**Introduction**

The state-mandated school closures through the end of the 2019-2020 school year not only changed the way schools delivered instruction but impacted how students were expected to learn grade-level and course content. As districts prepare for the 2020-2021 school year, the Ohio Department of Education is providing a series School Readiness Toolkits to help educators reflect on their instructional practices and support them in determining where their students are in their acquisition and retention of knowledge and skills.

**Background**

The items contained in the School Readiness Toolkits have been selected from the pool of released items from previous spring administrations of Ohio’s State Tests. The items are grouped together by Reporting Category and Critical Area of Focus. The collection of items as a whole is not representative of a single test form. The items presented are selected to offer a range of opportunity to work with each reporting category but do not comprise an actual test statistically. They are chosen to offer a range of experience with items of varying levels of difficulty or complexity. Items contained in School Readiness Toolkits are reflective of the 2017 Ohio’s Learning Standards for Mathematics. All items satisfy the criteria set forth by the grade-level/course Test Specifications and Content Elaborations and Expectations for Learning established by the grade-level/course Model Curriculum.

**How These Items Can Be Used**

The School Readiness Toolkits documents can be used to support instruction in a variety of ways. Districts can choose to administer the:

- Previous grade-level School Readiness Toolkits to acquire data and gather information on student understanding of previous grade-level content to begin the new school year;
- Current grade level School Readiness Toolkits items in sections as pre-assessments based on the grade level/course Critical Areas of Focus or local unit of study;
- Current grade-level School Readiness Toolkits in their entirety;
- Problems may be individually selected for use during local instruction; or
- Problems may be selected for use on local assessments.

**How to Identify Released Items**

At the bottom of the page for each released item, there is a page number and year. For example: 3 (2018), identifies the item can be found on page 3 of the 2018 Released Item document for the grade level or course. Released Item Scoring Guides for Mathematics are available in the Test Portal in the Student Practice Resources for Mathematics folder under the Student Practice Resources.

The released item Release Scoring Guides sample responses and scoring rationales can help educators plan and deliver instruction by providing example responses for each question along with scoring rationales for each response.

- 2017 Item Release Scoring Guide Grade 8
- 2018 Item Release Scoring Guide Grade 8
- 2019 Item Release Scoring Guide Grade 8
Using Released Test Items to Plan Instruction after COVID-19

The following questions can be answered individually or as a teacher team in the review of the state-released items and subsequent reflection on the local curriculum, instructional practices and assessments (both formative and summative), along with the previous learning opportunities for students.

- What are the math concepts evident in the release item(s)?
  - What is the math a student needs to know in this item?
  - Specifically, what previous grade-level standards impact the ability to answer this item?

- What math strategies can a student use to answer the item?
  - Identify examples of how these can be included in your instruction.

- Does the item focus on procedural fluency or conceptual understanding?
  - Procedural fluency follow-up:
    - What are the procedures and/or skills a student needs to know?
    - What experiences do students have to be prepared to demonstrate this learning?
    - What experiences can be used to move toward the desired outcome(s)?

  - Conceptual understanding follow-up:
    - What mathematical understanding is evident in the item?
    - What tasks can be used to develop that mathematical understanding?

- Does the item require the student to make connections across standards? If so, what are they?
  - What previous grade-level expectations are evident in the item?
  - What experiences can improve a student’s ability to demonstrate these learning expectations?

- Which Standards for Mathematical Practice are most evident in the item?
  - What types of experiences will improve student success?
Preparing for Instruction
Identify a grade-level Critical Area of Focus or a mathematical topic of related standards. Think about what your typical instruction for this critical area of focus looks like. Determine whether changes are needed to grow all students mathematically.

- What was present in past instruction that helped students perform well?
  - Using the Gap Analysis, Critical Area of Focus, Learning Progressions and Model Curriculum documents, what previous learning is likely absent or weak?
  - What experiences would support bridging the gap(s)?
  - How could you strengthen the Standards for Mathematical Practice to help support or enhance learning?
  - Specifically, what tasks would be used?

- What does typical instruction include?
  - Models/representations? What models or representations need introduction?
  - One-step, two-step or multi-step problems? Is more experience needed? What?
  - Routine and non-routine problems? Is more experience needed? What?
  - Mathematical and real-world contexts? Is more experience needed? What rich tasks could incorporate multiple standards?

- Did the mathematical contexts use numbers and operations appropriate for the grade level?
  - How could those numbers be modified to highlight the mathematical understanding needed and increase access for all students?

- Were the real-world contexts familiar or unfamiliar to the students?
  - How do you know?
  - What is needed now?

- Did the instruction allow opportunities for student reasoning and communication?
  - Productive struggle?
  - Student analysis of individual work, thinking and reasoning of others?
  - Descriptions, explanations and justifications?
  - Error analysis and reasonableness of answers?
  - What changes are needed to strengthen the Standards for Mathematical Practice?

- From this analysis, what overall changes are needed in instruction?
  - What instructional strategies should be maintained?
  - What instructional strategies require modification?
  - What needs to happen next to increase learning for all students?
    - Resources
    - Instructional strategies
    - Professional development
      - Do I need to seek out professional learning opportunities? What opportunities do I have for growing my own learning? What supports do I have to make these changes?
Critical Area of Focus #1
Formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations.
Question 15

Marisol, Timothy, and Zorian each have a machine that purifies water. The two tables show how much purified water Marisol’s and Timothy’s machines have produced at certain times after pouring water into the machine.

<table>
<thead>
<tr>
<th>Time (hours)</th>
<th>Amount of Water (ounces)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>5</td>
<td>30</td>
</tr>
<tr>
<td>8</td>
<td>48</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time (hours)</th>
<th>Amount of Water (ounces)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>36</td>
</tr>
<tr>
<td>6</td>
<td>54</td>
</tr>
<tr>
<td>9</td>
<td>81</td>
</tr>
</tbody>
</table>

Zorian’s machine produces purified water at a constant rate that is faster than the rate for Marisol’s machine and slower than the rate for Timothy’s machine.

Which equation could represent the amount of purified water, $y$, in ounces, that Zorian’s system produces after $x$ hours?

A) $y = 15x$
B) $y = 9x$
C) $y = 8x$
D) $y = 6x$

Points Possible: 1

**Content Cluster:** Understand the connections between proportional relationships, lines, and linear equations.

**Content Standard:** Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed. (8.EE.5)
Question 9

Point P is located at (−1, 5) on the coordinate plane, and point Q is located at (3, −3).

Which point lies on line PQ?

A  (5, −13)
B  (2, 1)
C  (1, 1)
D  (3, 13)

Points Possible: 1

Content Cluster: Understand the connections between proportional relationships, lines, and linear equations.

Content Standard: Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation \( y = mx \) for a line through the origin and the equation \( y = mx + b \) for a line intercepting the vertical axis at \( b \). (8.EE.6)

Depth of Knowledge: Level 2
a. Use models to represent mathematical concepts
b. Solve a routine problem requiring multiple steps/decision points, or the application of multiple concepts.
Question 5

Point M is located at (10, 10) and point N is located at (15, 25).

Which point lies on line MN?

A  (0, 0)
B  (11, 13)
C  (13, 13)
D  (20, 20)

Points Possible: 1

Content Cluster: Understand the connections between proportional relationships, lines, and linear equations.

Content Standard: Use similar triangles to explain why the slope $m$ is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at $b$. (8.EE.6)
Question 18

What is the solution to the equation $3x + 2 + 5x = 16$?

$x =$

Points Possible: 1

Content Cluster: Analyze and solve linear equations and pairs of simultaneous linear equations.

Content Standard: Solve linear equations in one variable. (8.EE.7)

b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

Depth of Knowledge: Level 2
d. Solve a routine problem requiring multiple steps/decision points, or the application of multiple concepts
Question 27

Which equation has exactly one solution?

A. $7x = 7$
B. $7x = 7x$
C. $x + 1 = x + 1$
D. $x + 1 = x + 2$

Points Possible: 1

Content Cluster: Analyze and solve linear equations and pairs of simultaneous linear equations.

Content Standard: Solve linear equations in one variable. (8.EE.7)

a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where $a$ and $b$ are different numbers).
Question 10

An equation is shown.

6x - 3 = 3x + 12

What is the solution to the equation?

\[ x = \]

Points Possible: 1

Content Cluster: Analyze and solve linear equations and pairs of simultaneous linear equations.

Content Standard: Solve linear equations in one variable. (8.EE.7)
b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.
Question 18

The graph of a system of two linear equations is shown.

Which point represents the solution to the system?

A. P  
B. Q  
C. R  
D. S

Points Possible: 1

Content Cluster: Analyze and solve linear equations and pairs of simultaneous linear equations.

Content Standard: Analyze and solve pairs of simultaneous linear equations graphically.  
(8.EE.8)

a. Understand that the solution to a pair of linear equations in two variables corresponds to the point(s) of intersection of their graphs, because the point(s) of intersection satisfy both equations simultaneously.
Question 13

A system of equations is shown.
\[
\begin{align*}
  y &= 2x - 7 \\
  y &= -x + 5
\end{align*}
\]

What is the solution to the system of equations?

Points Possible: 1

**Content Cluster:** Analyze and solve linear equations and pairs of simultaneous linear equations.

**Content Standard:** Analyze and solve pairs of simultaneous linear equations. \((8.EE.8)\)

*b.* Use graphs to find or estimate the solution to a pair of two simultaneous linear equations in two variables. Equations should include all three solution types: one solution, no solution, and infinitely many solutions. Solve simple cases by inspection. For example, \(3x + 2y = 5\) and \(3x + 2y = 6\) have no solution because \(3x + 2y\) cannot simultaneously be 5 and 6.

**Depth of Knowledge:** Level 2

*b.* Interpret information from a simple graph

*b.* Use models to represent mathematical concepts

*d.* Solve a routine problem requiring multiple steps/decision points, or the application of multiple concepts

*i.* Retrieve information from a table, graph, or figure and use it to solve a problem requiring multiple steps
Question 2

Which graph shows a line of best fit for the data?

A

B

C

D

E

F

Points Possible: 1

Content Cluster: Investigate patterns of association in bivariate data.

Content Standard: Understand that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line. (GAISE Model, steps 3 and 4) (8.SP.2)
Question 3

The number of inches of rain, \( y \), after \( x \) minutes of rainfall during a storm can be modeled by the equation shown.

\[ y = 0.003x \]

How many inches of rain falls in 2 minutes?

Points Possible: 1

Content Cluster: Investigate patterns of association in bivariate data.

Content Standard: Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height. (GAISE Model, steps 3 and 4) (8.SP.3)

Depth of Knowledge: Level 1
b. Apply/compute a well-known algorithm (e.g., sum, quotient)
i. Solve a one-step word problem
m. Solve linear equations
Grade 8

Reporting Category:

Functions

CRITICAL AREA OF FOCUS #2
Grasping the concept of a function and using functions to describe quantitative relationships
Question 24

This item has two parts.

A group of words and a rule are given.

**Words**

Six, Seven, Eight, Nine, Ten

**Rule**

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>The number of the letters in the word</td>
<td>The number the word represents</td>
</tr>
</tbody>
</table>

**Part A. Complete the table using the rule given.**

<table>
<thead>
<tr>
<th>Word</th>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Six</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seven</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eight</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ten</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Part B. Complete the statement.**

The table of values is a function because

**Drop down choices:**

The table of values is a function because

- all the outputs are different.
- two different inputs are assigned to the same output.
- each input is assigned to exactly one output.
- two different outputs are assigned to the same input.
Points Possible: 2

Content Cluster: Define, evaluate, and compare functions.

Content Standard: Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.
Function notation is not required for Grade 8. (8.F.1)

Depth of Knowledge: Level 2
d. Solve a routine problem requiring multiple steps/decision points, or the application of multiple concepts
j. Translate between tables, graphs, words and symbolic notation
l. Select a procedure according to criteria and perform it
Question 46

Points Possible: 1

Content Cluster: Define, evaluate, and compare functions.

Content Standard: Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. (8.F.1)
Question 22

Lyla and Dwayne each sell tickets at a concert. They start selling the tickets at the same time.

• Lyla starts with 500 tickets and sells them at an average rate of 5 tickets per minute.
• The number of tickets, \( t \), Dwayne has left after \( m \) minutes is represented in the table shown.

<table>
<thead>
<tr>
<th>( m )</th>
<th>( t )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>600</td>
</tr>
<tr>
<td>4</td>
<td>580</td>
</tr>
<tr>
<td>8</td>
<td>560</td>
</tr>
<tr>
<td>12</td>
<td>540</td>
</tr>
</tbody>
</table>

Which statement is true?

(A) Dwayne’s average rate of tickets sold per minute is higher than Lyla’s average rate.
(B) Lyla’s average rate of tickets sold per minute is higher than Dwayne’s average rate.
(C) Dwayne begins with more tickets than Lyla.
(D) Lyla begins with more tickets than Dwayne.

Points Possible: 1

Content Cluster: Define, evaluate, and compare functions.

Content Standard: Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change. (8.F.2)
Question 3

Pumps are used to empty water from two tanks, tank P and tank Q.

Tank P begins with 65 gallons of water and empties at a rate of 6.5 gallons per minute. The amount of water in tank Q is represented by the equation \( y = 63.5 - 5.25x \), where \( x \) is the number of minutes the pump has been emptying the tank.

Which statement is true?

A. Tank P empties at a faster rate than tank Q and had a lesser starting amount than tank Q.
B. Tank P empties at a faster rate than tank Q and had a greater starting amount than tank Q.
C. Tank P empties at a slower rate than tank Q and had a lesser starting amount than tank Q.
D. Tank P empties at a slower rate than tank Q and had a greater starting amount than tank Q.

Points Possible: 1

Content Cluster: Define, evaluate, and compare functions.

Content Standard: Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change. (8.F.2)
Two plumbers charge an initial fee and an hourly rate.

The equation \( y = 100 + 30x \) models plumber A’s fee, where \( y \) is the total charge, in dollars, and \( x \) is the number of hours worked.

The table shown represents plumber B’s total charge for different numbers of hours.

<table>
<thead>
<tr>
<th>Hours</th>
<th>Total Charges ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>105</td>
</tr>
<tr>
<td>2</td>
<td>160</td>
</tr>
<tr>
<td>3</td>
<td>215</td>
</tr>
</tbody>
</table>

Which statement about the plumbers’ charges is true?

A. The two plumbers have equal hourly rates.
B. Plumber A has a greater initial fee.
C. Plumber A has a greater hourly rate.
D. The two plumbers have equal initial fees.

**Points Possible: 1**

**Content Cluster:** Define, evaluate, and compare functions.

**Content Standard:** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change. (8.F.2)
Question 32

Which graph represents $y$ as a linear function of $x$?

- A
- B
- C
- D
Points Possible: 1

Content Cluster: Define, evaluate, and compare functions.

Content Standard: Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line. (8.F.3)

Depth of Knowledge: Level 1
a. Recall, observe, or recognize a fact, definition, term, or property
Question 6

Which graph represents a linear function?

Points Possible: 1

Content Cluster: Define, evaluate, and compare functions.

Content Standard: Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points $(1, 1), (2, 4)$ and $(3, 9)$, which are not on a straight line. (8.F.3)
Question 12

Points Possible: 1

Content Cluster: Use functions to model relationships between quantities.

Content Standard: Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two \((x, y)\) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. \((8.F.4)\)
Question 4

The graph of a linear function passes through the two given points on the coordinate plane.

(3, 15)
(6, 21)

What is the rate of change of the function?
Points Possible: 1

Content Cluster: Use functions to model relationships between quantities.

Content Standard: Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two \((x, y)\) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. \((8.F.4)\)

Depth of Knowledge: Level 2
Use models to represent mathematical concepts
Solve a routine problem requiring multiple steps/decision points, or the application of multiple concepts
i. Retrieve information from a table, graph, or figure and use it to solve a problem requiring multiple steps
Question 46

The graph of a function is shown.

Which statement correctly describes the graph?

- **A** The slope is zero.
- **B** The slope is undefined.
- **C** The function is increasing.
- **D** The function is decreasing.
Points Possible: 1

Content Cluster: Use functions to model relationships between quantities.

Content Standard: Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally. (8.F.5)

Depth of Knowledge: Level 1
a. Recall, observe, or recognize a fact, definition, term, or property
Question 50

Diedra has a new coin bank. For the first five days, she deposits the same amount of money into the coin bank. After that, she does not deposit any more money into the bank.

Which graph could represent the amount of money in Diedra’s bank?

Points Possible: 1

Content Cluster: Use functions to model relationships between quantities.

Content Standard: Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally. (8.F.5)
Question 42

Which graph shows a function that is increasing at a constant rate?

Points Possible: 1

Content Cluster: Use functions to model relationships between quantities.

Content Standard: Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally. (8.F.5)
Question 14

Mario rides his scooter to his friend’s house. His trip is represented in the graph shown.

Which statement describes Mario’s ride?

A. Mario first stayed in one place and then rode at a constant rate.
B. Mario first rode at a constant speed and then he stopped for some time.
C. Mario first rode at one constant speed and then at a faster constant speed.
D. Mario first rode at one constant speed and then at a slower constant speed.

Points Possible: 1

Content Cluster: Use functions to model relationships between quantities.

Content Standard: Describe qualitatively the functional relationship between two quantities by analyzing a graph, e.g., where the function is increasing or decreasing, linear or nonlinear. Sketch a graph that exhibits the qualitative features of a function that has been described verbally. (8.F.5)
Grade 8
Reporting Category:

Geometry

CRITICAL AREA OF FOCUS #3
Analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem
Question 20

A series of translations, rotations and reflections is applied to Triangle 1 to create Triangle 2, as shown.

What is the measure, in degrees, of the angle $x$?

degrees
Points Possible: 1

Content Cluster: Understand congruence and similarity using physical models, transparencies, or geometry software.

Content Standard: Verify experimentally the properties of rotations, reflections, and translations (include examples both with and without coordinates). (8.G.1)
b. Angles are taken to angles of the same measure.

Depth of Knowledge: Level 2
Solve a routine problem requiring multiple steps/decision points, or the application of multiple concepts
e. Compare and/or contrast figures or statements
i. Retrieve information from a table, graph, or figure and use it to solve a problem requiring multiple steps
Question 1

Two quadrilaterals are shown, where quadrilateral EFGH is created by reflecting quadrilateral ABCD across a line and then rotating it.

What is the value of $x$, in units?

$units$

Points Possible: 1

Content Cluster: Understand congruence and similarity using physical models, transparencies, or geometry software.

Content Standard: Verify experimentally the properties of rotations, reflections, and translations. (Include examples both with and without coordinates.) (8.G.1)
a. Lines are taken to lines, and line segments are taken to line segments of the same length.
Question 26

An architect designs floor plans for two houses. The floor plans for the houses are shown.

House B is a reflection of House A.

What is the value of $x$?

**Points Possible:** 1

**Content Cluster:** Understand congruence and similarity using physical models, transparencies, or geometry software.

**Content Standard:** Verify experimentally the properties of rotations, reflections, and translations: (8.G.1)
a. Lines are taken to lines, and line segments to line segments of the same length.
Question 2

Pentagon A is rotated 180° about its center and then translated to create pentagon B.

What is the value of \( x \)?

Points Possible: 1

Content Cluster: Understand congruence and similarity using physical models, transparencies, or geometry software.

Content Standard: Verify experimentally the properties of rotations, reflections, and translations: (8.G.1)

\( b \). Angles are taken to angles of the same measure.
Question 26

A transformation is to be performed on a figure.
Which transformation will not produce a congruent figure?

A reflection across the x-axis
B translation 2 units to the right
C rotation of 180 degrees about the origin
D dilation with a scale factor of 2 centered at the origin

Points Possible: 1

Content Cluster: Understand congruence and similarity using physical models, transparencies, or geometry software.

Content Standard: Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them. (Include examples both with and without coordinates.) (8.G.2)

Depth of Knowledge: Level 1
a. Recall, observe, or recognize a fact, definition, term, or property
Question 29

A figure is shown.

The figure is reflected across line \( l \).

Which figure is the result of this transformation?

(A)  

(B)  

(C)  

(D)  

Points Possible: 1

Content Cluster: Understand congruence and similarity using physical models, transparencies, or geometry software.

Content Standard: Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. (8.G.3)
Question 7

Quadrilateral ABCD is shown.

ABCD is translated to create quadrilateral EFGH.

What is the length, in units, of side EH?

Points Possible: 1

Content Cluster: Understand congruence and similarity using physical models, transparencies, or geometry software.

Content Standard: Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them. (Include examples both with and without coordinates.) (8.G.2)
Question 11

Which transformation can be applied to $\triangle JKL$ to create $\triangle MNO$?

A. a clockwise rotation of 180° about the origin
B. a clockwise rotation of 90° about the origin
C. a reflection across the line $y = x$
D. a reflection across the x-axis

Points Possible: 1

Content Cluster: Understand congruence and similarity using physical models, transparencies, or geometry software.

Content Standard: Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. (8.G.3)
Question 20

What transformations can be used to show that \(\triangle LMN\) is similar to \(\triangle PQR\)?

A. dilation, reflection  
B. reflection, translation  
C. rotation, dilation  
D. translation, rotation

Points Possible: 1

Content Cluster: Understand congruence and similarity using physical models, transparencies, or geometry software.

Content Standard: Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them. (Include examples both with and without coordinates.) (8.G.4)
Question 36

A horizontal line \( m \) is shown with two similar triangles, ABC and DEF.

How can triangle ABC be transformed to result in triangle DEF?

- A. a reflection across a vertical line
- B. a 90-degree rotation about point C
- C. a dilation, then a translation to the right
- D. a dilation, then a reflection across a vertical line

Points Possible: 1

Content Cluster: Understand congruence and similarity using physical models, transparencies, or geometry software.

Content Standard: Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them. (Include examples both with and without coordinates.) (8.G.4)

Depth of Knowledge: Level 2
- e. Compare and/or contrast figures or statements
  - i. Retrieve information from a table, graph, or figure and use it to solve a problem requiring multiple steps
Question 45

Line \( c \) intersects parallel lines \( m \) and \( n \) as shown.

What is the value of \( x \), in degrees?
Points Possible: 1

Content Cluster: Understand congruence and similarity using physical models, transparencies, or geometry software.

Content Standard: Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so. (8.G.5)

Depth of Knowledge: Level 2
i. Retrieve information from a table, graph, or figure and use it to solve a problem requiring multiple steps
Question 15

Parallel lines \( p \) and \( q \) are intersected by transversal \( r \), as shown.

\[ r \]

\[ 30^\circ \]

\[ p \]

\[ x^\circ \]

\[ q \]

What is the value of \( x \)?

Points Possible: 1

Content Cluster: Understand congruence and similarity using physical models, transparencies, or geometry software.

Content Standard: Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so. (8.G.5)
Question 7

A cone has a slant height of 25 inches and a radius of 7 inches as shown.

What is the height, $h$, in inches, of the cone?

$h =$ inches

Points Possible: 1

Content Cluster: Understand and apply the Pythagorean Theorem.

Content Standard: Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. (8.G.7)
Question 30

Chandni compares two cylinders.

- Both cylinders have an identical base.
- The first cylinder has a height of 4 inches and a volume of 120 cubic inches.
- The second cylinder has a height of 7 inches.

What is the volume, in cubic inches, of the second cylinder?

\[
\text{cubic inches}
\]

Points Possible: 1

Content Cluster: Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.

Content Standard: Solve real-world and mathematical problems involving volumes of cones, cylinders, and spheres. (8.G.9)

Depth of Knowledge: Level 3
- Use concepts to solve non-routine problems
- Perform procedures with multiple steps and multiple decision points
- Analyze the similarities and differences between procedures
Question 41

Point A is shown on the coordinate grid.

The distance between point A and point B is 5 units. The x-coordinate of point B is -2.

What is one possible y-coordinate of point B?

Points Possible: 1

Content Cluster: Understand and apply the Pythagorean Theorem.

Content Standard: Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. (8.G.8)
Question 4

Nadya has a cylindrical container that stores sugar. The radius of the container’s base is 5 centimeters, and the height of the container is 18 centimeters.

What is the volume of Nadya’s container, rounded to the nearest cubic centimeter?

Points Possible: 1

Content Cluster: Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.

Content Standard: Solve real-world and mathematical problems involving volumes of cones, cylinders, and spheres. (8.G.9)
Grade 8
Reporting Category:
The Number System

CRITICAL AREA OF FOCUS #4
Working with irrational numbers, integer exponents, and scientific notation
Question 49

Which expression is equivalent to $(5^2)^4 \cdot 5^5$?

A. $5^{11}$
B. $5^{13}$
C. $5^{30}$
D. $5^{40}$

Points Possible: 1

Content Cluster: Work with radicals and integer exponents.

Content Standard: Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$. (8.EE.1)
Question 25

An equation is given.

\[ x^3 = 27 \]

What is the value of \( x \)?

\[ x = \]

Points Possible: 1

Content Cluster: Work with radicals and integer exponents.

Content Standard: Use square root and cube root symbols to represent solutions to equations of the form \( x^2 = p \) and \( x^3 = p \), where \( p \) is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that \( \sqrt{2} \) is irrational. (8.EE.2)
Question 44

An expression is shown.

\[ \sqrt[3]{27} + 10 \]

What is the value of the expression?

Points Possible: 1

Content Cluster: Work with radicals and integer exponents.

Content Standard: Use square root and cube root symbols to represent solutions to equations of the form \( x^2 = p \) and \( x^3 = p \), where \( p \) is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that \( \sqrt{2} \) is irrational. (8.EE.2)

Depth of Knowledge: Level 1
a. Recall, observe, or recognize a fact, definition, term, or property
h. Evaluate an expression
Question 13

Which expression is equivalent to 0.00007?

A: $7 \times 10^{-5}$  
B: $7 \times 10^{-4}$  
C: $7 \times 10^{4}$  
D: $7 \times 10^{5}$

Points Possible: 1

Content Cluster: Work with radicals and integer exponents.

Content Standard: Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. For example, estimate the population of the United States as $3 \times 10^8$; and the population of the world as $7 \times 10^9$; and determine that the world population is more than 20 times larger. (8.EE.3)
Question 19

A scientist estimates that there are $2.2 \times 10^7$ walleye in Lake Erie. The total volume of Lake Erie is $4.83 \times 10^{11}$ cubic meters. A pool with a volume of 200,000 cubic meters is built to model the lake.

How many walleye should be put into the pool to model the conditions in the lake?

Points Possible: 1

Content Cluster: Work with radicals and integer exponents.

Content Standard: Perform operations with numbers expressed in scientific notation, including problems where both decimal notation and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities, e.g., use millimeters per year for seafloor spreading. Interpret scientific notation that has been generated by technology.

(8.EE.4)
An ant weighs $8.8 \times 10^{-6}$ pound and can carry objects up to 5,000 times greater than its own body weight.

What is the greatest weight, in pounds, the ant can carry? Express your answer in standard form.

**Points Possible:** 1

**Content Cluster:** Work with radicals and integer exponents.

**Content Standard:** Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading).
Interpret scientific notation that has been generated by technology.

(8.EE.4)

**Depth of Knowledge:** Level 2
d. Solve a routine problem requiring multiple steps决策 points, or the application of multiple concepts
Question 31

An expression is given that has a value between 4.4 and 4.5, and where \( x \) represents an integer.

\[ \sqrt{x} + \sqrt{x} \]

What is the value of \( x \)?

\[ x = \]

\[ \begin{array}{ccc}
1 & 2 & 3 \\
4 & 5 & 6 \\
7 & 8 & 9 \\
0 & - & \frac{n}{n} \\
\end{array} \]
Points Possible: 1

Content Cluster: Know that there are numbers that are not rational, and approximate them by rational numbers.

Content Standard: Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., \( \pi^2 \)). For example, by truncating the decimal expansion of \( \sqrt{2} \), show that \( \sqrt{2} \) is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations. (8.NS.2)

Depth of Knowledge: Level 3
e. Use concepts to solve non-routine problems
f. Perform procedures with multiple steps and multiple decision points
g. Generalize a pattern
i. Formulate a mathematical model for a complex situation
Approximate the value of $\sqrt{23}$ and place it on the number line.

**Points Possible:** 1

**Content Cluster:** Know that there are numbers that are not rational, and approximate them by rational numbers.

**Content Standard:** Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., $\pi^2$). For example, by truncating the decimal expansion of $\sqrt{2}$, show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations. (8.NS.2)
Question 16

The value of $\sqrt{k}$ lies between 2.2 and 2.3.
Select all possible values of $k$.

- [ ] 1.49
- [ ] 4.8
- [ ] 5
- [ ] 5.04
- [ ] 5.3
- [ ] 6

Points Possible: 1

Content Cluster: Know that there are numbers that are not rational, and approximate them by rational numbers.

Content Standard: Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions, e.g., $\pi^2$. For example, by truncating the decimal expansion of $\sqrt{2}$, show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations. (8.NS.2)