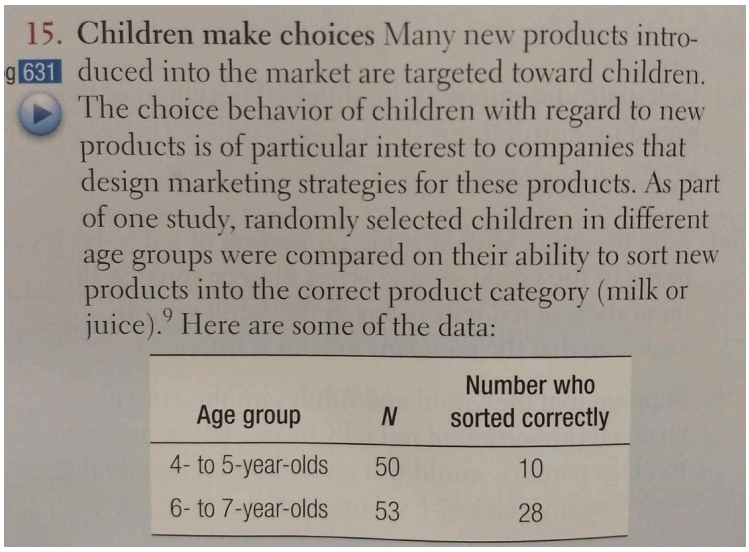
AP Statistics: 10-3 Significance Tests for a Difference in Proportions Practice

These problems are intended to be done in your notebooks. Email a picture of the problems to andrew.slagle@k12northstar.org when finished. It is encouraged for you to check your work with a friend, check your answers with the solutions on the website, or both.



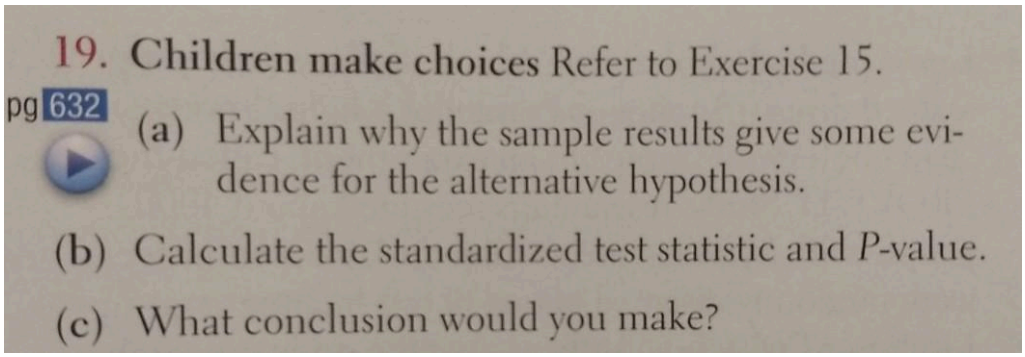
15. **Children make choices** Many new products introduced into the market are targeted toward children. The choice behavior of children with regard to new products is of particular interest to companies that design marketing strategies for these products. As part of one study, randomly selected children in different age groups were compared on their ability to sort new products into the correct product category (milk or juice).[9] Here are some of the data:

Age group	*N*	Number who sorted correctly
4- to 5-year-olds	50	10
6- to 7-year-olds	53	28

Researchers want to know if a greater proportion of 6- to 7-year-olds can sort correctly than 4- to 5-year-olds.

(a) State appropriate hypotheses for performing a significance test. Be sure to define the parameters of interest.

(b) Check if the conditions for performing the test are met.



19. **Children make choices** Refer to Exercise 15.

(a) Explain why the sample results give some evidence for the alternative hypothesis.

(b) Calculate the standardized test statistic and *P*-value.

(c) What conclusion would you make?

21. Bag lunch? Phoebe has a hunch that older students pg 635 at her very large high school are more likely to bring a bag lunch than younger students because they have grown tired of cafeteria food. She takes a simple random sample of 80 sophomores and finds that 52 of them bring a bag lunch. A simple random sample of 104 seniors reveals that 78 of them bring a bag lunch.

(a) Do these data give convincing evidence to support Phoebe's hunch at the $\alpha = 0.05$ significance level?

(b) Interpret the *P*-value from part (a) in the context of this study.

29. Texting and driving Does providing additional information affect responses to a survey question? Two statistics students decided to investigate this issue by asking different versions of a question about texting and driving. Fifty mall shoppers were divided into two groups of 25 at random. The first group was asked version A and the other half were asked version B. Here are the actual questions:

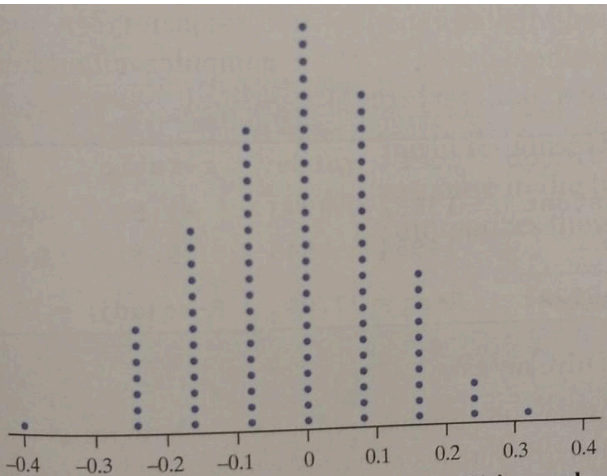
- *Version A:* A lot of people text and drive. Are you one of them?
- *Version B:* About 6000 deaths occur per year due to texting and driving. Knowing the potential consequences, do you text and drive?

Of the 25 shoppers assigned to version A, 16 admitted to texting and driving. Of the 25 shoppers assigned to version B, only 12 admitted to texting and driving.

(a) State appropriate hypotheses for performing a significance test. Be sure to define the parameters of interest.

(b) Explain why you should not use the methods of this section to calculate the *P*-value.

(c) We performed 100 trials of a simulation to see what differences (Version A−Version B) in proportions would occur due only to chance variation in the random assignment, assuming that the question asked doesn't matter. A dotplot of the results is shown here. What is the estimated *P*-value?



(d) What conclusion would you draw?

Multiple Choice: *Select the best answer for Exercises 31–34.*

Exercises 31–33 refer to the following setting. A sample survey interviews SRSs of 500 female college students and 550 male college students. Researchers want to determine whether there is a difference in the proportion of male and female college students who worked for pay last summer. In all, 410 of the females and 484 of the males say they worked for pay last summer.

31. Let p_M and p_F be the proportions of all college males and females who worked last summer. The hypotheses to be tested are

(a) $H_0: p_M - p_F = 0$ versus $H_a: p_M - p_F \neq 0$.

(b) $H_0: p_M - p_F = 0$ versus $H_a: p_M - p_F > 0$.

(c) $H_0: p_M - p_F = 0$ versus $H_a: p_M - p_F < 0$.

(d) $H_0: p_M - p_F > 0$ versus $H_a: p_M - p_F = 0$.

(e) $H_0: p_M - p_F \neq 0$ versus $H_a: p_M - p_F = 0$.

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32. The researchers report that the results were statistically significant at the 1% level. Which of the following is the most appropriate conclusion?

(a) Because the *P*-value is less than 1%, fail to reject H_0. There is not convincing evidence that the proportion of male college students in the study who worked for pay last summer is different from the proportion of female college students in the study who worked for pay last summer.

(b) Because the *P*-value is less than 1%, fail to reject H_0. There is not convincing evidence that the proportion of all male college students who worked for pay last summer is different from the proportion of all female college students who worked for pay last summer.

(c) Because the *P*-value is less than 1%, reject H_0. There is convincing evidence that the proportion of all male college students who worked for pay last summer is th same as the proportion of all female college students who worked for pay last summer.

(d) Because the *P*-value is less than 1%, reject H_0. There is convincing evidence that the proportion of all male college students in the study who worked for pay last summer is different from the proportion of all female college students in the study who worked for pay last summer.

(e) Because the *P*-value is less than 1%, reject H_0. There is convincing evidence that the proportion of all male college students who worked for pay last summer is different from the proportion of all female college students who worked for pay last summer.

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33. Which of the following is the correct margin of error for a 99% confidence interval for the difference in the proportion of male and female college students who worked for pay last summer?

(a) $2.576\sqrt{\frac{0.851(0.149)}{550}+\frac{0.851(0.149)}{500}}$

(b) $2.576\sqrt{\frac{0.851(0.149)}{1050}}$

(c) $2.576\sqrt{\frac{0.880(0.120)}{550}+\frac{0.820(0.180)}{500}}$

(d) $1.960\sqrt{\frac{0.851(0.149)}{550}+\frac{0.851(0.149)}{500}}$

(e) $1.960\sqrt{\frac{0.880(0.120)}{550}+\frac{0.820(0.180)}{500}}$