South Carolina Employability Credential

Essentials of Math 3: Practical Reasoning in Mathematics

DATA, PROBABILITY, AND STATISTICAL REASONING

1 **Apply statistical reasoning to complete investigations.** RM.DPSR.1

1 Formulate a statistical question and develop a statistical method to address questions/studies through exploration of the research cycle. Discuss data sources (including what constitutes primary data and secondary data) and the ethics of data collection, particularly with human subjects. RM.DPSR.1.1

2 Write and identify a null hypothesis and an alternative hypothesis, as well as what makes up an experimental study. Introduce case studies, then determine whether given studies are observational or experimental and learn about identification of participants, assignment of treatments, and the placebo effect. RM.DPSR.1.2

3 Identify the population of interest and the variables to be used in each study. Determine the appropriate sampling design, sampling technique, and statistical analysis for each research question. Identify various sampling techniques used. RM.DPSR.1.3

2 **Analyze data of a statistical experiment.** RM.DPSR.2

1 Compare and contrast categorical and quantitative data. The focus is narrowed to quantitative data and then to univariate data. RM.DPSR.2.1

2 Identify the variable of interest, interpret a variety of graphical displays (particularly histograms and box plots), and estimate center, spread, shape, outliers, and unusual features. RM.DPSR.2.2

3 Analyze histograms in depth, analyzing the effect of changing the bin size (also known as interval width). Consider having students explore these concepts in a research project. Use technology to construct graphical representations. RM.DPSR.2.3

4 Analyze the appropriateness and usefulness of the chosen measure of center and of the graphical display. Consider having students explore these concepts in a research project. RM.DPSR.2.4

5 Analyze the shape, spread, and unusual features of data sets and identify limitations based on data collection. Consider having students explore these concepts in a research project. RM.DPSR.2.5

3 **Explore the sources of variability in sampling methods.** RM.DPSR.3

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1 Analyze possible sources of variability in the data, including biased sampling methods (such as non-representative sampling and under coverage) and biased statistics, as well as natural and induced variability. Explore the importance of designing surveys and/or observation instruments as students finalize their own study and presentation of their results. RM.DPSR.3.1

2 Identify and explore various possible sources of statistical bias (such as response bias, nonresponse bias, and observer effect) and examine the effects of statistical bias on the generalizability of results. Investigate and explore bias, such as response bias. RM.DPSR.3.2

MEASUREMENT, GEOMETRY, AND SPATIAL REASONING

1 Identify transformations using matrices RM.MGSR.1

1 Use matrices to organize information and identify matrices that can be used to describe geometric transformations. Represent figures using matrices and then look at ways of determining different matrices that answer questions arising from different situations. Students will create and “move” their own figures using matrices, as seen in animation. RM.MGSR.1.1

2 Represent figures using matrices and explore ways of determining different transformations (translations, reflection, rotations, dilations, or combinations). Optionally, students can use freely available dynamic geometry software to apply in real-world situations. RM.MGSR.1.2

2 Analyze truth tables to validate real-world situations. RM.MGSR.2

1 Analyze truth tables to determine and verify the validity of arguments. Work with a variety of statements and arguments, which quickly become more complicated and generally more applicable. RM.MGSR.2.1

2 Create arguments and statements to validate arguments. Work with a variety of statements and arguments, which quickly become more complicated and generally more applicable. Have students validate their own arguments, as well as those of peers. RM.MGSR.2.2

NUMERICAL REASONING

1 Analyze numerical data through estimation and approximation in real-world situations. RM.NR.1

1 Use various numerical techniques when estimating and calculating very large and small values. Real-world situations may include assessing the size of a crowd and calculating the number of possible telephone numbers in the US. RM.NR.1.1

2 Apply proportional reasoning with aspect ratios. Include aspect ratios in photography, in movies and theaters, and on TV. RM.NR.1.2

3 Use weighted averages and sums. Decision making may include the best grading system, averages in sports ratings, cost indices for attending an event, and the Gunning Fog Index for measuring the readability of a piece of writing. RM.NR.1.3

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4 Investigate and validate identification numbers. Investigate real-world situations of identification numbers, including, but not limited to, check digits to prevent fraud, and creation of Universal Product Codes (UPCs). Decision making may include choosing the appropriate number of digits necessary to create unique ID numbers RM.NR.1.4

2 Analyze present and future value of investments involving interest. RM.NR.2

1 Compare and contrast the nominal interest rate with the annual percentage rate (APR). Use exponential functions representing the future value of an investment compounded annually and monthly. RM.NR.2.1

2 Determine the future value of an investment, given the present value. Investigate the present value of an annuity. RM.NR.2.2

3 Analyze real-world scenarios involving credit card debt and loans. RM.NR.3

1 Determine the monthly payment to retire a debt at a fixed rate. Use credit card statements to understand the concept of minimum payment, length of time to pay off debt using minimum payments, and the APR of minimum payments. RM.NR.3.1

2 Compare and contrast different credit card offers using minimum payments. Compare bank or credit union car loans, automobile dealer car loans, and cashback features. RM.NR.3.2

PATTERNS, ALGEBRA, AND FUNCTIONAL REASONING

1 Analyze regression of linear functions. RM.PAFR.1

1 Compute and analyze the correlation coefficient of data to determine the strength of the linear model. Explore data that follows an exponential pattern using the idea of a common ratio between consecutive values. Decision making may include determining an appropriate model and how far one could safely extrapolate. RM.PAFR.1.1

2 Analyze data that follow a linear pattern using recursively defined rules and compare those rules to explicit function rules. Students should be familiar with finding recursive and explicit formulas of arithmetic sequences. RM.PAFR.1.2

2 Analyze step and piecewise functions in real-world situations. RM.PAFR.2

1 Explore step and piecewise functions to make predictions and decisions about a variety of mathematical and real-world situations. Consider the use of scatter plots to assess the validity of a model and the function rule to determine values of the function at specific points in time. Students use these values to make predictions and decisions about a variety of problem situations. RM.PAFR.2.1

3 Analyze data that follow an exponential pattern using the idea of a common ratio between consecutive values. RM.PAFR.3

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1 Find recursive rules to model data and make connections between the recursive rule and the explicit function rule of the exponential relationship. Consider including the following to help develop students' understanding: • Recursion in Exponential Growth and Decay (example: Recursion and Exponential Functions and comparing models) • Recursion using Rate of Change (examples: Newton's Law of Coding; Rates of Change in Exponential Models) • Recursion in Cyclical Models RM.PAFR.3.1