Example

Solve the exponential equation. Express the solution as an exact answer in terms of natural logarithms. Then use a calculator to give an approximation of the solution, rounded to two decimal places.

$6e^{x+1} = 40.59$

**ANSWER:**

We need to isolate the $x$, so the best thing to do first is divide both sides by 6.

\[6e^{x+1} = 40.59\]
\[e^{x+1} = 6.765\]

Don’t round to two decimal places yet! If you do, you will get round-off error and your final answer will be slightly off. Also, your answer will not be exact anymore in this particular case. **In general, you should never round until you get to the final answer, unless the instructions say otherwise.** Next we take the natural log of both sides.

\[\ln(e^{x+1}) = \ln(6.765)\]
\[x + 1 = \ln(6.765)\]

Since we want the **exact** answer first (not the approximation) then we leave $\ln(6.765)$ as is for now. Now we solve for $x$.

\[6e^{x+1} = 40.59\]
\[e^{x+1} = 6.765\]
\[\ln(e^{x+1}) = \ln(6.765)\]
\[x + 1 = \ln(6.765)\]
\[x = \ln(6.765) - 1\]

So then the exact answer is $x = \ln(6.765) - 1$. Note that even though we have a decimal, this is still exact and not approximate, because $6.765$ is exactly equal to $40.59$ divided by $6$.

Finally we find the approximate solution to two decimal places. Using a calculator, we see that

\[\ln(6.765) - 1 \approx 0.911762.\]

Rounding to two decimal places gives us $x \approx 0.91$. 