

Name: Key

1. (4 points) A high school musical has leading roles that must be assigned to 5 different students. If 8 students audition for these roles, how many different ways can the director assign the roles if each student can only have one role and the roles are distinct (meaning each of the student is assigned a specific role)? order matters 8P5

a. 792 b. 56 c. 6,720 d. 336 e. none of these

2. (4 points) Of all the possible different five-card poker hands possible from a deck of 52 playing cards, how many would contain 3 hearts and 2 spades?

$$13C3 \cdot 13C2 = 22308$$

$\begin{array}{c} 1 \\ 13 \end{array}$

$\begin{array}{c} \downarrow \\ 13 \end{array}$

3. (4 points) A student council has 11 members. If they need to form a committee of 7 members, how many different committees are possible?

a. 823,543

b. 880

c. 330

d. 77,520

e. none of these

order does not matter

$$11C7 = 330$$

4. (6 points) The random variable X represents the number of maintenance visits a car needs per year along with the corresponding probabilities.

x	0	1	2	3	4
P(x)	<u>4/15</u>	<u>5/15</u>	<u>?</u>	2/15	1/15

- (a) Find the probability that a car needs 2 visits.

$$3/15 \quad (\text{to add up to } 1)$$

- (b) Find the probability that a car needs fewer than three visits.

a. 5/15

b. 12/15

c. 3/15

d. 7/15

e. none of these

$$\frac{4}{15} + \frac{5}{15} + \frac{3}{15}$$

5. (3 points) Find the mean of the following probability distribution:

x	1	3	5
P(x)	0.45	0.35	0.20

a. 2.20

b. 2.75

c. 2.50

d. 3.00

e. none of these

$$1 \cdot (0.45) + 3(0.35) + 5(0.2) = 2.5$$

or 1 var stats

6. (3 points) Find the standard deviation of the following probability distribution:

x	1	3	5	7
P(x)	0.30	0.25	0.25	0.20

a. 1.8

b. 2.2

c. 2.8

d. 3.4

e. none of these

$\rightarrow L_1$
 $\rightarrow L_2$

1 var stats (L_1, L_2)

2.2

7. (4 points) A lottery sells 5,000 tickets at \$2 each for two prizes valued at \$2,500 and \$800. What is the expected value of one ticket?

a. \$0.34

b. -\$1.34

c. \$1.66

d. -\$1.66

e. none of these

x	P(x)
2498	1/5000
798	1/5000
-2	4998/5000

8. (4 points) The probability of a student being left-handed is 12%. In a sample of 300 students, what is the mean and standard deviation of the number of left-handed students?

a. mean: 36; standard deviation: 5.1

b. mean: 36; standard deviation: 5.6

c. mean: 38.4; standard deviation: 5.6

d. mean: 38.4; standard deviation: 6.2

$$p = .12, n = 300$$

$$\mu = np = 300(.12) = 36$$

$$\sigma = \sqrt{npq} = 5.6$$

9. (10 points) The chance of a manufacturing defect in a computer chip is about 2%. A random sample of 80 chips is selected. $n = 80$

2 (a) Does this represent a binomial experiment? If yes, what is the probability of success p and what is n , the number of trials?

yes, $p = 0.02$, $n = 80$

2 (b) How many defective chips are expected in the sample?

$$np = 80(0.02) = 1.6$$

2 (c) What is the probability of exactly 3 defective chips?

$$\text{binomial pdf}(80, 0.02, 3) = 0.139$$

2 (d) What is the probability of at most 3 defective chips?

$$\text{binomial cdf}(80, 0.02, 3) = 0.923$$

2 (e) What is the probability of more than 1 defective chip?

$$1 - \text{binomial cdf}(80, 0.02, 1) = 0.477$$

10. (4 points) A distribution $X \sim U(5, 20)$. Find $P(7 < x < 12)$. Round answer to three decimal places.

a. 0.333

b. 0.667

c. 0.400

d. 0.267

e. none of these

$$\frac{11}{(5) \left(\frac{1}{15} \right)} = \frac{1}{3}$$

11. (3 points) Suppose you wait for a bus that arrives uniformly between 1 and 35 minutes after you reach the stop. Find the mean μ .

a. 16

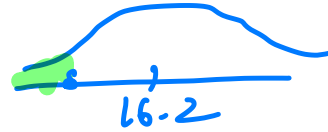
b. 18

c. 20

d. 17.5

e. none of these

$$\mu = \frac{a+b}{2} = \frac{35+1}{2} = \frac{36}{2}$$



12. (4 points) A manufacturer finds that the weight of their cereal boxes is normally distributed with a mean of 16.2 ounces and a standard deviation of 0.3 ounces. If they want no more than 5% of boxes to be underweight, what should be the advertised weight?

a. 16.8 oz b. 15.7 oz c. 16.0 oz d. 15.4 oz e. none of these

$$\text{inv Norm}(.05, 16.2, 0.3) = 15.7$$

13. (4 points) The number of daily customer complaints at a retail store is approximately normal with $\mu = 12.3$ and $\sigma = 2.8$.

What is the probability that during a given day the store will receive more than 15 complaints?

$$\text{normalcdf}(15, 1E99, 12.3, 2.8) = 0.167$$

14. (9 points) The distribution of birth weights in a hospital is approximately normal with $\mu = 3400\text{g}$ and $\sigma = 450\text{g}$.

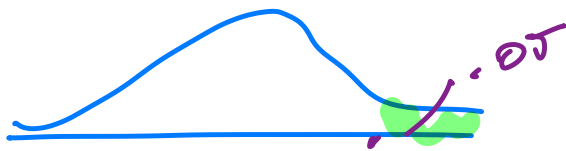
(a) Find the probability that a randomly selected baby has a birth weight between 3200g and 3600g.

$$\text{normalcdf}(3200, 3600, 3400, 450) = 0.343$$

(b) Find the probability that a randomly selected baby has a birth weight less than 3500g.

$$(-1E99, 3500, 3400, 450) = 0.583$$

(c) The top 5% of babies weigh more than how many grams?



$$\text{inv Norm}(.95, 3400, 450) = 4140.18\text{g.}$$

15. (4 points) Use the given information to find the mean and standard deviation for the sampling distribution of $\bar{x}$. The mean and standard deviation of the sampled population are $\mu = 82.5$ and $\sigma = 6.0$. Sample size is $n = 144$.

- a. $\mu_{\bar{x}} = 0.5$; $\sigma_{\bar{x}} = 82.5$
 b. $\mu_{\bar{x}} = 82.5$; $\sigma_{\bar{x}} = 0.5$
 c. $\mu_{\bar{x}} = 24.2$; $\sigma_{\bar{x}} = 1.2$
 d. $\mu_{\bar{x}} = 6.0$; $\sigma_{\bar{x}} = 0.5$

$$\mu_{\bar{x}} = 82.5$$

$$\sigma_{\bar{x}} = \frac{6}{\sqrt{144}}$$

16. (6 points) The average daily temperature in a city is normally distributed with a mean of 68°F and a standard deviation of 8°F .

- (a) What is the probability that the mean temperature of **one** randomly selected day will exceed 70°F ?

$$\text{normalcdf}(70, 1599, 68, 8) = 0.401$$

- (b) What is the probability that the mean temperature **during 16** randomly selected days will exceed 70°F ?

a. 0.1587

b. 0.1056

c. 0.3413

d. 0.8944

e. none of these

$$\text{normalcdf}(70, 1599, 68, \frac{8}{\sqrt{16}})$$

17. (6 points) When 280 smartphone users are randomly selected and surveyed, it is found that 196 use their phone for social media daily.

Use this information to find a 95% confidence interval for the true proportion of all smartphone users who use social media daily.

$$n = 280, x = 196$$

1 Prop Z Interval

$$x = 196$$

$$n = 280$$

$$CL = 0.95$$

$$(0.646, 0.754)$$

$$\sigma = 0.12 \text{ mg}$$

18. (7 points) A researcher studies the nicotine content in cigarettes of a certain brand. The population standard deviation is known to be 0.12 mg from previous extensive studies. In a sample of 36 cigarettes, the mean nicotine content was found to be 2.1 mg.

$$n = 36$$

$$\bar{x} = 2.1 \text{ mg.}$$

- (a) Find a 95% confidence interval for the population mean nicotine content.

$$z\text{Int: } (2.0608, 2.1392)$$

- (b) If we wanted to reduce the margin of error to 0.02 mg while maintaining 95% confidence, how large should our sample size be? Round up to the nearest whole number.

$$n = \left(\frac{z_{\alpha/2} \sigma}{ME} \right)^2 = \left(\frac{(1.96) \cdot (0.12)}{0.02} \right)^2 = 139$$

19. (7 points) A quality control engineer wishes to estimate the average lifetime of LED bulbs. They randomly select 64 bulbs and test them until failure. The sample produced a mean of 25,000 hours with a standard deviation of 3,000 hours. Assume the lifetime is normally distributed.

- (a) Find a 99% confidence interval for the mean lifetime.

$$\bar{x} = 25,000$$

$$n = 64$$

$$s = 3,000$$

TInterval

$$(24,004, 25,996)$$

- (b) Interpret the confidence interval.

We are 95% confident that the true average lifetime of LED bulbs is between 24,004 and 25,996 hours

20. (4 points) A researcher wants to estimate the proportion of college students who regularly use public transportation. She wants to construct a 95% confidence interval with a margin of error of 4%. A previous study at another university found that about 35% of students regularly used public transportation. What sample size should the researcher use?

- a. 385 b. 546 c. 601 d. 1,067 e. none of these

$$ME = .04$$

$$\hat{p} = .35$$

Question	Points	Score
1	4	
2	4	
3	4	
4	6	
5	3	
6	3	
7	4	
8	4	
9	10	
10	4	
11	3	
12	4	
13	4	
14	9	
15	4	
16	6	
17	6	
18	7	
19	7	
20	4	
Total:	100	