

PROBABILITY OF RESISTANCE DISTRIBUTION

Performance Standard (8B/10C).I

Understand the difference between the outcome of the experiment and the outcome that they expected:

- *Mathematical knowledge*: analyze outcome of probability experiment and compare theoretic and empirical results.
- *Strategic knowledge*: solve problem using systematic process.
- *Explanation*: explain completely what was done and why it was done.

Procedures

1. ***In order to interpret and describe numerical relationships using tables, graphs and symbols (8B) and determine, describe and apply probabilities of events (10C)***, provide students with sufficient learning opportunities to develop the following:
 - Determine simple probabilities using frequency tables.
 - Construct empirical probability distributions using simulations.
 - Create and connect representations that are tabular, graphical, numeric and algebraic from a set of data.Many industrial related occupations require a basic knowledge of electricity and the effect resistance tolerance has on measured resistance distribution around a nominal value. This skill, combined with the ability to understand simple probability distributions and draw conclusions from data, is important to employees in these industrial related occupations. This assessment relates to the Illinois Workplace Skills H4 (Solving Problems and Critical Thinking/Employ reasoning skills) and H7 (Solving Problems and Critical Thinking/Select and implement a solution to a problem.)
2. Provide students with the assessment task worksheet. Have students work individually.
 - a. The student will use a digital multi-meter to measure 30 resistors that are of equal value and tolerance and from the same manufacturer. The results should be graphed to show resistance distribution verses the stated nominal value.
 - b. The student will repeat the experiment using a digital multi-meter to measure 30 resistors of equal value and tolerance from a different manufacturer. Ten resistors will be chosen from each of three different manufacturers. The results should be graphed to show resistance distribution verses the stated nominal value.
3. Use the standard scoring rubric. Give each student a score in each of the three categories. A score of 4 should indicate a complete description of the differences in empirical and theoretical probability using correct terminology and represent the data in both tabular and graphical form giving complete descriptions and interpretations for the information. A 3 should represent nearly complete discussion that demonstrates the correct ideas, but they may not have communicated them clearly. A 2 should indicate that students have some idea about how to answer the question but miss important points that affect their answers. A 1 generally shows little understanding in their discussion but at least shows some understanding of probability. A score of 0 generally reflects no understanding of probability.
4. The solution should demonstrate clear understanding of theoretical and empirical probability results and ideas about probability distributions around the mean. Students should refer to their data tables and graphs to clarify their explanation.

Examples of Student Work

- [Meets](#)
- [Exceeds](#)

Time Requirements

- One class period

Resources

- Copies of the “Probability of Resistance Distribution” task sheet
- Writing utensil
- Graph paper
- 30 of the same resistors from the same manufacturer
- 10 of the same resistors from 3 different manufacturers
- Digital multi-meter
- Mathematics Rubric

MATHEMATICS RUBRIC

NAME _____ DATE _____

- Exceeds standard (must receive a 4 in each area)
- Meets standard (must receive all 3's or a combination of 3's and 4's)
- Approaches standard (must receive all 2's or any combination which may include a 3 or a 4)
- Begins standard (has no 3's or 4's but not all 1's)
- Absent (has all 1's and 0's)

	Mathematical Knowledge	Strategic Knowledge	Explanation
4	<ul style="list-style-type: none"> • Wrote the right answer. • Used math words correctly to show understanding of how math works. • Worked it out with no mistakes. • Used the right math words and labeled the answers. 	<ul style="list-style-type: none"> • Identified all the important parts of the problem, and knew how they went together. • Showed all the steps used to solve the problem. 	<ul style="list-style-type: none"> • Wrote what was done and why it was done. • If a drawing was used, all of it was explained in writing.
3	<ul style="list-style-type: none"> • Knew how to do the problem, but made small mistakes. 	<ul style="list-style-type: none"> • Identified most of the important parts of the problem. • Showed most of the steps used to solve the problem. 	<ul style="list-style-type: none"> • Wrote mostly about what was done. • Wrote a little about why it was done. • If a drawing was used most of it was explained in writing.
2	<ul style="list-style-type: none"> • Understood a little, but made a lot of big mistakes. 	<ul style="list-style-type: none"> • Identified some of the important parts of the problem. • Showed some of the steps used to solve the problem. 	<ul style="list-style-type: none"> • Wrote some about what was done or why it was done but not both. • If a drawing was used, some of it was explained in writing.
1	<ul style="list-style-type: none"> • Tried to do the problem, but didn't understand it. 	<ul style="list-style-type: none"> • Identified almost no important parts of the problem. • Showed almost none of the steps used to solve the problem. 	<ul style="list-style-type: none"> • Wrote or drew something that didn't go with the answer. • Wrote an answer that was not clear.
0	<ul style="list-style-type: none"> • No answer attempted. 	<ul style="list-style-type: none"> • No strategy shown. 	<ul style="list-style-type: none"> • No written explanation.
Score			