Exit Stage Left

Teachers Teaching with Technology™
Professional Development from Texas Instruments

Student Activity

7 8 9 10 **11** **12**

TI-30XPlus MathPrint™ | Activity | Student | 50 min

Introduction

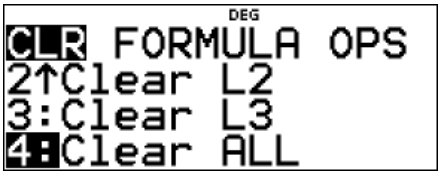
The term “exit stage left” refers to an uneventful departure, making way for more interesting events. If you’re female and working in the Hollywood, you might be mistaken for thinking the definition said “youthful” rather than “interesting”. When a 28 year old actress is knocked back because she is too old to play the love interest of a 39 year old actor, and a 37 year old actress too old for the 55 year old actor, something is clearly wrong. Could all of this be mumurs and rumblings from a small gendered group of disgruntled celebrities or is there data to support these claims?

In 2004 Geena Davis founded the “Geena Davis Institute on Gender in Media”, the organisation has been busy collecting data. Now it’s your turn, is this a case of “Entrapment” (1999) or “Somethings Gotta Give” (2003). The data source used for this investigation comes from the pinacle of the movie industry: the Academy Awards®. These awards commenced in May 1928. Since 1935, Pricewaterhouse has managed the awards and initiated the secrecy of the result by placing the winner’s name in a sealed envelope, coining the phrase: “The envelope please”. Past award winners include Jodie Foster (29), Gwyneth Paltrow (26), Julia Roberts (33), Will Smith (52), Jack Nicholson (60) and Anthony Hopkins (82).

Data Collection: Males

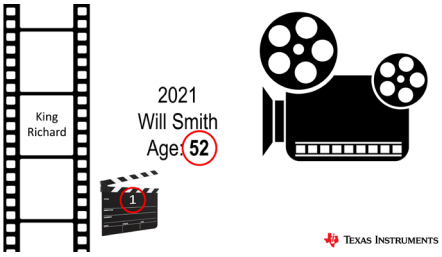
This activity uses all three of the TI-30XPlus MathPrint lists; it is therefore appropriate to clear all the lists before starting.

Press: stat-reg/distr data stat-reg/distr data ▲ … select option 4, **Clear All**.



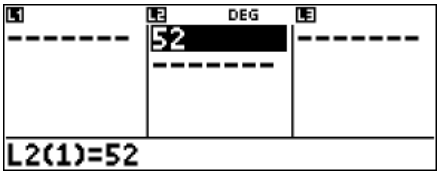
The first set of data to be explored is the age at which ‘actors’ (male) received their award. This activity uses the past 40 years as a sample from almost 100 years of awards.
The data for the male ages will be stored in List 2.

Navigate to list 2. Your teacher will present the data using a series of PowerPoint slides. Each slide contains the year, actor’s age (at the time of the award) and an item number. The item number should match the list item number on your calculator.



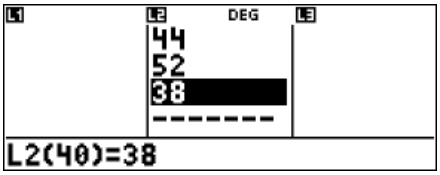
In the calculator screen image (opposite), Will Smith’s age has been entered as the first item in list 2: L2(1) = 52

Match the item number on each slide to make sure your data is correct.



Data Entry

Once you have finished entering the data, your screen should show the last item as: L2(40) = 38.



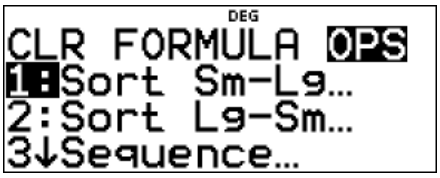
Author: P. Fox

Median

The median is the middle number in a sorted list, this means that 50% of the data lies above the median and 50% below. If the quantity of items in the list is even, the 'average' of the middle two items is calculated.

Sorting the List

We want to retain the current order for the data so the sorted data will be sent to a separate 'working' list.



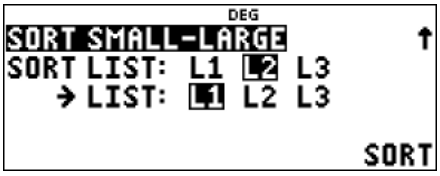
Press: stat-reg/distr data … select option 1: Sort Smallest to Largest.

Our data is located in List 2 (L2).

The sorted data will be sent to List 1 (L1).

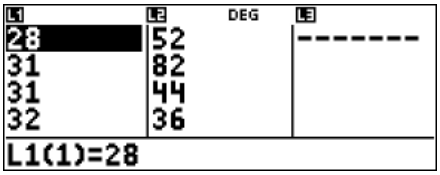
Once these selections have been made, select "SORT".

An ordered copy of List 2 will be sent to List 1.



We can see from the sorted list that the youngest actor to win an award in this forty-year period is 28 years of age. Navigate down to the 20th item in List 1.

Remember: There is an even quantity of data in the list.



Question: 1.

Use your sorted list to help determine the following statistics for male award winners over the past 40 years.

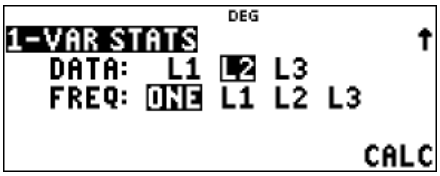
a) Minimum Age (Q_0) b) Maximum Age (Q_4) c) Median Age (Q_2)

d) First Quartile (Q_1) e) Third Quartile (Q_3)

The calculator can determine each of these quantities using the statistics menu.

Press: 2nd stat-reg/distr data … select option **2** (1 Variable Statistics)

The original data is located in List 2 (L2). The data does not include any frequency information, therefore, select "ONE" for the Frequency option, the select **calculate** (CALC).



Question: 2.

The mean age for male award winners over the past 40 years is approximately 44.5. Suggest reasons why this statistic is greater than the median for the same set of data.

Outliers

An outlier for a boxplot is a data point that lies beyond the whiskers. To calculate if a data point is an outlier, determine the Inter Quartile Range (IQR = $Q_3 - Q_1$) and then calculate the lower and upper fence.

Lower fence: $Q_1 - 1.5 \times IQR$ **Upper fence**: $Q_3 + 1.5 \times IQR$

Author: P. Fox

Question: 3.

Use your previous calculations to help determine each of the following:

a) Inter-Quartile Range (IQR)

b) Lower Fence

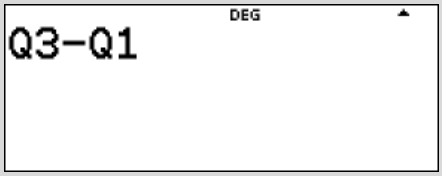
c) Upper Fence

d) Which data points (if any) are outliers?

Tip!

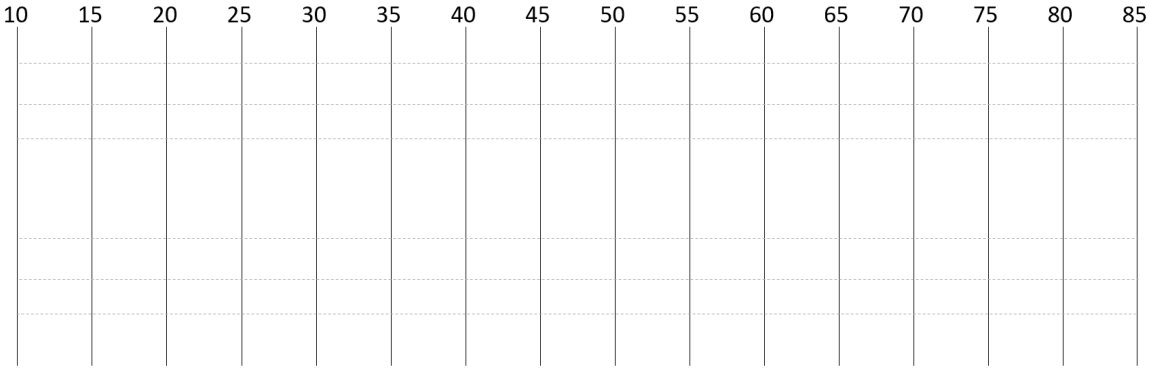
Press: stat-reg/distr 2nd data A 1

Navigate to Q_3 and Q_1 to paste these values to the calculator.



Question: 4.

Use the statistics determined previously, to draw a boxplot for the male award winners over the past 40 years.
Note: The additional space is for the female data to be added later.



Data Collection: Females

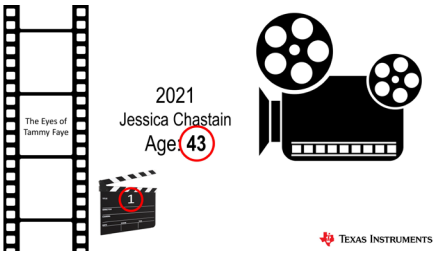
It's time to enter the data for the actresses. The slide set is in the same format. Use the clapper-board to make sure your data is correctly aligned.

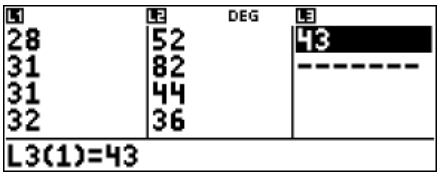
Store your data in List 3 (L3).

Do **NOT** delete the data for males, this will be used again later!

Press: stat-reg/distr data … navigate across to List 3 and enter the data.

The calculator screen opposite shows the first entry: 43 that has been entered into list 3: L3(1) = 43





Question: 5.

Use the statistics functionality of the calculator to determine the following statistics for female award winners over the past 40 years.

a) Minimum Age (Q_0)

b) Maximum Age (Q_4)

c) Median Age (Q_2)

d) First Quartile (Q_1)

e) Third Quartile (Q_3)

Author: P. Fox

Question: 6.

The mean age for female award winners over the past 40 years is approximately 38.9, just over five and a half years younger than their male counter-parts. Discuss whether you believe this to be a significant difference.

Question: 7.

Use your previous calculations to help determine each of the following for females:

a) Inter-Quartile Range (IQR)

b) Lower Fence

c) Upper Fence

d) Which data points (if any) are outliers?

Question: 8.

Use the statistics determined to draw a boxplot for female award winners over the past 40 years.
Note: Use the additional space provided adjacent to the male boxplot.

Question: 9.

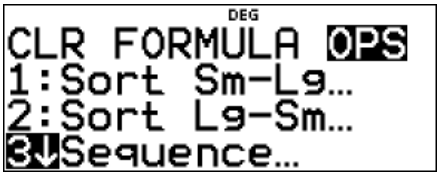
How do the adjacent boxplots support the concerns expressed by the Geena Davis Institute on Gender in Media?

Miss Representation

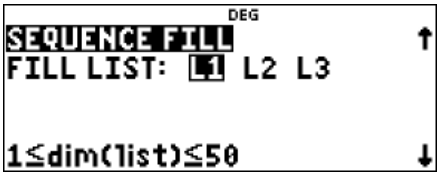
Our boxplots may be misrepresenting the data as they don't show trends over time.

To explore if any changes have occurred, the years need to be added, these will be stored in List 1 (L1).

Press: stat-reg/distr data ◂ and select option 3 (Sequence)



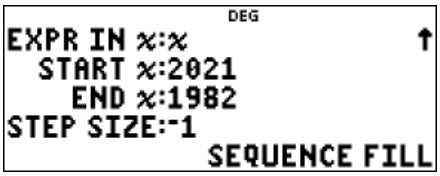
Select List 1 (L1) for the time series information.



Match the settings shown opposite.

The first data entry is for 2021, the last one is for 1982, so our dates are stepping backwards (-1).

Select SEQUENCE FILL and the years will be sent to List 1.

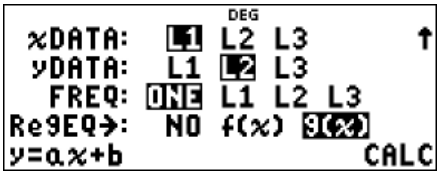


It's now time to see if there are any trends in our data.

Press: stat-reg/distr 2nd data … select option 4: **LinReg ax + b**

The "years" data is located in List 1 (L1), the ages for males located in List 2 (L2), store the regression equation in $g(x)$

Match the settings shown opposite then select **CALC.**



Author: P. Fox

Question: 10.

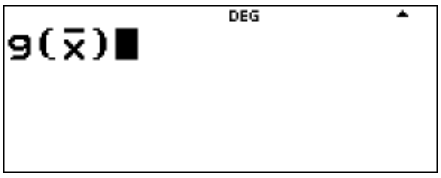
Determine the regression equation and comment on whether there is any trend in the data for the males.

Question: 11.

The regression equation has been stored in $g(x)$.

a) Calculate $g(\bar{x})$ using the Table tool and Stat-Vars where $\bar{x}$ represents the 'average' (mean) year.

b) Recall and compare the average (mean) age with the previous calculation.



Question: 12.

Determine the regression equation for the females and comment on whether there is any trend.

Question: 13.

The regression equation has been stored in $f(x)$, calculate and compare $f(\bar{x})$ and compare the result to the average age of female award winners.

Hidden Figures

The data investigated in this activity has focused only on the past 40 years. Trends may have occurred over longer periods of time, including movie directors and scripts incorporating leading roles for older females. For example, in the 1980's Katherine Hepburn (74), Shirley MacLaine (49), Geraldine Page (60) and Jessica Tandy (79) all won awards.

To analyse this data, "5 point median smoothing" will be applied.

Example:

Year:	1928	1929	1930	1931	1932
Winner:	Janet Gaynor	Mark Pickford	Norma Shearer	Marie Dressler	Helen Hayes
Age:	21	37	27	62	31

Question: 14.

Using the above table:

a) Calculate the mean.

b) Calculate the median

c) Which statistic, mean or median best represents the data?

Question: 15.

Collect the median data for the life span of the awards for both males and females and determine the following:

a) The regression equation for the 5 point median data for females.

b) The regression equation for the 5 point median data for males.

c) Discuss the two equations and the corresponding correlation.

Author: P. Fox