

Stat 328, Summer 2005

Exam #1, 5/21/05

Name (print) KEY

UnivID 123456789

*I have neither given nor received any
unauthorized aid in completing this exam.*

Signed Key

Answer each question completely—showing your work where appropriate (for possible partial credit).

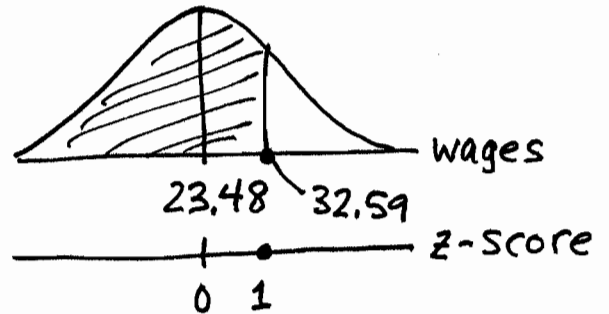
Round your answers to **4** decimal places.

1. The hourly wages of employees on a production line have an average of \$23.48 and a standard deviation of \$9.11. The production facility is located in Iowa.

(a) If you were to assume that the distribution of hourly wages is symmetric and mound-shaped, what could you say about the percent of employees making less than \$32.59 per hour? Show any supporting calculations.

2

Approximately 84% make less than \$32.59/hr

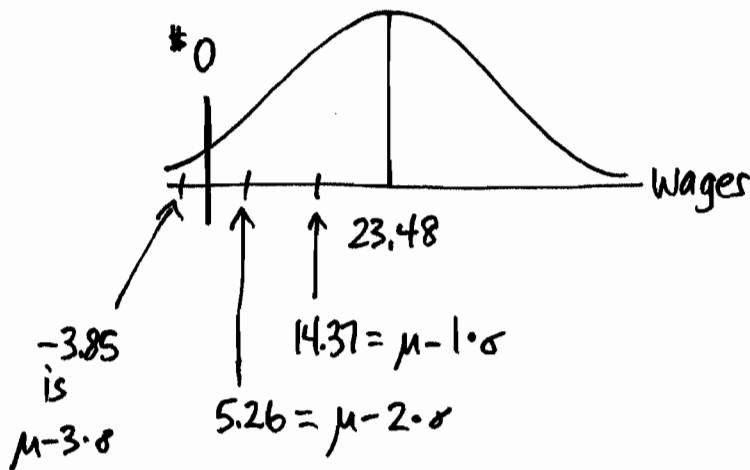


$$z = \frac{32.59 - 23.48}{9.11} = 1$$

Table A: $z=1 \leftrightarrow \text{area} = .8413 \approx 84\%$

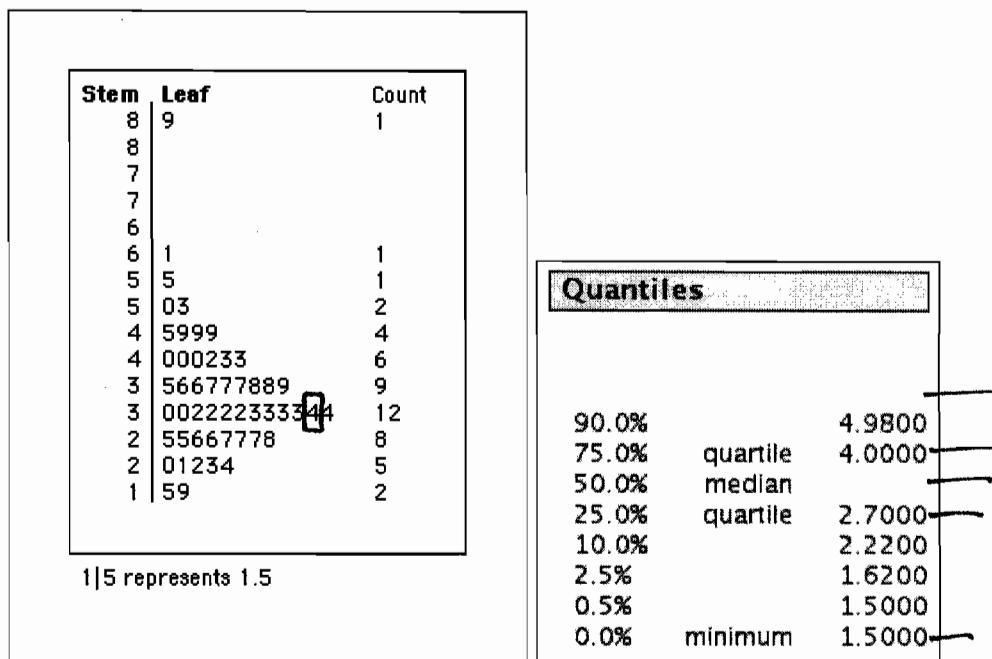
(b) Although we don't know the actual distribution of hourly wages for this population, we can tell that the distribution is *not* symmetric and mound-shaped. Why? (Explain your response clearly showing any calculations—a sketch may help your explanation also.)

2

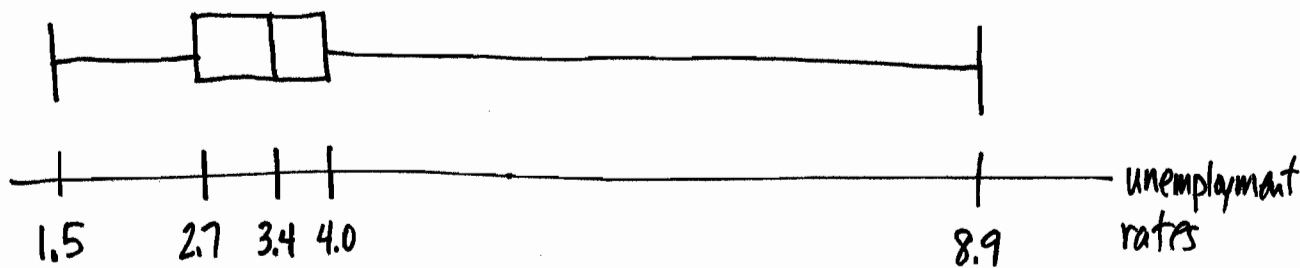


If the distribution were approximately Normal, we would see negative wages!

2. Below is some JMP output for the unemployment rates for each of the 50 states and Puerto Rico for December 2000.



- (a) The maximum unemployment rate is 8.9% 2
- (b) The median unemployment rate is 3.4% [26th observation] 2
- (c) Using JMP's Quantiles output, sketch a box plot of the unemployment rates. Be sure to include an appropriate axis and to mark the 5-number summary on the axis. 3



3. Assume that the Normal distribution is a reasonable model for rates of return for stocks listed on the New York Stock Exchange (NYSE). Further assume that the mean rate of return is $\mu = 5.1$ and the standard deviation of the rates of return is $\sigma = 1.52$.

(a) What percent of all NYSE stocks have returns greater than 9.356?

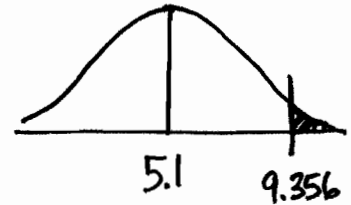


Table A: $z = 2.8 \leftrightarrow \text{area} = .9974$

$$1 - .9974 = .0026 = .26\% \approx \frac{1}{4}\%$$

have returns greater than 9.356%

($z = 2.8$)

(b) 20% of all NYSE stocks have returns less than 3.8232%. (Fill in the blank.)

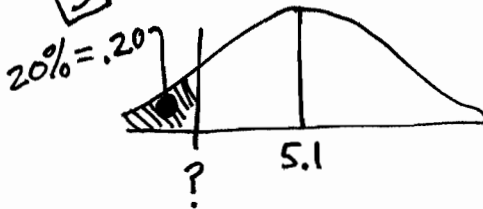


Table A: $\text{area} = .2000 \leftrightarrow z = -.84$

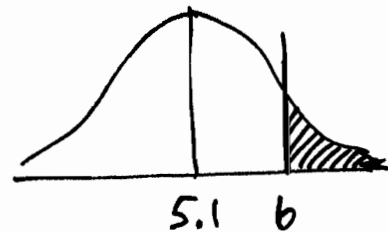
$$-.84 = \frac{x - 5.1}{1.52}$$

$$x = 5.1 - .84(1.52) = 3.8232\%$$

(c) If you were to create a portfolio of stocks from the NYSE by randomly selecting 10 NYSE stocks, what is the probability the average rate of return for these 10 stocks would be greater than 6?

$$P(\bar{X} > 6) = ?$$

\bar{X} is Normal with
 mean = 5.1 and
 std dev = $\frac{1.52}{\sqrt{10}} = .4807$



$z = 1.8724$

Table A: $\text{area} = .9693$

$$\text{so } P(\bar{X} > 6) = 1 - .9693 = \underline{\underline{0.0307}}$$

4. A study of the career paths of hotel general managers sent questionnaires to a simple random sample (SRS) of 16 hotels belonging to major U.S. hotel chains. All questionnaires were completed and returned. The average time these 16 general managers had spent with their current company was 11.8 years. The standard deviation for these data was 3.2 years.

(a) Calculate a 99% confidence interval for the mean number of years general managers of major-chain hotels have spent with their current company. You do not have to simplify your answer.

5

$$\bar{X} \pm t^* \cdot \frac{S}{\sqrt{n}} \longrightarrow 11.8 \pm (2.947) \frac{3.2}{\sqrt{16}}$$

df = 15
Conf = 99%

$$\longrightarrow 11.8 \pm 2.3576 \text{ years}$$

$$\longrightarrow 9.4424 \text{ to } 14.1576 \text{ years}$$

(b) If we wanted a 99% confidence interval similar to the one in part (a); however, we needed the error margin to be ± 1.0 year, how many managers would we need in our study? Show your work.

3

$$n \geq \left(\frac{z^* \cdot \sigma}{m} \right)^2 = \left[\frac{(2.576)(3.2)}{1.0} \right]^2 = 67.9503$$

We would need at least 68 managers.

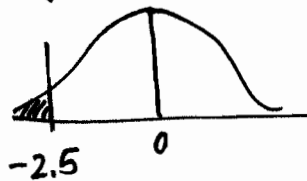
- 6 (c) This data set does not provide convincing evidence that the mean number of years spent with a company is significantly less than 12 years (the P -value is 0.4030). What if this was a sample of size $n = 1600$ rather than just a sample of size 16? Test $\mu = 12$ vs. $\mu < 12$ assuming that the $\bar{x} = 11.8$ and the $s = 3.2$ are calculated from $n = 1600$ questionnaires. Calculate the test statistic, the P -value, and state your conclusion.

$$\text{test statistic: } z = \frac{11.8 - 12}{\frac{3.2}{\sqrt{1600}}} = \frac{-0.2}{0.0800} = -2.50$$

(assumes $\mu=12$) (or t)

P-value: (Since the sample size is so large, we can use Table A here.)

$$P\text{-value} = P(Z < -2.50) = 0.0062$$



Conclusion: The P -value is small (less than 0.05, say) so we conclude that $\mu = 12$ is NOT plausible given the data we have. We conclude that $\mu < 12$ is reasonable.