOTE1 J=L 'GRAPH#7';
  J=R 'C:SAS\SUGI\GRAPH7';
```

Graph 8: A GROUP= action statement categorizes bars into separate groups.

```sas
PATTERN1 VALUE=SOLID C=BLACK ;
PATTERN2 VALUE=X3 C=BLACK ;
HBAR DATE /DISCRETE GROUP=BRANCH ;
FORMAT DATE DATE7.;
FOOTNOTE1 J=L 'GRAPH#8';
  J=R 'C:SAS\SUGI\GRAPH8';
```

Graph 9: To chart a specific variable, use the SUMVAR= action statement and then indicate the type of statistic with TYPE=.

```sas
PATTERN1 VALUE=SOLID C=GRAY ;
PATTERN2 VALUE=X3 C=BLACK ;
PATTERN3 VALUE=L3 C=BLACK ;
PROC GCHART DATA=SALES ;
VBAR DATE /DISCRETE SUBGROUP=PARTNUM ;
SUMVAR=SALES ;
TYPE=SUM ;
FORMAT DATE DATE7.;
```

Graph 8: A GROUP= action statement categorizes bars into separate groups.
Graph 10: An AXIS statement allows you to customize the appearance of the axes. ORDER= options changes the values displayed on the response axis. It indicates the starting and ending ticks marks and the increments of change.

`AXIS1 ORDER=(0 TO 25000 BY 5000) COLOR=BLACK LABEL=('SALES TOTALS')`;

`PATTERN1 VALUE=SOLID C=GRAY ; PATTERN2 VALUE=X3 C=BLACK ; PATTERN3 VALUE=L3 C=BLACK`;

`PROC GCHART DATA=SALES ; VBAR DATE /DISCRETE SUBGROUP=PARTNUM TYPE=SUM SUMVAR=SALES RAXIS=AXIS1 ; FORMAT DATE DATE7. FORMAT SALES DOLLAR10. ; FOOTNOTE1 J=L 'GRAPH#10' J=R 'C:\SAS\SUGI\GRAPH10' ;`

**PIE CHARTS**

A pie chart is a graphical representation of how data relates to itself.

Graph 12: The default pie chart shows a frequency of sales.

`GOPTIONS HTEXT=3 ; TITLE1 'INTRODUCTION TO SAS/GRAPH' ; TITLE2 'SUGI 21 - BEGINNING TUTORIAL' ; TITLE3 'DEFAULT PIE CHART' ; PROC GCHART DATA=SALES ; PIE AGENT ; FORMAT DATE DATE7. SALES DOLLAR4. ; FOOTNOTE1 J=L 'GRAPH#12' J=R 'C:\SAS\SUGI\GRAPH12' ;`

Graph 11: It is easy to display the value for each bar. Printing statistics simplifies the analysis of the chart.

`AXIS1 ORDER=(0 TO 25000 BY 5000) COLOR=BLACK LABEL=('SALES TOTALS') ; PATTERN1 VALUE=SOLID C=GRAY ; PATTERN2 VALUE=X3 C=BLACK ; PATTERN3 VALUE=L3 C=BLACK ; PROC GCHART DATA=SALES ; VBAR DATE /DISCRETE SUBGROUP=PARTNUM TYPE=SUM SUMVAR=SALES RAXIS=AXIS1 SUM PATTERNID=SUBGROUP ; FORMAT DATE DATE7. SALES DOLLAR10. ; FOOTNOTE1 J=L 'GRAPH#11' J=R 'C:\SAS\SUGI\GRAPH11' ;`
Graph 13: With some additional options, the pie chart is enhanced with color and labels. The NOHEADING option eliminates the default heading. The VALUE=ARROW connects the value of sales to the slice. SLICE=INSIDE places the label within the slice.

```
TITLE1 'INTRODUCTION TO SAS/GRAPH';
TITLE2 'SUGI 21 - BEGINNING TUTORIAL';
TITLE3 'ENHANCING A PIE CHART';

PROC GCHART DATA=SALES;
PIE AGENT / SUMVAR=SALES NOHEADING VALUE=ARROW SLICE=INSIDE FILL=SOLID CTEXT=BLACK;
FORMAT DATE DATE7. SALES DOLLAR10.;
FOOTNOTE1 J=L 'GRAPH#13' J=R 'C: \SAS\SUGI\GRAPH13';
RUN;
QUIT;
```

Graph 14: The slice for POOLE is exploded from the pie for added emphasis.

```
TITLE1 'INTRODUCTION TO SAS/GRAPH';
TITLE2 'SUGI 21 - BEGINNING TUTORIAL';
TITLE3 'EXPLODING A PIE CHART SLICE';
PROC GCHART DATA=SALES;
PIE AGENT / SUMVAR=SALES NOHEADING VALUE=ARROW SLICE=INSIDE FILL=SOLID CTEXT=RED EXPLODE='POOLE';
FORMAT DATE DATE7. SALES DOLLAR10.;
FOOTNOTE1 J=L 'GRAPH#14' J=R 'C: \SAS\SUGI\GRAPH14';
```

**PLOT CHARTS**

Plot or line charts show a trend over time or demonstrate a relationship of one variable to another.

Graph 15: The data points are joined with the SYMBOL statement and the option INTERPOL=JOIN. In technical jargon, interpolation estimates the distance between two values. SAS/GRAPH accepts up to 99 SYMBOL statements.

```
SYMBOL1 INTERPOL=JOIN COLOR=RED VALUE=DIAMOND HEIGHT=6;
PROC GPLOT DATA=DATE1;
PLOT SALES * DATE;
FORMAT DATE DATE7. SALES DOLLAR10.;
FOOTNOTE1 J=L 'GRAPH#15' J=R 'C: \SAS\SUGI\GRAPH15';
```

Graph 15: The data points are joined with the SYMBOL statement and the option INTERPOL=JOIN. In technical jargon, interpolation estimates the distance between two values. SAS/GRAPH accepts up to 99 SYMBOL statements.
Graph 16: In this example, AXIS statements are used to assign labels along the vertical and horizontal axes. Those statements are referenced in the VAXIS- and HAXIS= options, respectively. The text along the vertical axis is rotated to enhance the appearance of the chart.

```sas
TITLE1 'INTRODUCTION TO SAS/GRAPH';
TITLE2 'SUGI 21 - BEGINNING TUTORIAL';
TITLE3 'AXES LABELLING';

SYMBOL1 INTERPOL=JOIN
  COLOR=RED
  VALUE=Diamond
  HEIGHT=6;
AXIS1 LABEL=('DATE OF SALE');
AXIS2 LABEL=(ANGLE=-90 ROTATE=90 'TOTAL SALES');

PROC GPLOT DATA=DATE1;
  PLOT SALES * DATE / HAXIS=AXIS1 VAXIS=AXIS2;
;
FORMAT DATE DATE7. SALES DOLLAR10.;
FOOTNOTE1 J=L 'GRAPH#16'
  J=R 'C:\SAS\SUGI\GRAPH16';
RUN;
QUIT;
```

Graph 17: To analyze the relationship between two variables, you can make two plot requests within one PLOT statement with the OVERLAY action statement. The SYMBOL statements assign different attributes for each line. The OFFSET= option places the first major tick mark 2 units from the origin and the last major tick mark 2 units from the end of the axis.

```sas
TITLE1 'INTRODUCTION TO SAS/GRAPH';
TITLE2 'SUGI 21 - BEGINNING TUTORIAL';
TITLE3 'AXES LABELLING';

SYMBOL1 INTERPOL=JOIN
  COLOR=RED
  VALUE=Diamond
  HEIGHT=6;
SYMBOL2 INTERPOL=JOIN
  COLOR=BLUE
  VALUE=SQUARE
  HEIGHT=6;
AXIS1 LABEL=('DATE OF SALE');
AXIS2 LABEL=(ANGLE=-90 ROTATE=90 'TOTAL VALUE');

PROC GPLOT DATA=DATE1;
  PLOT COST*DATE SALES * DATE / HAXIS=AXIS1 VAXIS=AXIS2 OVERLAY;
;
FORMAT DATE DATE7. SALES COST DOLLAR10.;
FOOTNOTE1 J=L 'GRAPH#17'
  J=R 'C:\SAS\SUGI\GRAPH17';
```
Graph 18: In this last example, a plot chart is produce with a third variable.

**References:**


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