

# Math 111 FINAL

Name \_\_\_\_\_

I.D. # \_\_\_\_\_

1. (30 pts) Given the following data.

14 18 20 25 27 42 47 55

(a) Find the mean.

(b) Find the standard deviation.

(c) Find the five number summary.

(d) Make a box plot.

(e) Make a stem and leaf plot.

2. How much should a healthy Shetland pony weigh? Let  $x$  be the age of the pony (in months), and let  $y$  be the average weight of the pony (in kilograms). The following information is based on data taken from The merck Veterinary Manual (a reference used in most veterinary colleges).

$x$	3	6	12	17	22
$y$	60	95	140	170	185

(a) (5 pts) Draw a scatterplot for the given data. Is the relationship positive or negative associated?

(b) (10 pts) Calculate the correlation between  $x$  and  $y$ .

(c) (10 pts) Find the regression line.

(d) (5 pts) Using your regression line to estimate the average weight of the ponies with age of 10 months

3. (10 pts) Following is the probability table of a random variable  $X$ .

$X$ :	1	2	3	4
$Prob$	.1	.2	.3	.4

Find the mean and the standard deviation of  $X$ .

4. (20 pts) Let  $Z$  be the standard normal distribution.

(a) Find the percentage of  $Z < 1.72$ .

(b) Find the percentage of  $Z > -.07$ .

(c) Find the percentage of  $Z$  between 1.23 and 2.34.

(d) If 85% of  $Z$  bigger than  $Z_0$ , what is  $Z_0$ ?

5. (24 pts) A bottling company uses a filling machine to fill plastic bottles with a popular cola. The contents of bottles vary according to a normal distribution with mean  $\mu = 32$  oz and standard deviation  $\sigma = 0.25$  oz.

(a) If one bottle is randomly selected, what is the probability that the content will be less than 31.9 oz?

(b) If one bottle is randomly selected, 90% of time the content will more than what value?

(c) If sample of 24 bottles is taken, what is the probability that the average contents will be less than 31.9 oz?

6. (12 pts) A tire manufacturer claims that the tires his company produces last an average of 25000 miles. A researcher suspects that the actual average is lower than 25000 miles. She make a sample of 100 tires and it turned out that the average is 24000 miles. In this study,

(a) What is the population?

(b) What is the sample?

(c) What is the parameter?

(d) What is the statistic?

7. A tire manufacturer claims that the tires his company produces last an average of 25000 miles with a standard deviation of 1000 miles. A researcher suspects that the actual average is lower than 25000 miles. She make a sample of 100 tires and it turned out that the average is 24000 miles.

(a) (4 pts) State the null hypothesis  $H_0$  and the alternative hypothesis  $H_a$ .

(b) (6 pts) Find the z-value of the test.

(c) (6 pts) Find the P-value of the test.

(d) (4 pts) State your conclusion at the level of  $\alpha = 0.05$ .

(e) (10 pts) Construct a 95% confidence interval for the actual average miles.

8. A balanced coin is tossed 100 times.

(a) (4 pts) Will the sample proportion be exactly 50%?

(b) (5 pts) What is the mean value of the sample proportion?

(c) (5 pts) What is the standard deviation of the sample proportion?

(d) (10 pts) What is the probability that the sample proportion is more than 60%?

9. (20 pts) Suppose a random sample of 16 is selected from a normal distribution and the sample average is  $\bar{x} = 98$  and the sample standard deviation is  $S = 4$ .

(a) Construct a 95% confidence interval for the population mean  $\mu$ .

(b) To test  $H_0 : \mu = 100$  against  $H_a : \mu \neq 100$ , find the p-value of the test and make your

conclusion at level  $\alpha = 0.05$ .