AP Statistics - PVS: P-Values from Simulations

AP Statistics P-Values from Simulations (PVS) - 2 questions

2 Questions | 4 min

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1. A marriage counselor plans a study on whether a husband or a wife is happier on a greater proportion of days when the wife has a job outside the home and the husband is a stay-at-home dad. In a random sample of married couples where the wife works and the husband is at home, the difference in proportions of happy days between husband and wife is 0.1106. The counselor, who took a required statistics class in college, is concerned that the proportions she subtracted to get 0.1106 are not from independent samples. So she runs 200 simulations of couples with the null hypothesis that there is no difference in proportions of happy days. The dotplot of resulting proportion differences is below. Simulated Differences in Proportions Is there sufficient evidence of a significant difference in the proportion of happy days experienced by husbands and wives in marriages where the wife works and the husband is a stay-at-home dad?

(A) Yes, because 0.1106 > 0.0

(B) Yes, because 0.1106 > 0.05

(C) Yes, because the distribution of simulated differences is approximately normal so the central limit theorem applies

(D) No, because 0.1106 > 0.05

(E) No, because the simulated P-value is large

2. An industrial control check is as follows. Random samples are periodically gathered. If a particular statistic is significantly greater than what is expected during proper operation of the machinery, a recalibration is necessary. In a simulation of 100 such samples where the machinery is working properly, the resulting statistic is summarized in the following dotplot. Calculations of the statistic from random samples when the machinery is operating properly Suppose during one control check, the statistic from the random sample is 24. Is there sufficient evidence to necessitate a recalibration of the machinery?

(A) No, because with the machine operating properly, the simulation gave two statistics even greater than 24

(B) No, because stopping production to recalibrate is a serious, expensive decision, and given this data, the probability of a Type I error is too great

(C) No, because the distribution of simulation results is roughly bell-shaped so the 68-95-99.7 rule applies

(D) Yes, because the consequences of a Type II error are significant

(E) Yes, because the estimated P-value is less than 0.05