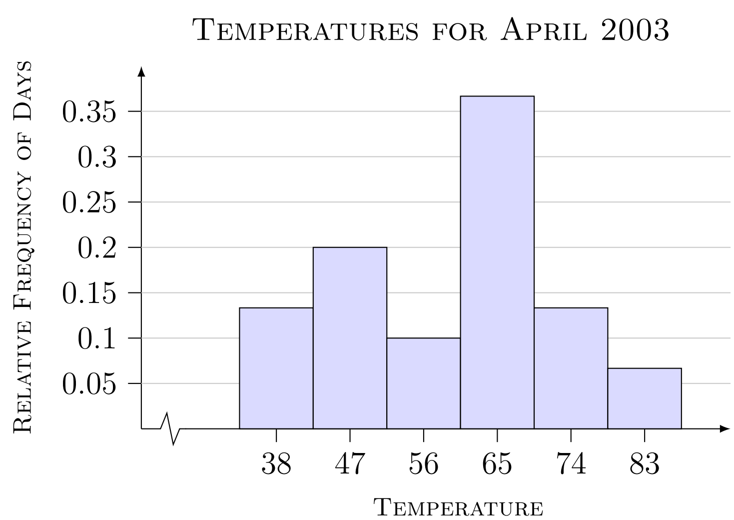
Math 115 Exam #1 Key (Fall 2016)

1 (a) ordinal; (b) interval; (c) ratio; (d) interval; (e) nominal.

2 Range of the data is $(84 - 36)/6 = 8$, and if we take 36 as the lower limit of the 1st class with class width of 8, then the upper limit of the 6th class will be 83. This fails to capture the highest data value of 84. Thus we should increase the class width to, say, 9, in which case we could afford to decrease the lower limit of the 1st class to, say, 34 (anything from 31 to 36 would work). The first two columns of the following table are the frequency distribution:

Class	f	f_r	f_c
34–42	4	0.133	4
43–51	6	0.200	10
52–60	3	0.100	13
61–69	11	0.367	24
70–78	4	0.133	28
79–87	2	0.067	30

3



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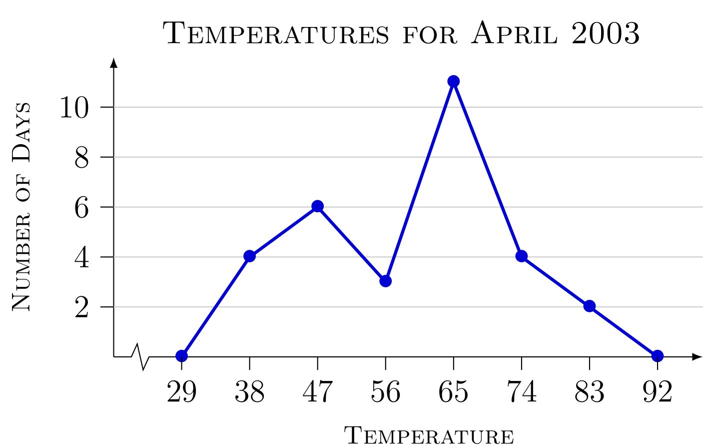

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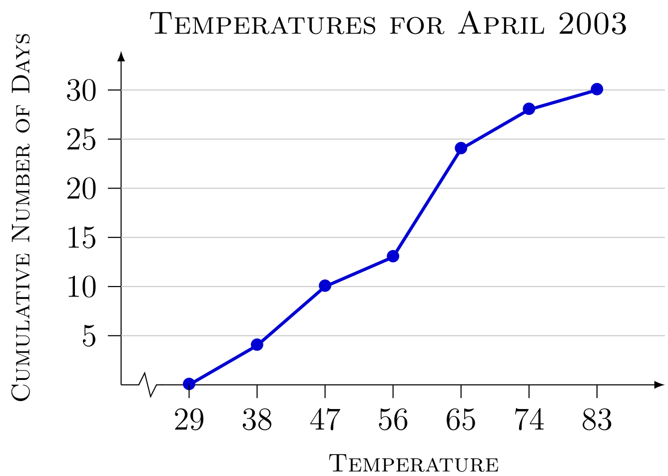


6

Key: 3|6 = 36

Stem	Leaves
3	6 7 9
4	2 6 7 7 7 8 9
5	3 6 8
6	1 1 2 2 5 5 5 6 6 8 9
7	2 3 5 7 9
8	4

7 Median $= \frac{29+29}{2} = 29$, Mode $= 29, 30$ (bimodal data set), and

$$\text{Mean} = \frac{1}{14}\sum_{k=1}^{14} x_k = \frac{204}{7} \approx 29.143.$$

8 First, Range $= 36 - 24 = 12$. The population standard deviation is

$$\sigma = \sqrt{\frac{\sum(x-\mu)^2}{N}} = \sqrt{\frac{\sum(x-204/7)^2}{14}} \approx 2.82482 \approx 2.825,$$

and the population variance is $\sigma^2 = (2.82482)^2 \approx 7.980$.

9 Flights lasting between 0.5 and 15.5 day are precisely within $k = 3$ standard deviations of the mean:

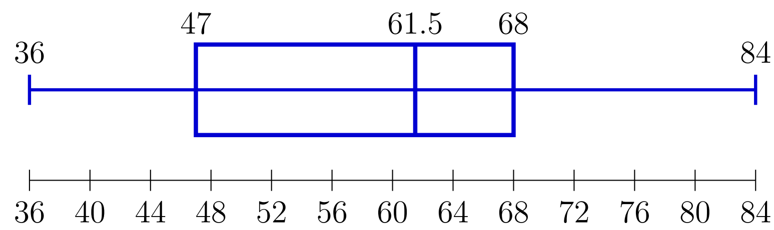
$$0.5 = 8 - 3(2.5) = 0.5 \quad \text{and} \quad 15.5 = 8 + 3(2.5) = 15.5.$$

By Chebychev's Theorem the proportion of the data set lying within $k = 3$ standard deviations of the mean is at least $1 - 1/k^2 = 1 - 1/3^2 = 8/9$. Now, $(8/9)(28) \approx 24.9$, and so at least 24 shuttle flights lasted between 0.5 and 15.5 days.

10a The Median is $(61+62)/2 = 61.5$, and so $Q_2 = 61.5$. Now we divide the data set into two halves: its smallest 15 values and its largest 15 values. The median of the smallest 15 values is $Q_1 = 47$, and the median of the largest 15 values is $Q_3 = 68$. Thus:

$$Q_1 = 47, \quad Q_2 = 61.5, \quad Q_3 = 68.$$

10b



11 Take the weighted average:

$$0.24(67\%) + 0.2(92\%) + 0.18(81\%) + 0.12(100\%) + 0.1(73\%) + 0.1(25\%) + 0.06(95\%) = 76.56\%.$$