HW 14-3

1. I & II bc they both occurred by chance in the random samples from the simulation. A sample with 24 red chips never occurred by chance, so seems more unlikely to happen for this population.

2. a. 60% & 70% successes. 64% didn't occur in 50% success population, it was in the range of sample % ∴ could have happened. No sample from 40% success population were as large as 64% ∴ not likely from here.

b. Yes, b/c haven't looked at any simulated distribution of sample proportions larger than 70%. 80% & 90% may turn out to be plausible as well.

3. a. ME = 0.15 b. ME = 0.15 c. ME = 0.15

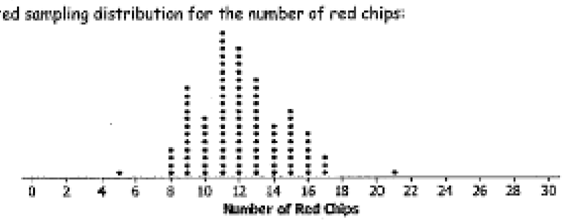
4. a. ME = 0.15 b. ME = 0.03 c. ME = 0.055 d. ME = 0.05

5. a. False, the smaller the sample size, the LARGER the margin of error.

b. 0.35 ± 0.05 = 0.30 and 0.40, which is not 0.40 and 0.50 ∴ False

Name Key

1. Tanya simulated drawing a sample of size 30 from a population of chips and got the following simulated sampling distribution for the number of red chips:

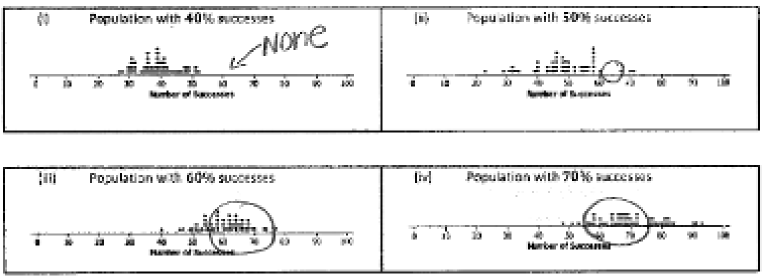


Which of the following results seem like they might have come from this population? Explain your reasoning.

I. 8 red chips in a random sample of size 30
II. 12 red chips in a random sample of size 30
III. 24 red chips in a random sample of size 30

B/c they occurred by chance in the random samples from the simulation. A sample with 24 red chips never occurred by chance, so seems more unlikely to happen for this population.

2. 64% of the students in a random sample of 100 high school students intended to go onto college. The graphs below show the results of simulating random samples of size 100 from several different populations where the success percentage was known and recording the percentage of successes in the sample.



a. Based on these graphs, which of the following are plausible values for the percentage of successes in the population from which the sample was selected: 40%, 50%, 60%, or 70%? Explain your reasoning. 64% successes was likely outcome from pop. w/ 60% and 70% successes. 64% didn't occur in 50% success pop, it was in range of sample % ∴ could have happened. No samples from [illegible]

b. Would you need more information to determine plausible values for the actual proportion of the population of high school students who intend to go to some postsecondary school? Why or why not?

Yes because haven't looked at any simulated distr. of sample proportions larger than 70%, 80% and 90% may turn out to be plausible as well.

3. Suppose the mystery bag from today's class had resulted in the following number of red chips. Using the simulated sampling distributions found in today's notes, find a margin of error in each case.

a. The number of red chips in a random sample of size 30 was 10 (Ex. 3 from today's notes).

.20 to .50 or .35 ± .15 Margin of Error = .15

b. The number of red chips in a random sample of size 30 was 21 (Ex. 3 from today's notes).

.50 to .80 or .65 ± .15 Margin of Error = .15

c. The number of red chips in a random sample of size 50 was 22 (Ex. 6 from today's notes).

.30 to .60 or ~~.50 ± .10~~ .45 ± .15 Margin of Error = ~~.10~~ .15

4. The following intervals were plausible population proportions for a given sample. Find the margin of error in each case.

est ± mE

			Margin of Error
$p = \frac{.35+.65}{2} = .50$	a. From 0.35 to 0.65	.50 ± .15	.15
$p = \frac{.72+.78}{2} = .75$	b. From 0.72 to 0.78	.75 ± .03	.03
$p = \frac{.84+.95}{2} = .895$	c. From 0.84 to 0.95	.895 ± .055	.055
$p = \frac{.47+.57}{2} = .52$	d. From 0.47 to 0.57	.52 ± .05	.05

5. Decide if each of the following statements is true or false. Explain your reasoning in each case.

a. The smaller the sample size, the smaller the margin of error.

False. Smaller the sample size, the larger the margin of error

CI = est ± mE

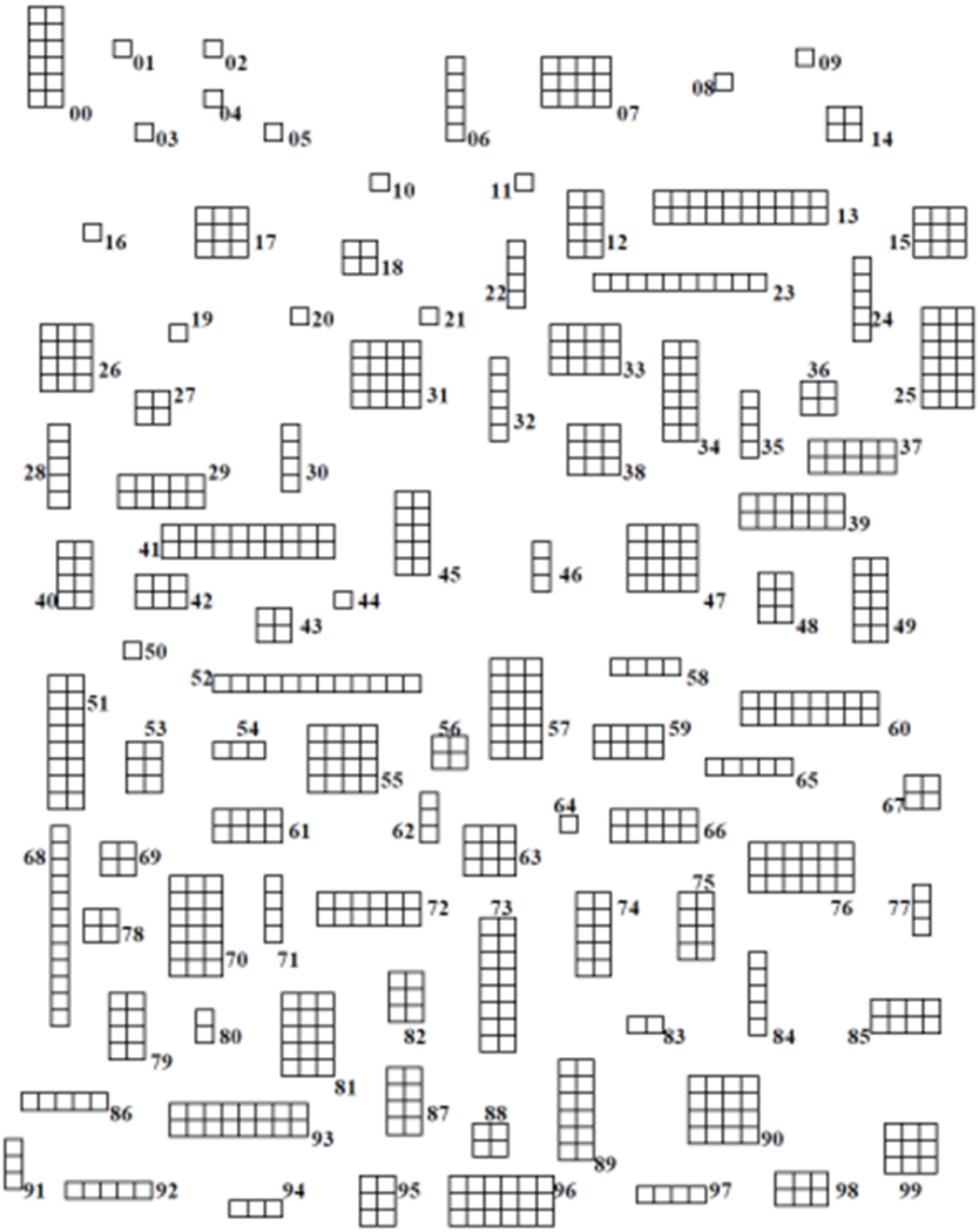
b. If the margin of error is 0.05 and the observed proportion of red chips is 0.35, then the true population proportion is likely to be between 0.40 and 0.50.

.35 ± .05 = .30 and .40, which is not 0.40 and 0.50 ∴ False

Example 1:

The course project in a computer science class was to create 100 computer games of various levels of difficulty that had ratings on a scale from 1 (easy) to 20 (difficult). We will examine a representation of the data resulting from this project.

Example 1: Describing a Population of Numerical Data



a. What do you think the rectangles represent in the context of the 100 computer games?

Each rectangle represents a computer game

b. What do you think the sizes of the rectangles represent in the context of the 100 computer games?

The difficulty rating of computer game. Min. rating is 1, max. rating is 20.

c. Why do you think the rectangles are numbered from 00 to 99 instead of from 1 to 100?

Easiest if all labels have same # of digits when taking a random sample. 100 = 00. 1 to 9 are 01, 02, etc.

2. Working with your partner, discuss how you would calculate the mean rating of all 100 computer games (the population mean).

All 100 ratings would be added and divided by 100

3. Discuss how you might select a random sample to estimate the population mean rating of all 100 computer games.

Use a RN generator to generate 10 (or more) 2 digit random #'s. The generated #'s identify the rectangles (computer games) that would be chosen for the sample.

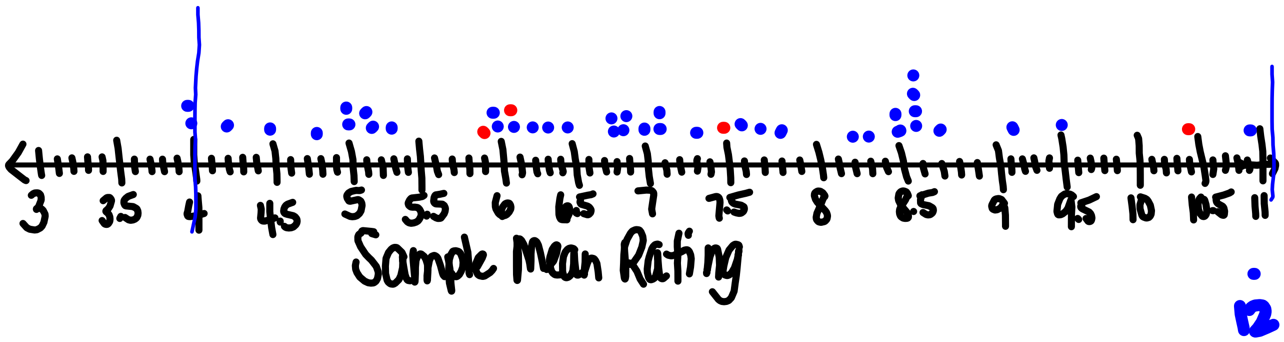
4. Calculate an estimate of the population mean rating of all 100 computer games based on a random sample of size 10. Your estimate is called a sample mean, and it is denoted by $\bar{x}$. Use the following random numbers to select your sample.

	34	86	80	58	04	43	96	29	44	51
Ratings:	12	5	2	4	1	4	18	10	1	16

Based on this sample, est. for population mean = $\frac{73}{10} = 7.3$

5. Work in pairs. Using a table of random digits or a calculator with a random-number generator, generate four sets of ten random numbers. Use these sets of random numbers to identify four random samples of size 10. Calculate the sample mean rating for each of your four random samples.

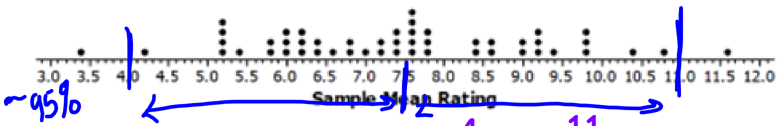
6. Write your sample means on separate sticky notes, and post them on a number line that your teacher has prepared.



7. The actual population mean rating of all 100 computer games is 7.5. Does your class distribution of sample means center at 7.5? Discuss why it does. Or, if it doesn't, discuss why it doesn't.

Reasonably close - samples means tend to gather around the population mean.
(Small sample size)

Suppose that 50 random samples each of size ten produced the sample means displayed in the following dot plot.



Note that almost all of the sample means are between 4 and 11. That is, almost all are roughly within 3.5 rating points of the population mean 7.5 (7.5 ± 3.5). The value 3.5 is a visual estimate of the margin of error. It is not really an "error" in the sense of "mistake." Rather, it is how far our estimate for the population mean is likely to be from the actual value of the population mean.

Based on the class distribution of sample means, is the visual estimate of margin of error close to 3.5? yes

Note that the margin of error measures how spread out the sample means are relative to the value of the actual population mean. From previous lessons, you know that the standard deviation is a good measure of spread. So, rather than producing a visual estimate for the margin of error from the distribution of sample means, another approach is to use the standard deviation of the sample means as a measure of spread. For example, the standard deviation of the 50 sample means in the example above is 1.7. Note that if you double 1.7 (3.4) you get a value for margin of error close to the visual estimate of 3.5.

REMEMBER: Another way to estimate margin of error is to use __2__ times the standard deviation of a distribution of sample means. For the above example, the refined margin of error (based on the standard deviation of sample means) is

7.5 ± 3.4 ← $2(1.7)$

Calculate a 95% confidence interval of the population mean rating of 100 computer games based on the standard deviation of your class distribution of sample means.

From class data: $\bar{x}$ = __7.1__ S_x = __1.8__

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NORMAL FLOAT AUTO REAL RADIAN MP
1-Var Stats
x̄=7.070454545
Σx=311.1
Σx²=2345.79
Sx=1.843729732
σx=1.822657843
n=44
minX=4
↓Q1=5.95
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$CI = 7.1 \pm 2(1.8)$

$CI = 7.1 \pm 3.6$

↑ ME