The best answer is \*\*(B) To show the effect sizes that are most compatible with the data under the given model.\*\* Here's a breakdown of why and why the other options are less suitable, reflecting a graduate-level understanding:

\* \*\*A) As another measurement of uncertainty like p-values:\*\* While confidence intervals and p-values both relate to uncertainty, they convey different information. P-values quantify the evidence \*against\* a null hypothesis, while confidence intervals provide a \*range of plausible values\* for a parameter. The core difference is what is considered in that uncertainty. Reporting p-values and confidence intervals together can provide a more complete picture, but they are not simply interchangeable measurements of uncertainty.

\* \*\*B) To show the effect sizes that are most compatible with the data under the given model:\*\* This is the most accurate and comprehensive interpretation. A confidence interval (e.g., a 95% CI) represents a range of values for a parameter (e.g., a mean, a difference in means, a regression coefficient) that are \*most consistent\* with the observed data, given the assumptions of the statistical model. The interval provides a sense of the magnitude of the effect and the precision of the estimate. This is a very useful interpretation in reporting as it allows a conclusion in terms of a meaningful effect size.

\* \*\*C) Instead of p-values by determining whether the null value is in the interval:\*\* This is a \*valid\* but limited use of confidence intervals. If the null value (the value specified by the null hypothesis) falls \*outside\* the confidence interval, you can reject the null hypothesis at the corresponding alpha level (e.g., a 95% CI implies a 0.05 alpha). However, the primary benefit of a confidence interval is not just hypothesis testing. It's the information about \*the range of plausible values\* themselves, which is crucial for understanding the practical significance of the results.

\* \*\*D) They should not be used because they lead to the same bad interpretations as p-values:\*\* This is incorrect. Confidence intervals can \*reduce\* some of the problematic interpretations associated with p-values, such as focusing solely on statistical significance and ignoring effect size. A confidence interval directly provides information on the range of possible values of the parameter, which can help to distinguish between a statistically significant finding and a practically meaningful one. While both p-values and confidence intervals can be misused, confidence intervals are generally considered to be more informative, as they better communicate the effect size of the data.

\*\*In summary:\*\* Option B highlights the core benefit of a confidence interval: providing a range of plausible values for a parameter, representing the effect size. This perspective is central to the way a statistically savvy graduate student would interpret and use confidence intervals. The ability to focus on what is most compatible with the data under the model is very important when reporting statistical findings.