1. Planned hypothesis tests should not be conducted if the p-value for the full F-test is greater than the pre-specified significance level for the full-F-test.

   True

   False

2. Which of the following is **not** a necessary condition for successfully conducting planned comparisons?

   Planned comparisons must have a significance level greater than or equal to the familywise error rate.

   The contrasts that are defined in the planned hypothesis tests are orthogonal.

   The number of planned hypothesis tests is no more than the corresponding degrees of freedom (number of groups minus one).

   Planned comparisons must be conducted regardless of the outcome of the full F-test.

3. Suppose that a one-way ANOVA is conducted, with a factor of 5 levels. The contrast using $c = (1, -1, -1, 0, 1)$ and $\mu = (\mu_1, \mu_2, \mu_3, \mu_4, \mu_5)$ is equivalent to the null hypothesis $H_0 : \mu_1 - \mu_2 - \mu_3 = \mu_5$.

   True

   False

4. Let $\boldsymbol{\gamma} = (\gamma_1, ..., \gamma_4)$ be a set of parameters. Then $\gamma_1 - \gamma_2 + 2\gamma_3 - 4\gamma_4$ is a contrast.

   True

   False

5. Markus is conducting a study on the effect of eating dark chocolate on health. In the study, Markus recruits $n = 24$ individuals, and splits them into three groups:

   1. A control group that eats no dark chocolate.
   2. A group that eats one ounce of dark chocolate per day for six weeks.
   3. A group that eats one ounce of dark chocolate per day for six weeks and performs at least 30 minutes of exercise four times per week.

   Markus and his team measured 10 different health markers, including blood pressure, blood sugar, and body fat percentage, before and after the six week period. Before conducting the study, the team know that they would want to study relationships between each of the 10 health markers and dark chocolate consumption. The subsequent data analysis showed that blood sugar levels were lower in the dark chocolate (no exercise) group.

   Which of the following criteria for planned comparisons were violated, based on the description above?

   The number of planned hypothesis tests is no more than the corresponding degrees of freedom (number of groups minus one).

   Planned comparisons must have a significance level greater than or equal to the familywise error rate.

   The hypotheses considered must be specified before observing and analyzing the data.