

Chapter 2 Review #2

1. Based on data concerning the performance of machines owned by the Zorra Company, it is known that the length of time a machine can go without repair is approximately normally distributed with $\mu = 350$ hours and $\sigma = 55$ hours. What is the probability that the machine can go without repair for:

- a) less than 424 hours? $.9108$
- b) between 198 and 302 hours? $.1885 \rightarrow .6952$
- c) between 267 and 389 hours?
- d) more than 412 hours? $.1298$
- e) What is the range of scores that we would expect 68% of the repair times to center around? 295 to 405

2. An educational testing service has designed a new test of mechanical aptitude. Scores on this test are normally distributed with $\mu = 400$ and $\sigma = 60$.

- a) What score would you need to be in the top 15%? 462.19
- b) What score represents the 45th percentile? 372.46
- c) If 200 students at McCallum took the test, how many would you expect to score below 300? $so\ do\ .0179(200) = 9.56\ or\ (\sim 10\ students)$

3. A student scores 75 on a test with $\mu = 60$ and $\sigma = 11$. What would be the equivalent score in a distribution with $\mu = 20$ and $\sigma = 20$?

$z = \frac{75-60}{11} = 1.36$ $1.36 = \frac{x-20}{20}$
 $x = 47.27$

Thirty students were asked at random to pick a number from zero to twenty (inclusive). Here are the results:

7	8	13	5	7	10	13	7	10	2	1	11	12
17	4	11	7	6	18	14	17	11	9	1	12	10
12	2	15	12									

Assess the normality.

5. The following is the list reflects the number of children of the presidents of the United States up through George W. Bush.

0	0	0	0	0	0	1	1	2	2	2	2	2
2	2	2	2	3	3	3	3	3	3	4	4	4
4	4	4	4	5	5	5	6	6	6	6	6	6
7	8	10	14									

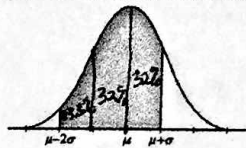
Assess the normality.

- 6. A researcher notes that two populations of lab mice - one consisting of mice with white fur, and one of the mice with grey fur - have the same mean weight, and both have approximately normal distributions. However, the population of white mice has a larger standard deviation than the population of grey mice. If the weights of both of these populations were plotted, how would the curves compare to each other? *white has larger SD, so white curve is more spread out/wider.*
- 7. Given the following statement: the percent of observations that are smaller than x in a standard normal distribution is 8%. What z-score make the statement true? *8th percentile z-score is -1.405*
- 8. In a certain southwestern city the air pollution index averages 62.5 during the year with a standard deviation of 18.0. Assuming that the empirical rule is appropriate, the index falls within what interval about 95% of the time? *$\pm 2\sigma$, so from 26.5 to 98.5*

- 9. Population P1 and P2 are both normally distributed. The standard deviation of P1 is 5 with a mean of 23 while the standard deviation of P2 is 10 with a mean of 17. What can be said about the percentage of observations falling within one standard deviation of the mean for each population? *P1 & P2 both have 68% of observations falling w/in 1SD since both are normally dist.*
- 10. A distribution of test scores is not symmetric. What is the best estimate of the z-score of the third quartile?

In a certain large population, 40% of households have a total annual income of at least \$70,000. A simple random sample of 4 of these households is selected. What is the probability that 2 or fewer of the households in the survey have an annual income of at least \$70,000.

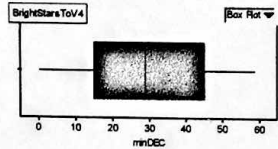
12. A certain type of remote-control car has a fully charged battery at the time of purchase. The distribution of running times of cars of this type, before they require recharging of the battery for the first time after its period of initial use, is approximately normal with a mean of 80 minutes and a standard deviation of 2.5 minutes. The shaded area in the figure below represents what probability?



$32\% + 32\% + 13.5\% = 81.5\%$ or $.8150$

3. Declination is the star's angle north or south of Earth's celestial equator. The following boxplot and histogram display the minimum declination angle for the 513 brightest stars.

a. Assess the normality of the data for the boxplot below. Write no more than a sentence or two.



15. Big Town Fisheries recently stocked a new lake in a city park with 2,000 fish of various sizes. The distribution of the lengths of these fish is approximately normal. Suppose the standard deviation is 0.3 inches while the mean length of the fish is 8 inches.

- a. Compute the probability that a random fish will have a length less than 7.75 inches. *N(8, .3) standardize by finding z-score. $z = \frac{7.75-8}{.3} = -.83$ Area = .2023*
- b. If you catch 18 fish, what is the probability that half of them will be less than 7.75 inches?

17. The length of human pregnancies from conception to birth varies according to a distribution that is approximately normal with mean 266 days and standard deviation 16 days. Draw and label a distribution. Note: some of the following questions will allow the use of the Empirical Rule.

- a. What percent of pregnancies last between 250 and 282 days? *Standardize w/ z-scores: $z = \frac{250-266}{16} = -1$ since date is from -1 to +1 or empirical rule can be used. $z = \frac{282-266}{16} = 1$*
- b. We know roughly 99.7% of all pregnancies fall between how many days? *within 3 σ of mean, so from 218 days to 314 days will be interval for 99.7% of all pregnancies.*

of all pregnancies 68% fall w/in this range of 250 + 282 days

- c. A pregnancy located in the 16th percentile would last how long? *Area = .1600, $z = -1$. InvNorm(.16, 266, 16) = 250.09*
- d. If 15 women are surveyed, what is the probability that 5 of them have a pregnancy that last between 250 and 266 days?

Just 50% 2SD pregnancy is @ the 16th percentile.

e. If a woman is claiming her pregnancy is lasting longer than 90% of pregnancies, how long might her pregnancy last?

Now need 90th percentile. Repeat same process as c). Look above for words & explanation. Saving time here. $x = 286.5$ days.

