The correct answer is \*\*(A) 30%, 35%, 15%, 40%, 50%\*\*. Here's a breakdown of why, along with a statistical explanation a graduate student would provide:

\*\*Understanding the Problem\*\*

This question tests our understanding of sampling variability and the expected behavior of sample statistics when drawing random samples from a population. We know the \*population proportion\* of yellow candies is 35%. The key is to recognize that sample proportions will \*vary\* around this value due to random chance. We need to assess which sequence of sample percentages is most consistent with this understanding, given the sample size (n=20).

\*\*Why the Correct Answer (A) is Plausible\*\*

\* \*\*Sampling Variability:\*\* Each student's sample is a random draw. Therefore, we \*expect\* some fluctuation around the population proportion of 35%. The percentages in option (A) are all relatively close to 35%, with a bit of spread.

\* \*\*Reasonable Range:\*\* With a sample size of 20, we'd expect the sample proportions to be reasonably stable. Option (A) values, while varying, don't represent extreme deviations from the population proportion. For example, 30% (6 yellow candies) and 50% (10 yellow candies) are quite plausible outcomes when sampling 20 candies.

\*\*Why the Other Options are Less Plausible\*\*

\* \*\*(B) 35%, 35%, 35%, 35%, 35%\*\*: While possible (it's not \*impossible\* to get the exact same percentage repeatedly in small samples), this sequence is highly \*unlikely\*. It suggests no sampling variability at all. The chances of perfectly reproducing the sample statistic (i.e., 35%) in all five samples are low, especially given the small sample size of 20.

\* \*\*(C) 5%, 60%, 10%, 50%, 95%\*\*: This sequence shows a much wider spread. The percentages range from 5% (1 yellow candy) to 95% (19 yellow candies). The values of 5% and 95% are very unlikely to occur in a sample of size 20 when the true population proportion is 35%. They suggest much more extreme sampling error than is expected.

\* \*\*(D) Any of the above\*\*: This answer is incorrect. While it's \*possible\* to get \*any\* of the sequences, some are far more plausible than others, given what we know about random sampling.

\*\*Statistical Reasoning (Graduate-Level Perspective)\*\*

A graduate student would consider these points:

1. \*\*Binomial Distribution:\*\* This is a binomial experiment. Each candy selection is a Bernoulli trial (yellow or not yellow). Since the candies are sampled randomly, the number of yellow candies in each sample of 20 follows a binomial distribution with \*n\* = 20 and \*p\* = 0.35 (the probability of selecting a yellow candy).

2. \*\*Standard Deviation/Standard Error:\*\* While we don't need to calculate it explicitly for this question, the standard error (SE) of a sample proportion helps us assess the likely spread of the sample percentages. The formula for the SE of a proportion is: `sqrt(p(1-p)/n)`. In this case, SE = sqrt(0.35 \* 0.65 / 20) ≈ 0.107.

3. \*\*Confidence Intervals (Conceptual):\*\* We know the SE. A 95% confidence interval for the sample proportion would be approximately the sample proportion plus/minus 2 \* SE (approximately - not a precise calculation, and not needed to solve the multiple-choice question but useful for understanding the logic of sampling).

4. \*\*Central Limit Theorem (Conceptual):\*\* Although n=20 is not a very large sample size, we're still dealing with a well-defined distribution (Binomial). We can rely on our intuition and the Central Limit Theorem, but we don't need to perform calculations based on it.

5. \*\*Evaluating Extremes:\*\* We know that extremely low (e.g., 5%) and high (e.g., 95%) sample proportions are far less likely than values closer to the population proportion of 35%, given the sample size.

\*\*In conclusion\*\*, the most plausible answer considers the expected variability in sample proportions due to random sampling, whereas the other options represent too little variability or too much variability. Option A is the only one that is both plausible and realistic.