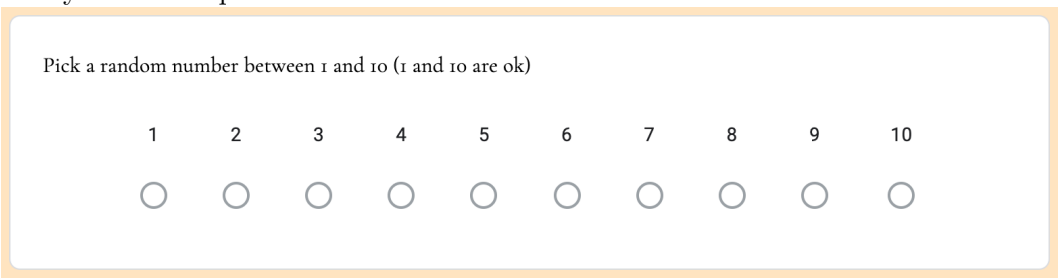
MATH 140 **Name** _____ **Date:**

Worksheet: Pick a Random Number

The Scene: The start of term survey asked you to pick a random number between 1 and 10. Here's exactly what the question looked like:



Here are the results of the random number question for the four sections of MATH 140 I've taught the last two years:

number	1	2	3	4	5	6	7	8	9	10
observed count	1	8	19	12	8	13	26	17	5	4

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1. If people in the survey are really just picking a number at random, each number from 1 to 10 has the same chance of being picked, and we would expect equal counts for all ten numbers. In a survey with $n = 113$ respondents what would be the expected counts for each of the ten numbers? (Give your answer to 1 decimal point - don't sweat it if the answer is not a whole number.) Record your answers in the table below.

number	1	2	3	4	5	6	7	8	9	10
expected count										

2. Determine the chi-square score associated with these data. Recall

$$\chi^2 = \sum_{\text{all cells}} \frac{(O-E)^2}{E}$$

3. The statistic you found in the previous question lives in a chi-square distribution with how many degrees of freedom?

Intermission: Conducting a Chi Square Goodness of Fit Test

Main Question

We wonder if people are good random number generators, and so we ask a group of people to pick a random number between 1 and 10 to see whether the group, as a whole, will pick

all 10 numbers with near equal frequency.

Hypotheses

H_o: People pick all ten numbers with equal frequency.

H_a: People do not pick all ten numbers with equal frequency.

Test Statistic

The chi-square score you computed above is our test statistic. It is a single number that measures how much the observed counts deviate from theoretical counts we would expect if the null hypothesis is true.

The p-value

This is the probability of obtaining data that produces a larger chi-square score than the one we observed. We find this probability as an area under a chi-square distribution:

$$\text{p-value} = 1 - \texttt{pchisq}(\text{chi-square score, df})$$

4. In R, determine the p-value for this test. Record your answer here.

5. If the null hypothesis is true (namely, people pick all ten numbers with equal frequency), how likely is it to obtain a chi-square test statistic as high or higher than the one we obtained from our sample?

6. Based on the analysis done in this worksheet, do you believe the class survey data provides good evidence that people aren't very good random number generators?