MTFC Common Core Standards Connection

Common Core Mathematical Practice Standards that pertain to students research and writing of the 1-page Project Proposal (and subsequent Challenge or Quest Project Reports).

The standards that would apply to every MTFC Project come from the 8 Math Practice Standards:

- ☐ CCSS.MATH.PRACTICE.MP1 Make sense of problems and persevere in solving them.
- ☐ CCSS.MATH.PRACTICE.MP2 Reason abstractly and quantitatively.
- ☐ CCSS.MATH.PRACTICE.MP3 Construct viable arguments and critique the reasoning of others.
- ☐ CCSS.MATH.PRACTICE.MP4 Model with mathematics.
- ☐ CCSS.MATH.PRACTICE.MP5 Use Appropriate Tools Strategically

The following concepts are highlighted in the training scenarios in the MTFC Resource Library.

https://www.mtfchallenge.org/training-scenarios/

Basic Training Scenario:
Phone Insurance

- Means, standard deviation, variance
- Basic probabilities
- Conditional probabilities
- Expected value calculations
- Mathematical Logic
- Critical thinking & problem solving skills
- Insurance basics, deductibles, premiums

Basic Training Scenario:
Federal Crop Insurance Corporation

- Calculating expected values
- Mean values, standard deviations
- Basic probabilities
- Mathematical logic
- Critical thinking & problem solving
- Applied Probability & Statistics
- Insurance basics, deductibles, and premiums.

Example Scenario:
Farm Insurance

- Probabilities, conditional probabilities
- Binomial probability
- Means
- Standard deviation
- Two-way frequency table
- Linear regression
- Expected value
- Probability distributions
- Mathematical Logic
- Critical thinking & problem solving skills
- Insurance concepts, deductibles, premiums

Example Scenario:
Flood Insurance

- Critical thinking
- Means
- Standard deviation, variance
- Probabilities, conditional probability
- Probability distributions, charts
- Linear regression
- Correlation coefficients
- Mathematical Logic
- Critical thinking & problem solving skills
- Insurance basics, deductibles, premiums

Common Core Math Standards

High School Statistics and Probability

☐ *Calculate expected values and use them to solve problems*

 ☐ **CCSS.MATH.CONTENT.HSS.MD.A.1 (+)** Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.

 ☐ **CCSS.MATH.CONTENT.HSS.MD.A.2 (+)** Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.

 ☐ **CCSS.MATH.CONTENT.HSS.MD.A.3.　　(+)** Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value. For example, find the theoretical probability distribution for the number of correct answers obtained by guessing on all five questions of a multiple-choice test where each question has four choices, and find the expected grade under various grading schemes.

 ☐ **CCSS.MATH.CONTENT.HSS.MD.A.4 (+)** Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value.

☐ *Use probability to evaluate outcomes of decisions*

 ☐ **CCSS.MATH.CONTENT.HSS.MD.A.5 (+)** Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.

 ☐ **CCSS.MATH.CONTENT.HSS.MD.A.6 (+)** Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).

 ☐ **CCSS.MATH.CONTENT.HSS.MD.A.7 (+)** Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).

☐ *Understand and evaluate random processes underlying statistical experiments*

 ☐ **CCSS.MATH.CONTENT.HSS.IC.A.1** Understand statistics as a process for making inferences about population parameters based on a random sample from that population.

 ☐ **CCSS.MATH.CONTENT.HSS.IC.A.2** Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.

☐ *Make inferences and justify conclusions from sample surveys, experiments, and observational studies*

 ☐ **CCSS.MATH.CONTENT.HSS.IC.B.3** Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.

 ☐ **CCSS.MATH.CONTENT.HSS.IC.B.4** Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.

 ☐ **CCSS.MATH.CONTENT.HSS.IC.B.5** Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.

 ☐ **CCSS.MATH.CONTENT.HSS.IC.B.6** Evaluate reports based on data.

☐ *Summarize, represent, and interpret data on two categorical and quantitative variables*

   ☐ **CCSS.MATH.CONTENT.HSS.ID.B.5** Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.

   ☐ **CCSS.MATH.CONTENT.HSS.ID.B.6** Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

   ☐ **CCSS.MATH.CONTENT.HSS.ID.B.6.A** Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.

   ☐ **CCSS.MATH.CONTENT.HSS.ID.B.6.B** Informally assess the fit of a function by plotting and analyzing residuals.

   ☐ **CCSS.MATH.CONTENT.HSS.ID.B.6.C** Fit a linear function for a scatter plot that suggests a linear association.

☐ *Interpret linear models*

   ☐ **CCSS.MATH.CONTENT.HSS.ID.C.7** Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

   ☐ **CCSS.MATH.CONTENT.HSS.ID.C.8** Compute (using technology) and interpret the correlation coefficient of a linear fit.

   ☐ **CCSS.MATH.CONTENT.HSS.ID.C.9** Distinguish between correlation and causation.

Common Core ELA Writing Standards

☐ **Text Types and Purposes:**

- ☐ **CCSS.ELA-LITERACY.W.11-12.1** Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
  - ☐ **CCSS.ELA-LITERACY.W.11-12.1.A** Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences claim(s), counterclaims, reasons, and evidence.
  - ☐ **CCSS.ELA-LITERACY.W.11-12.1.B** Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant evidence for each while pointing out the strengths and limitations of both in a manner that anticipates the audience's knowledge level, concerns, values, and possible biases.
  - ☐ **CCSS.ELA-LITERACY.W.11-12.1.C** Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
  - ☐ **CCSS.ELA-LITERACY.W.11-12.1.D** Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
  - ☐ **CCSS.ELA-LITERACY.W.11-12.1.E** Provide a concluding statement or section that follows from and supports the argument presented.
- ☐ **CCSS.ELA-LITERACY.W.11-12.2** Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
  - ☐ **CCSS.ELA-LITERACY.W.11-12.2.A** Introduce a topic; organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
  - ☐ **CCSS.ELA-LITERACY.W.11-12.2.B** Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
  - ☐ **CCSS.ELA-LITERACY.W.11-12.2.C** Use appropriate and varied transitions and syntax to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
  - ☐ **CCSS.ELA-LITERACY.W.11-12.2.D** Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.
  - ☐ **CCSS.ELA-LITERACY.W.11-12.2.E** Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
  - ☐ **CCSS.ELA-LITERACY.W.11-12.2.F** Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

- [ ] **Production and Distribution of Writing:**
  - [ ] **CCSS.ELA-LITERACY.W.11-12.4** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
  - [ ] **CCSS.ELA-LITERACY.W.11-12.5** Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
  - [ ] **CCSS.ELA-LITERACY.W.11-12.6** Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
- [ ] **Research to Build and Present Knowledge:**
  - [ ] **CCSS.ELA-LITERACY.W.11-12.7** Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
  - [ ] **CCSS.ELA-LITERACY.W.11-12.8** Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
  - [ ] **CCSS.ELA-LITERACY.W.11-12.9** Draw evidence from literary or informational texts to support analysis, reflection, and research.
  - [ ] **CCSS.ELA-LITERACY.W.11-12.9.B** Apply grades 11-12 Reading standards to literary nonfiction.
- [ ] **Range of Writing:**
  - [ ] CCSS.ELA-LITERACY.W.11-12.10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.