



# Dynamic Learning Maps Mathematics

## Initial and Distal Precursors

### 8<sup>th</sup> Grade

This English Language Arts resource provides teachers with enhanced descriptions of the Initial and Distal precursors for the most frequently used Essential Elements.

By providing a clear connection between the IP or DP linkage level and the Target linkage level, teachers can better tailor classroom instruction for each student. Additionally, links to instructional information for each Essential Element and familiar texts in ELA, make these handy classroom resources.

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## M.EE.8.NS.2.a

*M.EE.8.NS.2.a Express a fraction with a denominator of 100 as a decimal*

Link to Minimap:

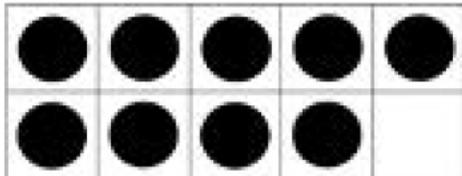
[http://www.dynamiclearningmaps.org/sites/default/files/documents/Math\\_EEs/M.EE.8.NS.2.a.pdf](http://www.dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.8.NS.2.a.pdf)

Target | Represent a fraction with a denominator of 100 as a decimal.

Proximal Precursor Explain the decimal point. Represent a fraction with a denominator of 10 as a decimal.	Distal Precursor: Partition sets into equal subsets. Explain unit fraction.	Initial Precursor: Recognize separateness. Recognize set.
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How is the Initial Precursor related to the target?

Initial Precursor: Converting a fraction to a decimal requires a student to be able to recognize that two or more sets or groups of items exist. Work on this skill using a variety of sets. Help students recognize when items are grouped together into a set or separated out. As educators present a set, they label it (e.g., two balls, one marker, three CDs), count the items, label it again, and encourage students to use numerals to label and count the separate sets. Use tools like the ten-frame to point out whole and parts (e.g., a row of 5 dots and a row of 4 dots are parts or subsets of 9).



How is the Distal Precursor related to the target?

Distal Precursor: As students become more adept at tracking discrete objects, they will begin working on one-to-one distribution of objects to person, objects to objects, and objects to available space (e.g., giving each person in the group a pencil; given four counters, they would line up four more counters in front of or on top of the first set; given three chairs at a table, the student would place a cup on the table for each available chair). As students understanding of one-to-one distribution develops, provide students many opportunities to recognize equivalence in sets with same items and then sets with differing items. As students work on all these skills and concepts, continue to draw their attention to parts and wholes.

## M.EE.8.NS.2.b

*M.EE.8.NS.2.b Compare quantities represented as decimals in real-world examples to hundredths.*

Link to Minimap:

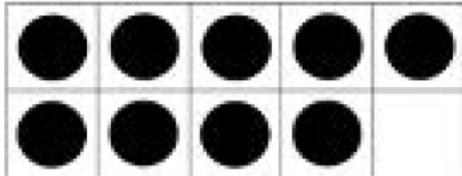
[http://dynamiclearningmaps.org/sites/default/files/documents/Math\\_EEs/M.EE.8.NS.2b.pdf](http://dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.8.NS.2b.pdf)

Target | Compare two decimals to hundredths using symbols.

<p>Proximal Precursor Represent a decimal to tenths as a fraction. Represent a decimal to hundredths as a fraction.</p>	<p>Distal Precursor: Recognize one tenth in a set model. Recognize tenths in a set model.</p>	<p>Initial Precursor: Recognize separateness.</p>
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How is the Initial Precursor related to the target?

Initial Precursor: Representing fractions as decimals requires a student to be able to recognize that two or more sets or groups of items exist. Work on this skill using a variety of sets. Help students recognize when items are grouped together into a set or separated out. As educators present a set, they label it (e.g., two balls, one marker, three CDs), count the items, label it again, and encourage students to use numerals to label and count the separate sets. Use tools like the ten-frame to point out whole and parts (e.g., a row of 5 dots and a row of 4 dots are parts or subsets of 9).



How is the Distal Precursor related to the target?

Distal Precursor: As students begin to understand labeling, counting small sets, and recognizing wholes and parts of objects and sets, use set models to provide a wide variety of sets of 10 to model tenths (e.g., for individual shapes to match the fraction, say, "I have 10 cubes in my bag, 1/10 of them are blue.").

## M.EE.8.G.1

*M.EE.8.G.1 Recognize translations, rotations, and reflections of shapes.*

Link to Minimap:

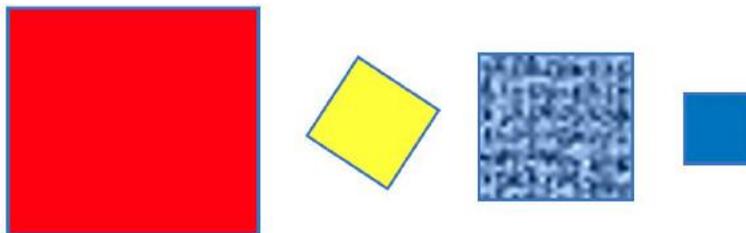
[http://dynamiclearningmaps.org/sites/default/files/documents/Math\\_EEs/M.EE.8.G.1.pdf](http://dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.8.G.1.pdf)

Target | Recognize translation.  
Recognize reflection.  
Recognize rotation.

Proximal Precursor Explain transformations.	Distal Precursor: Recognize the defining attributes of a shape. Recognize the non-defining attributes of a shape.	Initial Precursor: Recognize attribute values.
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How is the Initial Precursor related to the target?

Initial Precursor: Being able to recognize shapes given certain conditions requires a student to recognize when basic objects and shapes are the same or different. Work on this understanding by providing students with a shape and naming it (e.g., this is a square). Then provide multiple examples of the same shape so students can make comparisons (e.g., 3 or 4 squares of different size, color, and orientation), focusing student attention on the characteristics that make this a particular shape (e.g., a square has 4 sides that are the same size). As students explore shapes, label them and describe them as “same” or “different”.



NOTE: When presenting the same shape for comparison, do use shapes with different colors, textures, sizes, and orientation so that students understand the attribute that makes it that shape (e.g., 4 sides that are the same size).

How is the Distal Precursor related to the target?

Distal Precursor: Now that students have experience identifying shapes, provide instruction that focuses on the attribute of a given shape and making comparisons with other shapes. Educators should take care to use the names of the shapes while defining and describing the attributes. While students do not need to say the shape names, they do need to learn what makes a shape a shape (e.g., a square has four equal straight sides, a triangle has three straight sides, a cone is an object that narrows from a circular base to a point, and a rectangle does not have curves).

## M.EE.8.G.2

*M.EE.8.G.2 Identify shapes that are congruent.*

Link to Minimap:

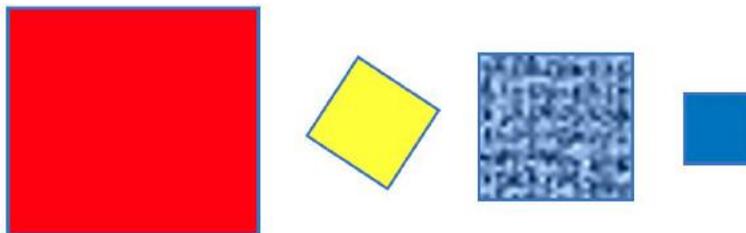
[http://www.dynamiclearningmaps.org/sites/default/files/documents/Math\\_EEs/M.EE.8.G.2.pdf](http://www.dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.8.G.2.pdf)

Target | Recognize congruent figures.

<p>Proximal Precursor Describe attributes of shapes. Analyze shapes to identify common attributes. Explain attribute relationships between shapes.</p>	<p>Distal Precursor: Match the same two-dimensional shape with same size and same orientation. Match the same two-dimensional shape with different sizes and same orientation.</p>	<p>Initial Precursor: Recognize same. Recognize different.</p>
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How is the Initial Precursor related to the target?

Initial Precursor: Being able to recognize congruent figures requires a student to recognize when basic objects and shapes are the same or different. Work on this understanding by providing students with a shape and naming it (e.g., “this is a square”). Then, provide multiple examples of the same shape so students can make comparisons, focusing student attention on the characteristics make this a particular shape (e.g., a square has 4 sides that are the same size). As students explore shapes, label them and describe them as same or different.



NOTE: When presenting the same shape for comparison, do use shapes with different colors, textures, sizes, and orientation so that students understand the attribute that makes it that shape (e.g., 4 sides that are the same size).

How is the Distal Precursor related to the target?

Distal Precursor: As students develop an understanding of same and different shapes, provide opportunities for students to match or group the same shapes based on the shape size (e.g., “this is a big square”, “this is a little square”). As students progress with identifying the size of shapes, the educator can begin to introduce different orientations of the shape.

NOTE: As new attributes (e.g., size and orientation) are introduced, be sure to support the student in remembering that the attribute doesn't change the name of the shape.

## M.EE.8.G.4

*M.EE.8.G.4 Identify similar shapes with and without rotation.*

Link to Minimap:

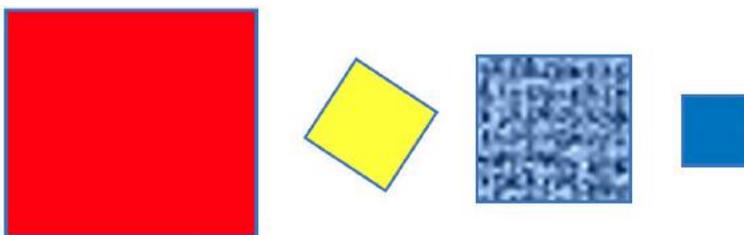
[http://dynamiclearningmaps.org/sites/default/files/documents/Math\\_EEs/M.EE.8.G.4.pdf](http://dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.8.G.4.pdf)

Target | Explain the relationship between similar figures and transformation.

Proximal Precursor Recognize similar figures. Recognize rotation.	Distal Precursor: Match the same three-dimensional shapes with different size and same orientation. Match the same two-dimensional shapes with different sizes and same orientation.	Initial Precursor: Recognize same. Recognize different.
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How is the Initial Precursor related to the target?

Initial Precursor: Being able to recognize congruent figures requires a student to recognize when basic objects and shapes are the same or different. Work on this understanding by providing students with a shape and naming it (e.g., “this is a square”). Then, provide multiple examples of the same shape so students can make comparisons, focusing student attention on the characteristics make this a particular shape (e.g., a square has 4 sides that are the same size). As students explore shapes, label them and describe them as same or different.



NOTE: When presenting the same shape for comparison, do use shapes with different colors, textures, sizes, and orientation so that students understand the attribute that makes it that shape (e.g., 4 sides that are the same size).

How is the Distal Precursor related to the target?

Distal Precursor: As students develop an understanding of same and different shapes, provide opportunities for students to match or group the same two- and three-dimensional shapes based on the shape size (e.g., “this is a big square”, “this is a little square”). As students progress with identifying the size of two- and three-dimensional shapes, the educator can begin to introduce different orientations of the shape.

NOTE: As new attributes (e.g., size and orientation) are introduced, be sure to support the student in remembering that the attribute doesn't change the name of the shape.

## M.EE.8.G.5

*M.EE.8.G.5 Compare any angle to a right angle and describe the angle as greater than, less than, or congruent to a right angle.*

Link to Minimap:

[http://dynamiclearningmaps.org/sites/default/files/documents/Math\\_EEs/M.EE.8.G.5.pdf](http://dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.8.G.5.pdf)

Target | Compare angles to a right angle.

Proximal Precursor Recognize obtuse angles. Recognize acute angles. Recognize right angles.	Distal Precursor: Recognize angle.	Initial Precursor: Recognize attribute values.
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How is the Initial Precursor related to the target?

Initial Precursor: In order to recognize angles, students begin by learning to notice what is new. The educator draws the students' attention to new objects or stimuli, labels them (e.g., "this is a circle, and it does not have any sides", "this is a rectangle, and it has four sides") and the student observes, feels, or otherwise interacts with the shapes.

How is the Distal Precursor related to the target?

Distal Precursor: At this level, educators are providing students with specific vocabulary (line, line segment, point, and ray) that are used to form an angle. These are all denoted by certain characteristics (a line has arrows on both ends; a line segment includes both endpoints; a point is a dot on a graph, a line, line segment, or a number line; a ray is a line that has a well-defined starting point). Educators should take care to use the names "line", "line segment", "point", and "ray" while defining and describing the angles. While students do not need to say the names, they do need to learn their meaning. Educators should teach these attributes within the context of working with angles.

## M.EE.8.G.9

### M.EE.8.G.9

Use the formulas for perimeter, area, and volume to solve real-world and mathematical problems (limited to perimeter and area of rectangles and volume of rectangular prisms).

Link to Minimap:

[http://www.dynamiclearningmaps.org/sites/default/files/documents/Math\\_EEs/M.EE.8.G.9.pdf](http://www.dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.8.G.9.pdf)

Target | Calculate volume of right rectangular prisms with formula.  
Calculate area for rectangles with formula.  
Calculate the perimeter of parallelograms with formula.

Proximal Precursor Explain volume. Explain area. Explain length. Explain perimeter	Distal Precursor: Recognize measurable attributes.	Initial Precursor: Recognize attribute values.
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How is the Initial Precursor related to the target?

Initial Precursor: In order to calculate volume, area, and perimeter with formulas, students begin by learning to notice what is new. The educator draws the students' attention to new objects or stimuli, labels them (e.g., "this is a circle, which has no corners, so we can go all the way around without stopping", "this is a rectangle, which has four corners, two long sides, and two short sides") and the student observes, feels, or otherwise interacts with the shapes. Students also work on counting small units, recognizing that two or more sets or groups of items exist. Work on this skill using a variety of sets. Help students recognize when items are grouped together into a set or separated out. As educators present sets, they label them (e.g., two balls, one bear, three blocks), count the items, label them again, and encourage students to use numbers to label and count the separate sets.

How is the Distal Precursor related to the target?

Distal Precursor: As students develop their attention to objects and notice the difference between objects, they will begin working on recognizing measurable attributes. Students need lots of experience making direct comparisons between objects. Educators should take care to use attribute words like "big"/"small", "tall"/"short", "longer"/"shorter" while defining and demonstrating their meaning. While students do not need to say these words, they do need to learn the meanings.

## M.EE.8.SP.4

*M.EE.8.SP.4 Construct a graph or table from given categorical data and compare data categorized in the graph or table.*

Link to Minimap:

[http://www.dynamiclearningmaps.org/sites/default/files/documents/Math\\_EEs/M.EE.8.SP.4.pdf](http://www.dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.8.SP.4.pdf)

Target | Use graphs to read between the data.  
Use tally chart to read between the data.  
Represent data using bar graph.  
Represent data using picture graph.  
Represent data using line plot (dot plot).  
Represent data using tally charts.

<p>Proximal Precursor</p> <p>Use bar graphs to read the data. Use picture graphs to read the data. Use line plots (dot plots) to read the data. Use tally charts to read the data.</p>	<p>Distal Precursor:</p> <p>Recognize the structure of a bar graph. Recognize the structure of a picture graph. Recognize the structure of a line plot (dot plot). Recognize the structure of tally chart.</p>	<p>Initial Precursor:</p> <p>Classify. Order objects.</p>
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How is the Initial Precursor related to the target?

Initial Precursor: In order to represent and use data, students begin by learning to recognize what is the same and different between familiar items such as color, shape, quantity, size, texture, and pattern. Educators should take care to use attribute words (e.g., circle/square, more/less/same, rough/smooth, red, green, red, green) while defining and demonstrating their meaning. While students do not need to say these words, they do need to learn the meanings. Students will also begin to group two or more items in the same set based on an attribute. As the students group two or more items, the educator will demonstrate the representation in a bar graph or line plot and encourage students to actively participate in its creation.

How is the Distal Precursor related to the target?

Distal Precursor: Students actively participate in the creation of bar graphs, picture graphs, line plots, and tally charts by placing representations, x's, or dots for each response to the research question.

## M.EE.8.EE.2

*M.EE.8.EE.2 Identify a geometric sequence of whole numbers with a whole number common ratio.*

Link to Minimap:

[http://www.dynamiclearningmaps.org/sites/default/files/documents/Math\\_EEs/M.EE.8.EE.2.pdf](http://www.dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.8.EE.2.pdf)

Target | Recognize geometric sequences.

Proximal Precursor Recognize shrinking patterns. Recognize growing patterns.	Distal Precursor: Recognize symbolic patterns. Recognize sequence.	Initial Precursor: Classify. Contrast objects. Order objects.
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How is the Initial Precursor related to the target?

Initial Precursor: In order to recognize geometric patterns, students begin by learning to notice what is new. The educator draws the students' attention to new objects or stimuli, labels them (e.g., "this set has all red objects; this set has all blue", "these fidgets are big; these fidgets are small") and the student observes, feels, or otherwise interacts with them. Educators encourage students to begin placing like objects together, drawing attention to the characteristics that make an item the same or different.

How is the Distal Precursor related to the target?

Distal Precursor: As students develop their awareness of attributes and putting like objects together, educators will draw the students' attention to patterns and sequences in numbers and letters (symbolic patterns) and allow the student to observe, feel, or otherwise interact with the patterns and sequences.

## M.EE.8.EE.7

*M.EE.8.EE.7 Solve simple algebraic equations with one variable using addition and subtraction.*

Link to Minimap:

[http://www.dynamiclearningmaps.org/sites/default/files/documents/Math\\_EEs/M.EE.8.EE.7.pdf](http://www.dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.8.EE.7.pdf)

Target | Solve linear equations in one variable.

Proximal Precursor Determine the unknown in an addition equation. Determine the unknown in a subtraction equation.	Distal Precursor: Demonstrate the concept of addition. Demonstrate the concept of subtraction.	Initial Precursor: Combine sets. Partition sets.
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How is the Initial Precursor related to the target?

Initial Precursor: Solving linear equations requires a student to count small units, recognizing that two or more sets or groups of items exist. Work on this skill using a variety of sets. Help students recognize when items are grouped together into a set or separated out. The educator presents a set, labels it (e.g., two balls, one marker, three CDs), counts the items, labels it again, and encourages students to use numbers to label and count the separate sets. The general goal is to explore how the set changes when items are separated out (partitioned) or combined.

How is the Distal Precursor related to the target?

Distal Precursor: As students begin to understand labeling and counting small sets, they begin to use the number sequence and become more adept at tracking individual objects. They can recognize when items are added to a set or when items are taken away. Work on this skill using a variety of sets, labeling and counting the set, and moving items in and out of the set, labeling and counting the set again.

NOTE: Educators can work on the Distal Precursor level using the sets of numbers that students working at the Target level are working with.

## M.EE.8.F.1-3

*M.EE.8.F.1-3 Given a function table containing at least 2 complete ordered pairs, identify a missing number that completes another ordered pair (limited to linear functions).*

Link to Minimap:

[http://dynamiclearningmaps.org/sites/default/files/documents/Math\\_EEs/M.EE.8.F.1-3.pdf](http://dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.8.F.1-3.pdf)

Target | Generate ordered pairs from 2 distinct numerical patterns.

<p>Proximal Precursor Extend a symbolic pattern by applying the rule. Explain coordinate pairs (ordered pairs).</p>	<p>Distal Precursor: Recognize growing patterns. Recognize shrinking patterns.</p>	<p>Initial Precursor: Arrange objects in pairs. Order objects.</p>
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How is the Initial Precursor related to the target?

Initial Precursor: In order to understand and work with function tables, students begin by learning to notice what is new. The educator draws the students' attention to new objects or stimuli, labels them (e.g., "this set has all red objects; this set has all blue", "these fidgets are big; these fidgets are small") and the student observes, feels, or otherwise interacts with them. Educators encourage students to begin placing like objects together, drawing attention to the characteristics that make an item the same or different.

How is the Distal Precursor related to the target?

Distal Precursor: Building on arranging and ordering objects, educators can use some of the other mathematical concepts like working with sets or recognizing a whole and parts to help students identify "same" and "different". For instance, students may create a set and then create a second set that has the same amount. Then, they can change one of the sets to make it different. As students are learning to create and identify sets that are same and different, educators can draw student attention to the various attributes of a set to teach students to order, classify, and contrast the sets. These understandings will then lead to students having the attentional skills to recognize growing and shrinking patterns.

## M.EE.8.F.4

*M.EE.8.F.4 Determine the values or rule of a function using a graph or a table.*

Link to Minimap:

[http://dynamiclearningmaps.org/sites/default/files/documents/Math\\_EEs/M.EE.8.F.4.pdf](http://dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.8.F.4.pdf)

Target | Describe the function rule from the list of ordered pairs given in a table.  
Describe the function rule from a given graph.

Proximal Precursor Recognize direction of covariation. Recognize covariation.	Distal Precursor: Generate ordered pairs from 2 distinct numerical patterns. Extend a symbolic pattern by applying the rule.	Initial Precursor: Arrange objects in pairs. Order objects.
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How is the Initial Precursor related to the target?

Initial Precursor: In order to understand and work with function tables, students begin by learning to notice what is new. The educator draws the students' attention to new objects or stimuli, labels them (e.g., "this set has all red objects; this set has all blue", "these fidgets are big; these fidgets are small") and the student observes, feels, or otherwise interacts with them. Educators encourage students to begin placing like objects together, drawing attention to the characteristics that make an item the same or different. Educators provide sorting activities that allow learners to isolate specific attributes while recognizing likenesses and differences among objects. Educators also provide activities that reinforce the skill of ordering (e.g., arrangement of objects from largest to smallest, sequencing daily events, and counting).

How is the Distal Precursor related to the target?

Distal Precursor: As student attention to objects and details develops, educators can extend their attention by providing experience with finding and creating simple patterns using objects and moving to symbols (e.g., numerals). Educators should take care to start with simple patterns (e.g., 1-2-1-2) and take advantage of the symbols that are already being used in the classroom. Educators should demonstrate how students can create and identify the pattern/rule (e.g., using colored cubes, the student creates a line of 5 cubes, the educator then creates a matching set and explains what to do to follow the student's pattern. Then, the student generates a third matching set. If the order is not followed, it is a good teaching opportunity to talk about why it doesn't fit the pattern). Learning to identify the rule of patterns will help students extend their thinking across patterns. As students work on identifying pattern rules, educators can also begin to demonstrate how rules can be used with ordered pairs (e.g., see example below). Provide students lots of opportunities to apply rules to create their own examples of ordered pairs.

Input	Rule	Output
5	+1	6
4	+1	5
7	+1	8
1	+1	

Input	Rule	Output
5	-2	3
4	-2	2
7	-2	
9	-2	7