

Calculator Functions Practice

For each of the following problems, find the answer using technology. Note: Make sure to show enough work to receive full credit on free response questions.

1. The principal at North High School is considering a schedule change to have lunch earlier in the day. If more than 50% of the student population supports changing the schedule, lunch will be moved to earlier in the day. The principal took a random sample of 100 students and found the 54 supported the change. The principal conducts an appropriate significance test to see if there is convincing evidence that more than 50% of student population supports a schedule change to have lunch occur earlier in the day. Calculate the p -value for this test.

One-sample z -test for p
 $H_a: p > 0.5$

Desmos Tip
Tails: Right

$$z = 0.8 \quad \boxed{p\text{-value} = 0.212}$$

2. A curious student wanted to determine if there was a difference in the average price of a quarter pound hamburger in the United States and Japan. The student randomly selected 15 McDonald's restaurants in the United States and 10 McDonald's restaurants in Japan and recorded the prices of their quarter pound hamburgers. Prices of the quarter pound hamburgers in Japan were converted to U.S. dollars. The data are summarized in the table below.

	Sample mean	Sample standard deviation	Sample size
U.S.	4.53	0.24	15
Japan	4.01	0.38	10

Calculate a 99 percent confidence interval for the difference in mean price for a quarter pound hamburger in the United States and Japan.

2-sample t -interval for $\mu_{U.S.} - \mu_{Japan}$
99% \rightarrow $\boxed{(0.117, 0.923)}$ $df = 13.8$

3. The heights of all adult males in Croatia are approximately normally distributed with a mean of 180 cm and a standard deviation of 7 cm. How tall must an adult male in Croatia be in order to be in the tallest 5% of these males?

Normal Distribution
 $\mu = 180 \text{ cm}$ $\sigma = 7 \text{ cm}$

Desmos Tip
Compute BOUNDS

$$P(X > \boxed{191.5}) = 0.05$$

4. When playing the card game Blackjack, multiple decks are used and reshuffled often so that the outcomes of the cards dealt are approximately independent. When a player receives two cards that are a combination of an ace and a face card, this is called a "natural blackjack" and automatically wins. A natural blackjack should occur in 4.5% of the rounds played. What is the probability that a player plays 20 rounds of Blackjack and gets three or more natural blackjacks?

Binomial Distribution
 $n = 20$ $p = 0.045$
 $P(X \geq 3) = \boxed{0.059}$

5. The students of a Statistics class want to estimate how many years it takes for a university professor to earn a PhD. They survey a random sample of 40 professors with PhDs, which results in a sample mean of 5.4 years and a standard deviation of 1.6 years. Give the 95% confidence interval for the true mean of the number of years it takes a professor to earn a PhD.

One-sample t-interval for μ
 95% : $\boxed{(4.888, 5.912)}$ $df = 39$

6. By one estimate, 3% of all Siberian Husky puppies are born with two different colored eyes (called *heterochromia iridum*). For random samples of 100 Siberian Husky puppies, what is the probability that exactly three puppies are born with two different colored eyes?

Binomial Distribution
 $n = 100$ $p = 0.03$
 $P(X = 3) = \boxed{0.2275}$

DESMONS Tip
 Click on the point at $x = 3$ to find the exact probability.

7. Electric vehicles make up a very small proportion of the overall car market, but by how much has that proportion increased? Independent surveys of randomly selected car dealerships were completed, with 10 of the 10,000 cars sold in the 2012 sample being electric vehicles, and 100 of the 20,000 cars in the 2016 sample being electric vehicles. Calculate the 95% confidence interval for the change in the proportion of electric cars sold from 2012 to 2016.

2-sample z-interval for $P_{2016} - P_{2012}$
 95% : $\boxed{(0.003, 0.005)}$

8. According to the National Association of Colleges and Employers, the mean salary for a new college graduate is \$45,327. A small college wants to know if the mean salary of their most recent graduates is greater than \$45,327. A random sample of 10 recent graduates from the small college was selected and the mean and standard deviation of the salary for those graduates was found. With all conditions for inference met, a test statistic of 2.51 was calculated. What is the p -value for the test?

t -distribution

$$df = 9$$

$$H_a: \mu > \$45,327$$

$$P(t > 2.51) = \boxed{0.017}$$

Desmos Tip
Tails: Right

9. A random sample of 95 vehicles is taken from a large parking lot at an office park. Below is the type of each vehicle, and whether it is owned or leased by the driver. A chi-square test will be conducted to determine if there is an association between type of vehicle and method of obtaining the vehicle. Calculate the test statistic.

	Car	SUV	Truck
Owned	29	20	11
Leased	21	10	4

χ^2 test for independence
 $df = 2$

$$\chi^2 = 1.398$$

10. The scores on the verbal section of the Graduate Records Examination (GRE) are approximately normally distributed with a mean of 150 and a standard deviation of 8.5. What is the probability that a randomly selected score on the verbal section is between 145 and 160?

Normal Distribution

$$\mu = 150 \quad \sigma = 8.5$$

$$P(145 \leq X \leq 160) = \boxed{0.602}$$

11. A local bakery has two machines that portion cookie dough into individual servings. The bakery owner is concerned that the machines are not dispensing portions of the same size. To test this, he takes a random sample of 10 cookie dough portions from each machine. The following results were obtained:

	\bar{x} (oz)	s (oz)
Machine A	1.35	0.10
Machine B	1.42	0.08

He performs a significance test to determine whether the machines are dispensing different portions of cookie dough. Find the p -value for this test.

2-sample t -test for $\mu_A - \mu_B$

$$df = 17.17 \quad t = -1.729 \quad \boxed{p\text{-value} = 0.102}$$

Desmos Tip \rightarrow *Tails: Both*