**Curriculum Sample Template**
Max. 8 Pages

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|---|---|---|---|
| **Grade Level** | 7 | **Content Area** | Mathematics |
| **Course Title** (grades 9-12 Only) | | | |
| **Expected Prior Knowledge**<br>*The knowledge/skills mastered earlier in the year foundational to the mastery of the required Standard in the current sample.* | Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences. | | |
| **Alignment to Program of Instruction**<br>*Briefly outline methods of instruction found in this sequence of lessons that align to the Program of Instruction described in A.3.* | As project based learning is a key feature in the school's mission, students will apply knowledge gained in math to complete projects and solve real world issues, and some may even be cross curricular. Lessons are aligned to both the program of instruction and common core standards by scaffolding knowledge, engaging students and requiring them to use higher depths of knowledge to demonstrate mastery and solve real world problems. | | |
| **Standard Number and Description**<br>*List the Number* and full description for the required Standard.* | 7.SP.2 Use random sampling to draw inferences about a population.<br>Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be. | | |
| **Materials/Resources Needed** | Worksheet of 20 random samples, guided research project worksheet, Independent research project rubric, access to larger school population to sample data, comprehensive written assessment. | | |

* ***Standard Number****: For English Language Arts (Reading and Writing), use Grade, Strand, Standard (e.g., 3.RI.2). For K-8 Math, use Grade, Domain, Standard (e.g., 6.EE.7). For HS Math, use Conceptual Category-Domain, Standard (e.g., A-REI.6). For Science, use Grade, Strand, Concept, PO (e.g., 4.1.3.1).*

| Lesson (add as | Instruction | Student Activities |
|---|---|---|
| **1** | **Objective: SWBAT Use random sampling to draw inferences about a population**<br>Discuss with students for bellwork: What is a random sample? Give an example of a random sample. Discuss your answer with face partner. Teacher introduces the lesson emphasizing the difference from the previous standard, which is that random sampling can be used in order to draw inferences about and unknown characteristic. Teacher facilitates as class brainstorms examples of random samples of an unknown characteristic. For example, how many hours does the average student spend on electronic devices per day after randomly sampling 3 students in the classroom. Students independently brainstorm. Class reviews examples of random samples brainstormed. Teacher facilitates independent practice by having the class complete a worksheet of 20 examples and decide which ones are random samples of an unknown characteristic of an interest and which are not. For example, estimating the mean word length of a book by sampling random words (example) and estimating how many red M&Ms are in a package without opening a package of M&Ms. Teacher reviews correct answers, and instructs students to highlight parts of the example that makes it a random sample of an unknown characteristic. If it is not a random sample, students must rewrite in order to make it a random sample. As closure, Teacher instructs students to explain how you use random samples to infer information about an unknown characteristic of interest. | Students complete bellwork question on their bellwork graphic organizer: What is a Random Sample? Give an example of a Random Sample. Discuss by sharing answers with face partner. Students take notes on instruction of Random Sampling with emphasis on the idea that Random Sampling can be used to draw inferences on an unknown characteristic of interest.<br>Students will use exactly 3 minutes to brainstorm as many examples as possible of random sampling that can be used to gather information about an unknown characteristic. Students will independently practice by identifying which examples are random samples that can be used to infer information about an unknown characteristic of interest and which are not examples. Students will participate in teacher review of the worksheet, and will highlight any areas they see that contribute to the example being a random sample, and rewrite any problems that are not random samples so they become accurate random samples. As closure, students must explain how to use random samples to infer information from about an unknown characteristic of interest. |

| | | |
|---|---|---|
| **2** | **Objective: Using their knowledge from yesterday's lesson, SWBAT Use random sampling to draw inferences about a population**<br>Teacher will review yesterday's lesson briefly and answer any questions. Students will be prompted to complete a project, and the data analysis portion serves as the first summative assessment. Using real data from the class in which they must randomly sample their classmates and draw inferences about the data. Teacher will give the following 3 questions for students to sample: How many siblings do you have? How many brothers do you have? How many sisters do you have? Teacher instructs students to sample by asking 5 random classmates and collect data. Teacher distributes summative assessment (separate from data collection), and instructs students to independently analyze data and answer the questions provided in the summative assessment. Teacher collects summative assessment. As closure, Teacher gathers class data, and as a class finds the real averages to compare the inferences based on the random samples to the actual data. | Students will ask any questions they have about yesterday's lesson before they begin first summative assessment project. Students will receive Project instructions/questions sheet to collect data and will first randomly sample the class asking the 3 questions (How many siblings do you have? How many brothers do you have? How many sisters do you have?). They will ask these questions to 5 separate classmates. Students will complete portion requiring them to collect data. Students will begin summative assessment in which they will analyze data and draw inferences based on their random samplings, and answer accompanying questions. As closure, students will then participate in sharing and computing data, finding out the average number of siblings, brother, and sisters within the class, and compare how accurate their inferences were. |
| **3** | **SWBAT Use random sampling to draw inferences about a population.**<br>Teacher will introduce large scale project/summative assessment in which students will design their own research questions and in which they sample a larger population. Teacher allows students 5 minutes to independently brainstorm research questions they could ask the entire school. Students must design an entire research project in which they randomly sample students within their school and infer information about the information. Teacher will show students the rubric and allow time in class for students to independently begin the project. Teacher will allow students time outside of class to complete this project and will give students 3 days until the final project is due, however this will be completed outside of class time. | Students will begin working on second summative assessment project during one class period independently, as well as outside of class. Students will first write the objective they wish to accomplish, in other words, what is the research they hope to accomplish? Students will design research questions, the questions and number of questions will be the student's decision. Students will randomly sample other students within the class to gather the data needed to infer information. Students will then write a description of their data sampling and their estimates of the data. Students must also include a written section about how they sampled, how they ensured the samples were random, and how accurate they believe this information is based on their estimate of the accurate data. |
| **4** | **Objective: SWBAT Use random sampling to draw inferences about a population.**<br>Teacher will distribute summative assessment in a formal written format. Teacher will instruct students will complete written summative assessment, which will take up the timeframe of an entire class period. | Students will complete written summative assessment, which will take the time of an entire class period. |

***1. Research Project***
***Data Collection***

| Students | How many siblings do you have? | How many brothers do you have? | How many sisters do you have? |
|---|---|---|---|
| Student 1 | | | |
| Student 2 | | | |
| Student 3 | | | |
| Student 4 | | | |
| Student 5 | | | |

**Summative Assessment**

1. Define a Random Sample:
2. Explain how a Random Sample can be used to infer information about an unknown characteristic interest.
3. Based on the above random sampling, infer information about the class average of siblings, brother, and sisters. What do you estimate are the class averages of each?
4. How did you ensure the samples you surveyed were **random?**
5. Based on what you know about random sampling, predict how accurate the inferred information is.
6. What could you have done to make this information more accurate?
7. Explain how random sampling to gather information about an unknown characteristic of interest is useful.

***Paste Answer Key/Scoring Rubric Here:***

1. A Random Sample is a sample in which every element in the population has an equal chance of being selected. 5 points
2. Random Samples can be used to draw overall conclusions about a population assuming the samples represent the entire population. 5 points.
   Responses will vary, inferred information should resemble the data collected in class, should reflect logic based on collected samples. 5 points.
3. Randomness is ensured by sampling different types of people within the population. 5 points.
4. Information tends to be almost accurate as it indicates an average, as long as the samples are taken from people representing an overall population, but these numbers are not 100% accurate. 5 points
5. Information will vary, should reflect the understanding that the sampling data represents the actual data and may differ. 5 points.
6. Answers can include: survey more people, survey greater variety of people, analyze samples better. 5 points.
7. Random sampling can be a useful tool to predict data when you do not have the time or resources to collect the full data. Random sampling is fairly accurate but not 100%. 10 points.

***2. Designed Research Project***

Directions: You will construct your own research question and state what you wish to learn through random sampling. You will design research questions of your own choice. Then, randomly sample other students within the class to gather the data needed to infer information. Write a description of your data sampling and your estimates of the data. You must also include a written section about how you sampled, how you ensured the samples were random, and how accurate you believe this information is.

| **Category** | **Level 4: Achieves Standards at a High Level** | **Level 3: Performance at Standard** | **Level 2: Performance below Standard** | **Level 1: Demonstrates Minimal Success** |
|---|---|---|---|---|
| **Question/ Purpose** | The purpose of the question to be answered during the lab is clearly identified and stated. | The purpose of the question to be answered during the lab is identified, but is stated in a somewhat unclear manner. | The purpose of the question to be answered during the lab is partially identified, and is stated in a somewhat unclear manner | The purpose of the question to be answered during the lab is erroneous or irrelevant. |
| **Data** | Professional looking and accurate representation of the data in tables and/or graphs. Graphs and tables are labeled and titled. | Essay addresses the prompt; however evidence may be inaccurate in places. | Accurate representation of the data in written form, but no graph or table is presented. | Data is not shown OR is inaccurate. |
| **Conclusion** | Conclusion includes whether the findings supported the hypothesis, possible sources of error, and what was learned from the experiment. | Conclusion includes whether the findings supported the hypothesis and what was learned from the experiment. | Conclusion includes what was learned from the experiment. | No conclusion was included in the report OR shows little effort and reflection. |
| **Replicability** | Procedures appear to be replicable. Steps are outlined sequentially and are adequately detailed. | Procedures appear to be replicable. Steps are outlined and are adequately detailed. | All steps are outlined, but there is not enough detail to replicate procedures. | Several steps are not outlined AND there is not enough detail to replicate procedures. |

### *3. Written Summative Assessment*

Directions: Select the best answer for each question.

**1.** The entire group of persons, places or things of interest to us that we **want to** collect observations from is known as a(n)

**A.** population
**B.** frame
**C.** sample
**D.** sample space
**E.** data set

**2.** The actual group of persons, places or things of interest to us that we **can** collect observations from is known as a(n)

**A.** population
**B.** frame
**C.** sample
**D.** sample space
**E.** data set

**3.** The group of persons, places or things of interest to us that we **actually** collect observations from is known as a(n)

**A.** population
**B.** frame
**C.** sample
**D.** sample space
**E.** data set

**4.** The population mean is a(n) _____, while the sample average is a(n)

**A.** population, sample
**B.** sample, population
**C.** parameter, statistic
**D.** statistic, parameter
**E.** sample space, data s

**5.** The sample average X-bar is the of the population mean m.
**A.** parameter
**B.** statistic
**C.** estimate
**D.** estimator
**E.** data set

**6.** The sample average X-bar = 63.5. The number 63.5 is the of the population mean m.
**A.** parameter
**B.** statistic
**C.** estimate
**D.** estimator
**E.** data set

**7.** The probability distribution of a statistic is called a(n)
**A.** population distribution
**B.** sampling distribution
**C.** estimate distribution
**D.** estimator distribution
**E.** data set distribution

**8.** The data set below contains information about a random sample of 15 individuals in an aerobics workout class at Northwest Athletic Club. What is your estimate of the mean age of the members? (Hint: the estimate, not the estimator)
**A.** 22.000
**B.** 25.889
**C.** 27.933
**D.** 29.344
**E. None of these**

Northwest Athletic Club Membership Data

| Age of Member | M/F | Number of Children | Member in Swimming Class? |
|---|---|---|---|
| 34 | F | 2 | Y |
| 39 | F | 1 | N |
| 35 | F | 1 | N |
| 25 | M | 0 | N |
| 20 | M | 0 | Y |
| 37 | F | 2 | Y |
| 15 | M | 0 | N |
| 22 | M | 0 | Y |
| 28 | F | 1 | N |
| 25 | F | 2 | Y |
| 33 | M | 3 | Y |
| 31 | M | 0 | N |
| 19 | F | 0 | Y |
| 29 | M | 1 | Y |
| 27 | F | 2 | N |

**Answer Key:**

**1.A 2.C 3.E 4.C 5.D 6.D 7.D 8. B**