Name Date

Round all decimal answers to the nearest hundredth.

1. You and a friend decide to conduct a survey at your school to see whether students are in favor of a new dress code policy. Your friend stands at the school entrance and asks the opinions of the first students who come to campus on Monday. You obtain a list of all students at the school and randomly select to survey.
	1. Your friend finds of his sample in favor of the new dress code policy, but you find only . Which do you believe is more likely to be representative of the school population? Explain your choice.
	2. Suppose of the students at the school are in favor of the new dress code policy. Below is a dot plot of the proportion of students who favor the new dress code for each of different random samples of students at the school.



If you were to select a random sample of students and ask them if they favor the new dress code, do you think that your sample proportion will be within of the population proportion? Explain.

* 1. Suppose ten people each take a simple random sample of students from the school and calculate the proportion in the sample who favors the new dress code. On the dot plot axis below, place values that you think are most believable for the proportions you could obtain.



 🡨sample proportion in favor of dress code 🡪

Explain your reasoning.

1. Students in a random sample of students were asked to measure their hand spans (distance from outside of thumb to outside of little finger when the hand is stretched out as far as possible). The graphs below show the results for the males and females.



* 1. Based on these data, do you think there is a difference between the population mean hand span for males and the population mean hand span for females? Justify your answer.
	2. The same students were asked to measure their heights, with the results shown below.



Are these height data more or less convincing of a difference in the population mean height than the hand-span data are of a difference in population mean hand span? Explain.

1. A student purchases a bag of “mini” chocolate chip cookies, and after opening the bag, finds one cookie that does not contain any chocolate chips! The student then wonders how unlikely it is to randomly find a cookie with no chocolate chips for this brand.
	1. Based on the bag of cookies, estimate the probability of this company producing a cookie with no chocolate chips.
	2. Suppose the cookie company claims that of all cookies it produces contain chocolate chips. Explain how you could simulate randomly selecting cookies (one bag) from such a population to determine how many of the sampled cookies do not contain chocolate chips. Explain the details of your method so it could be carried out by another person.
	3. Now, explain how you could use simulation to estimate the probability of obtaining a bag of cookies with exactly one cookie with no chocolate chips.
	4. If of the cookies made by this company contain chocolate chips, then the actual probability of obtaining a bag of cookies with one chipless cookie equals . Based on this result, would you advise this student to complain to the company about finding one cookie with no chocolate chips in her bag of ? Explain.

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| A Progression Toward Mastery  |
| Assessment Task Item | STEP 1Missing or incorrect answer and little evidence of reasoning or application of mathematics to solve the problem. | STEP 2Missing or incorrect answer but evidence of some reasoning or application of mathematics to solve the problem. | STEP 3A correct answer with some evidence of reasoning or application of mathematics to solve the problem, or an incorrect answer with substantial evidence of solid reasoning or application of mathematics to solve the problem. | STEP 4A correct answer supported by substantial evidence of solid reasoning or application of mathematics to solve the problem. |
| **1** | a 7.SP.A.1 | Student answers based on personal experience and does not use information from problem stem. | Student believes neither sample will be representative because of the small sample sizes. | Student indicates the friend because the sample size is larger or indicates the student but without justification. | Student indicates that only the second method, based on the random sampling method, is likely to produce a representative result for the school population. |
| b7.SP.A.2 | Student answer does not make use of dot plot. | Student focuses only on all dots being less than . | Student guarantees that any proportion will fall between and or focuses only on and. | Student notes that most of the random samples fall between and , so the chance of the next sample proportion being in that range is high. |
| c7.SP.A.2 | Student does not attempt problem or does not have ten dots. | Student distribution is similar to (b) but with fewer dots. | Student distribution indicates less variability than part (b), but student does not explain reasoning. | Student distribution indicates less variability based on the larger sample size producing results that tend to fall closer to the population proportion. |
| **2** | **a**7.SP.B.3 | Student answers based on personal experience and does not use information from problem stem. | Student only focuses on the sample sizes that are unequal, so no comparison can be made. ORStudent focuses only on how irregular looking the distributions are. | Student only discusses amount of overlap in distributions or the centers of the distributions (the means) with no consideration of variability; reasoning is not complete. | Student measures difference in centers of distributions as a multiple of MAD.  |
|  | **b**7.SP.B.4 |  Student answers based on personal experience and does not use information from problem stem. | Student focuses only on sample size or how data were collected. | Student examines amount of overlap in distributions using mean but makes no consideration of variability. ORStudent cannot reconcile the different MAD values. | Student measures difference in centers of distributions as a multiple of MAD. Student could also discuss how bulk of distributions does not overlap at all (especially compared to previous question). |
| **3** | **a**7.SP.C.57.SP.C.6 | Student does not provide an estimate of a probability. | Student uses context/intuition to estimate the probability rather than the given information. | Student makes a statement about how unusual the outcome is but does not give a numerical estimate; or, reports . | Student reports . |
| **b**7.SP.C.8 | Student does not provide meaningful instructions for carrying out a simulation. | Student description is very generic and not specific to this problem. | Student explains part of the simulation (e.g., how to represent ,) but description is either incomplete (e.g., does not draw cookies) or not sufficiently detailed that it could be implemented by another person. | Student explains how to set up a simulation (e.g., random digits, to represent with no chocolate chips, everything else chocolate chips) and how to select one-digit numbers. |
|  | **c** 7.SP.C.8 | Student does not include instructions for carrying out a simulation. | Student response does not differ from (b) or only differs in looking for one cookie vs. no cookie without chocolate chips. | Student focuses on one cookie with no chocolate chips but does not clearly indicate replication of the chance experiment a large number of times. | Student clearly describes repeating process in (b) a large number of times and looking at the proportion of “bags” with exactly one chocolate chip. |
| **d**7.SP.C.7 | Student does not make use of in making a decision. | Student only comments that is a small sample size, so it is difficult to make a decision. | Student discusses how her bag could have happened by chance but does not tie to. ORStudent considers a small value and evidence that her bag would be unusual if the company’s claim was true. | Student states that the purchased bag is within the expected sampling chance variability and supports this conclusion by stating that is not a small number. |

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	1. Your friend finds of his sample in favor of the new dress code policy, but you find only . Which do you believe is more likely to be representative of the school population? Explain your choice.

My students were randomly selected instead of only the early arrivers. My students would be more representative.

* 1. Suppose of the students at the school are in favor of the new dress code policy. Below is a dot plot of the proportion of students who favor the new dress code for each of different random samples of students at the school.



If you were to select a random sample of students and ask them if they favor the new dress code, do you think that your sample proportion will be within of the population proportion? Explain.

A little more than half of these samples are between 0 and 0, so there is a good chance, but a value like should be even better.

* 1. Suppose ten people each take a simple random sample of students from the school and calculate the proportion in the sample who favors the new dress code. On the dot plot axis below, place values that you think are most believable for the proportions you could obtain.



 🡨sample proportion in favor of dress code 🡪

Explain your reasoning.

The values will still center around but will tend to be much closer together than in part (b) where samples only had students. This is because a larger sample size should show less variability.

1. Students in a random sample of students were asked to measure their hand spans (distance from outside of thumb to outside of little finger when the hand is stretched out as far as possible). The graphs below show the results for the males and females.



* 1. Based on these data, do you think there is a difference between the population mean hand span for males and the population mean hand span for females? Justify your answer.

Yes, the male hand spans tend to be larger for males. All but two males are at least cm. Less than of the female hands are that large. The number of MADs by which they differ is significant.

* 1. The same students were asked to measure their heights, with the results shown below.



Are these height data more or less convincing of a difference in the population mean height than the hand-span data are of a difference in population mean hand span? Explain.

Even more convincing because there is even less overlap between the two distributions. The number of MADs by which they differ is significant: .

1. A student purchases a bag of “mini” chocolate chip cookies, and, after opening the bag, finds one cookie that does not contain any chocolate chips! The student then wonders how unlikely it is to randomly find a cookie with no chocolate chips for this brand.
	1. Based on the bag of cookies, estimate the probability of this company producing a cookie with no chocolate chips.
	2. Suppose the cookie company claims that of all cookies it produces contain chocolate chips. Explain how you could simulate randomly selecting cookies (one bag) from such a population to determine how many of the sampled cookies do not contain chocolate chips. Explain the details of your method so it could be carried out by another person.

Have a bag of chips; of them are red to represent cookies containing chips and 10 of them are blue to represent cookies without chips. Pull out a chip, record its color, and put it back. Do this times, and count how many are not red.

* 1. Now, explain how you could use simulation to estimate the probability of obtaining a bag of cookies with exactly one cookie with no chocolate chips.

Repeat the above process from part (b) many, many times, e.g., . See what proportion of these bags had exactly one blue chip. That number over is your estimate of the probability of a bag of cookies with one chocolate chip.

* 1. If of the cookies made by this company contain chocolate chips, then the actual probability of obtaining a bag of cookies with one chipless cookie equals . Based on this result, would you advise this student to complain to the company about finding one cookie with no chocolate chips in her bag of ? Explain.

No. That is not that small of a probability. I would not find the value convincing that this did not just happen to her randomly.