Exemplar Grade 4 Mathematics Test Questions

ACT® Aspire®

Introduction

This booklet explains ACT® Aspire® Grade 4 Mathematics test questions by presenting, with their answer keys, sample questions aligned to each reporting category on the test. A key includes the question's depth-of-knowledge (DOK) level,[1] an explanation of the task posed by each question, a thorough explanation of correct responses, ideas for improvement, and more. The exemplar test questions included here are representative of the range of content and types of questions found on the ACT Aspire Grade 4 Mathematics test. Educators can use this resource in several ways:

- Become familiar with ACT Aspire question types.
- See what typical questions in each ACT Aspire reporting category look like.
- Help reinforce or adjust teaching and learning objectives.
- Learn how ACT Aspire improvement idea statements can help students identify key skills they have not yet mastered.

ACT Aspire Mathematics tests provide a picture of the whole of a student's mathematical development, including a look at the concepts and skills new to the grade level as well as whether the student has continued to strengthen, integrate, and apply mathematics from earlier grades. These components are important in judging how a student is progressing and what next steps are appropriate.

Reporting Categories

The following ACT Aspire reporting categories help to provide this picture.

Grade Level Progress

The Grade Level Progress reporting category represents a student's achievement related to the mathematical topics new to the grade. To allow for an analysis of student strengths, the category also includes a reporting category for each of the grade-level domains that constitute Grade Level Progress for that grade.

---

[1] Norman L. Webb, "Depth-of-Knowledge Levels for Four Content Areas," last modified March 28, 2002, **http://facstaff .wcer.wisc.edu/normw/All%20content%20areas%20%20DOK%20levels%2032802.doc**.

Integrating Essential Skills

The Integrating Essential Skills reporting category looks at the mathematical growth of the student with topics learned in previous grades. This mathematics should not be static, but should be strengthened as the student progresses through the grades. Students should integrate and become more fluent in these topics, using them flexibly as needed to solve problems, give explanations, and accomplish tasks of greater complexity that reflect grade-level expectations for mathematical practice.

Together, the Grade Level Progress and Integrating Essential Skills categories make up the entirety of the ACT Aspire Mathematics test. Two other reporting categories, Modeling and Justification and Explanation, pull out information that crosses the other reporting categories.

Modeling

The Modeling reporting category highlights questions that assess understanding of mathematical models and their creation, interpretation, evaluation, and improvement. Modeling is closely tied to problem solving, and because models are frequently used to teach mathematics—especially in the early grades—modeling is also closely tied to learning mathematics. Modeling expectations increase from one grade to the next. To ensure that the Modeling reporting category provides a better indication of being on track, some modeling skills are a part of the reporting category in lower grades but not in upper grades.

Justification and Explanation

The Justification and Explanation (JE) category focuses on giving reasons for why things work as they do, where students create a mathematical argument to justify. The evidence is collected through constructed-response tasks designed around a progression of justification skills connecting Grades 3 and up.

Structure of the Mathematics Test

The structure of the ACT Aspire Mathematics test is the same from Grade 3 through early high school (Grades 9 and 10), assessing new topics for the grade and whether students continue to strengthen their mathematical core. (For the Early High School test, Grade 8 topics are included in the Grade Level Progress component to keep together formal algebra, functions, and geometry topics. This makes Grade Level Progress and its subcategories more coherent.) Within this structure of content comes a level of rigor represented in part by a distribution of depth of knowledge through Webb's level 3. The Integrating Essential Skills component includes only DOK level 2 and level 3 because that component is about assessing how well students have continued to strengthen their mathematical core. Across all parts of the test, students can apply Mathematical Practices to help them demonstrate their mathematical achievement.

Mathematical justification is a way of knowing. In theory, students will be able to learn new mathematics more reliably if they have a strong framework to build upon. Mathematical justification is glue for that framework. The Common Core State Standards for Mathematics (CCSSM) recognizes this in its Mathematical Practice 3 (MP3): "Create viable arguments and critique the reasoning of others." The ACT Aspire Mathematics test focuses attention on student justification.

Students respond to JE tasks with a grade-level-appropriate mathematical argument. These tasks utilize a constructed-response format, allowing students flexibility in the way they shape their arguments. Each response is evaluated on the basis of demonstrated evidence of particular skills associated with mathematical justification. These JE skills include stating relevant properties and definitions that support the justification, constructing an argument that includes reasons for claims, and demonstrating indirect proof or command of counterexample.

The JE skills identified in table 1 are arranged in a progression from Grade 3 through EHS. At each grade, the JE skills are divided into three levels. Trained scorers weigh evidence and then make an overall determination about the evidence for or against each skill level. Demonstrating JE skills at one level is evidence of having learned the skills in previous levels. In addition to looking at the JE skills, each response is rated according to how successful the student was in completing the task assigned; this is the Progress rating. A full-credit response shows evidence of the required level of JE skills needed to solve the problem and applies these skills to complete the task.

For each of the JE tasks, evidence for and against each of the JE levels is combined with the Progress rating and mapped to a 0–4 scale. These task scores contribute to the JE reporting category and to the total Mathematics score. Some of the tasks contribute to the Grade Level Progress reporting category, and the others contribute to the Integrating Essential Skills reporting category.

Level 1 JE skills are those where students should have a fluent command, and Level 2 JE skills are those most closely aligned with grade-level focus. Level 3 JE skills are more advanced. As the research base increases for this progression, the list will grow and become more refined. Note that there are two JE statements for evidence of misconceptions. These are marked with asterisks in table 1.

As students progress from grade to grade, expectations increase according to which JE skill belongs to which level. Some level 3 JE skills will become level 2, and some level 2 will become level 1.

Table 1. Justification and Explanation Skills Progression

Justification statement	JE level at grade:				
	3–4	5	6–7	8	10
EXA Provide an example.	1	1	1	1	1
DEF State a definition, theorem, formula, or axiom.	1	1	1	1	1
PRT State a property or classification of an object.	1	1	1	1	1
REL State a relationship between two or more objects.	1	1	1	1	1
PRO1 State one or more steps in a procedure.	1	1	1	1	1
VIS1 Provide a visual representation.	1	1	1	1	1
CMP1 Provide a computation.	1	1	1	1	1
LFD1 Use a Specific Statement to draw a Conclusion or Provide Specific Support for a Statement.	1	1	1	1	1
CMP2 Use a computation to Support a Statement or Conclusion.	2	1	1	1	1
PAT1 Generate a sequence from a rule OR explain a pattern using words, algebraic expressions, or numeric operations.	2	1	1	1	1
LFD2 Use two or more Specific Statements to draw a Conclusion.	2	1	1	1	1
ERR1 Indicate an error occurred.	2	1	1	1	1
PRO2 Explain why a step in a procedure is necessary.	2	2	2	1	1
CON1 Make a conditional statement (e.g. If-Then, When-Then, etc.).	2	2	2	1	1
VIS2 Draw and label a visual representation that illustrates a mathematical concept, property, or relationship.	2	2	2	1	1
PAT2 Use a pattern or sequence to support a Statement or Conclusion.	2	2	2	1	1
CNE1 Provide a counterexample of a conditional statement.	2	2	2	2	2
LFD3 Use a General Statement to draw a Conclusion or Provide General Support for a Statement.	2	2	2	2	2
LFD4 Use a Claim to draw a Conclusion and provide Specific Support for the Claim.	2	2	2	2	2
LFD5 Use a Claim to draw a Conclusion and provide General Support for the Claim.	3	3	2	2	2
LFD6 Use a Specific Statement and a General Statement to draw a Conclusion.	3	3	2	2	2
VIS3 Draw and label a visual representation that illustrates a mathematical concept, property, or relationship and use the labeling in one's prose to clarify an argument.	3	3	3	2	2
N-EXA Use proof by example.	3	3	3	2	2
CON2 Conclude from a conditional statement.	3	3	3	2	2
ERR2 Indicate an error and use a mathematical concept (definition, theorem, or axiom) to explain why an error occurred.	3	3	3	3	2
CNE2 Provide a counterexample and verify that the conditional conclusion does not hold for the example.	3	3	3	3	2

Table 1 *(continued)*

Justification statement	JE level at grade:				
	3–4	5	6–7	8	10
CNV Understand that a statement can be true and its converse or inverse can be false.	3	3	3	3	2
N-CNV States that the converse or inverse of a conditional statement is true because the original statement is true.	3	3	3	3	2
CLA1 State that an object belongs (or does not belong) to a class, state at least one of the common characteristics of the class, and state that the object has (or does not have) those characteristics.	3	3	3	3	2
LFD7 Use two or more Specific Statements to draw a Conclusion and provide Specific Support for at least one of the Statements.	3	3	3	3	2
LFD8 Use two General Statements to draw a Conclusion.	3	3	3	3	2
PAT3 Introduce a pattern or sequence and use it to support a Statement or Conclusion.	3	3	3	3	3
CNE3 Provide a counterexample and verify that the conditional hypotheses do hold for the example, while the conditional conclusion does not.	3	3	3	3	3
CON3 Conclude from a conditional statement and verify that the statement's hypotheses hold.	3	3	3	3	3
CAS Use cases in a proof.	3	3	3	3	3
IND Use indirect proof (e.g. proof by contradiction).	3	3	3	3	3
LFD9 Use two or more Claims to draw a Conclusion and provide Support for at least one Claim—at least one Claim or Support must be General.	3	3	3	3	3
CLA2 State what is required to be a member of a class, verify that an object meets all of those requirements, and then state that the object belongs to that class.	3	3	3	3	3

Improvement Ideas

ACT Aspire includes simple improvement ideas at the reporting category (skill) level on student and parent reports. These improvement ideas are provided for the lowest performing skill for each subject tested. The skills are always ordered from highest performing to lowest performing based on the percentage of points correct. If the percentages for two or more skills are tied, the skill with the lower number of total points is displayed first.

Keep in mind that the order of skills listed on reports may not always be exemplary of where to focus learning. For example, the skills in which a student performed within the ACT Readiness Range may not always be listed first, and the skills in which a student did not perform within the ACT Readiness Range may not always be listed last. Also, keep in mind the total number of points possible in each skill when interpreting the percentage correct.

There are two levels of improvement idea statements (low and high) for ACT Aspire summative reporting. Low statements are given on the report if the student's lowest skill score is below the ACT Readiness Range for that particular skill. High statements are given on the report if the student's lowest skill score is at or above the ACT Readiness Range for that particular skill.

Answer Key

This section presents the grade, question type, DOK level, alignment to the ACT Aspire reporting categories, and correct response for each of several test questions. Each question is also accompanied by an explanation of the question and by the correct response as well as improvement idea statements for ACT Aspire Mathematics.

Some test questions are appropriate at several grades: as a part of Grade Level Progress when the topic is new to the grade and then in later grades as a part of Integrating Essential Skills (as long as the question is at least DOK level 2 for that grade).

Question 1

Juliana divided the part of a number line from 0 to 1 into sections of equal length. She plotted point *M* on the number line, as shown below.

One of the following circles is shaded to represent a fraction that is equivalent to the number represented by point *M*. Which one?

A.

B.

C.

D.

E.
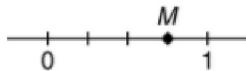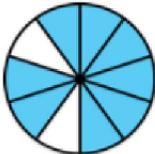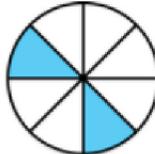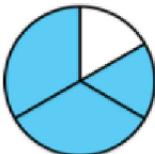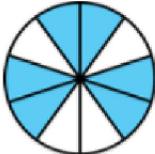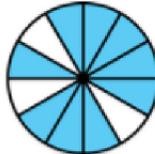
Question type	CCSSM topic	Correct response
Selected Response	3.NF.A, MP4, Recognize equivalent fractions and fractions in lowest terms (N 13–15)	E

Appropriate grade level(s)	Integrating Essential Skills and Grade Level Progress reporting categories	Modeling	DOK level
3	Grade Level Progress > Number and Operations—Fractions	Yes	3
4–5	Integrating Essential Skills	Yes	3
6–EHS	Integrating Essential Skills	Yes	2

In this selected-response (multiple-choice) question, students must analyze the number line given and determine what fraction is being represented (CCSSM.3.NF.A.3). Because this question requires students to analyze the situation and connect different representations, it is a DOK level 3 question for the Grades 3, 4, and 5 tests. For all other ACT Aspire tests, it is a DOK level 2 question. Because students are interpreting models, this question is a part of the Modeling reporting category (MP4).

Correct Response

After determining that the fraction at point M is $\frac{3}{4}$, students must then determine which of the circles provided has $\frac{3}{4}$ of its area shaded. The circle in answer option E has 9 out of 12 equally sized sections shaded, and $\frac{9}{12}$ is equivalent to $\frac{3}{4}$.

Improvement Idea Statements

Reporting category	Grade	Low statement (scored below ACT Readiness Range)	High statement (scored at or above ACT Readiness Range)
Integrating Essential Skills	4	Continue to strengthen your skills by using the mathematics you learned in previous grades.	Before you solve a math problem, predict how the solution will go and what method(s) will work.
Modeling	4	Work on creating picture representations of numerical statements and use the pictures to solve problems.	Create a 3-dimensional math problem by using everyday objects to represent numbers.

Question 2

After Cammy gets out of bed in the morning, she completes several activities to get ready for school. The list below shows the numbers of minutes she needs to complete each of these activities.

- 30 minutes: brush teeth, shower, and get dressed
- 10 minutes: eat breakfast
- 30 minutes: car ride to school

Cammy must be at school by 8:00 a.m. What is the **latest** time Cammy can get out of bed, complete all her activities, and still get to school on time? Explain why your answer is correct.

1000

Question type	CCSSM topic	Correct response
Justification and Explanation (Constructed Response)	3.MD.A, MP1, MP3	See explanation.

Appropriate grade level(s)	Integrating Essential Skills and Grade Level Progress reporting categories	JE level	Modeling	DOK level
3	Grade Level Progress	3	Yes	3
4–6	Integrating Essential Skills	3	No	3

This Justification and Explanation task asks students not just to find a solution, but to explain the procedure that leads to that solution. Successful students will explain how they solved the problem and give reasons why their solution is correct. Procedure, computation, and logical flow justification are a few of the justification skills this task elicits. The content here is addition and subtraction of time intervals (CCSSM.3.MD.A). This problem enables students to relate the mathematics they learn in the classroom to their everyday experience. A successful student will make sense of the problem and persevere in solving it (MP1). Students are doing modeling by simulating the events and connecting them to the time each takes. This level of modeling is a part of the Modeling reporting category for Grade 3 but not for higher grades.

For Grade 3 students, this task would be a part of the Grade Level Progress reporting category. This task would also be appropriate for the Grades 4, 5, or 6 tests. However, it would be a part of the Integrating Essential Skills reporting category for those tests. At these grade levels, this task requires JE level 3 reasoning and is part of the JE reporting category; the task also is a DOK level 3 task.

Response 1

The reasoning in the following sample response is within reach of a Grade 3 student and would receive full credit.

30 + 10 + 30 = 70 min

70 − 60 = 10

70 min = 1 hr 10 min

8 a.m. − 1 hr 10 min = 6:50 a.m.

Cammy must wake up at 6:50 a.m. so she is not late for school. I know my answer is correct because Cammy has to be at school at 8 and you need to figure how much time it takes to get ready and get to school. I added the times for dressing, eating, and driving to school to get 70 minutes. Then, I subtracted the time needed from the school's start time to find when Cammy needs to get up.

Describing the computational procedure and its results can make an argument more clear, so ACT Aspire captures when students use those types of justification techniques. The main JE statements captured in this response are "Use a computation to Support a Statement or Conclusion," "Explain why a step in a procedure is necessary," and "Use two or more Specific Statements to draw a Conclusion and provide Specific Support for at least one of the Statements." The response also provides direct evidence of "Provide a computation," "State a relationship between two or more objects," and "State one or more steps in a procedure." A response of this type demonstrates direct evidence for all three levels of justification at Grade 4.

This response successfully completes the assigned task by finding the time that Cammy has to wake up and by thoroughly supporting that answer. The response demonstrates understanding of the given information and the goal. The student's calculations are evidence that the student understands a procedure required to complete the task successfully, and the explanation is presented clearly and is well organized. This response would be given a Progress score of 3.

With Level 3 justification and a Progress score of 3, this response would be given 4 points.

Response 2

8 a.m. – 30 min = 7:30 a.m.

7:30 a.m. – 30 min = 7 a.m.

7 a.m. – 10 min = 6:50 a.m.

Cammy should get up at 6:50 a.m.

The main JE statements captured in this response are "Provide a computation" and "Use a computation to Support a Statement or Conclusion." While the computations are important to the student's approach, the argument could be strengthened by explaining why the computations are being done. A response of this type demonstrates evidence of the first two levels of justification at Grade 3.

This response arrives at the correct conclusion. The calculations are evidence that the student understands the procedure, that subtraction is required to complete the task successfully, and that the student approached the task correctly. However, the response fails to explain why the answer is correct or why the subtractions were done to arrive at the answer. The student demonstrates a successful approach to the problem, but some evidence is implicit. Because of the strong approach to the task, this response would be given a Progress score of 2.

Since this is a JE Level 3 task at Grade 3, Level 2 justification and a Progress score of 2 would give this response 2 out of the 4 points possible for this task.

Response 3

> The latest time Cammy can get up is 6:50 a.m.

Since this response is only the answer to the task's question, there is no evidence of justification present.

This response arrives at the correct conclusion and demonstrates a developing understanding of the goal. However, the response fails to provide the steps or calculations used to arrive at the conclusion; while the answer is correct, the response does not address the "Explain why your answer is correct" portion of the task. Since there is some evidence of understanding, this response would be given a Progress score of 1.

With no justification and a Progress score of 1, this response would be given 1 out of the 4 points possible for this task.

Response 4

> 8 a.m. + 30 min + 30 min + 10 min = 9:10 a.m.

The main JE statement captured in this response is "Provide a computation." Adding reasons for doing the computations and a more formal explanation of the student's reasoning would increase the justification evidence present and also add to the clarity of the response. A response of this type demonstrates only the first level of justification.

This response doesn't include a clear answer to the task's question. The response demonstrates a lack of understanding of how to achieve the goal by using an incorrect approach. Further, no logical reason for the calculation is provided. Since the response has little evidence of understanding the task, a Progress score of 0 would be given.

With Level 1 justification and a Progress score of 0, this response would be given 1 out of the 4 points possible for this task.

Improvement Idea Statements

Reporting category	Grade	Low statement (scored below ACT Readiness Range)	High statement (scored at or above ACT Readiness Range)
Justification and Explanation	4	Give reasons for your steps when solving a mathematical problem. Why do you do those things? Explain how to solve a problem from your homework to a classmate.	On one or two of your homework problems each day, put in steps to better show what you were thinking, and add justifications for each step.
Integrating Essential Skills	4	Continue to strengthen your skills by using the mathematics you learned in previous grades.	Before you solve a math problem, predict how the solution will go and what method(s) will work.

Question 3

Explain what a line of symmetry is.

Explain why the dashed line drawn in the figure below is NOT a line of symmetry for the figure.

Question type	CCSSM topic	Correct response
Justification and Explanation (Constructed Response)	4.G.A, MP4	See explanation.

Appropriate grade level(s)	Integrating Essential Skills and Grade Level Progress reporting categories	JE level	Modeling	DOK level
4	Grade Level Progress	3	Yes	3
5–8	Integrating Essential Skills	3	Yes	3
EHS	Integrating Essential Skills	2	Yes	3

This Justification and Explanation task elicits an explanation of why something is not true. The task is crafted carefully so that successful students must give a definition and tie it to their explanation—an important way of reasoning in mathematics and in many areas of life. The context here is symmetry, a topic from Grade 4 (CCSSM.4.G.A.3, "Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry"). A response that successfully justifies the result will contain a general definition of a line of symmetry and show why that definition does not fit the specific situation shown by the drawing. This is JE level 3 reasoning for Grade 4 students and would be a part of the Grade Level Progress reporting category. The task is also a part of the JE reporting category. This task would also be appropriate for the Grades 5, 6, 7, 8, and Early High School tests where it would be a part of the Integrating Essential Skills and the JE reporting categories. While most students at these higher grades are easily able to recognize lines of symmetry, this task still requires students to use definitions and create a cohesive explanation—valuable skills to measure even if the content isn't advanced. The reasoning skills assessed by this task are at JE level 3 for Grades 4–8 and JE level 2 for EHS. At all grades, this is a task at DOK level 3.

The figure is a possible model for the definition of a line of symmetry, and the student must judge whether the model fits, so this question contributes to the Modeling reporting category (MP4).

Response 1

The reasoning in the following sample response is within reach of Grade 4 students and would receive full credit.

> A line of symmetry is a line that divides a figure into two equal parts where you can fold along the line and make the edges match up. Folding along the given line will not make the edges match up because it does not divide the picture into two equal parts, so the dashed line is not a line of symmetry.

The primary justification skills in this response are captured by the JE statements "State that an object belongs (or does not belong) to a class, state at least one of the common characteristics of the class, and state that the object has (or does not have) those characteristics" and "Use a Specific Statement and a General Statement to draw a Conclusion." The response also demonstrates direct evidence of "State a property or classification of an object" and "State a definition, theorem, formula, or axiom." A response of this type demonstrates evidence of all three levels of justification at Grade 4.

This response successfully completes the assigned task by stating the definition of a line of symmetry and using that definition to conclude that the line in question was not, in fact, a line of symmetry. In addition to successfully completing the task, the response also shows understanding of the given information and the required goal, and it expresses the argument in a clear and organized manner. This response would be given a Progress score of 3. Note that the definition provided in this response may not be adequate for higher grade levels.

With Level 3 justification and a Progress score of 3, this response would be given 4 points.

Response 2

A line of symmetry is a line that divides a figure into two equal parts where you can fold along the line and make the edges match. So the dashed line is not a line of symmetry.

This response's justification is captured by the JE statements "State a definition, theorem, formula, or axiom" and "Use a General Statement to draw a Conclusion or Provide General Support for a Statement," which provide evidence of the first two levels of justification at Grade 4.

This response provides a general definition of a line of symmetry and uses this general statement to arrive at the conclusion. The definition is evidence that the student understands the concept of a line of symmetry. However, explaining how the definition is connected to the given figure would have been a more thorough response. Though the correct definition was employed, the lack of thoroughness means that this response would be given a Progress score of 2.

Since this is a JE Level 3 task at Grade 4, Level 2 justification and a Progress score of 2 would give this response 2 out of the 4 points possible for this task.

Response 3

You fold along the line to check for symmetry. The dashed line is not a line of symmetry.

This response's justification is captured by the JE statements "State one or more steps in a procedure," "Explain why a step in a procedure is necessary," and "Use a Specific Statement to draw a Conclusion or Provide Specific Support for a Statement," which provide evidence for the first two levels of justification at Grade 4. The argument could have been strengthened by explaining how folding along the line is related to being or not being a line of symmetry. This could be done, for example, by giving the definition of a line of symmetry.

This response uses a specific statement about the procedure required to test the line of symmetry of the given figure in order to arrive at the correct conclusion. The response demonstrates a developing understanding of the goal. However, the student failed to provide an explanation of a line of symmetry. Since some understanding of lines of symmetry is demonstrated, this response would be given a Progress score of 1.

With Level 2 justification and a Progress score of 1, this response would be given 2 out of the 4 points possible for this task.

Response 4

> The line is not a line of symmetry because it does not divide the heart into 2 sections of equal area. If you move the line down a little, then the areas will be the same, so it will be a line of symmetry.

This response's justification is captured by the JE statements "State a property or classification of an object," "Make a conditional statement (e.g. If-Then, When-Then, etc.)," and "Use two or more Specific Statements to draw a Conclusion and provide Specific Support for at least one of the Statements," which is evidence of all three levels of justification at Grade 4. It is important to note that even though the definition given was incorrect, this does not affect the justification evidence that is present.

Even though this response gives the correct conclusion, it shows a misconception of the definition of a line of symmetry. With little else present except the misconception, this response would be given a Progress score of 0.

Even though this response would be given a Progress score of 0, the evidence of high-level justification would give this response 2 out of the 4 points possible for this task.

Improvement Idea Statements

Reporting category	Grade	Low statement (scored below ACT Readiness Range)	High statement (scored at or above ACT Readiness Range)
Justification and Explanation	4	Give reasons for your steps when solving a mathematical problem. Why do you do those things? Explain how to solve a problem from your homework to a classmate.	On one or two of your homework problems each day, put in steps to better show what you were thinking, and add justifications for each step.
Grade Level Progress	4	Complete your homework when assigned. Ask questions in class.	Explain one of your assignments to a parent, grandparent, brother, or sister.
Modeling	4	Work on creating picture representations of numerical statements and use the pictures to solve problems.	Create a 3-dimensional math problem by using everyday objects to represent numbers.

Question 4

Mario and Jenna each drew a circle. Mario divided his circle in half. Jenna divided her circle into twice as many equal sections as Mario's circle.

Select the word below that names the fraction Jenna divided her circle into, and select **all** of the figures below that could represent Jenna's circle.
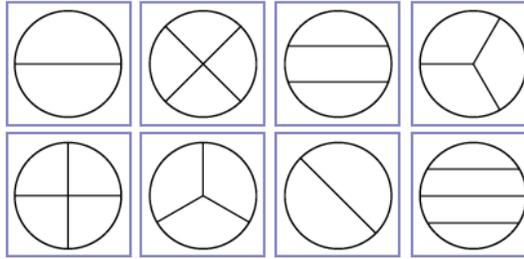
thirds	halves	three

four	two	fourths

Question type	CCSSM topic	Correct response
Technology Enhanced	2.G.A, MP4	

thirds	halves	three

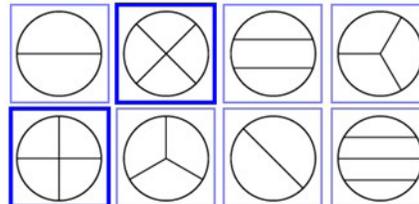| four	two	**fourths**

Appropriate grade level(s)	Integrating Essential Skills and Grade Level Progress reporting categories	Modeling	DOK level
3–6	Integrating Essential Skills	Yes	2

This technology-enhanced question involves partitioning circles and using correct terms to describe that partitioning (CCSSM.2.G.A.3). This problem is part of the Integrating Essential Skills reporting category for the Grades 3, 4, 5, and 6 tests, and it assesses DOK level 2 skills on each of those tests. Students must judge the appropriateness of each shape as a model for the situation. This problem is a part of the Modeling reporting category.

Correct Response

Students must translate the description given in the problem and connect that to mathematical words and figures. Students who do this correctly will find that Jenna divided her circle into fourths.

Improvement Idea Statements

Reporting category	Grade	Low statement (scored below ACT Readiness Range)	High statement (scored at or above ACT Readiness Range)
Integrating Essential Skills	4	Continue to strengthen your skills by using the mathematics you learned in previous grades.	Before you solve a math problem, predict how the solution will go and what method(s) will work.
Modeling	4	Work on creating picture representations of numerical statements and use the pictures to solve problems.	Create a 3-dimensional math problem by using everyday objects to represent numbers.

Question 5

Which of the following numbers has the same number of factors as 20 ?

- ○ A. 8
- ○ B. 10
- ○ C. 18
- ○ D. 25
- ○ E. 60

Question type	CCSSM topic	Correct response
Selected Response	4.OA.B.4, MP1, MP2, MP4, Work with numerical factors (N 24–27)	C

Appropriate grade level(s)	Integrating Essential Skills and Grade Level Progress reporting categories	Modeling	DOK level
4	Grade Level Progress > Operations and Algebraic Thinking	Yes	3
5–7	Integrating Essential Skills	Yes	2

This question assesses a student's ability to find all factors of whole numbers (CCSSM. 4OA.B.4). For Grade 4 students, such a question calls upon previous multiplication and division skills learned in Grade 3 and expands upon them with the introduction of factor pairs. Because students must find all the factors of 20 and determine which other number has the same number of factors, this is a DOK 3 question in the Operations and Algebraic Thinking reporting category in the Grade Level Progress category. Given the higher cognitive demand, this question would appear on a Grade 5–7 test in the Operations and Algebraic Thinking reporting category in the Integrating Essential Skills but would become a DOK 2 skill at Grade 5 due to the higher degree of mastery students have with the concepts of factors and multiples.

Correct Response

The student response will require knowing what a factor is and then finding all the factors of the number 20. Students will then identify the answer option that has the same number of factors as 20, which is option C. Certain incorrect responses provide indications as to what errors a student made when factoring.

Improvement Idea Statements

Reporting category	Grade	Low statement (scored below ACT Readiness Range)	High statement (scored at or above ACT Readiness Range)
Grade Level Progress	4	Complete your homework when assigned. Ask questions in class.	Explain one of your assignments to a parent, grandparent, brother, or sister.
Operations and Algebraic Thinking	4	Work on finding factors and multiples of whole numbers. Given a rule for the next term, can you make a sequence of numbers that follow the rule?	Make up a rule for a pattern and ask a friend to generate 5 values in the pattern. Ask the friend to then make up a rule for a pattern and let you generate 5 values.

Question 6

Which of the following expressions has the greatest value?

   ○ A. $80,000 + 9,000 + 6$

   ○ B. $80,000 + 3,000 + 900 + 90 + 9$

   ○ C. $600,000 + 30,000 + 2,000 + 900 + 1$

   ○ D. $600,000 + 30,000 + 2,000 + 700 + 20 + 9$

   ○ E. $600,000 + 20,000 + 9,000 + 700 + 50 + 7$

Question type	CCSSM topic	Correct response
Selected Response	4.NBT.A.2, MP2, Identify a digit's place value (N 16–19)	C

Appropriate grade level(s)	Integrating Essential Skills and Grade Level Progress reporting categories	Modeling	DOK level
4	Grade Level Progress > Numbers and Operations	No	1

This question assesses a student's ability to understand expanded form and compare values based on the digits in each place value (CCSSM.4.NBT.A.2). For Grade 4 students, such a question builds upon previous expanded form skills with the addition of larger numbers and comparing 2 multidigit numbers. Given the lower cognitive demand, this question would only appear on a Grade 4 test in the Number and Operations reporting category within the Grade Level Progress category.

Correct Response

The student response will require an understanding of reading expanded form. Specifically, the student must compare the digits in each place value of the expanded form numbers to identify the number with the greatest value, option C, which is 600,000 + 30,000 + 2,000 + 900 + 1. Certain incorrect responses provide indications as to what misconceptions a student may have about place value and/or expanded form.

Improvement Idea Statements

Reporting category	Grade	Low statement (scored below ACT Readiness Range)	High statement (scored at or above ACT Readiness Range)
Grade Level Progress	4	Complete your homework when assigned. Ask questions in class.	Explain one of your assignments to a parent, grandparent, brother, or sister.
Number and Operations in Base 10	4	Work on understanding place value for multidigit whole numbers. Find where a store receipt uses adding, subtracting, multiplying, and dividing.	Show someone at home how you perform multidigit arithmetic with real-world data.

Question 7

The 4th-grade class pet is a lizard named Larry. The total length of Larry's body, including his tail, is 18 inches. His tail is $\frac{2}{3}$ of his total length. What is the total length, in inches, of Larry's tail?

- ○ A. 3
- ○ B. 6
- ○ C. 12
- ○ D. 15
- ○ E. 16

Question type	CCSSM topic	Correct response
Selected Response	4.NF.B.4.c, MP1, MP4, Solve routine one-step arithmetic problems using positive rational numbers, such as single-step percent (N 16–19)	C

Appropriate grade level(s)	Integrating Essential Skills and Grade Level Progress reporting categories	Modeling	DOK level
4	Grade Level Progress > Numbers and Operations	Yes	2
5	Integrating Essential Skills	Yes	2

This question assesses a student's understanding of multiplying fractions by whole numbers (CCSSM.4.NF.B.4.c). For Grade 4 students, such a question expands upon previous understanding of multiplication. Students must analyze the situation and determine the path to the correct answer (MP1). Given the importance of this skill along with the cognitive demand, this item would also appear on a Grade 5 test in the Integrating Essential Skills reporting category.

Correct Response

The student response requires an understanding of multiplication. Specifically, the student must determine the need to multiply the number 18 by 2/3 and understand the solution is (18 x 2)/3, which is option C, 12. Certain incorrect responses provide indications as to what misconceptions a student may have about division and/or remainders.

Improvement Idea Statements

Reporting category	Grade	Low statement (scored below ACT Readiness Range)	High statement (scored at or above ACT Readiness Range)
Grade Level Progress	4	Complete your homework when assigned. Ask questions in class.	Explain one of your assignments to a parent, grandparent, brother, or sister.
Numbers and Operations— Fractions	4	Work on comparing, adding, and subtracting fractions. Can you convert a decimal number to a fraction and a fraction to a decimal number?	Make a drawing that shows how multiplying fractions is related to addition. Use your drawing to explain this process to a friend.
Modeling	4	Work on creating picture representations of numerical statements and use the pictures to solve problems.	Create a 3-dimensional math problem by using everyday objects to represent numbers.

Question 8

Exactly how many minutes are in 1 week?

○ A. 168

○ B. 1,440

○ C. 2,520

○ D. 7,880

○ E. 10,080

Question type	CCSSM topic	Correct response
Selected Response	4.MD.A.1, MP1, MP4, Perform common conversions of money and of length, weight, mass, and time within a measurement system (G 13–15)	E

Appropriate grade level(s)	Integrating Essential Skills and Grade Level Progress reporting categories	Modeling	DOK level
4	Grade Level Progress > Measurement and Data	Yes	3
5–6	Integrating Essential Skills	Yes	2

This question assesses a student's ability to convert from a larger unit of measure to a smaller unit (CCSSM.4.MD.A.1). At Grade 4, this question expands upon a student's previous understanding of units of time and requires the use of grade-appropriate multiplication skills. This question also reinforces the need to analyze the problem and determine a solution path (MP1). This item would appear in the Measurement and Data reporting category within the Grade Level Progress reporting category. Given the high cognitive demand, this question would also appear on a Grade 5 and Grade 6 test in the Integrating Essential Skills reporting category but would be DOK 2 due to the increased mastery of the concepts involved.

Correct Response

The student response will require an understanding of the conversions to change from weeks to minutes and the ability to multiply. Specifically, the student must convert by using the correct conversion from weeks to days, days to hours, and hours to minutes in order to find the correct answer of 10,080, which is option E. Certain incorrect responses provide indications to what misconceptions a student may have about converting between measurements or multiplication. This question assesses a student's ability to round a whole number with multiple digits.

Improvement Idea Statements

Reporting category	Grade	Low statement (scored below ACT Readiness Range)	High statement (scored at or above ACT Readiness Range)
Grade Level Progress	4	Complete your homework when assigned. Ask questions in class.	Explain one of your assignments to a parent, grandparent, brother, or sister.
Measurement and Data	4	Work on converting measurements from a larger unit to a smaller unit and understanding angle concepts.	Find the length, in feet, of at least 3 objects in your home or neighborhood and convert those measurements to inches.
Modeling	4	Work on creating picture representations of numerical statements and use the pictures to solve problems.	Create a 3-dimensional math problem by using everyday objects to represent numbers.

Question 9

Which of the following has 2 shapes that both have at least 1 pair of parallel sides?
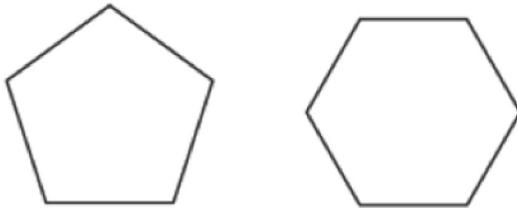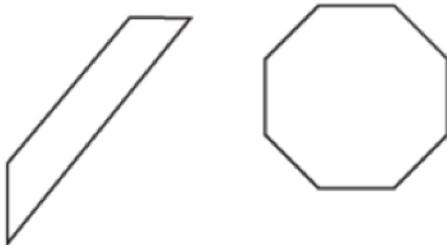
○ A.

○ B.

○ C.

○ D.

○ E.
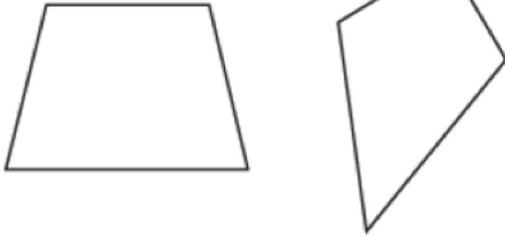
Question type	CCSSM topic	Correct response
Selected Response	4.G.A.2 MP1 and MP4	E

Appropriate grade level(s)	Integrating Essential Skills and Grade Level Progress reporting categories	Modeling	DOK level
4	Grade Level Progress > Geometry	Yes	2
5	Integrating Essential Skills	Yes	2

This question assesses a student's ability to identify parallel lines and classify shapes based on the presence of parallel lines (CCSSM.4.G.A.2). For the Grade 4 test, this question is part of the Geometry reporting category in the Grade Level Progress reporting category. At Grade 5 this question is part of the Integrating Essential Skills reporting category. Students must identify the important parts of the shapes to make sense of the problem (MP1).

Correct Response

The student response will require an understanding of what parallel lines are and the ability to identify them in the given shapes. Specifically, the student must identify the pair that is composed of shapes that each have at least 1 pair of parallel sides. In option A, the right figure does not have a pair of parallel sides, so it is eliminated. In option B, the left figure does not have a pair of parallel sides, so it is eliminated. In option C, the left figure does not have a pair of parallel sides, so it is eliminated. In option D, the left figure does not have a pair of parallel sides, so it is eliminated. In option E, both figures have pairs of parallel sides, and it is the correct response.

Improvement Idea Statements

Reporting category	Grade	Low statement (scored below ACT Readiness Range)	High statement (scored at or above ACT Readiness Range)
Grade Level Progress	4	Complete your homework when assigned. Ask questions in class.	Explain one of your assignments to a parent, grandparent, brother, or sister.
Geometry	4	Work on classifying shapes by properties of their lines and angles and identifying lines of symmetry.	Consider basic shapes that form real-world objects (e.g., a book can be modeled by a rectangle). How many lines of symmetry can you find?
Modeling	4	Work on creating picture representations of numerical statements and use the pictures to solve problems.	Create a 3-dimensional math problem by using everyday objects to represent numbers.