Note: "OIS" refers to OpenIntro Statistics, the textbook for this class.

Problem 1: OIS Exercise 7.11, page 261 (9 points)

Georgianna claims that in a small city renowned for its music school, the average child takes less than 5 years of piano lessons. We have a random sample of 20 children from the city, with a mean of 4.6 years and a standard deviation of 2.2 years.

(a) Evaluate Georgianna's claim (or that the opposite might be true) using a hypothesis test (4 pts).

(b) Construct a 95% confidence interval for the number of years students in this city take piano lessons, and interpret it in the context of the data (2 pts).

Note: you do not have to write down the Prepare and Check steps for (b), only Calculate and Interpret.

Problem 2: OIS Exercise 6.26a, page 227 (6 points)

A news article reports that "Americans have differing views on two potentially inconvenient and invasive practices that airports could implement to uncover potential terrorist attacks." This news piece was based on a survey conducted among a random sample of 1,137 aduts nationwide, where one of the questions on the survey was "Some airports are now using 'full-body' digital x-ray machines to electronically screen passengers in airport security lines. Do you think these new x-ray machines should or should not be used at airports?" Below is a summary of responses based on party affiliation.[27]

		Party Affiliation		
		Republican	Democrat	Independent
Answer	Should	264	299	351
	Should not	38	55	77
	Don't know/No answer	16	15	22
	Total	318	369	450

(4 pts) Conduct an appropriate hypothesis test evaluating whether there is a difference in the proportion of Republicans and Democrats who think that the full-body scans should be applied in airports.[1].

Problem 3 (10 points)

Prices of diamonds are determined by what is known as the 4 C's: cut, clarity, color, and carat weight. The prices of diamonds of up as the carat weight increases, but the increase is not smooth. For example, the difference between the size of a 0.99 carat diamond and a 1 carat diamond is undetectable to the naked human eye, but the price of a 1 carat diamond tends to be much higher than the price of a 0.99 carat diamond.

In this question, we use two random samples of diamonds with carat weights 0.99 and 1. In order to be able to compare equivalent units, we calculate the price per carat, by dividing the price for each diamond by 100 times its weight in carats. That is, for a 0.99 carat diamond, we divide the price by 0.99. For a 1 carat diamond, we divide the price by 100. The variable to analyze is stored in the variable `ppc`.

[1] S. Condon. "Poll: 4 in 5 Support Full-Body Airport Scanners". In: *CBS News* (2010)

```
diamonds <- read.csv("https://vincentarelbundock.github.io/Rdatasets/csv/ggplot2/diamonds.csv")

diamonds <- diamonds[c(386, 424, 1276, 3171, 4308, 6025, 6168, 6217, 6226, 6460, 6558,
                       6955, 7006, 7816, 8482, 9022, 9360, 10225, 10309, 10416, 10540,
                       10752, 10805, 11090, 11357, 11884, 12018, 12602, 13931, 13940,
                       14125, 14559, 14608, 14777, 14991, 15159, 15170, 15230, 15907,
                       16294, 16550, 16899, 20147, 46680, 47803, 48260),]

diamonds$ppc <- as.numeric(diamonds$price/(100*diamonds$carat))
```

(a) Create two histograms of the price per carat, one for the group of 0.99 carat diamonds and one for the group of 1 carat diamonds. The histograms should have five bins (4 pts).

(b) Comment on the two histograms (2 pts).

(c) Conduct an appropriate hypothesis test evaluating whether there is a difference in price per carat for 0.99 carat diamonds and 1 carat diamonds. Use your results from parts (a) and (b) to check the conditions (4 pts).

This problem was inspired by OIS Exercise 7.24, page 274.