

**FST NOTES 1-4**

TOPIC: Box Plots

**GOAL**

Examine distributions as a whole using box plots

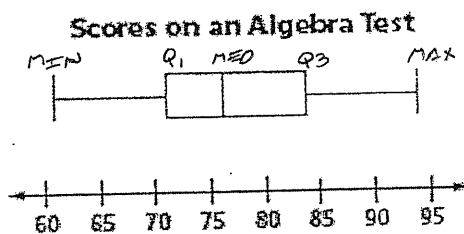
**SPUR Objectives**

A Calculate measures of center and spread for data sets.

E Use statistics to draw conclusions about data.

I Read, interpret, and draw box plots from data.

**Label Parts of the Box Plot**



RANGE:  $MAX - MIN$   
 IQR:  $Q_3 - Q_1$

**Vocabulary**

box plot, box-and-whiskers plot

minimum *SMALLEST #*

first (lower) quartile  $Q_1$

second quartile  $Q_2$  OR *MEDIAN*

third (upper) quartile  $Q_3$

maximum *LARGEST #*

five-number summary *MED, Q1, MED, Q3, MAX*

Interquartile range (IQR)  $Q_3 - Q_1$

whiskers *OFF BOX, 1ST + 4TH QUANTILES*

outlier *SMALLER THAN  $Q_1 - 1.5(IQR)$*

*OR*  
*LARGER THAN  $Q_3 + 1.5(IQR)$*

**Warm-Up**

In 1-4, think of the dots as representing numbers in order in a data set.

For each set of dots, identify:

- a. the median dot;
- b. the median of the dots before the median;
- c. the median of the dots after the median.

(Place a vertical bar on a dot if it is the median. Place a vertical bar between dots if the median is between two dots.)

- 1. ● ● | ● ● | ● ● | ● ●
- 2. ● ● | ● ● | ● ● | ● ●
- 3. ● ● | ● ● | ● ● | ● ●
- 4. ● ● | ● ● | ● ● | ● ●

### Additional Examples

1. In 1998, the American Film Institute unveiled a list of the 100 Best American Movies of All Time as judged by 1500 members. Here are the top 25 with their years of first release.

1	Citizen Kane	1941
2	Casablanca	1942
3	The Godfather	1972
4	Gone with the Wind	1939
5	Lawrence of Arabia	1962
6	The Wizard of Oz	1939
7	The Graduate	1967
8	On the Waterfront	1954
9	Schindler's List	1993
10	Singin' in the Rain	1952
11	It's a Wonderful Life	1946
12	Sunset Boulevard	1950
13	The Bridge on the River Kwai	1957
14	Some Like It Hot	1959
15	Star Wars	1977
16	All About Eve	1950
17	The African Queen	1951
18	Psycho	1960
19	Chinatown	1974
20	One Flew Over the Cuckoo's Nest	1975
21	The Grapes of Wrath	1940
22	2001: A Space Odyssey	1968
23	The Maltese Falcon	1941
24	Raging Bull	1980
25	E.T. the Extra-Terrestrial	1982

- Give the five-number summary of these years.
- Draw the box plot.

2. Consider the data given in Example 1. Use the  $1.5 \times \text{IQR}$  criterion to determine if there are any outliers.

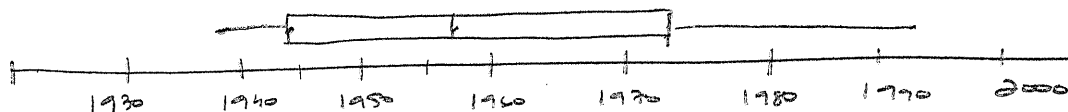
We will use our calculator to answer the above questions.

- Enter the data      STAT 1: EDIT - L1
- Sort the data from smallest to largest      STAT 2: Sort A (L1)
- Find 5-number summary      STAT → CALC 1: 1-Var Stats L1

Min 1939      Q1 1944      Median 1957      Q3 1973      Max 1993

$$\text{IQR: } 1973 - 1944 = 29$$

4) Draw Box Plot



5) Find any outliers – extreme values  
IQR – Interquartile range, Q3-Q1

Any number larger than  $Q3 + 1.5(\text{IQR})$   
Or smaller than  $Q1 - 1.5(\text{IQR})$

$$1944 - 1.5(29) = 1900.5$$

↳ outlier if below this #

$$1973 + 1.5(29) = 2011.5$$

↳ outlier if higher than this #

NO OUTLIERS

No.	Job	Salary (\$1000)
1	CEO	380
2	CEO Asst	35
3	VP	150
4	VP Asst	30
5	Parts Mgr	90
6	Parts Worker	30
7	Parts Worker	30
8	Custodian	27
9	Custodian	24
10	Custodian	24
11	Sales Mgr	90
12	Sales Rep	65
13	Sales Rep	65
14	Sales Rep	65
15	Sales Rep	65

Example: For the salary data at the right, find

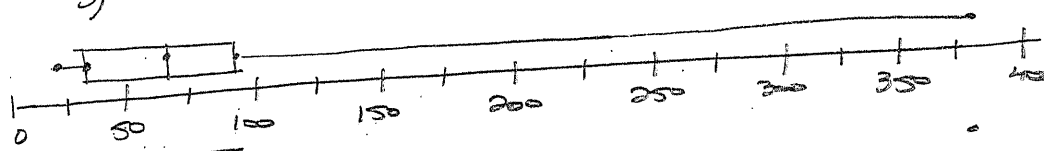
- 1) The 5-# summary
- 2) Are there any outliers
- 3) Create a box plot of the data

1) MIN: 24      Q<sub>1</sub>: 30      MED: 65  
       Q<sub>3</sub>: 90      MAX: 380

2) IQR: 90 - 30 = 60  
 $30 - 1.5(60) = -60$   
 $90 + 1.5(60) = 180$

YES, OUTLIER @ 380,000

3)



\* MODIFIED BOX PLOT (SHOWS OUTLIER)

### Box Plots on your calculator (using American Film Institute Data)

Graph Box Plot

2ND Y= (STAT PLOTS) 1: PLOT 1  
 ON, TYPE, XLIST: L1

↳ REGULAR + MODIFIED  
 ZOOM-9: Zoom Stat      OPTIONS

TRACE ; RIGHT  
 ADD  
 LEFT  
 ARROW