<table>
<thead>
<tr>
<th>Grade-Level Standard</th>
<th>DLM Essential Element</th>
<th>Linkage Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.N-CN.2.a</td>
<td>M.EE.N-CN.2.a</td>
<td></td>
</tr>
<tr>
<td>Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers</td>
<td>Use the commutative, associative, and distribute properties to add, subtract, and multiply whole numbers</td>
<td>Initial Precursor:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Recognize separateness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Recognize set</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Recognize subset</td>
</tr>
<tr>
<td>Distal Precursor:</td>
<td></td>
<td>• Combine sets</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Demonstrate the concept of addition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Combine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Demonstrate the concept of multiplication</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Solve repeated addition problems</td>
</tr>
<tr>
<td>Proximal Precursor:</td>
<td></td>
<td>• Add 1 and 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Add 1 to 2, 3, and/or 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Add within 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Add within 10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Add within 20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Multiply by 1, 2, 3, 4, 5, and/or 10</td>
</tr>
<tr>
<td>Target:</td>
<td></td>
<td>• Apply associative property of addition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Apply commutative property of addition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Apply the commutative property of multiplication</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Apply the associative property of multiplication</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Apply the distributive property</td>
</tr>
<tr>
<td>Successor:</td>
<td></td>
<td>• Explain the associative property of addition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Explain the commutative property of addition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Explain the commutative property of multiplication</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Explain the distributive property</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Explain the associative property of multiplication</td>
</tr>
</tbody>
</table>
A diagram showing the relationship of nodes in the mini-map appears below.

Key to map codes in upper right corner of node boxes:

- **IP**: Initial Precursor
- **SP**: Supporting
- **DP**: Distal Precursor
- **S**: Successor
- **PP**: Proximal Precursor
- **UN**: Untested
- **T**: Target

**M.EE.N-CN.2.a** Use the commutative, associative, and distribute properties to add, subtract, and multiply whole numbers
<table>
<thead>
<tr>
<th>Grade-Level Standard</th>
<th>DLM Essential Element</th>
<th>Linkage Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.N-CN.2</td>
<td>Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers</td>
<td>M.EE.N-CN.2.b Solve real-world problems involving addition and subtraction of decimals and whole numbers, using models when needed</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Initial Precursor:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Recognize set</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Recognize separateness</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Distal Precursor:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Recognize a unit</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Explain ten as a composition of ten ones</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Explain place value for ones and tens</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Proximal Precursor:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Add 2 decimals with digits in the tenths place</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Subtract 2 decimals with digits in the tenths place</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Target:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Solve word problems involving addition with rational numbers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Solve word problems involving subtraction with rational numbers</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Successor:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Solve multi-step problems with rational numbers</td>
</tr>
</tbody>
</table>

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A diagram showing the relationship of nodes in the mini-map appears below.

**Key to map codes in upper right corner of node boxes:**

- **IP** Initial Precursor
- **DP** Distal Precursor
- **PP** Proximal Precursor
- **SP** Supporting
- **T** Target
- **S** Successor
- **UN** Untested
M.EE.N-CN.2.b Solve real-world problems involving addition and subtraction of decimals, using models when needed
### Essential Element, Linkage Levels, and Mini-Map

**Math: High School**  
**M.EE.N-CN.2.c**

<table>
<thead>
<tr>
<th>Grade-Level Standard</th>
<th>DLM Essential Element</th>
<th>Linkage Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.N-CN.2</td>
<td>Use the relation $i^2 = -1$ and the commutative, associative, and distributive</td>
<td><strong>Initial Precursor:</strong></td>
</tr>
<tr>
<td></td>
<td>properties to add, subtract, and multiply complex numbers</td>
<td>• Recognize separateness</td>
</tr>
<tr>
<td></td>
<td>M.EE.N-CN.2.c Solve real-world problems involving multiplication of decimals and</td>
<td><strong>Distal Precursor:</strong></td>
</tr>
<tr>
<td></td>
<td>whole numbers, using models when needed</td>
<td>• Recognize a unit</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Explain place value for ones and tens</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Explain ten as a composition of ten ones</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Proximal Precursor:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Multiply 2 decimals with digits in the tenths</td>
</tr>
<tr>
<td></td>
<td></td>
<td>place</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Target:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Solve word problems involving multiplication</td>
</tr>
<tr>
<td></td>
<td></td>
<td>with rational numbers</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Successor:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Solve multi-step problems with rational numbers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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- SP: Supporting
- S: Successor
- UN: Untested
- T: Target
M.EE.N-CN.2.c Solve real-world problems involving multiplication of decimals and whole numbers, using models when needed
**M.EE.N-RN.1**

<table>
<thead>
<tr>
<th>Grade-Level Standard</th>
<th>DLM Essential Element</th>
<th>Linkage Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.EE.N-RN.1</td>
<td>M.EE.N-RN.1</td>
<td>Initial Precursor:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Combine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Combine sets</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Demonstrate the concept of addition</td>
</tr>
<tr>
<td></td>
<td>Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. For example, we define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5^{(1/3)3}$ to hold, so $(5^{1/3})^3$ must equal 5</td>
<td>Distal Precursor:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Explain repeated addition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Represent repeated addition with a model</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Solve repeated addition problems</td>
</tr>
<tr>
<td></td>
<td>Determine the value of quantity that is squared or cubed</td>
<td>Proximal Precursor:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Explain product</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Explain multiplication problems</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Demonstrate the concept of multiplication</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Target:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Evaluate expressions with whole number exponents</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Successor:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Explain perfect cubes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Explain perfect squares</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
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<th>Description</th>
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<td>Distal Precursor</td>
</tr>
<tr>
<td>PP</td>
<td>Proximal Precursor</td>
</tr>
<tr>
<td>T</td>
<td>Target</td>
</tr>
<tr>
<td>SP</td>
<td>Supporting</td>
</tr>
<tr>
<td>S</td>
<td>Successor</td>
</tr>
<tr>
<td>UN</td>
<td>Untested</td>
</tr>
</tbody>
</table>
**M.EE.N-RN.1** Determine the value of quantity that is squared or cubed
# ESSENTIAL ELEMENT, LINKAGE LEVELS, AND MINI-MAP

## MATH: HIGH SCHOOL

### M.EE.S-CP.1-5

<table>
<thead>
<tr>
<th>Grade-Level Standard</th>
<th>DLM Essential Element</th>
<th>Linkage Levels</th>
</tr>
</thead>
</table>
| **M.S-CP.1** Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (“or,” “and,” “not”); **M.S-CP.2** Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent; **M.S-CP.3** Understand the conditional probability of A given B as \( P(A \text{ and } B) / P(B) \), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B; **M.S-CP.4** Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities; **M.S-CP.5** Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations | **M.EE.S-CP.1-5** Identify when events are independent or dependent | *Initial Precursor:*  
- Compare objects for sameness  
- Arrange objects in pairs  
- Contrast objects  
*Distal Precursor:*  
- Classify  
*Proximal Precursor:*  
- Recognize possible outcomes  
- Explain simple events  
- Recognize impossible outcomes  
*Target:*  
- Determine if 2 events are independent or dependent  
*Successor:*  
- Explain compound events |

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<th>Description</th>
</tr>
</thead>
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<td>Initial Precursor</td>
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<tr>
<td>DP</td>
<td>Distal Precursor</td>
</tr>
<tr>
<td>PP</td>
<td>Proximal Precursor</td>
</tr>
<tr>
<td>SP</td>
<td>Supporting</td>
</tr>
<tr>
<td>S</td>
<td>Successor</td>
</tr>
<tr>
<td>UN</td>
<td>Untested</td>
</tr>
<tr>
<td>T</td>
<td>Target</td>
</tr>
</tbody>
</table>

**M.EE.S-CP.1-5** Identify when events are independent or dependent
# Essential Element, Linkage Levels, and Mini-Map

**Math: High School**

**M.EE.S-IC.1-2**

<table>
<thead>
<tr>
<th>Grade-Level Standard</th>
<th>DLM Essential Element</th>
<th>Linkage Levels</th>
</tr>
</thead>
</table>
| **M.S-IC.1** Understand statistics as a process for making inferences about population parameters based on a random sample from that population; **M.S-IC.2** Decide if a specified model is consistent with results from a given data generating process, e.g., using simulation. For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model? | **M.EE.S-IC.1-2** Determine the likelihood of an event occurring when the outcomes are equally likely to occur | **Initial Precursor:**  
- Compare objects for sameness  
- Arrange objects in pairs  

**Distal Precursor:**  
- Recognize outcomes of an event  
- Recognize possible outcomes  

**Proximal Precursor:**  
- Recognize sample space  

**Target:**  
- Determine theoretical probability of a simple event where all outcomes are equally likely  

**Successor:**  
- Determine theoretical probability of simple event where some outcomes are more likely than others |

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- **SP** Supporting
- **DP** Distal Precursor
- **S** Successor
- **PP** Proximal Precursor
- **UN** Untested
- **T** Target
M.EE.S-IC.1-2 Determine the likelihood of an event occurring when the outcomes are equally likely to occur
# Essential Element, Linkage Levels, and Mini-Map
## Math: High School
### M.EE.G.CO.1

<table>
<thead>
<tr>
<th>Grade-Level Standard</th>
<th>DLM Essential Element</th>
<th>Linkage Levels</th>
</tr>
</thead>
</table>
| M.G.CO.1 Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc | M.EE.G.CO.1 Know the attributes of perpendicular lines, parallel lines, and line segments, angles, and circles | **Initial Precursor:**  
- Recognize same  
- Recognize different  
- Recognize attribute values  

**Distal Precursor:**  
- Recognize point  
- Recognize ray  
- Recognize angle  
- Recognize right angles  

**Proximal Precursor:**  
- Recognize circles  
- Recognize parallel lines/line segments  
- Recognize perpendicular lines/line segments  

**Target:**  
- Define circle  
- Explain angle  
- Explain perpendicular lines/line segments  
- Explain parallel lines/line segments  

**Successor:**  
- Explain straight angles  
- Explain adjacent angles  
- Explain vertical angles  

---

A diagram showing the relationship of nodes in the mini-map appears below.

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- SP: Supporting  
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- S: Successor  
- PP: Proximal Precursor  
- UN: Untested  
- T: Target
M.EE.G.CO.1 Know the attributes of perpendicular lines, parallel lines, and line segments, angles, and circles

- F-76 recognize different
- F-65 recognize attribute values
- F-2 recognize same
- F-46 match the same two-dimensional shape with different sizes and same orientation
- M-823 recognize point
- M-822 recognize ray
- M-833 recognize right angles
- M-803 recognize angle
- M-820 recognize parallel lines/line segments
- M-131 recognize circles
- M-2634 classify same two-dimensional shapes with same size and same orientation
- M-831 classify same two-dimensional shapes with different size and different orientation
- M-2441 recognize intersecting lines/line segments
- M-1920 give an informal argument for the formula for circumference
- M-1630 define circle
- M-829 explain parallel lines/line segments
- M-790 explain angle
- M-2440 explain intersecting lines/line segments
- M-827 explain perpendicular lines/line segments
- M-1338 explain vertical angles
- M-1447 explain straight angles
- M-1342 explain adjacent angles
- M-840 represent perpendicular lines/line segments
- M-767 explain line segment
## Essential Element, Linkage Levels, and Mini-Map

**Math: High School**

### M.EE.G-CO.4-5

<table>
<thead>
<tr>
<th>Grade-Level Standard</th>
<th>DLM Essential Element</th>
<th>Linkage Levels</th>
</tr>
</thead>
</table>
| M.G-CO-4             | Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments; | M.EE.G-CO.4-5 Given a geometric figure and a rotation, reflection, or translation of that figure, identify the components of the two figures that are congruent | Initial Precursor:  
- Recognize same  
- Recognize different |
| M.G-CO.5             | Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another | Distal Precursor:  
- Match the same three-dimensional shapes with same size and different orientation  
- Match the same two-dimensional shape with same sizes and different orientations |

### Initial Precursor:
- Recognize same  
- Recognize different

### Distal Precursor:
- Match the same three-dimensional shapes with same size and different orientation  
- Match the same two-dimensional shape with same sizes and different orientations

### Proximal Precursor:
- Recognize translation  
- Recognize rotation  
- Recognize reflection  
- Recognize congruent figures

### Target:
- Explain the relationship between congruent figures and transformation

### Successor:
- Use a sequence of transformations to describe congruence of 2 given figures

---

A diagram showing the relationship of nodes in the mini-map appears below.

**Key to map codes in upper right corner of node boxes:**

- **IP** Initial Precursor  
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- **PP** Proximal Precursor  
- **T** Target  
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- **UN** Untested

---

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Given a geometric figure and a rotation, reflection, or translation of that figure, identify the components of the two figures that are congruent.
## Grade-Level Standard

**M.G-CO.6** Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent; **M.G-CO.7** Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent; **M.G-CO.8** Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.

## DLM Essential Element

**M.EE.G-CO.6-8** Identify corresponding congruent and similar parts of shapes.

## Linkage Levels

<table>
<thead>
<tr>
<th><strong>Initial Precursor:</strong></th>
<th>Recognize same</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Distal Precursor:</strong></td>
<td>Recognize different</td>
</tr>
<tr>
<td><strong>Proximal Precursor:</strong></td>
<td>Match the same two-dimensional shape with different sizes and same orientation</td>
</tr>
<tr>
<td></td>
<td>Match the same two-dimensional shape with same size and same orientation</td>
</tr>
<tr>
<td></td>
<td>Match the same three-dimensional shape with different size and same orientation</td>
</tr>
<tr>
<td></td>
<td>Match the same three-dimensional shape with same size and same orientation</td>
</tr>
<tr>
<td><strong>Target:</strong></td>
<td>Recognize congruent figures</td>
</tr>
<tr>
<td></td>
<td>Recognize similar figures</td>
</tr>
<tr>
<td><strong>Successor:</strong></td>
<td>Explain congruent figures</td>
</tr>
<tr>
<td></td>
<td>Explain similar figures</td>
</tr>
<tr>
<td></td>
<td>Explain the relationship between congruent figures and transformation</td>
</tr>
<tr>
<td></td>
<td>Explain the relationship between similar figures and transformation</td>
</tr>
</tbody>
</table>
A diagram showing the relationship of nodes in the mini-map appears below.

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- **SP** Supporting
- **DP** Distal Precursor
- **S** Successor
- **PP** Proximal Precursor
- **UN** Untested
- **T** Target

**M.EE.G-CO.6-8** Identify corresponding congruent and similar parts of shapes
# Essential Element, Linkage Levels, and Mini-Map
## Math: High School
### M.EE.G-MG.1-3

<table>
<thead>
<tr>
<th>Grade-Level Standard</th>
<th>DLM Essential Element</th>
<th>Linkage Levels</th>
</tr>
</thead>
</table>
| M.G-MG.1 Use geometric shapes, their measures, and their properties to describe objects; M.G-MG.2 Apply concepts of density based on area and volume in modeling situations M.G-MG.3 Apply geometric methods to solve design problems | M.EE.G-MG.1-3 Use properties of geometric shapes to describe real-life objects | **Initial Precursor:**  
- Recognize same  
- Recognize different  

**Distal Precursor:**  
- Match the same two-dimensional shape with same size and same orientation  
- Match the same two-dimensional shape with different size and same orientation  
- Match the same three-dimensional shapes with same size and same orientation  
- Match the same three-dimensional shapes with different size and same orientation  

**Proximal Precursor:**  
- Recognize squares, circles, triangles, rectangles, cubes, cones, cylinders, and/or spheres  

**Target:**  
- Use geometric shapes to describe objects  

**Successor:**  
- Use geometric methods to solve design problems

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A diagram showing the relationship of nodes in the mini-map appears below.

**Key to map codes in upper right corner of node boxes:**
- IP: Initial Precursor
- DP: Distal Precursor
- PP: Proximal Precursor
- SP: Supporting
- S: Successor
- UN: Untested
- T: Target
**M.EE.G-MG.1-3** Use properties of geometric shapes to describe real-life objects
# Essential Element, Linkage Levels, and Mini-Map
## Math: High School
### M.EE.G-GPE.7

<table>
<thead>
<tr>
<th>Grade-Level Standard</th>
<th>DLM Essential Element</th>
<th>Linkage Levels</th>
</tr>
</thead>
</table>
| M.G-GPE.7 Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula | M.EE.G-GPE.7 Find perimeters and areas of squares and rectangles to solve real-world problems | **Initial Precursor:**  
- Recognize attribute values  

**Distal Precursor:**  
- Recognize measureable attributes  

**Proximal Precursor:**  
- Calculate perimeter by adding all the side lengths  
- Calculate area by counting unit squares  

**Target:**  
- Solve word problems involving perimeter of polygons  
- Solve word problems involving area of rectangles  

**Successor:**  
- Mathematize contextual situation involving perimeter of polygons  
- Mathematize contextual situations involving area of polygons |

A diagram showing the relationship of nodes in the mini-map appears below.

---

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- IP: Initial Precursor
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- PP: Proximal Precursor
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**M.EE.G-GPE.7** Find perimeters and areas of squares and rectangles to solve real-world problems
Grade-Level Standard | DLM Essential Element | Linkage Levels
--- | --- | ---
M.N-Q.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays; M.N-Q.2 Define appropriate quantities for the purpose of descriptive modeling; M.N-Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities | M.EE.N-Q.1-3 Express quantities to the appropriate precision of measurement | Initial Precursor: • Use perceptual subitizing
Distal Precursor: • Round decimals to any place
Proximal Precursor: • Solve word problems involving multiplication with rational numbers • Solve word problems involving subtraction with rational numbers • Solve word problems involving addition with rational numbers
Target: • Express numerical answers with a degree of precision appropriate for the problem context
Successor: • Solve multi-step problems with rational numbers

Key to map codes in upper right corner of node boxes:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP</td>
<td>Initial Precursor</td>
</tr>
<tr>
<td>DP</td>
<td>Distal Precursor</td>
</tr>
<tr>
<td>PP</td>
<td>Proximal Precursor</td>
</tr>
<tr>
<td>T</td>
<td>Target</td>
</tr>
<tr>
<td>SP</td>
<td>Supporting</td>
</tr>
<tr>
<td>S</td>
<td>Successor</td>
</tr>
<tr>
<td>UN</td>
<td>Untested</td>
</tr>
</tbody>
</table>

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A diagram showing the relationship of nodes in the mini-map appears below.
Express quantities to the appropriate precision of measurement

- M-2421: Explain ten as a composition of ten ones
- M-45: Explain place value for ones and tens
- M-972: Explain place value for tenths
- M-973: Explain place value for hundredths
- M-818: Round decimals to any place
- M-975: Subtract 2 decimals with digits in the tenths place
- M-976: Multiply 2 decimals with digits in the tenths place
- M-974: Add 2 decimals with digits in the tenths place
- M-978: Add 2 decimals with digits in the hundredths place
- M-1302: Solve word problems involving multiplication with rational numbers
- M-1301: Solve word problems involving subtraction with rational numbers
- M-1274: Solve word problems involving addition with rational numbers
- M-2724: Express numerical answers with a degree of precision appropriate for the problem context
- M-1304: Solve multi-step problems with rational numbers
## Essential Element, Linkage Levels, and Mini-Map

### Math: High School

#### M.EE.S-ID.1-2

<table>
<thead>
<tr>
<th>Grade-Level Standard</th>
<th>DLM Essential Element</th>
<th>Linkage Levels</th>
</tr>
</thead>
</table>
| **M.S-ID.1** Represent data with plots on the real number line (dot plots, histograms, and box plots); **M.S-ID.2** Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets | **M.EE.S-ID.1-2** Given data, construct a simple graph (table, line, pie, bar, or picture) and interpret data | **Initial Precursor:**  
- Classify  
- Order Objects  
**Distal Precursor:**  
- Recognize the structure of a bar graph  
- Recognize the structure of a picture graph  
- Recognize the structure of a line graph  
- Recognize the structure of a pie chart  
**Proximal Precursor:**  
- Use bar graphs to read the data  
- Use picture graphs to read the data  
- Use line graphs to read the data  
- Use pie charts to read the data  
**Target:**  
- Use graphs to read beyond the data  
- Represent data using bar graph  
- Represent data using picture graph  
- Represent data using line graph  
- Represent data using pie charts  
**Successor:**  
- Use graphs to read beyond the data |

---

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- **S** Successor  
- **PP** Proximal Precursor  
- **UN** Untested  
- **T** Target
M.EE.S-ID.1-2 Given data, construct a simple graph (table, line, pie, bar, or picture) and interpret data

- M-209 recognize the structure of a bar graph
- M-326 recognize the structure of a picture graph
- M-2719 recognize the structure of a line graph
- M-2473 recognize the structure of a pie chart
- M-2476 choose the appropriate graph for a given set of data
- M-210 use bar graphs to read the data
- M-327 use picture graphs to read the data
- M-2720 use line graphs to read the data
- M-2474 use pie charts to read the data
- M-214 use graphs to read between the data
- M-2675 use graphs to read beyond the data

M.E.E.S-ID.1-2 Copyright © 2018 University of Kansas Center for Research. All rights reserved.
## Grade-Level Standard

**M.S-ID.3**

Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers)

## DLM Essential Element

**M.EE.S-ID.3**

Interpret general trends on a graph or chart

## Linkage Levels

<table>
<thead>
<tr>
<th>Initial Precursor:</th>
<th>Order objects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distal Precursor:</td>
<td>Classify</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Recognize the structure of a bar graph</td>
</tr>
<tr>
<td></td>
<td>Recognize the structure of a picture graph</td>
</tr>
<tr>
<td></td>
<td>Recognize the structure of a line plot (dot plot)</td>
</tr>
<tr>
<td></td>
<td>Recognize the structure of a pie chart</td>
</tr>
<tr>
<td><strong>Proximal Precursor:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Recognize symmetric distribution</td>
</tr>
<tr>
<td></td>
<td>Recognize outliers</td>
</tr>
<tr>
<td></td>
<td>Recognize peaks in data distribution</td>
</tr>
<tr>
<td></td>
<td>Recognize variability in a data set</td>
</tr>
<tr>
<td><strong>Target:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Analyze overall shape of the data distribution</td>
</tr>
<tr>
<td></td>
<td>Draw inferences by interpreting general trends on a graph or chart</td>
</tr>
<tr>
<td><strong>Successor:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Draw inferences by comparing two data sets</td>
</tr>
</tbody>
</table>

A diagram showing the relationship of nodes in the mini-map appears below.

### Key to map codes in upper right corner of node boxes:

- **IP** Initial Precursor
- **SP** Supporting
- **DP** Distal Precursor
- **S** Successor
- **PP** Proximal Precursor
- **UN** Untested
- **T** Target
M.EE.S-ID.3 Interpret general trends on a graph or chart
Grade-Level Standard | DLM Essential Element | Linkage Levels
--- | --- | ---
M.S-ID.4 | M.EE.S-ID.4 Calculate the mean of a given data set (limit the number of data points to fewer than five) | Initial Precursor:
- Recognize attribute values
Distal Precursor:
- Classify
Proximal Precursor:
- Summarize data by the number of observations
Target:
- Calculate mean
Successor:
- Summarize data by measurement

Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?

Calculate the mean of a given data set (limit the number of data points to fewer than five)

A diagram showing the relationship of nodes in the mini-map appears below.

Key to map codes in upper right corner of node boxes:

- IP: Initial Precursor
- DP: Distal Precursor
- PP: Proximal Precursor
- SP: Supporting
- S: Successor
- UN: Untested
- T: Target
M.EE.S-ID.4 Calculate the mean of a given data set (limit the number of data points to fewer than five)
# Essential Element, Linkage Levels, and Mini-Map
## Math: High School
### M.EE.A-CED.1

<table>
<thead>
<tr>
<th>Grade-Level Standard</th>
<th>DLM Essential Element</th>
<th>Linkage Levels</th>
</tr>
</thead>
</table>
| M.A-CED.1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions | M.EE.A-CED.1 Create an equation involving one operation with one variable, and use it to solve a real-world problem | **Initial Precursor:**  
- Combine sets  
- Partition sets  
**Distal Precursor:**  
- Represent multiplication with equations  
- Represent division with equations  
- Represent subtraction with equations  
- Represent addition with equations  
**Proximal Precursor:**  
- Represent expressions with variables  
- Represent the unknown in an equation  
**Target:**  
- Solve real-world problems using equations with non-negative rational numbers  
- Represent real-world problems as equations  
**Successor:**  
- Solve rational equations in 1 variable |

A diagram showing the relationship of nodes in the mini-map appears below.

**Key to map codes in upper right corner of node boxes:**
- **IP** Initial Precursor
- **SP** Supporting
- **DP** Distal Precursor
- **S** Successor
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- **T** Target
M.EE.A-CED.1 Create an equations involving one operation with one variable, and use it to solve a real-world problem
# Essential Element, Linkage Levels, and Mini-Map

## Math: High School

### M.EE.A-CED.2-4

<table>
<thead>
<tr>
<th>Grade-Level Standard</th>
<th>DLM Essential Element</th>
<th>Linkage Levels</th>
</tr>
</thead>
</table>
| **M.A-CED.2** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales; | **M.EE.A-CED.2-4** Solve one-step inequalities | **Initial Precursor:**  
  - Partition sets  
  - Combine sets  
| **M.A-CED.3** Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context; | | **Distal Precursor:**  
  - Represent division with equations  
  - Represent subtraction with equations  
  - Represent addition with equations  
  - Represent multiplication with equations  |
| **M.A-CED.4** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations | | **Proximal Precursor:**  
  - Solve linear equalities in one variable  |

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DP  Distal Precursor  S  Successor
PP  Proximal Precursor  UN  Untested
T  Target
M.EE.A-CED.2-4 Solve one-step inequalities

M.711 demonstrate the concept of division
M.2570 explain division problems
M.714 explain quotient
M.616 represent division with equations
M.618 determine the unknown in a division equation
M.145 represent subtraction with equations
M.146 represent addition with equations
M.145 determine the unknown in a subtraction equation
M.145 determine the unknown in an addition equation
M.615 represent multiplication with equations
M.617 determine the unknown in a multiplication equation
M.2527 solve repeated addition problems
M.710 demonstrate the concept of multiplication
M.713 explain product
M.429 explain multiplication problems
M.2506 recognize the equal sign
M.274 explain repeated addition
M.23 demonstrate the concept of addition
F.79 partition sets
F.30 combine sets
M.140 demonstrate the concept of subtraction
M.2506 recognize the equal sign
M.140 demonstrate the concept of subtraction
F.30 combine sets
F.79 partition sets
M.EE.A-CED.2-4 Solve one-step inequalities
# Essential Element, Linkage Levels, and Mini-Map
## Math: High School
### M.EE.A-SSE.1

<table>
<thead>
<tr>
<th>Grade-Level Standard</th>
<th>DLM Essential Element</th>
<th>Linkage Levels</th>
</tr>
</thead>
</table>
| M.A-SSE.1 Interpret expressions that represent a quantity in terms of its context | M.EE.A-SSE.1 Identify an algebraic expression involving one arithmetic operation to represent a real-world problem | **Initial Precursor:**  
- Combine sets  
- Partition sets  
**Distal Precursor:**  
- Represent subtraction with equations  
- Represent addition with equations  
- Represent multiplication with equations  
- Represent division with equations  
**Proximal Precursor:**  
- Represent the unknown in an equation  
- Represent expressions with variables  
**Target:**  
- Represent real-world problems as equations  
- Represent real-world problems as expressions  
**Successor:**  
- Solve real-world problems using equations with non-negative rational numbers |

A diagram showing the relationship of nodes in the mini-map appears below.

**Key to map codes in upper right corner of node boxes:**
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- **DP** Distal Precursor
- **S** Successor
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- **T** Target
M.EE.A-SSE.1 Identify an algebraic expression involving one arithmetic operation to represent a real-world problem
# Essential Element, Linkage Levels, and Mini-Map
## Math: High School
### M.EE.A-SSE.3

<table>
<thead>
<tr>
<th>Grade-Level Standard</th>
<th>DLM Essential Element</th>
<th>Linkage Levels</th>
</tr>
</thead>
</table>
| M.A-SSE.3            | M.EE.A-SSE.3 Solve simple algebraic equations with one variable using multiplication and division | **Initial Precursor:**  
- Partition sets  
- Combine sets  

**Distal Precursor:**  
- Demonstrate the concept of division  
- Demonstrate the concept of multiplication  

**Proximal Precursor:**  
- Determine the unknown in a division equation  
- Determine the unknown in a multiplication equation  

**Target:**  
- Solve linear equations in one variable  
- Solve linear equations in 1 variable with rational number coefficients  

**Successor:**  
- Solve linear inequalities in 1 variable

---

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- **PP** Proximal Precursor  
- **UN** Untested  
- **T** Target
M.EE.A-SSE.3 Solve simple algebraic equations with one variable using multiplication and division

M-2570 explain division problems

M-616 represent division with equations

M-1039 explain variable

M-2027 solve repeated addition problems

M-271 represent repeated addition with an equation

M-274 explain repeated addition

M-710 demonstrate the concept of multiplication

M-429 explain multiplication problems

M-1036 explain expression

M-617 determine the unknown in a multiplication equation

M-1150 represent expressions with variables

M-2758 partition sets into equal subsets

M-711 demonstrate the concept of division

M-714 explain quotient

M-618 determine the unknown in a division equation

M-1796 solve linear equations in one variable

M-1797 solve linear inequalities in 1 variable

M-1468 solve linear equations in 1 variable with rational number coefficients

M-23 demonstrate the concept of addition

F-30 combine sets
<table>
<thead>
<tr>
<th>Grade-Level Standard</th>
<th>DLM Essential Element</th>
<th>Linkage Levels</th>
</tr>
</thead>
</table>
| **M.A-REI.10** Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line); **M.A-REI.11** Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately; **M.A-REI.12** Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes | **M.EE.A-REI.10-12** Interpret the meaning of a point on the graph of a line. For example, on a graph of pizza purchases, trace the graph to a point and tell the number of pizzas purchased and the total cost of the pizzas | **Initial Precursor:**  
- Arrange objects in pairs  
- Order objects  
**Distal Precursor:**  
- Explain coordinate pairs (ordered pairs)  
- Explain x-coordinate  
- Explain y-coordinate  
**Proximal Precursor:**  
- Recognize covariation  
- Recognize direction of covariation  
- Describe rate of change in a graph  
**Target:**  
- Analyze linear function graphs  
- Interpret a point on the graph of a linear function  
**Successor:**  
- Solve real-world problems by interpreting linear function graphs |
Key to map codes in upper right corner of node boxes:

IP  Initial Precursor  SP  Supporting
DP  Distal Precursor   S   Successor
PP  Proximal Precursor UN  Untested
T   Target
Interpret the meaning of a point on the graph of a line
# Essential Element, Linkage Levels, and Mini-Map

## Math: High School

### M.EE.A-SSE.4

<table>
<thead>
<tr>
<th>Grade-Level Standard</th>
<th>DLM Essential Element</th>
<th>Linkage Levels</th>
</tr>
</thead>
</table>
| M.A-SSE.4 Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. For example, calculate mortgage payments | M.EE.A-SSE.4 Determine the successive term in a geometric sequence given the common ratio | Initial Precursor:  
- Classify  
- Contrast objects  
- Order objects  

Distal Precursor:  
- Recognize symbolic patterns  
- Recognize sequence  

Proximal Precursor:  
- Recognize the recursive rule for geometric sequences  
- Recognize geometric sequences  

Target:  
- Extend a geometric sequence by applying the recursive rule  

Successor:  
- Determine the term in a geometric sequence given the nth term formula |

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- UN: Untested
M.EE.A-SSE.4 Determine the successive term in a geometric sequence given the common ratio
## Grade-Level Standard

**M.F-BF.1** Write a function that describes a relationship between two quantities

## DLM Essential Element

**M.EE.F-BF.1** Select the appropriate graphical representation (first quadrant) given a situation involving constant rate of change

## Linkage Levels

<table>
<thead>
<tr>
<th>Initial Precursor:</th>
<th>Distal Precursor:</th>
<th>Proximal Precursor:</th>
<th>Target:</th>
<th>Successor:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Order objects</td>
<td>• Explain y-coordinate</td>
<td>• Recognize covariation</td>
<td>• Represent real-world problems as graphs</td>
<td>• Solve real-world problems by interpreting linear function graphs</td>
</tr>
<tr>
<td>• Arrange objects in pairs</td>
<td>• Explain coordinate pairs (ordered pairs)</td>
<td>• Recognize direction of covariation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Explain x-coordinate</td>
<td>• Describe rate of change in a graph</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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- **PP**: Proximal Precursor
- **T**: Target
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- **S**: Successor
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M.EE.F-BF.1 Select the appropriate graphical representation (first quadrant) given a situation involving constant rate of change
# Essential Element, Linkage Levels, and Mini-Map

## Math: High School

**M.EE.F-BF.2**

<table>
<thead>
<tr>
<th>Grade-Level Standard</th>
<th>DLM Essential Element</th>
<th>Linkage Levels</th>
</tr>
</thead>
</table>
| M.F-BF.2 Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms | M.EE.F-BF.2 Determine an arithmetic sequence with whole numbers when provided a recursive rule | **Initial Precursor:**
- Classify  
- Contrast objects  
- Order objects  

**Distal Precursor:**  
- Recognize symbolic patterns  
- Recognize sequence  

**Proximal Precursor:**  
- Recognize arithmetic sequences  
- Recognize the recursive rule for arithmetic sequences  

**Target:**  
- Extend an arithmetic sequence by applying the recursive rule  

**Successor:**  
- Determine the term in an arithmetic sequence given the nth term formula  

---

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A diagram showing the relationship of nodes in the mini-map appears below.

*Key to map codes in upper right corner of node boxes:*

- IP Initial Precursor  
- SP Supporting  
- DP Distal Precursor  
- S Successor  
- PP Proximal Precursor  
- UN Untested  
- T Target
M.EE.F-BF.2 Determine an arithmetic sequence with whole numbers when provided a recursive rule
## Essential Element, Linkage Levels, and Mini-Map

### Math: High School

#### M.EE.F-IF.1-3

<table>
<thead>
<tr>
<th>Grade-Level Standard</th>
<th>DLM Essential Element</th>
<th>Linkage Levels</th>
</tr>
</thead>
</table>
| **M.F-IF.1** Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If \( f \) is a function and \( x \) is an element of its domain, then \( f(x) \) denotes the output of \( f \) corresponding to the input \( x \). The graph of \( f \) is the graph of the equation \( y = f(x) \); **M.F-IF.2** Use function notation, evaluate functions for inputs in their domains, interpret statements that use function notation in terms of a context; **M.F-IF.3** Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by \( f(0) = f(1) = 1, f(n + 1) = f(n) + f(n - 1) \) for \( n \geq 1 \) | **M.EE.F-IF.1-3** Use the concept of function to solve problems | **Initial Precursor:**  
- Order objects  
- Arrange objects in pairs  
**Distal Precursor:**  
- Explain \( x \)-coordinate  
- Explain \( y \)-coordinate  
- Explain coordinate pairs (ordered pairs)  
**Proximal Precursor:**  
- Describe the rate of change in a table  
- Describe rate of change in a graph  
**Target:**  
- Solve real-world problems by interpreting linear function graphs  
- Solve real-world problems by interpreting linear function tables  
**Successor:**  
- Use graphs to read beyond the data  
- Use tables to predict function values |
A diagram showing the relationship of nodes in the mini-map appears below.

Key to map codes in upper right corner of node boxes:

- **IP** Initial Precursor
- **SP** Supporting
- **DP** Distal Precursor
- **PP** Proximal Precursor
- **UN** Untested
- **T** Target

**M.EE.F-IF.1-3** Use the concept of function to solve problems
### Grade-Level Standard

**M.F-IF.4** For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity;

**M.F-IF.5** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function $h(n)$ gives the number of person-hours it takes to assemble $n$ engines in a factory, then the positive integers would be an appropriate domain for the function;

**M.F-IF.6** Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.

### DLM Essential Element

**M.EE.F-IF.4-6** Construct graphs that represent linear functions with different rates of change and interpret which is faster/slower, higher/lower, etc.

### Linkage Levels

**Initial Precursor:**
- Arrange objects in pairs
- Order objects

**Distal Precursor:**
- Explain coordinate pairs (ordered pairs)
- Explain x-coordinate
- Explain y-coordinate

**Proximal Precursor:**
- Recognize covariation
- Recognize direction of covariation
- Describe rate of change in a graph

**Target:**
- Compare two functions with different rate of change
- Analyze linear function graphs

**Successor:**
- Solve real-world problems by interpreting linear function graphs
- Compare properties of 2 functions represented in the same way

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A diagram showing the relationship of nodes in the mini-map appears below.
Key to map codes in upper right corner of node boxes:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP</td>
<td>Initial Precursor</td>
</tr>
<tr>
<td>DP</td>
<td>Distal Precursor</td>
</tr>
<tr>
<td>PP</td>
<td>Proximal Precursor</td>
</tr>
<tr>
<td>SP</td>
<td>Supporting</td>
</tr>
<tr>
<td>S</td>
<td>Successor</td>
</tr>
<tr>
<td>UN</td>
<td>Untested</td>
</tr>
<tr>
<td>T</td>
<td>Target</td>
</tr>
</tbody>
</table>
Construct graphs that represent linear functions with different rates of change and interpret which is faster/slower, higher/lower, etc.
## ESSENTIAL ELEMENT, LINKAGE LEVELS, AND MINI-MAP
### MATH: HIGH SCHOOL
### M.EE.F-LE.1-3

<table>
<thead>
<tr>
<th>Grade-Level Standard</th>
<th>DLM Essential Element</th>
<th>Linkage Levels</th>
</tr>
</thead>
</table>
| M.F-LE.1 Distinguish between situations that can be modeled with linear functions and with exponential functions; **M.F-LE.2** Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table); **M.F-LE.3** Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function | **M.EE.F-LE.1-3** Model a simple linear function such as $y=mx$ to show that these functions increase by equal amounts over equal intervals | **Initial Precursor:**  
- Arrange objects in pairs  
- Order objects  
**Distal Precursor:**  
- Explain $x$-coordinate  
- Explain $y$-coordinate  
- Explain coordinate pairs (ordered pairs)  
**Proximal Precursor:**  
- Recognize covariation  
- Recognize direction of covariation  
- Determine slope based on coordinate pairs  
**Target:**  
- Explain average rate of change  
- Determine rate of change of linear functions  
**Successor:**  
- Recognize intervals where function is increasing  
- Recognize intervals where function is decreasing  
- Estimate average rate of change given graph |

A diagram showing the relationship of nodes in the mini-map appears below.

**Key to map codes in upper right corner of node boxes:**
- IP Initial Precursor
- DP Distal Precursor
- PP Proximal Precursor
- T Target
- SP Supporting
- S Successor
- UN Untested

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EE.F-LE.1-3 Model a simple linear function such as $y=mx$ to show that these functions increase by equal amounts over equal intervals.