

Quiz 9

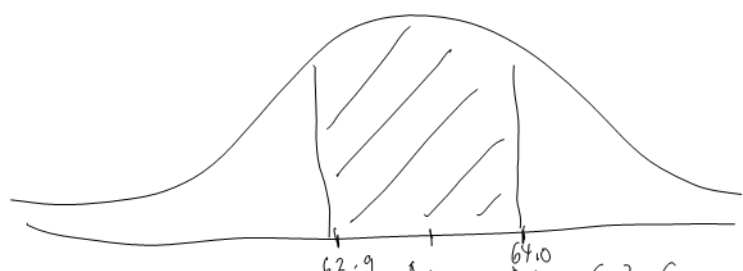
- 3) Assume that women's heights are normally distributed with a mean of 63.6 inches and a standard deviation of 2.5 inches. If 90 women are randomly selected, find the probability that they have a mean height between 62.9 inches and 64.0 inches.

A) 0.7248

B) 0.9318

C) 0.1739

D) 0.0424



$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{2.5}{\sqrt{90}}$$

$\bar{X}$

$n > 30$

($n \leq 30$, normally dist. population)

$$\begin{aligned} \mu &= 63.6 \text{ in} \\ \sigma &= 2.5 \text{ in} \\ n &= 90 \end{aligned}$$

$$P(62.9 < \bar{X} < 64.0) = \text{Normalcdf}(62.9, 64.0, 63.6, 2.5/\sqrt{90}) = 0.9315$$

- 14) Find the probability that in 200 tosses of a fair die, we will obtain at least 40 fives.

A) 0.2229

B) 0.0871

C) 0.1210

D) 0.3871

$$\begin{aligned} \mu &= np \geq 5 \\ nq &\geq 5 \end{aligned}$$

$$n = 200$$

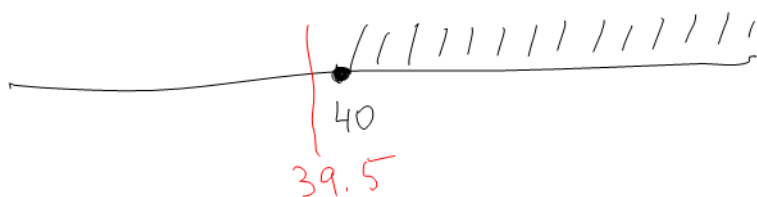
$$p = \frac{1}{6}, q = 1 - p = \frac{5}{6}$$

$$\mu = (200 \cdot \frac{1}{6}) = 33.3 \geq 5$$

$$200 \cdot \frac{5}{6} = 166.7 \geq 5$$

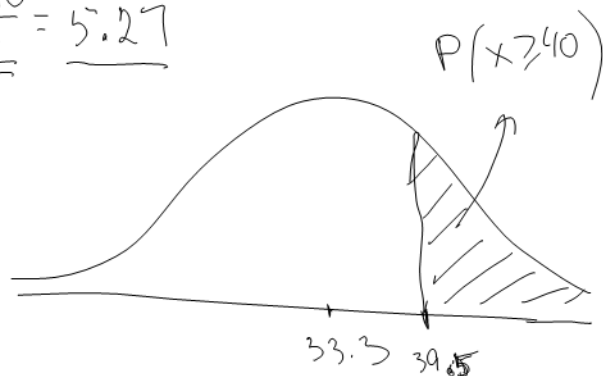
$$\sigma = \sqrt{npq} = \sqrt{200 \cdot \frac{1}{6} \cdot \frac{5}{6}} = \frac{5\sqrt{10}}{3} = 5.27$$

$$P(X \geq 40)$$



$$z = \frac{x - \mu}{\sigma} = \frac{39.5 - \frac{200}{6}}{(5\sqrt{10}/3)} = 1.17$$

$$\text{Normalcdf}(1.17, \infty, 0, 1) = 0.1210$$



$$\text{Normalcdf}(39.5, \infty, 33.3, 5.27) = 0.1197$$

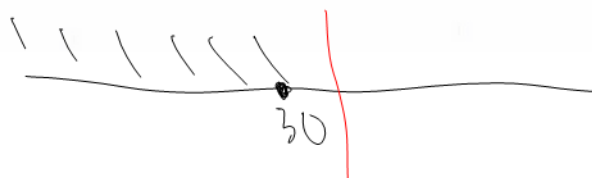
15) Find the probability that in 200 tosses of a fair die, we will obtain at most 30 fives.

A) 0.1871

B) 0.4936

C) 0.3229

D) 0.2946



$$X \leq 30$$

$$z = \frac{(30.5 - \frac{200}{6})}{(5\sqrt{10}/3)} = -0.54$$

$$\mu = np = 200 \cdot \frac{1}{6} = 33.3$$

$$n = 200$$

$$\sigma = \sqrt{200 \cdot \frac{1}{6} \cdot \frac{5}{6}} = 5.27$$

$$p = \frac{1}{6}$$

$$q = \frac{5}{6}$$



0.2976

$$P(X \leq 30) = \text{Normalcdf}(-1E99, 30.5, 33.3, 5.27) =$$

$$\text{Normalcdf}(-1E99, -0.54, 0, 1) = 0.2946$$

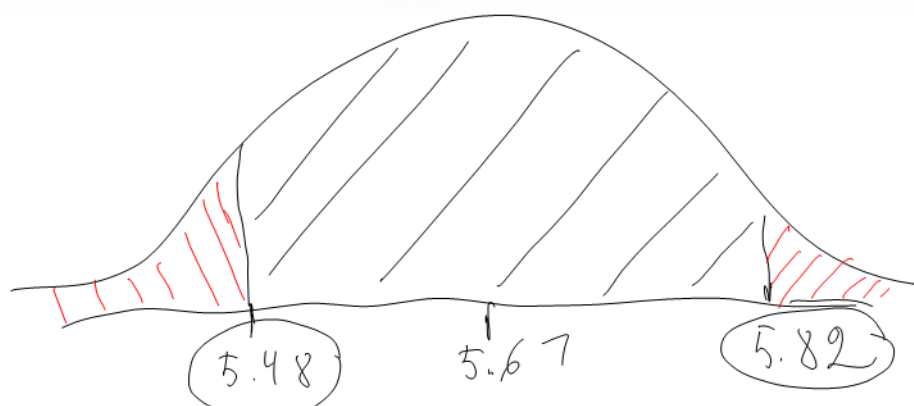
6) Assume that the weights of quarters are normally distributed with a mean of 5.67 g and a standard deviation 0.070 g. A vending machine will only accept coins weighing between 5.48 g and 5.82 g. What percentage of legal quarters will be rejected?

A) 0.0196%

B) 2.48%

C) 1.62%

D) 1.96%



Percentage of rejected quantum = 1 - Percentage of accepted quantum

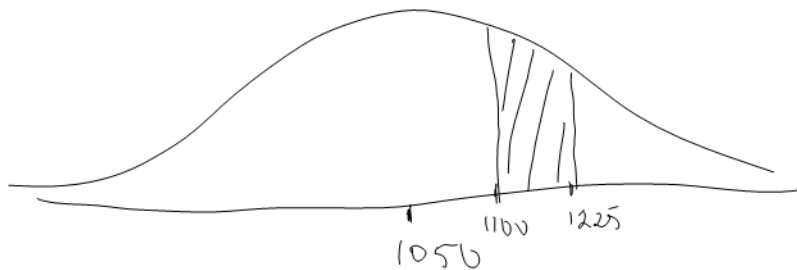
$$1 - \text{Normalcdf}(5.48, 5.82, 5.67, 0.07) = 0.0194$$

1.94%

$$\text{Normalcdf}(\dots) = 0.9806$$

$$1 - 0.9806 = 0.0194$$

- 14) In one region, the September energy consumption levels for single-family homes are found to be normally distributed with a mean of 1050 kWh and a standard deviation of 218 kWh. For a randomly selected home, find the probability that the September energy consumption level is between 1100 kWh and 1225 kWh.



$$\begin{aligned} \mu &= 1050 \text{ kWh} \\ \sigma &= 218 \text{ kWh} \end{aligned}$$

$$P(1100 < x < 1225)$$

$$\text{Normalcdf}(1100, 1225, 1050, 218) = 0.1982$$

$$z = \frac{x - \mu}{\sigma}$$

$$z_1 = \frac{1100 - 1050}{218} = 0.23$$

$$z_2 = \frac{1225 - 1050}{218} = 0.80$$

$$\text{Normalcdf}(0.23, 0.80, 0, 1) = \underline{\underline{0.1972}}$$

Sample size

5) Margin of error: 0.008; confidence level: 98%; $\hat{p}$ and $\hat{q}$ unknown

A) 21,207

B) 20,308

C) 10,384

D) 22,184

6) Margin of error: 0.04; confidence level: 95%; from a prior study, $\hat{p}$ is estimated by the decimal equivalent of 60%.

A) 996

B) 577

C) 1441

D) 519

#5

$$E = 0.008$$

$$C.L. = 98\%$$

$$z_{\alpha/2} = \frac{2.326}{2.33}$$

$$n = \left(\frac{z_{\alpha/2}}{E} \right)^2 \cdot 0.25$$

$$n = \left(\frac{2.326}{0.008} \right)^2 \cdot 0.25 = 21134$$

$$n = \left(\frac{2.33}{0.008} \right)^2 \cdot 0.25 = 21207$$

20) Of 260 employees selected randomly from one company, 18.46% of them commute by carpooling. Construct a 90% confidence interval for the true percentage of all employees of the company who carpool.

A) $12.3\% < p < 24.7\%$

C) $14.5\% < p < 22.4\%$

B) $13.7\% < p < 23.2\%$

D) $12.9\% < p < 24.1\%$

$$\hat{p} \pm E$$

$$E = z_{\alpha/2} \sqrt{\frac{\hat{p} \hat{q}}{n}}$$

$$E = 1.645 \sqrt{\frac{0.1846 \cdot 0.8154}{260}} = 0.040$$

4%
0.0395

$$18.46\% - 4\% < p < 18.46\% + 4\%$$

$$14.46\% < p < 22.46\%$$

$\hat{p}$ - sample proportion

$$n = 260$$

$$C.L. = 90\%$$

$$\hat{p} = 0.1846$$

$$\hat{q} = 1 - \hat{p} = 1 - 0.1846 = 0.8154$$

$$z_{\alpha/2} = 1.645$$

1-Prop Zint

STAT → TESTS



A: 1-PropZint

X: 46

n: 260

C-Level: .90

$$\hat{p} = \frac{x}{n}$$

$$x = \hat{p} \cdot n = 0.1846 \cdot 260 = 47.996 \approx 48$$

$$(.14504, .22419)$$

Use the confidence level and sample data to find a confidence interval for estimating the population μ . Round your answer to the same number of decimal places as the sample mean.

- 16) A random sample of 104 light bulbs had a mean life of $\bar{x} = 543$ hours with a standard deviation of $\sigma = 26$ hours. Construct a 90% confidence interval for the mean life, μ , of all light bulbs of this type. 16) _____

A) $538 \text{ hr} < \mu < 548 \text{ hr}$

C) $537 \text{ hr} < \mu < 549 \text{ hr}$

B) $536 \text{ hr} < \mu < 550 \text{ hr}$

D) $539 \text{ hr} < \mu < 547 \text{ hr}$

- 17) A random sample of 187 full-grown lobsters had a mean weight of 19 ounces and a standard deviation of 3.3 ounces. Construct a 98% confidence interval for the population mean μ . 17) _____

A) $17 \text{ oz} < \mu < 19 \text{ oz}$

C) $19 \text{ oz} < \mu < 21 \text{ oz}$

B) $18 \text{ oz} < \mu < 20 \text{ oz}$

D) $18 \text{ oz} < \mu < 21 \text{ oz}$

#16. $n = 104$

$$\bar{x} = 543$$

$$\sigma = 26 \rightarrow z\text{-interval}$$

$$C.L. = 90\%$$

STAT → TESTS



7: z-interval
stats

$$\sigma = 26$$

$$\bar{x} = 543$$

$$n = 104$$

$$C\text{-Level} : .90$$

$$(538.8, 547.2)$$

$$(539, 547)$$

24) The amounts (in ounces) of juice in eight randomly selected juice bottles are:

15.4 15.8 15.4 15.1

15.8 15.9 15.8 15.7

Construct a 98% confidence interval for the mean amount of juice in all such bottles.

A) $15.89 \text{ oz} < \mu < 15.33 \text{ oz}$

B) $15.33 \text{ oz} < \mu < 15.89 \text{ oz}$

C) $15.23 \text{ oz} < \mu < 15.99 \text{ oz}$

D) $15.99 \text{ oz} < \mu < 15.23 \text{ oz}$

Stat: Edit

(L1) (LIST)

STAT $\rightarrow$ TESTS

$\downarrow$ 8: TInterval

(Data)

(Stats)

List: L1

Freq: 1

C. level: .98

(15.316, 15.909)

(15.32, 15.91)

Provide an appropriate response.

1) Assume that adults have IQ scores that are normally distributed with a mean of 100 and a standard deviation of 15 (as on the Wechsler test). Find the probability that a randomly selected adult has an IQ between 90 and 120 (somewhere in the range of normal to bright normal).

1) _____

A) 0.6014

B) 0.6227

C) 0.6977

D) 0.6568

2) Assume that adults have IQ scores that are normally distributed with a mean of 100 and a standard deviation of 15 (as on the Wechsler test). Find P_{30} , which is the IQ score separating the bottom 30% from the top 70%.

2) _____

A) 92.2

B) 92.8

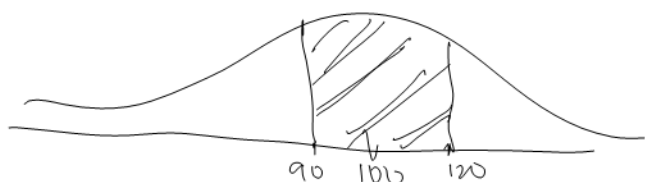
C) 91.9

D) 91.4

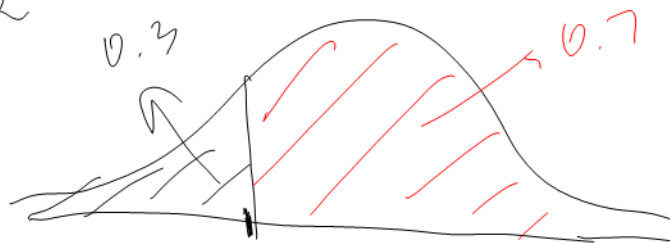
#1

$\mu = 100, \sigma = 15$

$$P(90 < x < 120) = \text{Normalcdf}(90, 120, 100, 15) = 0.6562$$



#2



$$P_{30} = \text{invNorm}(0.3, 100, 15) = 92.1$$

area to the left of the score

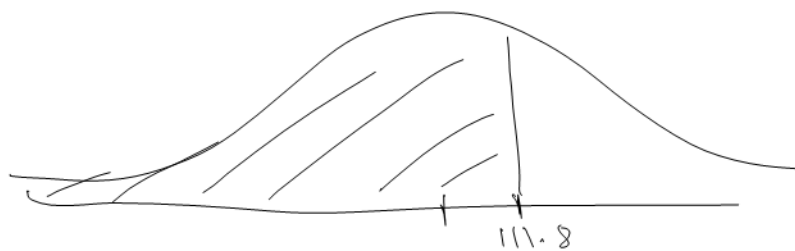
- 4) The annual precipitation amounts in a certain mountain range are normally distributed with a mean of 109 inches, and a standard deviation of 10 inches. What is the probability that the mean annual precipitation during 25 randomly picked years will be less than 111.8 inches?

A) 0.0808

B) 0.4192

C) 0.5808

D) 0.9192



$$\mu_{\bar{x}} = \mu = 109$$

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{10}{\sqrt{25}} = \frac{10}{5} = 2$$

$$\begin{aligned} \mu &= 109 \text{ in} \\ \sigma &= 10 \text{ in} \\ P(\bar{x} < 111.8) \\ n &= 25 \end{aligned}$$

$$P(\bar{x} < 111.8) = \text{Normalcdf}(-1E99, 111.8, 109, 2) = 0.9192$$

- 16) Margin of error: 0.005; confidence level: 96%; p and q unknown

A) 32,024

B) 42,018

C) 42,025

D) 42,148

$$E = 0.005$$

$$C.L. = 96\%$$

$$n = \left(\frac{z_{2/2}}{E} \right)^2 \cdot 0.25$$

$$z_{2/2} = 2.054$$

$$n = \left(\frac{2.054}{0.005} \right)^2 \cdot 0.25 = 42189.16$$

$$z_{2/2} = 2.05$$

$$n = \left(\frac{2.05}{0.005} \right)^2 \cdot 0.25 = 42025$$

Use the given degree of confidence and sample data to construct a confidence interval for the population proportion p .

18) A survey of 865 voters in one state reveals that 408 favor approval of an issue before the legislature. 18) _____

Construct the 95% confidence interval for the true proportion of all voters in the state who favor approval.

A) $0.444 < p < 0.500$

C) $0.438 < p < 0.505$

B) $0.471 < p < 0.472$

D) $0.435 < p < 0.508$

STAT $\rightarrow$ TESTS



A: 1-PropZint

X: 408

n: 865

C.L. .95

$$0.4717 - 0.0333 < p < 0.4717 + 0.0333$$

$$\hat{p} \pm E$$

$$\hat{p} = \frac{408}{865} = 0.4717$$

$$\hat{q} = 1 - \hat{p} = 0.5283$$

$$E = 1.96 \sqrt{\frac{0.4717 \cdot 0.5283}{865}} = 0.0333$$

$$n = 865$$

$$X = 408$$

$$C.L. = 95\%$$

$$Z_{\alpha/2} = 1.96$$

$(.43841, .50494) \rightarrow 0.438 < p < 0.505$

Solve the problem.

21) In a certain population, body weights are normally distributed with a mean of 152 pounds and a standard deviation of 26 pounds. How many people must be surveyed if we want to estimate the percentage who weigh more than 180 pounds? Assume that we want 96% confidence that the error is no more than 4 percentage points.

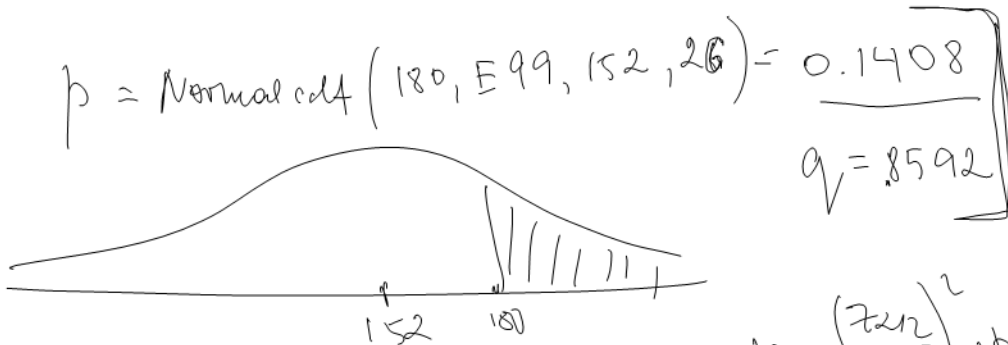
21) _____

A) 232

B) 501

C) 317

D) 658



C.L. 96%

$E = 0.04$

$Z_{\alpha/2} = 2.054$

$$n = \left(\frac{Z_{\alpha/2}}{E} \right)^2 \cdot p \cdot q = \left(\frac{2.054}{0.04} \right)^2 \cdot 0.1408 \cdot 0.8592$$

$$= 318.9 \approx 319$$