

Mathematics of Industry & Government

Adopted 2021

Mathematical Practices

MP. Display perseverance and patience in problem-solving. Demonstrate skills and strategies needed to succeed in mathematics, including critical thinking, reasoning, and effective collaboration and expression. Seek help and apply feedback. Set and monitor goals. **MIG.MP**

1. Make sense of problems and persevere in solving them. **MIG.MP.1**

2. Reason abstractly and quantitatively. **MIG.MP.2**

3. Construct viable arguments and critique the reasoning of others. **MIG.MP.3**

4. Model with mathematics. **MIG.MP.4**

5. Use appropriate tools strategically. **MIG.MP.5**

6. Attend to precision. **MIG.MP.6**

7. Look for and make use of structure. **MIG.MP.7**

8. Look for and express regularity in repeated reasoning. **MIG.MP.8**

Mathematical Modeling

1. Apply mathematics to real-life situations; model real-life phenomena using mathematics. **MIG.MM.1**

1. Explain contextual, mathematical problems using a mathematical model. **MIG.MM.1.1**

2. Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities contexts. **MIG.MM.1.2**

3. Using abstract and quantitative reasoning, make decisions about information and data from a contextual situation. **MIG.MM.1.3**

4. Use various mathematical representations and structures with this information to represent and solve real-life problems. **MIG.MM.1.4**

Abstract Reasoning & Deterministic Decision-

2. Solve contextual, mathematical problems involving linear programming and use the mathematics as a model to make decisions about real life

Making – Linear Programming

phenomena. [MIG.ARDDM.2](#)

1. Use advanced linear programming to make decisions and interpret results in real-life contexts. [MIG.ARDDM.2.1](#)
 2. Distinguish among continuous, integer, and binary contexts [MIG.ARDDM.2.2](#)
 3. Model and interpret results of a contextual problem with three or more variables using linear programming. [MIG.ARDDM.2.3](#)
 4. Solve problems with three or more variables using technology and principles of linear programming. [MIG.ARDDM.2.4](#)
 5. Examine cause and effect of contextual changes. [MIG.ARDDM.2.5](#)
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Abstract Reasoning & Deterministic Decision-Making – Optimal Locations

3. Solve contextual, mathematical problems involving optimal locations and use the mathematics as a model to make decisions about real life phenomena. [MIG.ARDDM.3](#)

1. Find the optimal median location in a one-dimensional context. [MIG.ARDDM.3.1](#)
 2. Find the optimal median location in a rectilinear context. [MIG.ARDDM.3.2](#)
 3. Find the optimal location given three equally weighted, noncollinear points [MIG.ARDDM.3.3](#)
 4. Find the optimal location in a set covering context. [MIG.ARDDM.3.4](#)
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Abstract Reasoning & Deterministic Decision-Making – Optimal Paths

4. Solve contextual, mathematical problems involving optimal paths and use the mathematics as a model to make decisions about real life phenomena. [MIG.ARDDM.4](#)

1. Relate context to a network representation. [MIG.ARDDM.4.1](#)
 2. Apply appropriate recursive algorithms. [MIG.ARDDM.4.2](#)
 3. Examine alternate decisions in response to contextual changes. [MIG.ARDDM.4.3](#)
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Abstract Reasoning & Probabilistic Decision-Making – Normal Distributions

5. Solve contextual, mathematical problems with normal distributions to make appropriate decisions. [MIG.ARPDM.5](#)

1. Use properties of normal distributions to make decisions about optimization and efficiency. [MIG.ARPDM.5.1](#)
 2. Calculate, analyze and interpret theoretical and empirical probabilities using standardized and non-standardized data. [MIG.ARPDM.5.2](#)
 3. Consider contextual factors and investigate issues within the decision-making process. [MIG.ARPDM.5.3](#)
 4. Apply techniques to quality control settings. [MIG.ARPDM.5.4](#)
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Abstract Reasoning & Probabilistic Decision-Making – Binomial, Geometric, and Poisson Distributions

6. Solve contextual, mathematical problems using other distributions (e.g., binomial, geometric, and Poisson) as well as simulations to make appropriate decisions. [MIG.ARPDM.6](#)

1. Calculate theoretical and empirical probabilities using standardized and non-standardized data. [MIG.ARPDM.6.1](#)
 2. Analyze and interpret the probabilities in terms of context. [MIG.ARPDM.6.2](#)
 3. Consider contextual factors and investigate issues within the decision-making process. [MIG.ARPDM.6.3](#)
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Probabilistic Reasoning – Probabilistic Models

7. Use probabilistic models to make appropriate decisions. [MIG.PR.7](#)

1. Use program evaluation review technique (PERT) to investigate completion times of a project. [MIG.PR.7.1](#)
 2. Develop and apply transition matrices to make predictions using Markov Chains. [MIG.PR.7.2](#)
 3. Apply queuing theory [MIG.PR.7.3](#)
 4. Consider contextual factors and investigate issues within the decision-making process. [MIG.PR.7.4](#)
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Abstract Reasoning & Probabilistic Decision- Making – Simulations

8. Use simulations to make appropriate decisions. [MIG.ARPDM.8](#)

1. Use technology to simulate a real-world situation. [MIG.ARPDM.8.1](#)
 2. Analyze, evaluate, and interpret results of simulations. [MIG.ARPDM.8.2](#)
 3. Examine alternate decisions in response to contextual changes of simulations. [MIG.ARPDM.8.3](#)
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Abstract Reasoning & Probabilistic Decision- Making – Fair Representation

9. Using quantitative reasoning, determine fair methods to reflect the wishes of a larger population with representatives. [MIG.ARPDM.9](#)

1. Develop and analyze fair methods for voting. [MIG.ARPDM.9.1](#)
2. Develop and analyze fair methods for apportioning representatives. [MIG.ARPDM.9.2](#)
3. Develop fair methods for setting voting district boundaries. [MIG.ARPDM.9.3](#)