

**Question Four**

- (a) Print the names of all 50 gymnasts on pieces of paper and place them in a hat. Then pick at random 25 names from the hat. These 25 gymnasts will form the group that receives the new treatment, and the remainder will be in the group that receives the current treatment.

*[Be sure to specify which group the first 25 names will go into. Very often students will say they go into “one group” without saying which group this is. Also, note that the method where you flip a coin for each gymnast and stop when you have 25 in one of the groups is not completely random assignment. For further details, please see “Know how to achieve random assignment” in Part II, Section 3 of “Top Tips for AP Statistics” in the Question Book.]*

- (b) If some of the gymnasts were allowed to choose which group they would go into then it is quite possible, for example, that the more enthusiastic gymnasts who practice more would be keen to try out the new treatment. So then any greater toughness in the new treatment might be masked by the fact that those gloves were used more heavily. Random assignment produces two groups of subjects that are expected to be similar in all respects.

*[Be careful not to suggest that random assignment might eliminate differences between the groups.]*

- (c) Despite the random assignment, in the first design there can be large differences between the individuals in the two groups and therefore the heaviness of use could differ greatly between the two treatments. The effect on the results of any difference in the toughness of the two treatments cannot be distinguished from the effect of the differences in the heaviness of use, and therefore any difference in toughness is harder to detect. However, under the second design, the two treatments will be subjected to almost identical use, and so any differences in the wear on the two types of glove can be attributed almost exclusively to the differences in the effectiveness of the two treatments. (The random assignment of the gloves to the hands means that any factors resulting from use by dominant or non-dominant hands are expected to be equally distributed between the two treatments.)

*[Remember – when comparing two things you must consider both in what you write.]*