



Dynamic Learning Maps Mathematics

Initial and Distal Precursors

High School

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.N-CN.2.a

M.EE.N-CN.2.a Use the commutative, associative, and distribute properties to add, subtract, and multiply whole numbers.

Link to Minimap:

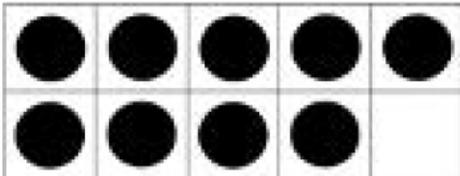
http://www.dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.N-CN.2.a.pdf

Target | Apply associative property of addition.
Apply commutative property of addition.
Apply the commutative property of multiplication.
Apply the associative property of multiplication.
Apply the distributive property.

Proximal Precursor Add 1 and 1. Add 1 to 2, 3, and/or 4. Add within 5. Add within 10. Add within 20. Multiply by 1, 2, 3, 4, 5, and/or 10.	Distal Precursor: Combine sets. Demonstrate the concept of addition. Combine. Demonstrate the concept of multiplication. Solve repeated addition problems.	Initial Precursor: Recognize separateness. Recognize set. Recognize subset.
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How is the Initial Precursor related to the target?

Initial Precursor: Using the properties of addition and multiplication 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. 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 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' understanding of labeling and counting sets develops, they will begin working on adding items to a set and combining sets to create a new set. Additionally, students will work on developing an understanding of equal shares by actively participating in one-to-one distribution of objects to person (e.g., giving each person in the group two pencils), objects to objects (e.g., given four counters, students line up four more counters in front of or on top of the first set), and objects to available space (e.g., given three chairs at a table, the student places a cup on the table for each available chair).

M.EE.N-CN.2.b

M.EE.N-CN.2.b Solve real-world problems involving addition and subtraction of decimals and whole numbers, using models when needed.

Link to Minimap:

http://www.dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.N-CN.2.b.pdf

Target | Solve word problems involving addition with rational numbers.
Solve word problems involving subtraction with rational numbers.

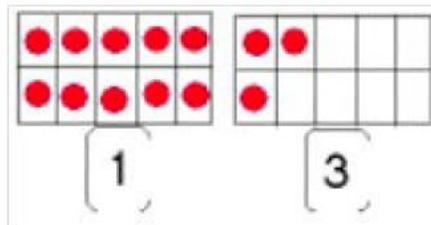
<p>Proximal Precursor</p> <p>Add 2 decimals with digits in the tenths place.</p> <p>Subtract 2 decimals with digits in the tenths place.</p>	<p>Distal Precursor:</p> <p>Recognize a unit.</p> <p>Explain ten as a composition of ten ones.</p> <p>Explain place value for ones and tens.</p>	<p>Initial Precursor:</p> <p>Recognize set.</p> <p>Recognize separateness.</p>
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How is the Initial Precursor related to the target?

Initial Precursor: Adding and subtracting rational numbers 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. 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 numerals to label and count the separate sets.

How is the Distal Precursor related to the target?

Distal Precursor: As students' understanding of numbers develops, they will work with numbers greater than nine (two-digit numbers). Use tools to create tactual and visual models of tens and ones (e.g., ten-frames, connecting cubes, bundling sticks). Educators will describe these numbers as __ groups of ten and __ ones. (e.g., 13 is 1 group of ten and 3 ones).



M.EE.N-CN.2.c

M.EE.N-CN.2.c Solve real-world problems involving multiplication of decimals and whole numbers, using models when needed.

Link to Minimap:

http://dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.N-CN.2.c.pdf

Target | Solve word problems involving multiplication with rational numbers.

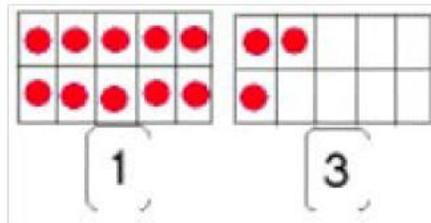
Proximal Precursor Multiply 2 decimals with digits in the tenths place.	Distal Precursor: Recognize a unit. Explain ten as a composition of ten ones. Explain place value for ones and tens.	Initial Precursor: Recognize separateness.
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How is the Initial Precursor related to the target?

Initial Precursor: Solving multiplication problems with or without 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. 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 numerals to label and count the separate sets.

How is the Distal Precursor related to the target?

Distal Precursor: As students' understanding of number develops, they will work with numbers greater than nine (two-digit numbers). Use tools to create tactual and visual models of tens and ones (e.g., ten-frames, connecting cubes, bundling sticks). Educators will describe these numbers as __ groups of ten and __ ones. (e.g., 13 is 1 group of ten and 3 ones).



M.EE.N-RN.1

M.EE.N-RN.1 Determine the value of a quantity that is squared or cubed.

Link to Minimap:

http://dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.N-RN.1.pdf

Target | Evaluate expressions with whole number exponents.

<p>Proximal Precursor</p> <p>Explain product. Explain multiplication problems. Demonstrate the concept of multiplication.</p>	<p>Distal Precursor:</p> <p>Explain repeated addition. Represent repeated addition with a model. Solve repeated addition problems.</p>	<p>Initial Precursor:</p> <p>Combine. Combine sets. Demonstrate the concept of addition.</p>
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How is the Initial Precursor related to the target?

Initial Precursor: Determining the value of a quantity that is squared or cubed requires a student to count small amounts, 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 combined.

How is the Distal Precursor related to the target?

Distal Precursor: As students gain an understanding of how to group items into sets, educators will begin to help students connect their knowledge of sets with their knowledge of counting and addition. Educators will provide multiple experiences counting sets and combining sets using multiple models. As student understanding progresses, educators provide experience with multiple small sets, and students will use repeated addition to find the total. They can check their work by counting the individual items in each group. Educators should take care to use words like “some”, “all”, “put”, and “add” while defining and demonstrating their meaning. While students do not need to say these words, they do need to learn the meanings.

M.EE.S-CP.1-5

M.EE.S-CP.1-5 Identify when events are independent or dependent.

Link to Minimap:

http://dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.S-CP.1-5.pdf

Target | Determine if 2 events are independent or dependent.

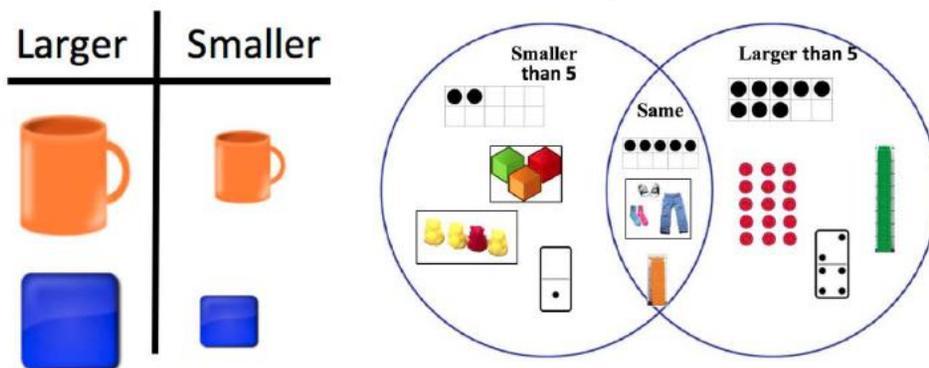
<p>Proximal Precursor Recognize possible outcomes. Explain simple events. Recognize impossible outcomes.</p>	<p>Distal Precursor: Classify.</p>	<p>Initial Precursor: Compare objects for sameness. Arrange objects in pairs. Contrast objects.</p>
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How is the Initial Precursor related to the target?

Initial Precursor: In order to identify events as independent or dependent (i.e., probability), students begin by learning about attributes, numbers, and measurement. Educators draw student attention to new objects or stimuli, label and describe them (e.g., “this is a circle, so it won't have any sides”, “this egg carton has 12 spaces, so it is likely that 12 eggs will fit into those spaces”, “this book is a small book, so it's impossible for it to get bigger”) and students observe, feel, or otherwise interact with the items.

How is the Distal Precursor related to the target?

Distal Precursor: Proportional understanding is key when working toward describing events as independent or dependent (i.e., probability). Educators provide many opportunities for students to classify (i.e., group) items based on their size (e.g., compare two or more items and determine which is larger or smaller), amount (e.g., numbers larger or smaller than a given number), and distance between numbers (e.g., skip counting by 2, 5, or 10). Educators should also take care to use words like will, won't, might, likely, unlikely (e.g., “these will go in the same group”, “these won't go in the same group”) when working with sets. While students do not need to say these words, they do need to learn the meanings.



Use a number line or counters to model how you got your answer.

2, 4, 6, ?

M.EE.S-IC.1-2

M.EE.S-IC.1-2 Determine the likelihood of an event occurring when the outcomes are equally likely to occur.

Link to Minimap:

http://dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.S-IC.1-2.pdf

Target | Determine theoretical probability of a simple event where all outcomes are equally likely.

Proximal Precursor Recognize sample space.	Distal Precursor: Recognize outcomes of an event. Recognize possible outcomes.	Initial Precursor: Compare objects for sameness. Arrange objects in pairs. Contrast objects.
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How is the Initial Precursor related to the target?

Initial Precursor: In order to determine the likelihood of an event, students begin by learning about attributes, numbers, and measurement. Educators draw student attention to new objects or stimuli, label and describe them (e.g., “this is a circle; it won't have any sides”, “compare sets of objects, counting them and comparing them using the words same, different, more, less”, “use direct comparison to compare objects”) and students observe, feel, or otherwise interact with the objects.

How is the Distal Precursor related to the target?

Distal Precursor: Proportional understanding is key when working toward describing events as independent or dependent. Educators provide many opportunities for students to classify (i.e., group) items based on their size (e.g., compare two or more items and determine which is larger or smaller), amount (e.g., numbers larger or smaller than a given number), and distance between numbers (e.g., skip counting by 2, 5, or 10). Educators should also take care to use words like “will”, “won't”, “might”, “likely”, and “unlikely” when talking about events (e.g., “The traffic lights will change from red to green. The traffic lights won't change from red to blue.”, “A ball is likely to bounce when it is dropped.”, “It is unlikely I will travel to the moon.”). While students do not need to say these words, they do need to learn the meanings.

M.EE.G-CO.1

M.EE.G.CO.1 Know the attributes of perpendicular lines, parallel lines, and line segments, angles, and circles

Link to Minimap:

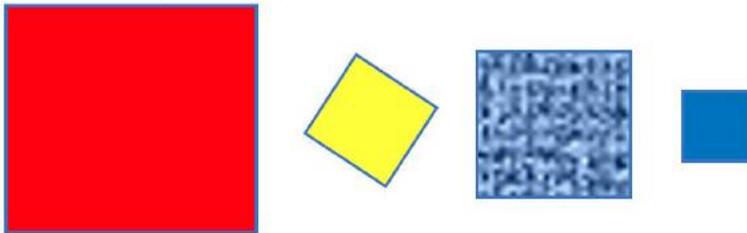
http://www.dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.G-CO.1.pdf

Target | Define circle.
Explain angle.
Explain perpendicular lines/line segments.
Explain parallel lines/line segments.

Proximal Precursor Recognize circles. Recognize parallel lines/line segments. Recognize perpendicular lines/line segments.	Distal Precursor: Recognize point. Recognize ray. Recognize angle. Recognize right angles.	Initial Precursor: Recognize same. Recognize different. Recognize attribute values.
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How is the Initial Precursor related to the target?

Initial Precursor: Knowing the attributes of various shapes, angles, and lines requires a student to first 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., multiple squares in different colors, sizes, and orientations) 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: As students increase their understanding of what makes shapes the same or different, they will begin to learn about other characteristics that make up a shape. The educator will provide multiple objects and tactuals, helping the student explore them and guide the student using hand-under-hand to draw their attention to where lines start and stop (e.g., points and rays) and where two lines meet to make an angle.

NOTE: Recognizing point should only be taught in the context of a lesson on lines, line segments, and angles.

M.EE.G-CO.4-5

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.

Link to Minimap:

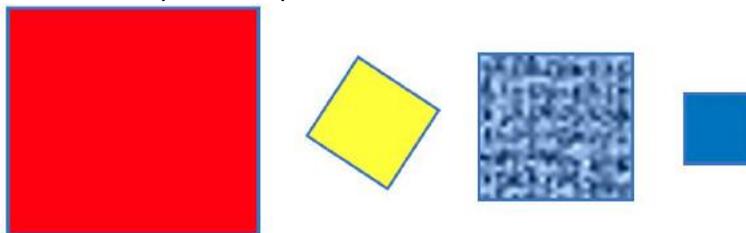
http://dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.G-CO.4-5.pdf

Target | Explain the relationship between congruent figures and transformation.

Proximal Precursor Recognize translation. Recognize rotation. Recognize reflection. Recognize congruent figures.	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.
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How is the Initial Precursor related to the target?

Initial Precursor: Recognizing congruency requires a student to first 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 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: 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.G-CO.6-8

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

Link to Minimap:

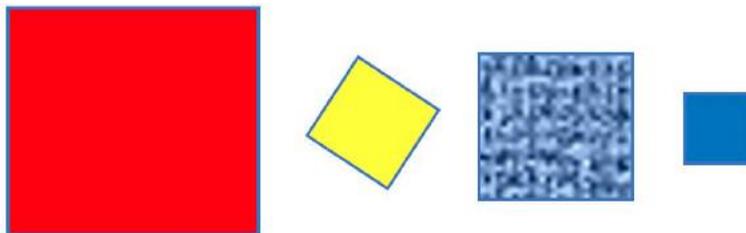
http://dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.G-CO.6-8.pdf

Target | Explain congruent figures.
Explain similar figures.

<p>Proximal Precursor Recognize congruent figures. Recognize similar figures.</p>	<p>Distal Precursor: Match the same two-dimensional shape with different sizes and same orientation. Match the same two-dimensional shape with same size and same orientation. Match the same three-dimensional shape with different size and same orientation. Match the same three-dimensional shape with same size 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: Recognizing congruent and similar parts of a shape requires a student to first 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 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: 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 as well as three-dimensional shapes.

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

M.EE.G-MG.1-3

M.EE.G-MG.1-3 Use properties of geometric shapes to describe real-life objects.

Link to Minimap:

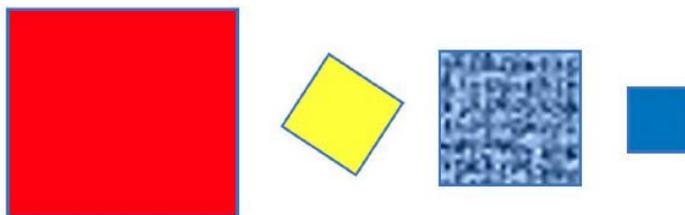
http://dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.G-MG.1-3.pdf

Target | Use geometric shapes to describe objects.

<p>Proximal Precursor Recognize squares, circles, triangles, rectangles, cubes, cones, cylinders, and/or spheres.</p>	<p>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.</p>	<p>Initial Precursor: Recognize same. Recognize different.</p>
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How is the Initial Precursor related to the target?

Initial Precursor: In order to describe real-life objects, students must first 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 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: 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 as well as three-dimensional shapes.

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

M.EE.G-GPE.7

M.EE.G-GPE.7 Find perimeter and area of squares and rectangles to solve real-world problems.

Link to Minimap:

http://dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.G-GPE.7.pdf

Target | Solve word problems involving perimeter of polygons.
Solve word problems involving area of rectangles.

<p>Proximal Precursor</p> <p>Calculate perimeter by adding all the side lengths.</p> <p>Calculate area by counting unit squares.</p> <p>Calculate area of a rectangle with tiling.</p>	<p>Distal Precursor:</p> <p>Recognize measurable attributes.</p>	<p>Initial Precursor:</p> <p>Recognize attribute values.</p>
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How is the Initial Precursor related to the target?

Initial Precursor: In order to find the perimeter and area of a shape, 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, so it does not have sides", "this is a rectangle, so 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: As students develop their attention to objects and notice the difference between objects, they will begin working on recognizing and describing measurable attributes. Students need lots of experience making direct comparisons between objects. Educators should use and demonstrate the meaning of comparison words (e.g., big/small, tall/short, longer/shorter). While students do not need to say them, they do need to learn their meaning.

M.EE.N-Q.1-3

M.EE.N-Q.1-3 Express quantities to the appropriate precision of measurement.

Link to Minimap:

http://dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.N-Q.1-3.pdf

Target | Express numerical answers with a degree of precision appropriate for the problem context.

<p>Proximal Precursor</p> <p>Solve word problems involving multiplication with rational numbers.</p> <p>Solve word problems involving subtraction with rational numbers.</p> <p>Solve word problems involving addition with rational numbers.</p>	<p>Distal Precursor:</p> <p>Round decimals to any place.</p>	<p>Initial Precursor:</p> <p>Use perceptual subitizing.</p>
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How is the Initial Precursor related to the target?

Initial Precursor: To express quantities with precision, students first need to know number names, the count sequence, one-to-one correspondence, and have cardinality. These procedures and concepts develop through many experiences in early counting. Perceptual subitizing happens when the student is able to name the amount (1-3 items) without actually counting them. For example when an educator asks the student to get their shoes and asks, "How many shoes do you have?" The student would reply, "two," without using the count sequence of one, two. This only happens when students have been given many experiences counting small numbers with many different contexts and materials.

NOTE: Students who are blind will learn to use tactile enumeration for 1-3 items.

How is the Distal Precursor related to the target?

Distal Precursor: As students continue to gain experience in counting, educators will introduce the concept that 10 can be grouped into one unit. Educators will use models that help students perceive a group of 10 and some more (e.g., bundles, ten-frames, number line, arrays, etc.). Teen numbers are an important part of understanding this concept. Additionally, educators provide students experience working with money values (e.g., \$2.42, \$0.67, \$5.94) and learning how to round up to the nearest dollar (e.g., \$2.42 rounds to \$3.00) or tenths place (e.g., \$0.67 rounds to \$0.70) or ones place (e.g., \$5.94 rounds to \$5.95). Students should also have experience with rounding down, but not in the context of money (e.g., 0.73 rounds to 70).

M.EE.S-ID.1-2

M.EE.S-ID.1-2

Given data, construct a simple graph (table, line, pie, bar, or picture) and interpret data.

Link to Minimap:

http://www.dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.S-ID.1-2.pdf

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.

<p>Proximal Precursor</p> <p>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.</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 graph. Recognize the structure of a pie 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 words that describe (e.g., more, less, red circle, same, different) 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 (e.g., two CDs, bumpy balls and bumpy gravel, red rectangles). As the students group two or more items, the educator will demonstrate the representation in graphs and charts and encourage students to actively participate in their creation.

How is the Distal Precursor related to the target?

Distal Precursor: Students actively participate in the creation of bar graphs, picture graphs, line graphs, and pie charts by placing representations for each response to the research question.

M.EE.A-CED.1

M.EE.A-CED.1

Create an equation involving one operation with one variable, and use it to solve a real-world problem.

Link to Minimap:

http://www.dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.A-CED.1.pdf

Target | Solve real-world problems using equations with non-negative rational numbers.
Represent real-world problems as equations.

Proximal Precursor Represent expressions with variables. Represent the unknown in an equation.	Distal Precursor: Represent multiplication with equations. Represent division with equations. Represent subtraction with equations. Represent addition with equations.	Initial Precursor: Combine sets. Partition sets.
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How is the Initial Precursor related to the target?

Initial Precursor: Representing and solving 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. Work on this skill using a variety of sets, labeling and counting the sets, and moving items in and out of the sets, labeling and counting the set again. Additionally, the educators will pair those sets with the symbolic representations for addition, subtraction, multiplication, and division (e.g., $3 \times 2 = ?$, $3 - 2 = ?$).

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.S-ID.1-2

M.EE.S-ID.1-2 Given data, construct a simple graph (table, line, pie, bar, or picture) and interpret the data.

Link to Minimap:

http://dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.S-ID.1-2.pdf

Target | Use graphs to read beyond the data.

Represent data using bar graph.

Represent data using picture graph.

Represent data using bar graph.

Represent data using picture graph.

Represent data using line graph.

Represent data using pie charts.

<p>Proximal Precursor</p> <p>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.</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 graph. Recognize the structure of a pie 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 construct a graph, 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 words that describe (e.g., more, less, red circle, same, different) 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 (e.g., two CDs, bumpy balls and bumpy gravel, red rectangles). As the students group two or more items, the educator will demonstrate the representation in graphs and charts and encourage students to actively participate in their creation.

How is the Distal Precursor related to the target?

Distal Precursor: Students actively participate in the creation of bar graphs, picture graphs, line graphs, and pie charts by placing representations for each response to the research question.

M.EE.S-ID.3

M.EE.S-ID.3 Interpret general trends on a graph or chart.

Link to Minimap:

http://dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.S-ID.3.pdf

Target | Analyze overall shape of the data distribution.
Draw inferences by interpreting general trends on a graph or chart.

<p>Proximal Precursor</p> <p>Recognize symmetric distribution. Recognize outliers. Recognize peaks in data distribution.</p> <p>Recognize symmetric distribution. Analyze the overall shape of the data distribution. Recognize peaks in data distribution.</p> <p>Recognize variability in a date set.</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 a pie chart.</p>	<p>Initial Precursor:</p> <p>Order objects. Classify.</p>
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How is the Initial Precursor related to the target?

Initial Precursor: In order to construct a graph, 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 words that describe (e.g., more, less, red circle, same, different) 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 (e.g., two CDs, bumpy balls and bumpy gravel, red rectangles). As the students group two or more items, the educator will demonstrate the representation in graphs and charts and encourage students to actively participate in their creation.

How is the Distal Precursor related to the target?

Distal Precursor: Students actively participate in the creation of bar graphs, picture graphs, line graphs, and pie charts by placing representations for each response to the research question.

M.EE.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).

Link to Minimap:

http://dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.S-ID.4.pdf

Target | Calculate mean.

Proximal Precursor Summarize data by the number of observations.	Distal Precursor: Classify.	Initial Precursor: Recognize attribute values.
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How is the Initial Precursor related to the target?

Initial Precursor: In order to calculate the mean of a data set, 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 since it does not have any sides", "two fidgets are big and two fidgets are small"), 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 a set, label it (e.g., two balls, one bear, three blocks), count the items, label it 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 ability to attend to the details of an object and to count objects, educators provide many opportunities for students to classify (group) items based on their size (e.g., compare two or more items and determine which is larger or smaller), amount (e.g., numbers larger or smaller than a given number), and distance between numbers (e.g., skip counting by 2, 5, or 10). Educators should also take care to use attribute words when defining and demonstrating grouping items. While students do not need to say these words, they do need to learn the meanings.

M.EE.A-CED.1

M.EE.A-CED.1 Create an equation involving one operation with one variable, and use it to solve a real-world problem.

Link to Minimap:

http://dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.A-CED.1.pdf

Target | Solve real-world problems using equations with non-negative rational numbers.

Represent real-world problems as equations.

Represent real-world problems as equations.

<p>Proximal Precursor</p> <p>Represent expressions with variables.</p> <p>Represent the unknown in an equation.</p>	<p>Distal Precursor:</p> <p>Represent multiplication with equations.</p> <p>Represent division with equations.</p> <p>Represent subtraction with equations.</p> <p>Represent addition with equations.</p>	<p>Initial Precursor:</p> <p>Combine sets.</p> <p>Partition sets.</p> <p>Combine sets.</p>
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How is the Initial Precursor related to the target?

Initial Precursor: The knowledge needed to create an equation requires students to manipulate sets (i.e., combining and separating or partitioning). Provide students many opportunities to take a set of objects (e.g., tiles, linking cubes, buttons) and separate them based on a given characteristic (e.g., shape, color, size) into two distinct sets, then separate them again based on another characteristic. Guide students to notice how the set size changes each time you combine or partition the sets.

How is the Distal Precursor related to the target?

Distal Precursor: As students begin to understand labeling and counting sets, they begin to use the number sequence and become more adept at tracking individual objects. Work on this skill using a variety of sets, labeling and counting the sets, and moving items in and out of the sets, labeling and counting the set again. Additionally, the educators will pair those sets with the symbolic representations for addition, subtraction, multiplication, and division (e.g., $3 + 2 = ?$, $3 \times 2 = ?$).

M.EE.A-CED.2-4

M.EE.A-CED.2-4 Solve one-step inequalities.

Link to Minimap:

http://dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.A-CED.2-4.pdf

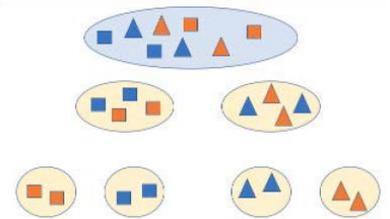
Target | Solve linear inequalities in 1 variable.

Represent solutions of inequalities on a number line.

<p>Proximal Precursor Solve linear equalities in one variable.</p>	<p>Distal Precursor: Represent division with equations. Represent subtraction with equations. Represent addition with equations. Represent multiplication with equations.</p>	<p>Initial Precursor: Partition sets. Combine sets.</p>
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How is the Initial Precursor related to the target?

Initial Precursor: The knowledge needed to solve one-step inequalities requires students to manipulate sets (i.e., combining and separating or partitioning). Provide students many opportunities to take a set of objects (e.g., tiles, linking cubes, buttons) and separate them based on a given characteristic (e.g., shape, color, size) into two distinct sets, then separate them again based on another characteristic. Guide students to notice how the set size changes each time you combine or partition the sets.



How is the Distal Precursor related to the target?

Distal Precursor: As students begin to understand labeling and counting sets, they begin to use the number sequence and become more adept at tracking individual objects. Work on this skill using a variety of sets, labeling and counting the sets, and moving items in and out of the sets, labeling and counting the set again. Additionally, the educators will pair those sets with the symbolic representations for addition, subtraction, multiplication, and division (e.g., $3 + 2 = ?$, $3 \times 2 = ?$).

M.EE.A-SSE.1

M.EE.A-SSE.1 Identify an algebraic expression involving one arithmetic operation to represent a real-world problem.

Link to Minimap:

http://dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.A-SSE.1.pdf

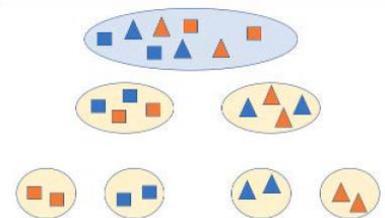
Target | Represent real-world problems as equations.

Represent real-world problems as expressions.

<p>Proximal Precursor</p> <p>Represent the unknown in an equation.</p> <p>Represent expressions with variables.</p>	<p>Distal Precursor:</p> <p>Represent subtraction with equations.</p> <p>Represent addition with equations.</p> <p>Represent multiplication with equations.</p> <p>Represent division with equations.</p>	<p>Initial Precursor:</p> <p>Combine sets.</p> <p>Partition sets.</p>
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How is the Initial Precursor related to the target?

Initial Precursor: The knowledge needed to represent equations requires students to manipulate sets (i.e., combining and separating or partitioning). Provide students many opportunities to take a set of objects (e.g., tiles, linking cubes, buttons) and separate them based on a given characteristic (e.g., shape, color, size) into two distinct sets, then separate them again based on another characteristic. Guide students to notice how the set size changes each time you combine or partition the sets.



How is the Distal Precursor related to the target?

Distal Precursor: As students begin to understand labeling and counting sets, they begin to use the number sequence and become more adept at tracking individual objects. Work on this skill using a variety of sets, labeling and counting the sets, and moving items in and out of the sets, labeling and counting the set again. Additionally, the educators will pair those sets with the symbolic representations for addition, subtraction, multiplication, and division (e.g., $3 + 2 = ?$, $3 \times 2 = ?$).

M.EE.A-SSE.3

M.EE.A-SSE.3 Solve simple algebraic equations with one variable using multiplication and division.

Link to Minimap:

http://dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.A-SSE.3.pdf

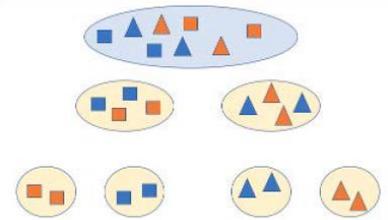
Target | Solve linear equations in one variable.

Solve linear equations in 1 variable with rational number coefficients.

<p>Proximal Precursor</p> <p>Determine the unknown in a division equation.</p> <p>Determine the unknown in a multiplication equation.</p>	<p>Distal Precursor:</p> <p>Demonstrate the concept of division.</p> <p>Demonstrate the concept of multiplication.</p>	<p>Initial Precursor:</p> <p>Partition sets.</p> <p>Combine sets.</p>
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How is the Initial Precursor related to the target?

Initial Precursor: The knowledge needed to represent equations requires students to manipulate sets (i.e., combining and separating or partitioning). Provide students many opportunities to take a set of objects (e.g., tiles, linking cubes, buttons) and separate them based on a given characteristic (e.g., shape, color, size) into two distinct sets, then separate them again based on another characteristic. Guide students to notice how the set size changes each time you combine or partition the sets.



How is the Distal Precursor related to the target?

Distal Precursor: As students' understanding of labeling and counting sets develops, they will begin working on adding items to a set and combining sets to create a new set. Additionally, students will work on developing an understanding of equal shares by actively participating in one-to-one distribution of objects to person (e.g., giving each person in the group two pencils), objects to objects (e.g., given four counters, they would line up four more counters in front of or on top of the first set), and objects to available space (e.g., given three chairs at a table, the student places a cup on the table for each available chair). Students should also experience dividing a whole into equal shares (e.g., having 15 counters and 3 people in the group, give one to each person until there are no more, then count how many each person received).

M.EE.A-SSE.4

M.EE.A-SSE.4 Determine the successive term in a geometric sequence given the common ratio.

Link to Minimap:

http://dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.A-SSE.4.pdf

Target | Extend a geometric sequence by applying the recursive rule.

Proximal Precursor Recognize the recursive rule for geometric sequences. Recognize geometric sequences.	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 determine a geometric sequence (e.g., 2, 4, 8, 16, 32), students begin by learning to notice what is new. The educator draws the students' attention to new objects or stimuli, labels them (e.g., "there are two cubes", "this is a circle", "this fidget is big and this fidget is 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 understanding of attributes and work toward geometric sequences, educators provide interactive lessons around patterns using attributes like shape, size, and color. At this level, students are also expected to recognize symbolic (e.g., number) patterns. This also requires that students recognize numerals in order (i.e., 1, 2, 3...). Educators should take care to use number names while defining and demonstrating symbolic sequences. While students do not need to say these words, they do need to learn the meanings and the sequence.

M.EE.A-REI.1012

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.

Link to Minimap:

http://dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.A-SSE.4.pdf

Target | Analyze linear function graphs.

Interpret a point on the graph of a linear function.

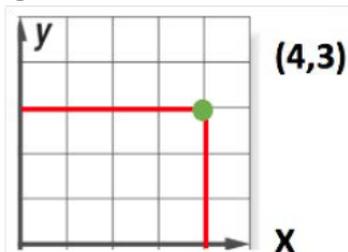
Proximal Precursor Recognize covariation. Recognize direction of covariation. Describe rate of change in a graph.	Distal Precursor: Explain coordinate pairs (ordered pairs). Explain x-coordinate. Explain y-coordinate.	Initial Precursor: Arrange objects in pairs. Order objects.
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How is the Initial Precursor related to the target?

Initial Precursor: In order to analyze function graphs, 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 students' 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 are working on identifying pattern rules, educators can also begin to demonstrate how rules can be used with ordered pairs. Provide students lots of opportunities to apply rules to create their own examples of ordered pairs. Educators should demonstrate how students can use their counting skills to figure out where to mark the point by counting how far along and how far up the x- and y-axes.



M.EE.F-BF.1

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

Link to Minimap:

http://dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.F-BF.1.pdf

Target | Represent real-world problems as graphs.

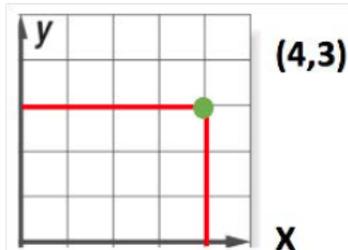
Proximal Precursor Recognize covariation. Recognize direction of covariation. Describe rate of change in a graph.	Distal Precursor: Explain y-coordinate. Explain coordinate pairs (ordered pairs). Explain x-coordinate.	Initial Precursor: Order objects. Arrange objects in pairs.
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How is the Initial Precursor related to the target?

Initial Precursor: In order to represent real-world problems on graphs, 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 students' 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 are working on identifying pattern rules, educators can also begin to demonstrate how rules can be used with ordered pairs. Provide students lots of opportunities to apply rules to create their own examples of ordered pairs. Educators should demonstrate how students can use their counting skills to figure out where to mark the point by counting how far along and how far up the x- and y-axes.



M.EE.F-BF.2

M.EE.F-BF.2 Determine an arithmetic sequence with whole numbers when provided a recursive rule.

Link to Minimap:

http://dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.F-BF.2.pdf

Target | Extend an arithmetic sequence by applying the recursive rule.

Proximal Precursor Recognize arithmetic sequences. Recognize the recursive rule for arithmetic sequences.	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 determine an arithmetic sequence (e.g., 1, 4, 7, 10, 13), students begin by learning to notice what is new. The educator draws the students' attention to new objects or stimuli, labels them (e.g., "there are two cubes", "this is a circle", "this fidget is big and this fidget is 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 understanding of attributes and work towards arithmetic sequences, educators provide interactive lessons around patterns using attributes like shape, size, and color. At this level, students are also expected to recognize symbolic (e.g. numbers) patterns. This also requires that students recognize numerals in order. (i.e., 1, 2, 3...). Educators should take care to use number names while defining and demonstrating symbolic sequences. While students do not need to say these words, they do need to learn the meanings and the sequence.

M.EE.F-IF.1-3

M.EE.F-IF.1-3 Use the concept of function to solve problems.

Link to Minimap:

http://dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.F-IF.1-3.pdf

Target | Solve real-world problems by interpreting linear function graphs.
Solve real-world problems by interpreting linear function tables.

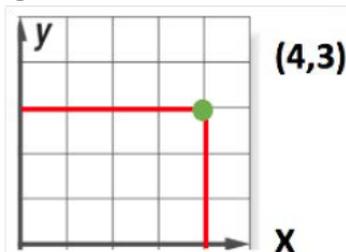
Proximal Precursor Describe the rate of change in a table. Describe rate of change in a graph.	Distal Precursor: Explain x-coordinate. Explain y-coordinate. Explain coordinate pairs (ordered pairs).	Initial Precursor: Order objects. Arrange objects in pairs.
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How is the Initial Precursor related to the target?

Initial Precursor: In order to use functions to solve problems, 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 students' 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 are working on identifying pattern rules, educators can also begin to demonstrate how rules can be used with ordered pairs. Provide students lots of opportunities to apply rules to create their own examples of ordered pairs. Educators should demonstrate how students can use their counting skills to figure out where to mark the point by counting how far along and how far up the x- and y-axes.



M.EE.F-IF.4-6

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.

Link to Minimap:

http://dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.F-IF.4-6.pdf

Target | Compare two functions with different rate of change.
Analyze linear function graphs.

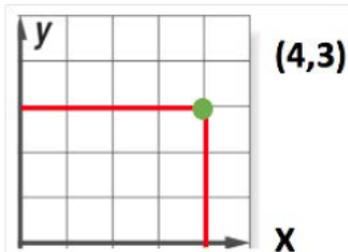
Proximal Precursor Recognize covariation. Recognize direction of covariation. Describe rate of change in a graph.	Distal Precursor: Explain x-coordinate. Explain y-coordinate. Explain coordinate pairs (ordered pairs).	Initial Precursor: Arrange objects in pairs. Order objects.
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How is the Initial Precursor related to the target?

Initial Precursor: In order to construct graphs that represent a linear function, 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 students' 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 are working on identifying pattern rules, educators can also begin to demonstrate how rules can be used with ordered pairs. Provide students lots of opportunities to apply rules to create their own examples of ordered pairs. Educators should demonstrate how students can use their counting skills to figure out where to mark the point by counting how far along and how far up the x- and y-axes.



M.EE.F.LE.1-3

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.

Link to Minimap:

http://dynamiclearningmaps.org/sites/default/files/documents/Math_EEs/M.EE.F.LE.1-3.pdf

Target | Explain average rate of change.
Determine rate of change of linear functions.

Proximal Precursor Recognize covariation. Recognize direction of covariation. Determine slope based on coordinate pairs.	Distal Precursor: Explain x-coordinate. Explain y-coordinate. Explain coordinate pairs (ordered pairs).	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 model linear functions, 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 students' 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 are working on identifying pattern rules, educators can also begin to demonstrate how rules can be used with ordered pairs. Provide students lots of opportunities to apply rules to create their own examples of ordered pairs. Educators should demonstrate how students can use their counting skills to figure out where to mark the point by counting how far along and how far up the x- and y-axes.

