Practice Problem-1: Warm Up!!

The time required for putting together a food order at a restaurant is normally distributed with $\mu = 45$ min and $\sigma = 8$ min. The restaurant manager plans to have work begin on an order 10 minutes after the order has been placed and the customer is told that their food will be ready within 1 hour from order. What is the probability that the restaurant manager cannot meet his commitment?

Practice Problem-1: Solution

- Let T be the time it takes to work on an order
- We have that $T \sim N(45, 8^2)$
- The work begins 10 minutes after getting the order
- So we need the order to be completed in $t \leq 50$ minutes

Fun Question: Why am I using ‘t’ instead of ‘T’ here?

Practice Problem-1: Solution

What is the probability that the restaurant manager cannot meet his commitment?

- Convert this into math!

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- $P(T \geq 50)$

What do we do next?

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- $P(T \geq 50)$

What do we do next?

- Convert to Z (Standard Normal)
- $Z = \frac{T-\mu}{\sigma} \sim N(0, 1)$
- $P(T \geq 50) = P(Z \geq \frac{50-45}{8}) = P(Z \geq 0.625)$
- In R try function **= pnorm(q=0.625, lower.tail = F)**
- Or **=1 – pnorm(q=0.625)**

Practice Problem-1: Solution

What is the probability that the restaurant manager cannot meet his commitment?

$$P(T \geq 50) = 0.2659$$

Practice Problem-2

A book publisher monitors the size of shipments of its textbooks to university bookstores. For a sample of texts used at various schools, the 95% confidence interval for the size of the shipment was 250 ± 45 books. Which, if any, of the following interpretations of this interval, are correct?

(a) All shipments are between 205 and 295 books
(b) 95% of shipments are between 205 and 295 books.
(c) The procedure that produced this interval generates ranges that hold the population mean for 95% of samples.
(d) If we get another sample, then we can be 95% sure that the mean of this second sample is between 205 and 295.
(e) We can be 95% confident that the range of 160 to 340 holds the population mean.

Practice Problem-2: Solution

All shipments are between 205 and 295 books

- Incorrect. The interval describes, with 95% confidence, the location of the average shipment size μ, not the sizes of individual shipments

95% of shipments are between 205 and 295 books

- Incorrect. The interval does not describe individual shipments

The procedure that produced this interval generates ranges that hold the population mean for 95% of samples.

- Correct. 95% of intervals created in this fashion contain the true population mean.

Practice Problem-2: Solution

If we get another sample, then we can be 95% sure that the mean of this second sample is between 205 and 295.

- Incorrect. The interval does not describe the mean of another sample.

We can be 95% confident that the range of 160 to 340 holds the population mean.

- Incorrect. The interval does not correspond to a 95% confidence level.

Practice Problem-3

A survey of 5,250 business travelers worldwide conducted by OAG Business Travel Lifestyle indicated that 91% of business travelers consider legroom the most important in-flight feature. (Angle of seat recline and food service were second and third, respectively.) Give a 95% confidence interval for the proportion of all business travelers who consider legroom the most important feature.

Practice Problem-3: Solution

Identify the random variable here.

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Identify the random variable here.

Proportion of business travelers who consider leg-room to be the most important in-flight feature.

Practice Problem-3: Solution

We want a 95% CI for a proportion.

- Let π be the population proportion
- An estimate is the sample proportion, $p =?$

Practice Problem-3: Solution

We want a 95% CI for a proportion.

- Let π be the population proportion
- An estimate is the sample proportion, $p = 0.91$

The $(1 - \alpha)$ *100% CI for π is :

$$p \pm z_{\alpha/2} \frac{\sqrt{p(1-p)}}{\sqrt{n}}$$

Practice Problem-3: Solution

The $(1-\alpha)$ *100% CI for π is :

$$p \pm z_{\alpha/2}\frac{\sqrt{p(1-p)}}{\sqrt{n}}$$

- $\alpha = 0.05$, $z_{0.025} = 1.96$, n $= 5250$

$$0.91 \pm 1.96 * \frac{\sqrt{0.91*(1-0.91)}}{\sqrt{5250}} = (0.90, 0.92)$$