

Math Innovative Item Types

*Disclaimer: The items shown in the document may be live items for 18-19 and **should not** be used for classroom instruction.*

What is an innovative item?

An innovative item is a machine-scored item type whose unique format allows for assessment of a concept in a way traditional paper-and-pencil selected-response items do not allow. Innovative items often provide a format that makes it more difficult for students to guess the correct answer and can uniquely enhance the standard being assessed.

As of August 2018, ANet math interims will provide the innovative item types listed below. All item types available in 2017-18 will be available this upcoming year, in addition to several new item types offered in our online Assessment Delivery System (ADS). [Click here for more information on what to expect with the student experience in the new ADS.](#)

Item Type	Description	Scoring and Notable Features
Charts <New in 18-19>	A technology-enhanced item in which students create and/or modify a line plot, dot plot, bar graph, and histogram	<ul style="list-style-type: none"> Worth 1 point (no option for partial credit)
Choice Matrix <New in 18-19>	A technology-enhanced item in which students are required to evaluate each of several stems based on answer choices given on the right side of the page	<ul style="list-style-type: none"> Can be worth 1 or 2 points (with partial credit for 2-point items) May include stems with multiple correct answer choices
Fill Shape <New in 18-19>	A technology-enhanced item in which students drag and drop different sized shapes/parts into circle, rectangle, or grid	<ul style="list-style-type: none"> Worth 1 point (no option for partial credit)
Shading <New in 18-19>	A technology-enhanced item in which students select cells in a figure to be shaded to represent fractions, ratios, or calculations	<ul style="list-style-type: none"> Worth 1 point (no option for partial credit)
Drag & Drop Classification	A technology-enhanced item in which students drag and drop answer options to sort answers into categories	<ul style="list-style-type: none"> Can be worth 1 or 2 points (with partial credit for 2-point items) Has answers that duplicate themselves so that students can sort an answer into more than one category Often includes “distractors” (incorrect answers) that students do not use
Drag & Drop Matching	A technology-enhanced item in which students drag and drop answer options to match corresponding prompts	<ul style="list-style-type: none"> Can be worth 1 or 2 points (with partial credit for 2-point items) Will have a double-sided arrow to denote what to match Often includes “distractors” (incorrect answers) that students do not use
Drag & Drop Ordering	A technology-enhanced item in which students drag and drop answer options to order them numerically	<ul style="list-style-type: none"> Worth 1 point (no option for partial credit) Will not include “distractors” in math; students must always use all answers

Math Innovative Item Type Descriptions 2018-19

Drop-Down Menu	A technology-enhanced item in which students select from multiple drop-down menus to complete missing information	<ul style="list-style-type: none"> • Can be worth 1 or 2 points (with partial credit for 2-point items) • Often requires that students complete a sentence, inequality, equation, or table
Graphing on a Coordinate Plane	A technology-enhanced item in which students graph point(s) or line(s) to answer a prompt	<ul style="list-style-type: none"> • Can be worth 1 or 2 points (with partial credit for 2-point items)
Graphing on a Number Line	A technology-enhanced item in which students graph one or multiple points on a number line to answer a prompt	<ul style="list-style-type: none"> • Worth 1 point (no option for partial credit)
Math Short Answer <Available on paper & online assessments>	An item in which students type numerical values into one or multiple response boxes	<ul style="list-style-type: none"> • Worth 1 point (no option for partial credit)
Multi-Part Item	An innovative item in which students answer two different item types in a “Part A...Part B” format; Part A and Part B will relate to one another in content, but computation in Part B is independent of the answer to Part A	<ul style="list-style-type: none"> • Worth 2 points, with an option to get 1 point partial credit for answering any one of the two parts correctly
Multiple Select <Available on paper & online assessments>	An item in which students select 2-3 correct answers from 5-7 answer choice options	<ul style="list-style-type: none"> • Can be worth 1 or 2 points (with partial credit for 2-point items) • In grades 3-5, the prompt tells students how many answers to select; in grades 6-8, students must determine how many answers to select

Math Innovative Item Design Considerations

When designing innovative items, the math assessment team uses the following guiding questions to drive innovative item development:

- Does the format of the item *enhance* student demonstration of the standard?**

Certain item types are well-suited to assess certain skills. For example, drag & drop matching items are well-suited to assess standards where students are asked to show equivalent forms of a single prompt. When creating innovative items, the assessment team first thinks about how the format of the innovative item will enhance or uniquely elicit an aspect of the standard being assessed.
- Does the item have the opportunity to provide teachers with actionable data grounded in student misunderstanding?**

In order to further the purpose of our assessments in providing actionable data for teachers, the assessment team also thinks carefully about how the item will be analyzed to provide information about what students do and do not understand about a given standard. Factors such as how many answer choices and distractors the item has, how many points the item is worth, and how partial credit will operate for the item push the assessment team to provide items that lend themselves towards data analysis.

In addition to these considerations, the assessment team has item-specific considerations they incorporate when designing innovative items. The following pages provide an overview of each innovative item type available on ANet interims and the assessment team’s item-specific design considerations.

Math Innovative Item Type Descriptions

Charts <New in 18-19>

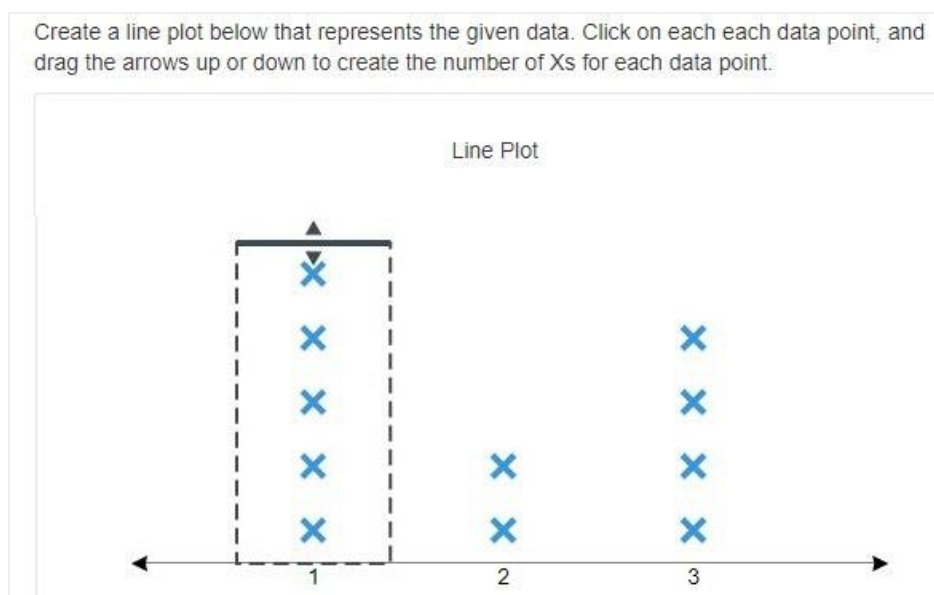
Item Overview

Chart items are innovative items that provide students an opportunity to interact with line or dot plots, bar graphs, and histograms. Students will create and/or modify a chart based on a given data set or provided context.

Item Design Considerations

- Items are worth 1 point with no option for partial credit.
- This item type is ideal for measurement and statistics standards that ask students to draw or make charts that represent data.

CHARTS EXAMPLE



Choice Matrix <New in 18-19>

Item Overview

Choice matrix items are technology-enhanced items (TEIs) in which a student is required to evaluate one or more question stems (row items) using a set of answer choices (column options). Each question stem will have a correct answer. There may be more than one correct answer choice for a question stem. Similarly with a multiple-select items, choice matrix items make it difficult to guess or to use the process of elimination to identify the correct answer.

Item Design Considerations

- Items can be worth either 1 or 2 points with the possibility of earning partial credit on 2-point items for selecting some, but not all, correct answers.
- Some content is assessed particularly well through this item type. Two examples are given below:

True or False

In a choice matrix TEI, students may be presented with several equations, or inequalities and evaluate which are true or false under certain conditions.

Evaluating Characteristics

In a choice matrix TEI, students may be presented with several values, operations, or rigid motions that need to be evaluated based on certain characteristics or conditions.

CHOICE MATRIX EXAMPLE

Identify which transformations preserve just the line segment lengths, just the angle measures, or both the line segment lengths and angle measures of a transformed figure. Select Line Segment Length, Angle Measure, or Both for each transformation below.

Transformation	Line Segment Length	Angle Measure	Both
Dilation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reflection	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rotation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Translation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Fill Shape <New in 18-19>

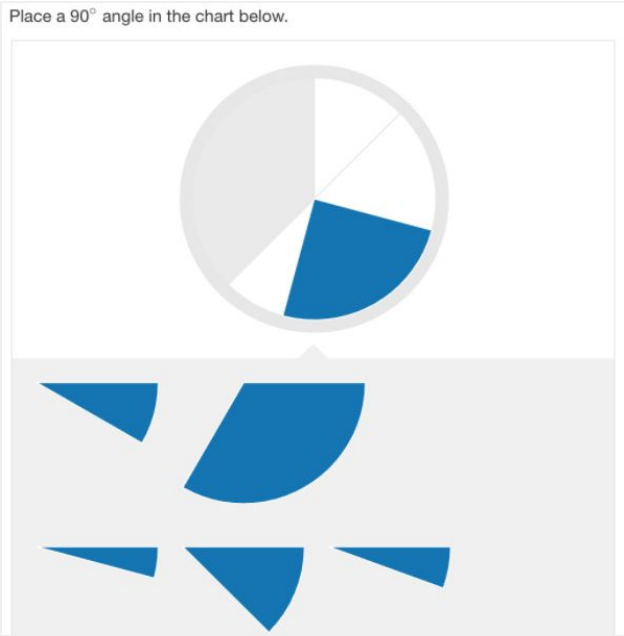
Item Overview

In a fill shape TEI, students are prompted to drag and drop different sized shapes/parts into a circle, rectangle, or grid to answer a question. Depending on the item, students may need to compute, interpret, or apply various mathematical concepts and/or skills to determine the correct approach to filling the provided shape.

Item Design Considerations

- Items are worth 1 point with no option for partial credit.
- This item type is ideal for assessing standards that involve students demonstrating an understanding of fractions, ratios, and measurement.

FILL SHAPE EXAMPLE



Shading <New in 18-19>

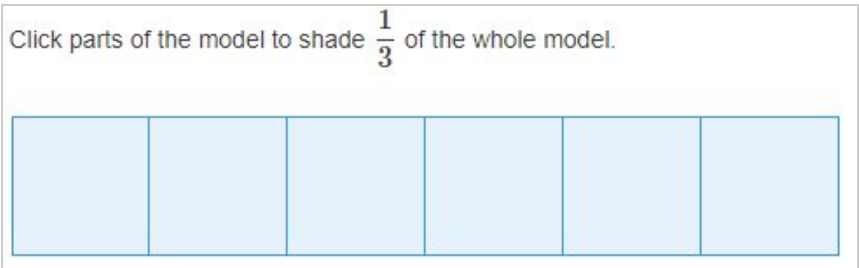
Item Overview

Shading items are innovative items that involve students selecting cells or sections in a figure to be shaded. In order to represent fractions, ratios, or calculations. The item may require just the correct number of cells or sections are shaded or the correct number in addition to the correct location of the shaded cells or sections.

Item Design Considerations

- Items are worth 1 point with no option for partial credit.
- This item type is ideal for standards that ask students to demonstrate an understanding of fractions, ratios, or calculations.

SHADING EXAMPLE



Drag and Drop Items

Item Overview

Drag-and-drop items are technology-enhanced items (TEIs) in which a student interacts with the item by “picking up” an image, phrase, number, etc. and dragging it to a different location on the page. There are no pre-set answers for students to choose from, but rather, students create their answers by interacting with the content in the item. Examples of specific types of drag-and-drop items are below:

Drag and Drop Classification

In a drag-and-drop classification TEI, students are given “buckets” or categories with labels that describe what should be dragged into each area. Students are presented with a set of options, and they must decide in which bucket each option belongs. Students may pick up an option more than once and drag it to multiple buckets. They do not know how many options should go in each bucket, and some buckets may be empty.

- Items can be worth either 1 or 2 points with the possibility of earning partial credit on 2-point items for correctly sorting answers into one or more buckets.
- This item type is ideal for assessing standards that ask students to categorize information, identify examples of a given mathematical property, or distinguish mathematical characteristics.

DRAG & DROP CLASSIFICATION EXAMPLE

Drag and drop each equation into the correct category.

- Each equation should only be used once.
- All equations should be sorted into a category.

This equation represents a linear function.

This equation represents a nonlinear function.

⌘ $D = 16t^2$

⌘ $L = 9.81N$

⌘ $C = \frac{5}{9}(F - 32)$

⌘ $V = s^3$

⌘ $K = C + 273.15$

Drag and Drop Ordering

In a drag-and-drop ordering TEI, students are prompted to drag and drop a set of values in a specific order, for example, from least to greatest. Depending on the item, students may need to compute, interpret, or compare, etc. the math content in the item in order to determine the correct order.

- Items are worth 1 point with no option for partial credit.
- This item type is ideal for assessing standards that ask students to compare numerical values or compare numerical aspects of equations.
- In math, students will be prompted to order all of the values that are given; students will not be prompted to first select the appropriate values out of a larger set and then order those chosen values.

DRAG & DROP ORDERING EXAMPLE

Drag and drop the decimals to order them from **greatest** (top) to **least** (bottom).

≡ 0.09

≡ 0.4

≡ 0.61

≡ 0.29

Drag and Drop Matching

In a drag-and-drop matching TEI, students are presented with a set of descriptions, values, images, or other prompts on the left-hand side of the item, and they must pick the correct option(s) that match on the right-hand side. Some matching TEIs will have the exact number of answer options as there are answer prompts, but others will have more answer options than prompts to match to, including “distractors” (incorrect answer options) that students will not use.

- Items can be worth either 1 or 2 points with the possibility of earning partial credit on 2-point items for answering some, but not all, parts correctly.
- This item type is ideal for assessing standards that ask students to represent equivalence of statements, expressions, ratios, etc. and standards that ask students to demonstrate fluency.

DRAG & DROP MATCHING EXAMPLE

Drag and drop the expressions to match with the equivalent expression.

Drop-Down Menu

Item Overview

Drop-down-menu items are technology-enhanced items (TEIs) in which a student interacts with the item by selecting a value, phrase, symbol, etc. from a drop-down menu of options. There may be more than one drop-down menu in each item with the same or different options for each menu. In this way, students create their answer by selecting their chosen option(s).

Item Design Considerations

- Items can be worth either 1 or 2 points with the possibility of earning partial credit on 2-point items for answering some, but not all, parts correctly.
- Some content is assessed particularly well through this item type. Two examples are given below:

Completing a sentence

In a drop-down-menu TEI, students may be presented with a sentence, phrase, or comparison that is incomplete. For example, students may be presented with two values and a drop-down menu in between that prompts students to choose the correct symbol to compare the two values.

Creating expressions, equations, or inequalities

In a drop-down-menu TEI, students may be presented with an expression, equation, or inequality that is partially complete. An operation, value, or variable may be missing, and instead, a drop-down menu of options is shown. Compared to an item where a student must construct the entire equation, a drop-down-menu item can target a specific component of the equation and hone in on targeted misconceptions.

DROP-DOWN MENU EXAMPLE

At the local hardware store, 2 feet of copper wire costs \$3.60.

Use the drop-down menus below to make a true statement.

The copper wire costs per .

\$0.56

\$0.60

\$0.15

\$1.80

Graphing on a Coordinate Plane

Item Overview

Graphing on a coordinate plane items are technology-enhanced items (TEIs) that will appear on online assessments. In a graphing on a coordinate plane TEI, a student will interact with the item by selecting points on a coordinate plane to graph points, lines, rays, or circles.

Item Design Considerations

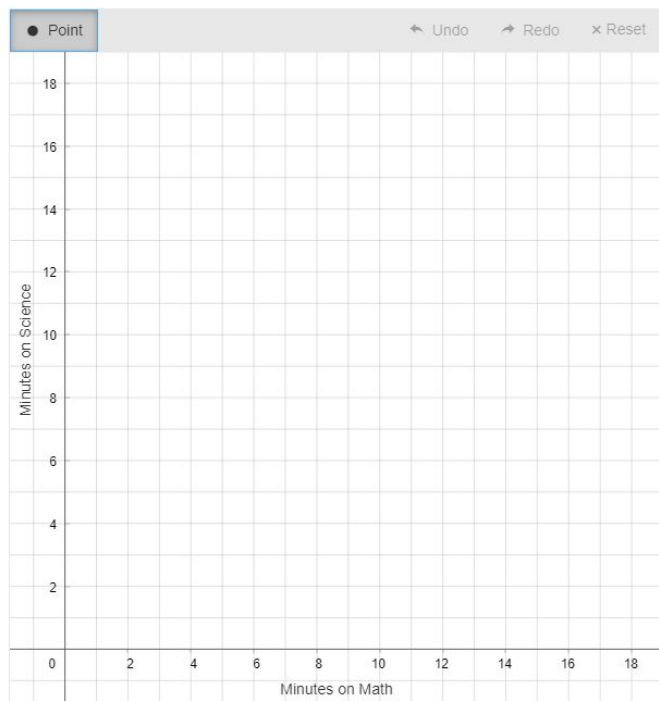
- Items can be worth either 1 or 2 points with the possibility of earning partial credit on 2-point items for selecting some, but not all, correct answers.
- This item type is ideal for standards that ask students to plot points or graph lines on a coordinate plane.

GRAPHING ON A COORDINATE PLANE EXAMPLE

Last night, Tyrus spent 3 minutes on math homework for every 4 minutes he spent on science homework.

If he spent 12 minutes doing math homework, graph the point on the coordinate plane below that represents the total amount of time he spent doing math and science homework last night.

Time Spent on Math and Science Homework



Graphing on a Number Line

Item Overview

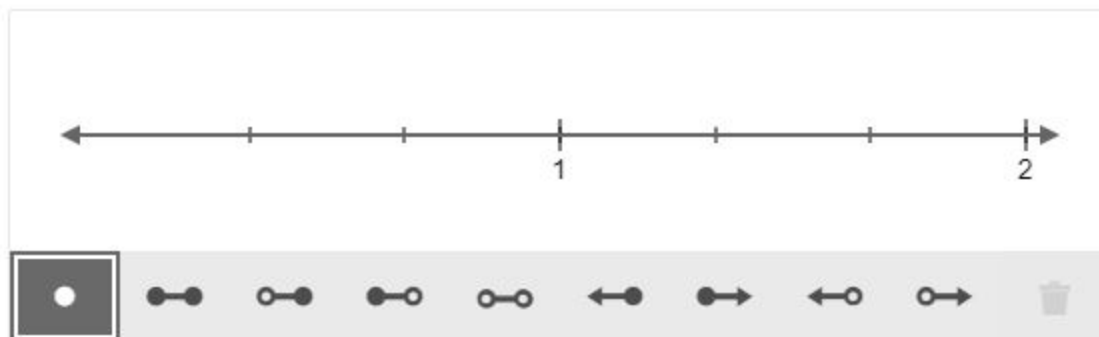
Graphing on a number line items are technology-enhanced items (TEIs) that will appear on online assessments. In a graphing on a number line TEI, a student will interact with the item by selecting one or multiple points to answer a given prompt.

Item Design Considerations

- Items are worth 1 point with no option for partial credit.
- This item type is ideal for standards that ask students to plot points on a number line. The platform allows students to graph rational numbers (including negative numbers and decimals.)

GRAPHING ON A NUMBER LINE EXAMPLE

Plot a point at $\frac{4}{3}$ on the number line below.



Math Short-Answer <Available on paper & online assessments>

Item Overview

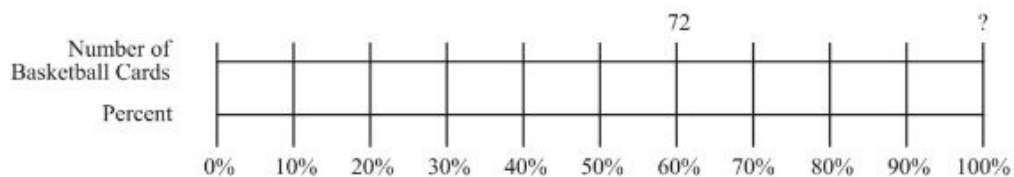
A math short-answer item is a type of innovative item that will appear on online assessments. In a math short-answer item, students enter numeric values into one or more response boxes to complete an item. These items are the online corollary to the math short-answer item type available on paper assessments.

Item Design Considerations

- Items are worth 1 point with no option for partial credit.
- Because it is difficult for students to guess the correct answer, this item type is well-suited for assessing computational standards.

MATH SHORT ANSWER EXAMPLE

The double number line below shows the number of basketball cards that represents 60% of Juan's basketball card collection.



How many basketball cards are in Juan's whole basketball card collection?

Respond in the space provided.

If your test is on paper, write your answer on the answer sheet.

basketball cards

7	8	9	-
4	5	6	
1	2	3	
0	.	,	
◀	▶	✕	

Multi-Part Items

Item Overview

Multi-part items are innovative items that combine two items into a single item with a Part A and Part B. Each part of a multi-part item can use a different item type; there may be some items for which each part is the same item type, depending on the content of the item. The content in each part will be related to one another, but scoring in Part B is not dependent on successful completion of Part A. Items are constructed so that the computation in Part B is independent of the answer to Part A.

Item Design Considerations

- Items are worth 2 points, with partial credit given if students only answer one of the two parts correctly. Unlike EBSR's, scoring for multi-part items is independent, meaning that students who only answer Part B correctly can still be awarded partial credit.
- Each part of a multi-part item can be tagged to a different standard, making this item type ideal for assessing coherence across different standards in one item.
- Multi-part items are also ideal for assessing standards that ask students to demonstrate multiple tasks to show one skill. For example, 6.EE.B.7 asks students to both write equations to solve real-world and mathematical problems and to solve the written equations. As a result, this standard would be ideal for being assessed through a multi-part item to allow each part of the item to address one aspect of the standard.

MULTI-PART EXAMPLE

Jake and his two brothers complete chores for their neighbors during the summer. They make \$467 in June and \$514 in July. They pay \$243 for supplies. Jake and his two brothers share the remaining money equally.

Part A

Use the drop-down menus below to create an equation that represents M , the amount of money each brother will receive.

(467 514 243) ÷ = M

Part B

How much money will each brother receive?

Respond in the space provided.

If your test is on paper, write your answer on the answer sheet.

\$

7	8	9
4	5	6
1	2	3
0	.	,
◀	▶	✖

Multiple Select <Available on paper & online assessments>

Item Overview

A multiple-select item is a selected-response item that has more than one correct answer. Multiple-select items can have 5 to 7 possible answer choices with between 2 to 3 of those choices being correct. Unlike traditional selected-response items, items with multiple correct answers make it difficult to guess or to use the process of elimination to identify the single correct answer.

Item Design Considerations

- Items can be worth either 1 or 2 points with the possibility of earning partial credit on 2-point items for selecting some, but not all, correct answers.
- In grades 3-5, students are prompted with the number of answer choices to select, minimizing the processing demands for elementary students (ex: “Select the three statements that are true.”)
- In grades 6-8, students are not given the number of correct answers (ex: “Select all that apply.”)
- Some content is assessed particularly well through this item type. Two examples are given below:

Fluency standards

According to PARCC, “Wherever the word fluently appears in a content standard, the word means quickly and accurately.” Multiple-select items can assess fluency in a way that a traditional selected-response item cannot. For example, one multiple-select item can address several multiplication facts at once, thereby better measuring the fluency of the standard (3.OA.7).

Equivalence

Several Common Core standards call for students to understand and represent equivalence of statements, values, expressions, ratios, etc. In the past, some items have addressed this skill by asking students to identify the **one** answer that is **not** equivalent to the others, implicitly asking students to identify the three answers that are. With the multiple-select format, the question stem can be reworded to the positive, asking students to identify **all** answers that **are** equivalent.

MULTIPLE SELECT EXAMPLE

Select **two** values that are greater than 180, 450.

A	180, 500
B	$9,000 + 100,000 + 400$
C	$(1 \times 100,000) + (9 \times 10,000)$
D	Twenty thousand, four hundred twenty-one
E	One hundred sixteen thousand, seven hundred five