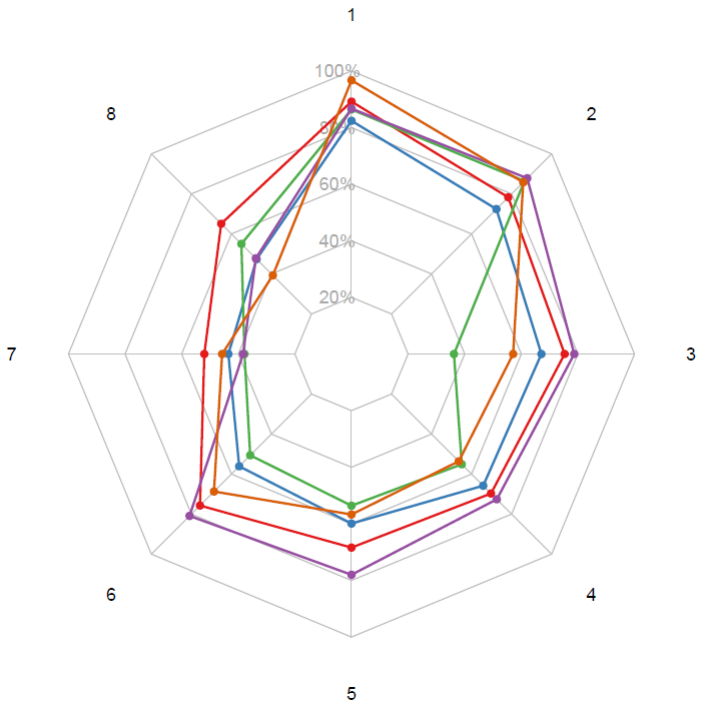
Graphing Cyclical Data

1



2

Use ggradar()?

3

Cyclical Time Series

Example Topic: Presidential Effectiveness in Congress

Data indicate the percentage of all Congressional roll call votes on which a majority took the same position as the president.

Is presidential "success" with Congress partially a function of the stage of a president's term? Is there a "honeymoon" period at the beginning of a term, or only a first term? Do lame duck presidents have less success with Congress? ("Lame duck" refers to someone who is at the end of his/her term of office.)

Looking only at presidents who have served 8 years in office. (The US Constitution limits presidents to two four-year terms.)

4

```
library(readxl)
preswins <-
  read_excel("Z:/Private Folder/Data/vs/vitalstats_ch8_tbl1x8.xlsx")
View(preswins)
```

First value in each column indicates the president's year in office.
Names of the presidents are in the first column.

	A	B	C	D	E	F	G	H	I
1		1	2	3	4	5	6	7	8
2	**Eisenhower**	89.2	78.3	75.3	69.7	68.4	75.7	52.0	65.1
3	**Reagan**	82.4	72.4	67.1	65.8	59.9	56.1	43.5	47.4
4	**Clinton**	86.4	86.4	36.2	55.1	53.6	50.6	37.8	55.0
5	**GWBush**	86.7	87.8	78.7	72.6	78.0	80.9	38.3	47.8
6	**Obama**	96.7	85.8	57.1	53.6	56.7	68.7	45.7	39.3

5

Cyclical Time Series

Import the data into R.

Convert the data object (imported as a "tibble") into a dataframe.

Use the first column values to create row names.

Delete the first column values.

Add two rows of data. The first row should indicate the maximum value of the scale for the graph. The second row should indicate the minimum value.

6

```
library(readxl)
library(fmsb)
preswins <-
  read_excel("Z:/Private Folder/Data/vs/vitalstats_ch8_tbl1x8.xlsx")
View(preswins)
```

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Untitled1* preswins

Filter

	...1	1	2	3	4	5	6	7	8
1	Eisenhower	89.2	78.3	75.3	69.7	68.4	75.7	52.0	65.1
2	Reagan	82.4	72.4	67.1	65.8	59.9	56.1	43.5	47.4
3	Clinton	86.4	86.4	36.2	55.1	53.6	50.6	37.8	55.0
4	GWBush	86.7	87.8	78.7	72.6	78.0	80.9	38.3	47.8
5	Obama	96.7	85.8	57.1	53.6	56.7	68.7	45.7	39.3

8

```
library(readxl)
library(fmsb)
preswins <-
  read_excel("Z:/Private Folder/Data/vs/vitalstats_ch8_tbl1x8.xlsx")
View(vitalstats_ch8_tbl1x8)


#convert the tibble into a data frame
preswins.df <- as.data.frame(preswins)
View(preswins.df)
```

9

Untitled1* × preswins ×

Filter

	...1	1	2	3	4	5	6	7	8
1	Eisenhower	89.2	78.3	75.3	69.7	68.4	75.7	52.0	65.1
2	Reagan	82.4	72.4	67.1	65.8	59.9	56.1	43.5	47.4
3	Clinton	86.4	86.4	36.2	55.1	53.6	50.6	37.8	55.0
4	GWBush	86.7	87.8	78.7	72.6	78.0	80.9	38.3	47.8
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10

```
library(readxl)
library(fmsb)
preswins <-
  read_excel("Z:/Private Folder/Data/vs/vitalstats_ch8_tbl1x8.xlsx")
View(vitalstats_ch8_tbl1x8)


#convert the tibble into a data frame
preswins.df <- as.data.frame(preswins)
View(preswins.df)

#use the first column values to create row names
rownames(preswins.df) <- preswins.df[, 1]
```

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Untitled1* | preswins.df | preswins

Filter

	...1	1	2	3	4	5	6	7	8
Eisenhower	Eisenhower	89.2	78.3	75.3	69.7	68.4	75.7	52.0	65.1
Reagan	Reagan	82.4	72.4	67.1	65.8	59.9	56.1	43.5	47.4
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GWBush	GWBush	86.7	87.8	78.7	72.6	78.0	80.9	38.3	47.8
Obama	Obama	96.7	85.8	57.1	53.6	56.7	68.7	45.7	39.3

12

```
library(readxl)
library(fmsb)
preswins <-
  read_excel("Z:/Private Folder/Data/vs/vitalstats_ch8_tbl1x8.xlsx")
View(vitalstats_ch8_tbl1x8)


#convert the tibble into a data frame
preswins.df <- as.data.frame(preswins)
View(preswins.df)

#use the first column values to create row names
#then delete the first column
rownames(preswins.df) <- preswins.df[, 1]
preswins.df$...1 <- NULL
View(preswins.df)
```

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Untitled1* | preswins.df | preswins

Filter

	...1	1	2	3	4	5	6	7	8
Eisenhower	Eisenhower	89.2	78.3	75.3	69.7	68.4	75.7	52.0	65.1
Reagan	Reagan	82.4	72.4	67.1	65.8	59.9	56.1	43.5	47.4
Clinton	Clinton	86.4	86.4	36.2	55.1	53.6	50.6	37.8	55.0
GWBush	GWBush	86.7	87.8	78.7	72.6	78.0	80.9	38.3	47.8
Obama	Obama	96.7	85.8	57.1	53.6	56.7	68.7	45.7	39.3

Untitled1* | preswins.df | preswins

Filter

	1	2	3	4	5	6	7	8
Eisenhower	89.2	78.3	75.3	69.7	68.4	75.7	52.0	65.1
Reagan	82.4	72.4	67.1	65.8	59.9	56.1	43.5	47.4
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GWBush	86.7	87.8	78.7	72.6	78.0	80.9	38.3	47.8
Obama	96.7	85.8	57.1	53.6	56.7	68.7	45.7	39.3

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```
library(readxl)
library(fmsb)
preswins <-
  read_excel("Z:/Private Folder/Data/vs/vitalstats_ch8_tbl1x8.xlsx")
View(vitalstats_ch8_tbl1x8)


#convert the tibble into a data frame
preswins.df <- as.data.frame(preswins)
View(preswins.df)

#use the first column values to create row names
#then delete the first column
rownames(preswins.df) <- preswins.df[, 1]
preswins.df$..1 <- NULL
View(preswins.df)

#Combine three sets of data: #Row 1 (a vector created with a rep()
#function) will contain the maximum value (upper limit) of the
#graph's radii scale (100).
#Row 2 is a vector that will contain the minimum value (20) of
#the radii scale.
#Finally, append the data to the upper and lower limits of the scale
```

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`rep(x, … )`

Some arguments:

`x`	A vector or factor that you want the function to repeat.
`times`	An integer-valued vector giving the (non-negative) number of times to repeat each element if of length length(x), or to repeat the whole vector if of length 1. Negative or NA values are an error.

`rbind( … )`	Take a sequence of vector, matrix or data-frame arguments and combine them by rows.

Some arguments:

…	Vectors or matrices to combine. Objects are combined in the order specified in the syntax.

Adapted from sources: www.rdocumentation.org/packages/base/versions/3.6.2/topics/rep and www.rdocumentation.org/packages/base/versions/3.6.2/topics/cbind 16

```
library(readxl)
library(fmsb)
preswins <-
  read_excel("Z:/Private Folder/Data/vs/vitalstats_ch8_tbl1x8.xlsx")
View(vitalstats_ch8_tbl1x8)


#convert the tibble into a data frame
preswins.df <- as.data.frame(preswins)
View(preswins.df)

#use the first column values to create row names
#then delete the first column
rownames(preswins.df) <- preswins.df[, 1]
preswins.df$..1 <- NULL
View(preswins.df)

#Combine three sets of data #Row 1 (a vector created with a rep()
#function) will contain the maximum value (upper limit) of the
#graph's radii scale (100).
#Row 2 is a vector that will contain the minimum value (20) of
#the radii scale.
#Finally, append the data to the upper and lower limits of the scale
preswins.df = rbind(rep(100, 8), rep(20 ,8), preswins.df)
View(preswins.df)
```

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Untitled1* | preswins.df | preswins

Filter

	1	2	3	4	5	6	7	8
1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Eisenhower	89.2	78.3	75.3	69.7	68.4	75.7	52.0	65.1
Reagan	82.4	72.4	67.1	65.8	59.9	56.1	43.5	47.4
Clinton	86.4	86.4	36.2	55.1	53.6	50.6	37.8	55.0
GWBush	86.7	87.8	78.7	72.6	78.0	80.9	38.3	47.8
Obama	96.7	85.8	57.1	53.6	56.7	68.7	45.7	39.3

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Use the `radarchart()` function. (Requires the "fmsb" package.)

`radarchart(`*`data`*`, … )`

Some arguments:

`data`	Data table, such as a data frame.
`pcol`	A vector of colors for the lines plotted on the chart.
`plwd`	A vector of widths for the lines plotted on the chart. Default is 1. If you specify a single value, the plot will apply that value to all lines.
`na.itp`	TRUE (default) or FALSE. Determines whether the plot imputes values for NA values.
`cglcol`	Specifies the color of the radar grid lines. Default is "navy".
`cglty`	Specifies the type of line used to draw the radar grid. Default is "3" (dotted). Other values based on the "`lty`" graphical parameter used in base R `plot()` function, for example 1 = continuous line.
`seg`	Number of grid segments. Default is "4".
`axistype`	Specifies the type of axis. 0 = no axis label (default). 1 = center axis only; 2 = around-the-chart labels only. (See R doc for more options.)

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```
library(fmsb)

line_colors <- c("#e41a1c", "#377eb8", "#4daf4a", "#984ea3",
                 "#d95f02")

radarchart(preswins.df,
           na.itp = FALSE,
           pcol = line_colors,
           plwd = 2,
           plty = 1,
           axistype = 1,
           caxislabels = c("20%", "40%", "60%", "80%", "100%"),
           axislabcol = "darkgrey",
           cglcol = "grey",
           cglty = 1)
```

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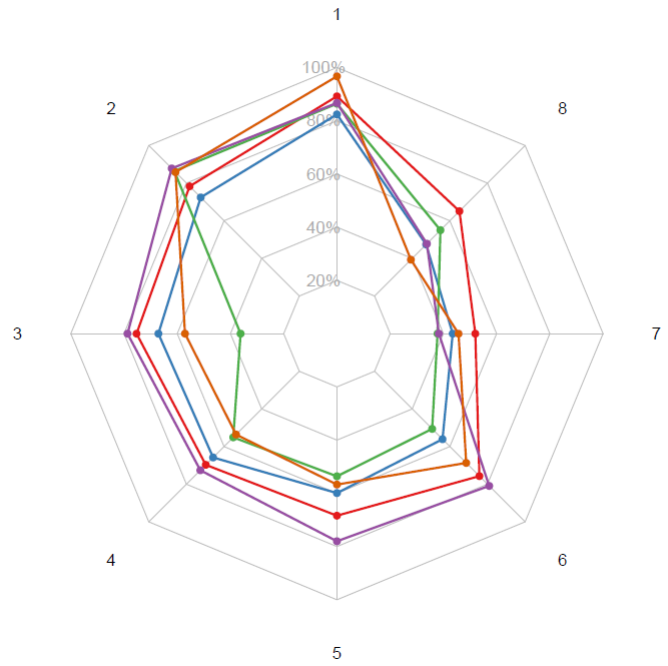

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```
preswins.dfclk <- preswins.df[, c(1, 8:2)]
View(preswins.dfclk)
```

Untitled1* | preswins.dfclk | preswins.df | preswins

Filter

	1	8	7	6	5	4	3	2
1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Eisenhower	89.2	65.1	52.0	75.7	68.4	69.7	75.3	78.3
Reagan	82.4	47.4	43.5	56.1	59.9	65.8	67.1	72.4
Clinton	86.4	55.0	37.8	50.6	53.6	55.1	36.2	86.4
GWBush	86.7	47.8	38.3	80.9	78.0	72.6	78.7	87.8
Obama	96.7	39.3	45.7	68.7	56.7	53.6	57.1	85.8

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```
radarchart(preswins.dfclk,
           na.itp = FALSE,
           pcol = line_colors,
           plwd = 2,
           plty = 1,
           axistype = 1,
           caxislabels = c("20%", "40%", "60%", "80%", "100%"),
           axislabcol = "darkgrey",
           cglcol = "grey",
           cglty = 1)
```

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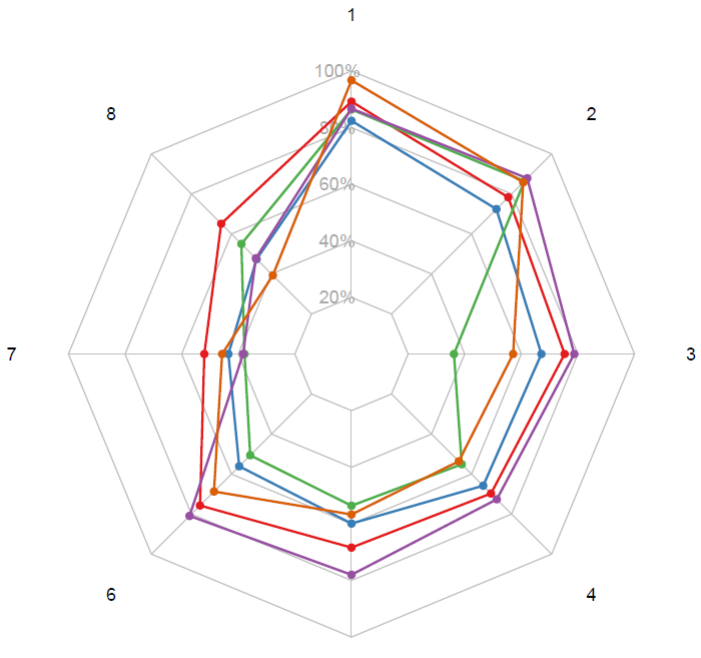

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Draw a legend (to be refined in Illustrator).

```
legend()
```

Some arguments:

`x, y`	the plot area location of the legend.
`legend`	character or expression vector of legend value names.
`bty`	is the type of box drawn around the legend. N = “none”.
`pch`	is the plotting symbol in the legend; use base R plot point codes.
`col`	is a vector of the colors of points or lines appearing in the legend.

Adapted from www.rdocumentation.org/packages/graphics/versions/3.6.2/topics/legend

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Draw a legend (to be refined in Illustrator).

```
legend(x = 1.3, y = 1,
       legend = rownames(preswins.dfclk[-c(1, 2), ]),
       bty = "n",
       pch = 20,
       col = line_colors)
```

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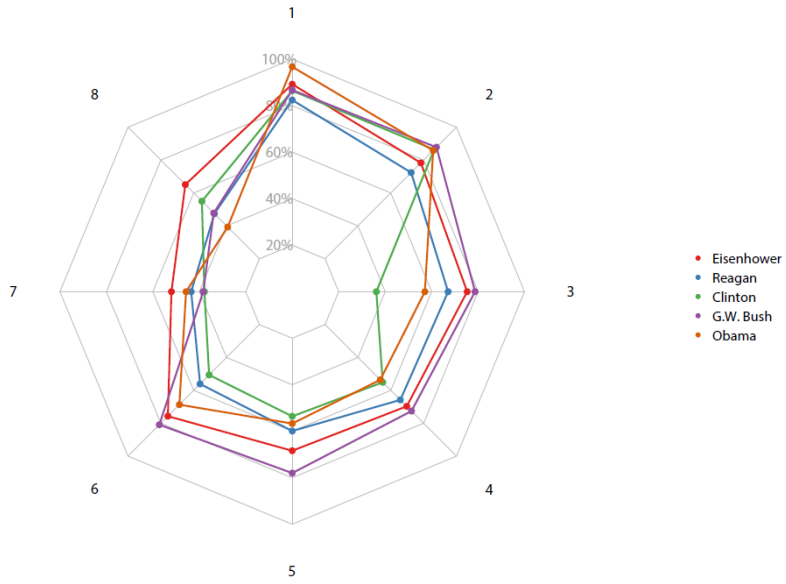
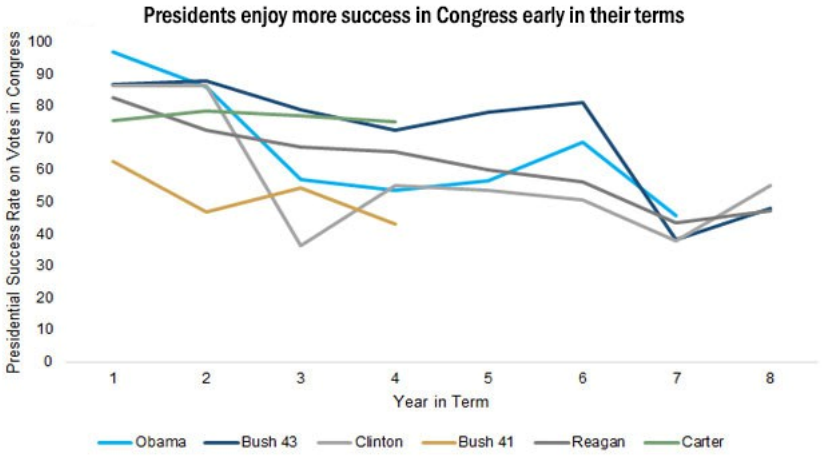
Presidents enjoy more success in Congress early in their terms.

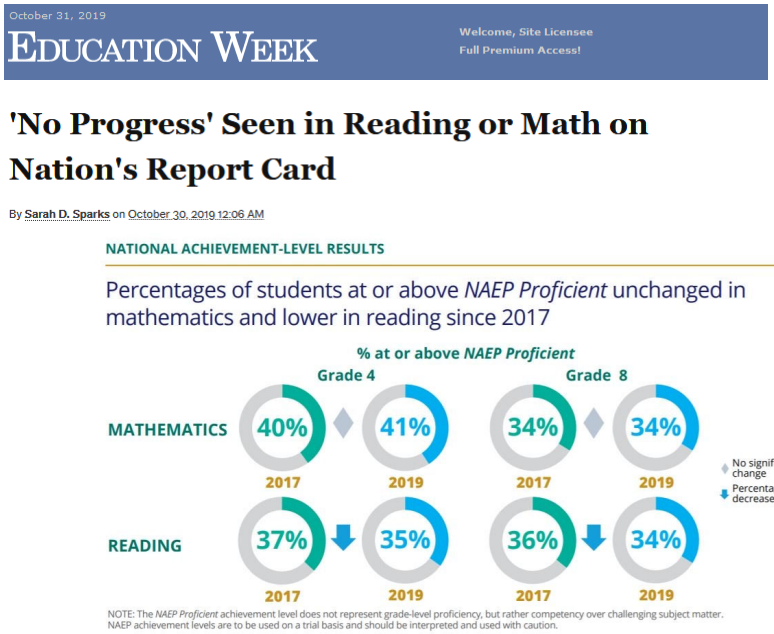
Percent of times Congress votes to support a president's clearly taken position. The percentage of presidential victories are shown from years one through eight of all presidents who served for two terms between 1953 and 2017.



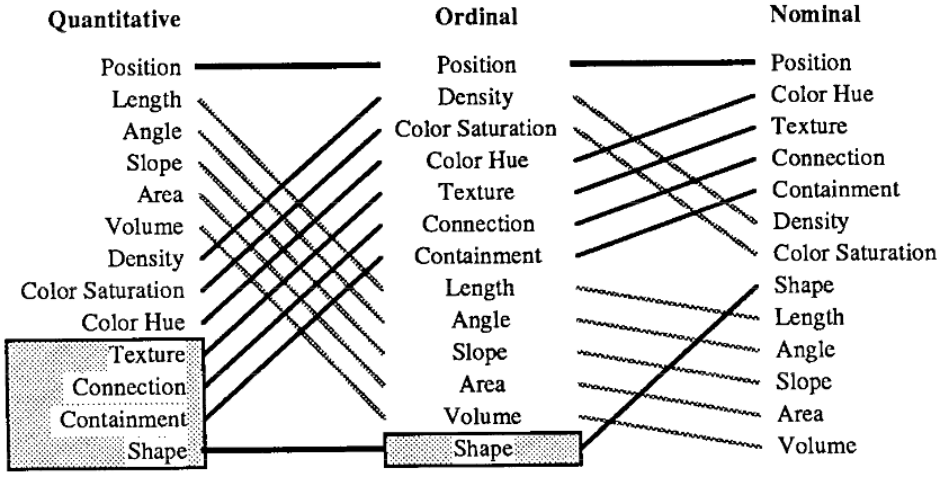
Data: *Vital Statistics*, The Brookings Institution and The American Enterprise Institute.



Source: www.brookings.edu/multi-chapter-report/vital-statistics-on-congress/ 28



Source: blogs.edweek.org/edweek/inside-school-research/2019/10/reading_math_NAEP_2019.html 29



Jock Mackinlay. "Automating the Process of Graphical Presentations of Relational Information." *ACM Transactions in Graphics,* 5:2 (1986).

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