FACULTY NOTES

The LTAs and Spinoffs are designed so that each professor can implement them in a way that is consistent with his/her teaching style and course objectives. This may range from using the materials as out-of-class projects with minimal in-class guidance to doing most of the work in class. The LTAs and Spinoffs are amenable to small group cooperative work and typically benefit from the use of some learning technology. Since the objective of the LTAs and Spinoffs is to support the specific academic goals you have set for your students, the Faculty Notes are not intended to be prescriptive. The purpose of the Faculty Notes is to provide information that assists you to take full advantage of the LTAs and Spinoffs. This includes suggestions for instruction as well as answers for the exercises.

FACULTY NOTES

SPINOFF 9A

Descriptive Statistics for Shuttle Data

LTA 9 introduces students to concepts and experiences relating to work sampling at the Orbiter Processing Facility (OPF) at the Kennedy Space Center. The Spinoffs provide additional sets of data for the first 75 shuttle missions. Some of the data will be used specifically in an exercise or activity in the Spinoffs. Additional up to date information is also readily available at the NASA web site on the Internet. The TI-83™ was used to obtain many of the answers for Spinoffs 9A and 9B. Spinoff 9C uses the TI-92™ for analyzing two-variable data sets.

Answers

1. a)

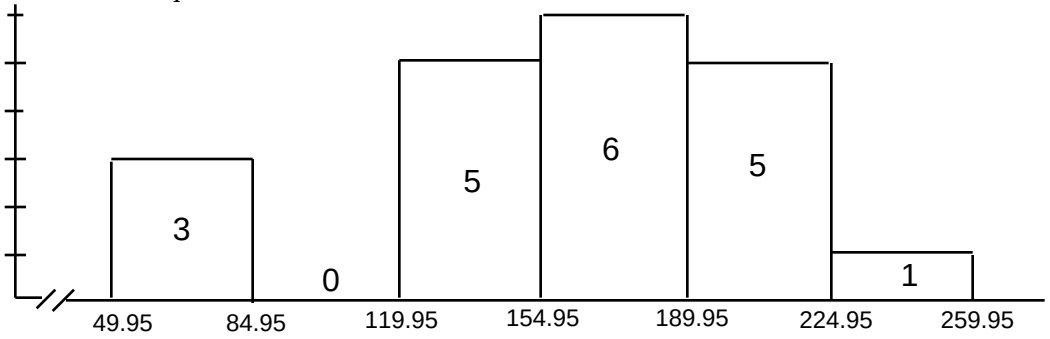
Table 9A

col. 1 Flight #	col. 2 Launch Date	col. 3 Mission Duration (hrs:mins: secs)	col. 4 Mission Duration (hrs as decimal to nearest tenth)	col. 5 Flight Distance (miles)	col. 6 Flight Distance (in thousands of miles)	col. 7 Altitude (miles at apogee)	col. 8 No. of Orbits
1	4/12/81	54:20:32	54.4	1,074,567	1075	166	36
2	11/12/81	54:13:13	54.2	1,074,757	1075	157	36
3	3/22/82	192:04:45	**192.1**	3,334,904	3335	147	129
4	6/27/82	169:09:40	**169.2**	2,900,000	**2900**	197	112
5	11/11/82	122:14:26	**122.2**	2,110,849	**2111**	184	80
6	4/4/83	122:14:26	**122.2**	2,094,293	**2094**	178	81
7	6/18/83	146:23:59	**146.4**	2,530,567	**2531**	195	97
8	8/30/83	145:08:43	**145.2**	2,514,478	**2514**	191	97
9	11/28/83	247:47:24	**247.8**	4,295,853	**4296**	155	166
10	2/3/84	191:15:55	**191.3**	3,311,380	**3311**	202	127
11	4/6/84	167:40:27	**167.7**	2,870,000	**2870**	313	107
12	8/30/84	144:56:04	**144.9**	2,490,000	**2490**	205	96
13	10/5/84	197:23:33	**197.4**	3,434,444	**3434**	218	132
14	11/8/84	191:44:56	**191.8**	3,289,406	**3289**	224	126
15	1/24/85	73:33:23	**73.6**	1,250,000	**1250**	220	48
16	4/12/85	167:55:23	**167.9**	2,889,785	**2890**	289	109
17	4/29/85	168:08:46	**168.2**	2,890,383	**2890**	222	110
18	6/17/85	169:38:53	**169.7**	2,916,127	**2916**	240	111
19	7/29/85	190:45:26	**190.8**	3,282,543	**3283**	207	126
20	8/27/85	170:18:29	**170.3**	2,919,576	**2920**	278	111

b) The **mean** of the flight duration times is equal to 154.4 days. The mean is a measure of the center of the data. Think of twenty, one-pound weights suspended from a weightless bar. The flight times give the distance of each weight from the left end of the bar. The one-pound weight associated with flight #1 is 54.4 units from the left end of the bar; the weight for flight #20 is 170.3 units from the left end. The mean indicates the the bar would exactly balance on a knife edge located 154.4 units from its left end. In this sense, the mean provides a measure of where the center of data is located.

The **median** flight duration time is equal to 168.1 days. This median is also a measure of the center of the data. One-half of the mission flight times were less than 168.1 days; one-half of the missions lasted more than 168.1 days.

c) The answers for this exercise may vary. The histogram below is based on six classes with class width equal to 35.



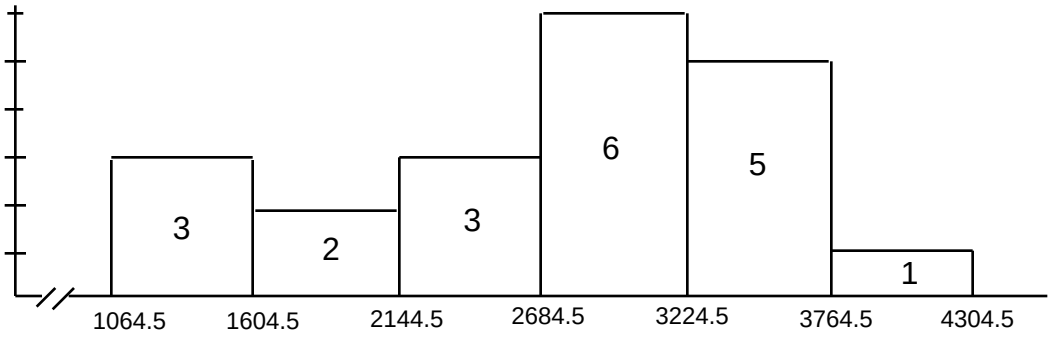
Flight Duration Times

d) For the above histogram, the modal class is [154.95, 189.95]. This means that more flight times are in the interval from 154.9 to 189.5 days than are in any one of the other intervals.

2. a) Complete Column 6 by rounding the flight distances to the nearest thousands of miles, and write your answer in units of 1000 miles. (See Table 9A.)

b) **Mean** = 2673.25 thousands of miles. **Median** = 2889.5 thousands of miles. These statistics are two different measures of location of the center of the flight distance data. If the flight distances were the coordinates of equal weights suspended from a bar, the bar would balance on a knife edge located at coordinate 2673.25 (the mean) units. On the other hand, 50% of the flight times exceed 2889.5 (the median) and 50% are less than that number.

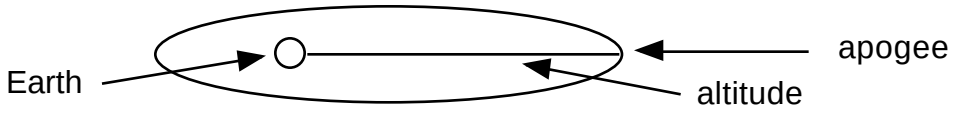
c) The answers for this exercise may vary. The histogram below is based on six classes with class width equal to 540.



Flight Distances

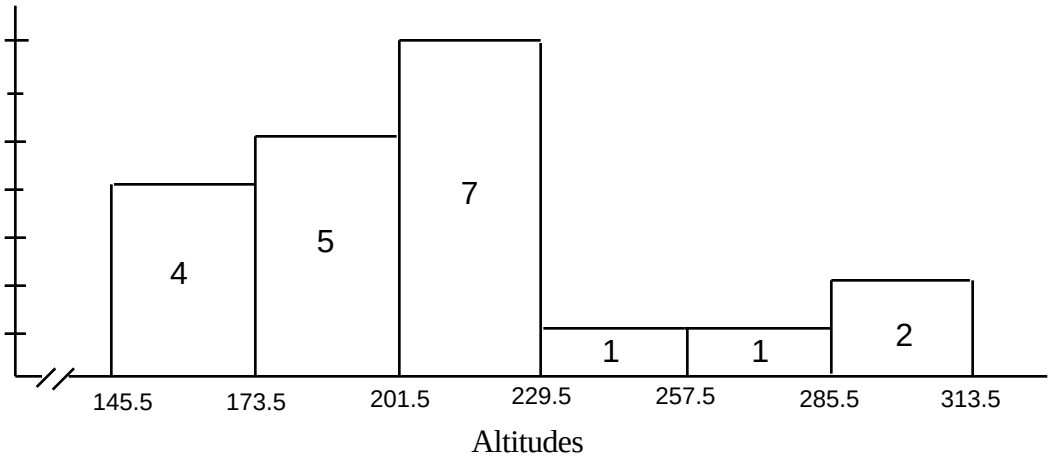
d) The modal class for the above is [2684.5, 3224.5]. More flight distances are in the interval from 2684.5 to 3224.5 thousands of miles than are in any one of the other intervals.

3. a) The apogee for any body in orbit about the earth is the point in its orbit that is the greatest distance from the earth. In this exercise, altitude is the distance between the shuttle orbiter and the earth when measured from the orbiter's apogee.



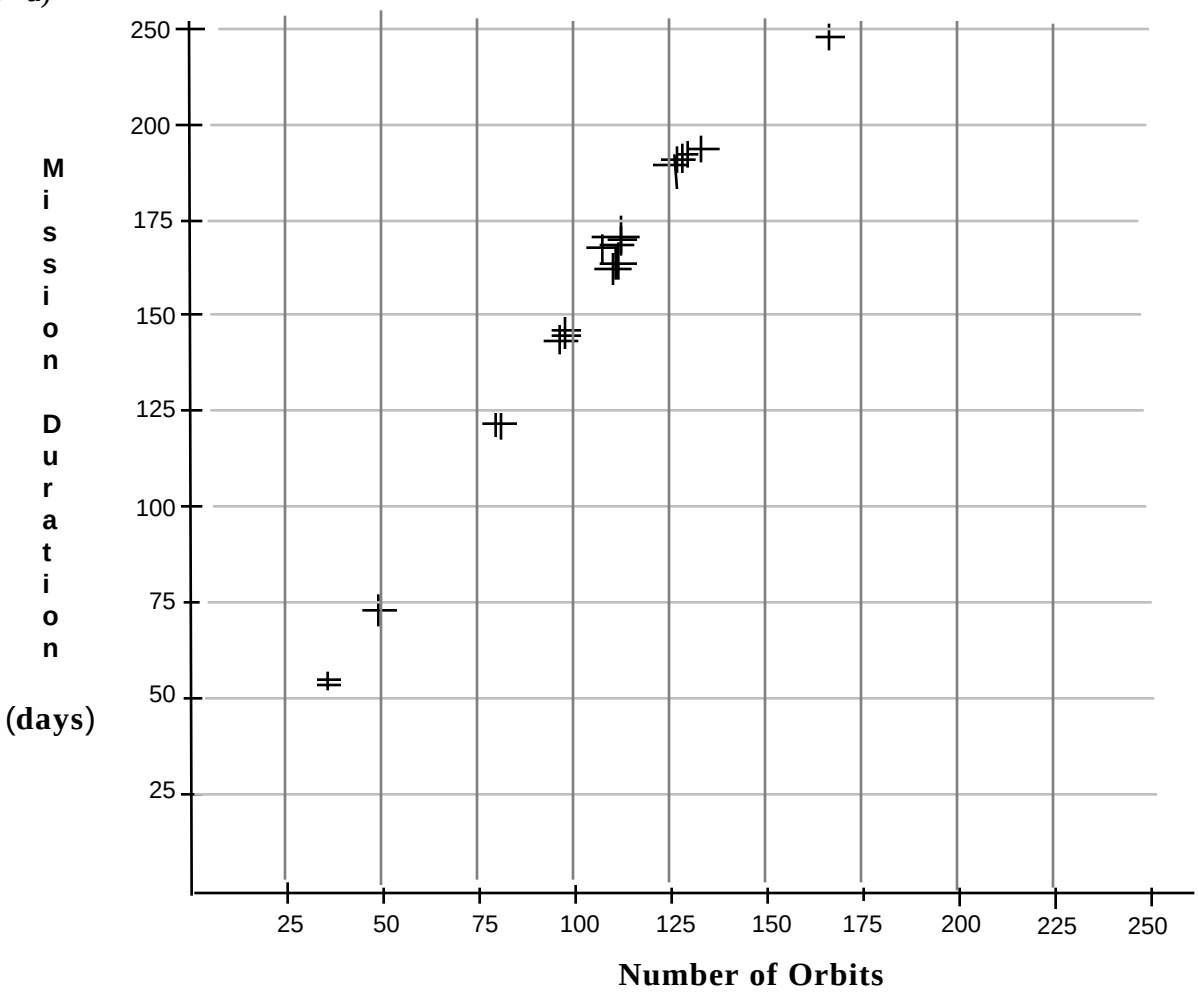
b) **Mean** = 209.4 miles. **Median** = 203.5 miles. These statistics are two different measures of the location of the center of the flight distance data. If the altitudes were the coordinates of equal weights suspended from a bar, the bar would balance on a knife edge located at coordinate 209.4 (the mean) units. On the other hand, 50% of the flight times exceed 203.5 (the median) and 50% are less than that number.

c) The answers for this exercise may vary. The histogram below is based on six classes with class width equal to 28.



d) For the above histogram, the modal class is [201.5, 229.5]. More altitudes are in the interval from 201.5 to 229.5 miles than are in any one of the other 5 classes.

4. a)



b) The mission duration increases as the number of orbits increases. In fact, the relationship appears to be linear because the data cluster about a straight line.