

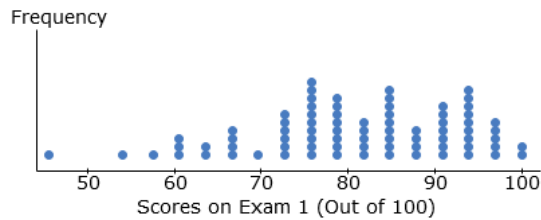
SAMPLING DISTRIBUTIONS VS DISTRIBUTION OF A SAMPLE; PROBABILITIES USING THE NORMAL DISTRIBUTION

Recall what a **sampling distribution** is.

When we generate all possible samples of a certain size from a given population and find the proportion of the desired characteristic in each sample, we are generating a **sampling distribution**, or a distribution of **sample proportions**. They look like other distributions we have seen of data.

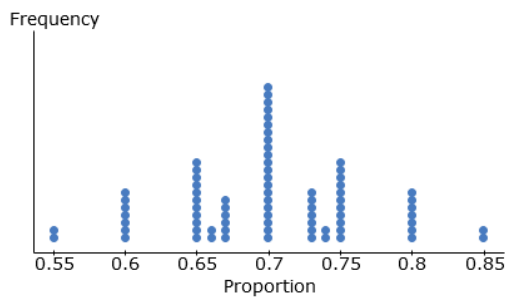
Analyze the following scenarios and graphs. Label each as being a **data distribution** or an estimate of a **sampling distribution**. Explain your reasoning.

1. A statistics instructor records each student's Exam 1 score and makes the following dotplot. (*Hint: Think about what **each dot** represents.*)

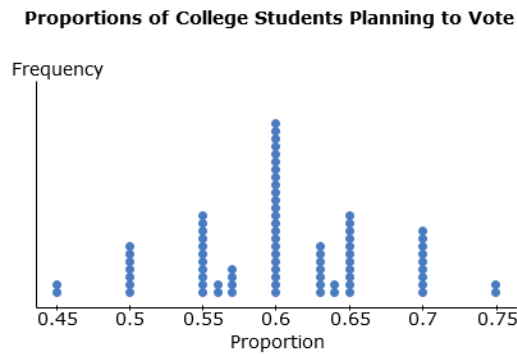


2. A school district consists of 78 statistics classes, each having the same number of students. After Exam 1, each instructor reported to the School Board the proportion of students that passed Exam 1 with a grade of C or better. The School Board made the following dotplot to show parents. (*Hint: Think about what **each dot** represents.*)

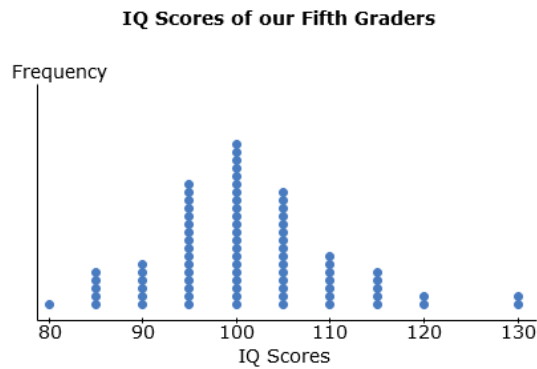
Proportions of Students Scoring C or Higher



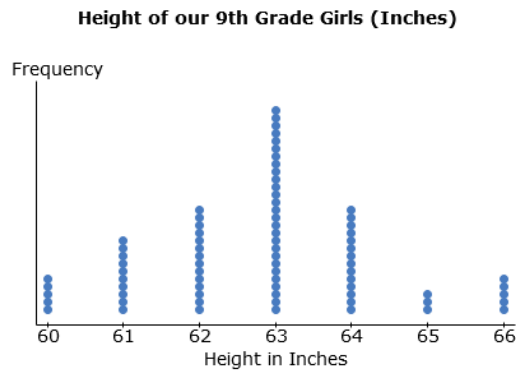
3. A pollster took 80 random samples of 100 college students and asked them if they planned to vote in the upcoming election. She recorded the proportion in each sample that planned to vote in the upcoming election. (*Hint: Think about what **each dot** represents.*)



4. A school superintendent recorded the IQ scores of all fifth graders in the district and made the following dotplot. (*Hint: Think about what **each dot** represents.*)



5. The school's athletic director was trying to recruit 9th grade girls to play on the basketball team, so he recorded the height, in inches, of each of the 9th grade girls in the district and made the following dotplot. (*Hint: Think about what **each dot** represents.*)



Given the scenarios below, find the desired probability. Remember, if you are dealing with a **sampling distribution** (of sample proportions or sample means), you need to check the conditions for the Central Limit Theorem and use the *standard error* while using the `normalcdf()` command on your calculator. If you are dealing with a **data distribution**, use the *standard deviation*. Please show all work, including your calculation of the standard error when needed, and write the full command you used on your calculator.

- Suppose that the age of Kent State University students is normally distributed, with an average of 21.5, with a standard deviation of 0.75. What is the probability that a randomly selected student is older than 24?
- A fifth teacher believes that 10% of her students are late for class. If the teacher is right, what is the probability that the proportion of late students in a sample of 50 students would be less than 9%?
- The weights of steers in a herd are distributed normally. The standard deviation is 100 lbs and the mean steer weight is 1300 lbs. Find the probability that the mean weight of a sample of 30 randomly selected steers is between 1269 and 1320 lbs.
- A soft drink machine outputs a mean of 27 ounces per cup. The machine's output is normally distributed with a standard deviation of 4 ounces. What is the probability of filling a cup between 21 and 31 ounces?
- The time spent waiting in the line is approximately normally distributed. The mean waiting time is 4 minutes and the standard deviation of the waiting time is 2 minutes. Find the probability that a person will wait for more than 1 minute.

11. According to the Regional Bar Association, approximately 60% of the people who take the bar exam to practice law in the region pass the exam. Find the approximate probability that more than 63% of 200 randomly sampled people taking the bar exam will pass.

12. Suppose that the average country song length in America is 4.75 minutes with a standard deviation of 1.75 minutes. It is known that song length is not normally distributed. Suppose a sample of 49 songs is taken from the population. What is the approximate probability that the average song length will last more than 5.25 minutes? Round to the nearest thousandth.

13. According to the Regional Teachers' Association, approximately 69% of people who take the licensure exam to teach high school in the region pass the exam. Find the approximate probability that at least 72% of 200 randomly sampled people taking the licensure exam will pass.