



NWEA Image Description Guidelines for Assessments

Making assessment accessible for all students

Table of Contents

Part 1. Introduction.....	4
Purpose of Guidelines.....	4
About NWEA.....	4
About NCAM.....	5
Part 2. General Guidelines for Image Descriptions.....	6
Introduction.....	6
Image Description Principles.....	6
Integrity and Fairness.....	7
Visual Bias.....	8
When Image Descriptions Are Unnecessary.....	11
Tactile Graphics.....	12
Creating a Smoother User Experience.....	13
Part 3. Math.....	16
Base-Ten Blocks.....	16
Charts and Graphs.....	16
Clocks.....	25
Coordinate Planes.....	26
Equations Represented as Images (Vertical Equations).....	36
Figures and Shapes (Geometry).....	36
Fractions (Represented by Shaded Parts of a Shape).....	42
Groups and Patterns.....	42
Money.....	45
Number Lines.....	45
Rulers.....	49
Spinners.....	50
Thermometers.....	51
Venn Diagrams.....	52
Visual Bias in Math Item Types.....	54
Part 4. Reading and Language Usage.....	62
Blanks.....	62
Circle/Pie Graphs.....	62
Forms.....	63

Table of Contents

Labeled Sentence Parts.....	65
Passages with Images	67
Sentence Corrections.....	68
Sequence of Events Charts (Plot Diagrams)	69
Timelines.....	70
Venn Diagrams.....	71
Webs (Word Association or Word Map)	72
Visual Bias in Reading and Language Usage Item Types	73
Part 5. Science	75
Chemical Elements.....	75
Chemical Models	77
Containers.....	80
Cycles	81
Diagrams	83
Diagrams That Convey Change	90
Process Diagrams and Flowcharts	91
Geology	92
Graphs.....	96
Maps	99
Periodic Table of the Elements.....	100
Punnett Squares.....	101
Pyramids and Webs	103
Visual Bias in Science Item Types	104
Part 6. Resources	109
NWEA Contact Information	109
Additional Resources	109

Part 1. Introduction

Purpose of Guidelines

An image description, also known as alternative text or alt text, is a message or description that provides information about an image (e.g., chart, diagram, graph, picture, poster). Image descriptions may allow students who use screen readers and/or refreshable braille to answer questions that otherwise would be inaccessible. Image descriptions are an unbiased way to provide accessibility to test items that contain images.

The NWEA® Image Description Guidelines for Assessments is intended as a general guide for creating descriptions for images in assessments. It is not meant to be definitive. NWEA recommends using it along with other sources and your own best judgment.

“NWEA has taken the lead in preparing a comprehensive document that supports efforts toward helping all kids learn. This document will serve as a starting point to any education vendor looking to build an inclusive online assessment. When creating text alternatives for images for use within an assessment, there are many considerations that determine how an image will be described. It can be a much different and much more challenging task than creating image descriptions for instruction. These guidelines, based on research and practice, and generously shared by NWEA, should prove to be an invaluable resource.”

—The Carl and Ruth Shapiro Family National Center for Accessible Media at WGBH

About NWEA

NWEA is a research-based, not-for-profit organization that supports students and educators worldwide by creating assessment solutions that precisely measure growth and proficiency—and provide timely data to help tailor instruction. For more than 40 years, NWEA has developed innovative pre-K–12 assessments, including our flagship interim assessment, MAP® Growth™; our progress monitoring and skills mastery tool, MAP® Skills™; and our reading fluency and comprehension assessment, MAP® Reading Fluency™. Educators trust our professional learning offerings to accelerate student learning and our research to support assessment validity and data interpretation. More than 11 million students in 146 countries use our solutions to support their learning and growth each year.

NWEA is dedicated to our mission of *Partnering to help all kids learn*® by ensuring an assessment experience that is most authentic to students’ everyday learning experiences. With support from the National Center of Accessible Media (NCAM) at WGBH, NWEA is building questions and assessments that are accessible to the most widely available and utilized accessibility software and computer-native applications (e.g., screen reader and magnification software). This allows for a more equitable assessment experience for all students. At the heart of efforts at NWEA is a commitment to providing assessments that are flexible and adaptable to unique student learning needs. NWEA is also committed to capturing and yielding valid information about what each student knows and can do. These efforts are driven by our vision: NWEA advances equity and partners to create systemic change in education by delivering solutions that reveal and unlock potential wherever learning takes place.

About NCAM

The Carl and Ruth Shapiro Family National Center for Accessible Media at WGBH (NCAM) began working with NWEA in 2011 in an effort to improve the accessibility of online assessments and related materials (including in-test tools and accommodations).

NCAM is part of the WGBH Educational Foundation, which is the largest producer of websites for PBS online programs and online content in the United States and has 50 years of experience in making media and technology accessible for people with disabilities. NCAM brings to this partnership unparalleled expertise with the technologies used by people with disabilities and an esteemed history of developing and implementing proven technological solutions. Its staff have participated in many multimedia, streaming media, and web accessibility standards groups at the World Wide Web Consortium (W3C) and its Web Accessibility Initiative (WAI), of which NCAM is a founding member. Since the very first generation of the Web Content Accessibility Guidelines (WCAG) in 1999, NCAM has played an active role in the definition, clarification, and dissemination of accessibility information and training. In fact, Geoff Freed represented NCAM as one of two professionals charged with designing and implementing the very first WCAG curriculum. NCAM staff served on the original Federal Access Board committee that created the recommendations for Section 508 of the Rehabilitation Act, and they chaired the Audio-Visual Subcommittee of the 2007–2009 committee that refreshed these federal requirements (the Telecommunications and Electronic and Information Technology Advisory Committee).

NCAM is capable of determining and validating product testing protocols, assessment methodologies, remediation strategies, and tools to test websites and web applications, documents and product conformance to Section 508, state accessibility standards, and all conformance levels of WCAG 2.0/2.1. With a deep understanding of the regulations and continuous involvement and interaction with these groups, NCAM ensures that it understands not just the spirit but the letter of all applicable accessibility standards and the related technical requirements, and it can evaluate digital assets and train interested parties so that they can follow them meaningfully. The staff at NCAM have the tools, the experience, the materials, and the expertise to handle all manner of evaluation needs, from the most introductory to the most complex. NCAM values its decade of partnership with NWEA.

Part 2. General Guidelines for Image Descriptions

Introduction

When approaching the construction of an image description, it is important to consider how students who are blind or visually impaired access the world and how information communicated through images in assessments should be presented to maximize accessibility.

Image Description Principles

While the content of an image description will depend on the image itself and the item in which it appears, there are some guiding principles to keep in mind when writing image descriptions.

Validity

Determine whether the image needs to be described. In instances where an image description does not add clarity to an assessment item or where the image is explained by the surrounding text, it might suffice to simply state the presence of an image without providing details (e.g., “An image of a car.”). See the section [When Image Descriptions Are Unnecessary](#) for additional details and scenarios.

Brevity

Provide the information necessary for students to answer the question. Avoid long descriptions that are not essential to the item and that might require a greater effort of short-term memory. Group information together where possible. For example, if an item presents four similar graphs in the answer options, first give an overarching description of the characteristics that are shared between the graphs (if the assessment platform has the functionality to present this information separately from individual graphics). Then, within each answer option, describe only the unique characteristics of each graph. This reduces the overall amount of description because the language describing the shared characteristics is no longer repeated in each answer option.

Clarity

Focus on making the image description as clear and straightforward as possible. If students need to listen to the image description several times because it is presented in a confusing manner, the image description is not accessible and should be rewritten. Always read the whole item after writing the image description to ensure that it ties in seamlessly with the rest of the item.

Language Complexity

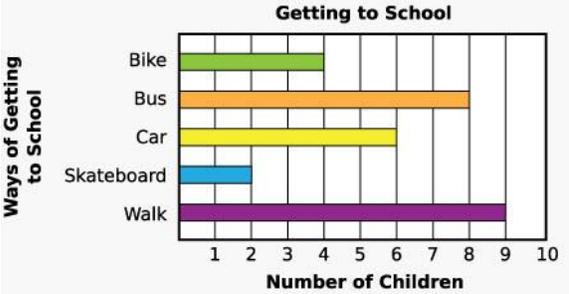
Use simple, grade-appropriate, subject-related language. Where possible, use language that is in the item itself and emphasize the tactile quality (e.g., smooth, bumpy, sharp) of what is depicted in the image. Avoid vision-centric language, such as “U-shaped,” that may be inaccessible for students who are blind or visually impaired.

Drill-Down Organization

Use drill-down organization when describing an image. Start with the title, give a brief summary of the image, and then provide specific data or descriptions, if necessary.

Figure 2.1. Drill-down organization.

Sara's class recorded how they get to school on a bar graph.



Ways of Getting to School	Number of Children
Bike	4
Bus	8
Car	6
Skateboard	2
Walk	9

How many more children get to school by walking than by car?

A. 2

B. 3

C. 4

D. 6

E. 9

(Note: In the following image description for figure 2.1, the text in parentheses and the underlined text would not be included in the actual image description.)

Alt text: A bar graph. Longdesc: (title) The horizontal bar graph is titled Getting to School. (summary) The vertical axis shows Ways of Getting to School. The horizontal axis shows Number of Children. There are 5 bars.

(details)

- Bike, 4 children.
- Bus, 8 children.
- Car, 6 children.
- Skateboard, 2 children.
- Walk, 9 children.

For more information about the use of alt text and longdesc (long description), see “Image Description Categories” in the [Creating a Smoother User Experience](#) section.

Integrity and Fairness

Assessments hold unique challenges for image descriptions. To maximize accessibility without impacting the integrity of the item, it is important to keep the following points in mind.

Asset Image

- Make sure the image description contains all the vital information students need to access and answer the question.
- Make sure the image description does not cue the answer.

Part 2. General Guidelines for Image Descriptions

- c. Make sure the image description reflects the distractors in the item. Sometimes what might seem like extraneous information needs to be included because it relates to the distractors in the answer options.

Answer Option Images

- a. Keep image descriptions of answer options consistent in length, language complexity, and sentence structure.
- b. Respect the rationales behind the answer options by making sure that the image descriptions reflect this information.
- c. Make sure the image descriptions for answer options are unique within the item; no two image descriptions in an item may be identical.
- d. Be cognizant of how multiple image descriptions in the answer options may add to the cognitive load (and overload) of the item.

Visual Bias

As it pertains to images in assessments, visual bias is the classification given to an image when it cannot be described. The reason why an image has visual bias can be intrinsic to that image, be related to the context of the item, or be related to the skill being assessed.

The context of an item can affect some images' visual bias. This means that the same image can cause visual bias in one item and be accessible with an image description in another item. It is important to evaluate the item as a whole before deciding whether the image makes the item have visual bias.

When evaluating an item for visual bias, ask the following questions.

Is the image needing description too complex?

While many images can be described, it is important to keep in mind the skill being assessed, the language level of the intended learners, and the concept of cognitive lift and overload. If the image needs so much description that students would be unable to keep track of the information, or if the image description requires language too complex for the targeted grade, the image has visual bias.

Figure 2.2. Too complex.

Use the diagram to answer the question.	
<p>The lines p, q, and r are parallel to each other.</p> <p><i>*not drawn to scale</i></p>	<p>What is the value of $x - y$?</p> <p><input type="radio"/> A. 50°</p> <p><input type="radio"/> B. 60°</p> <p><input type="radio"/> C. 70°</p> <p><input type="radio"/> D. 100°</p>

Describing the specific positions of the angles and lines in figure 2.2 would require such detailed and lengthy descriptions that it would become difficult for students to keep track of the information,

Part 2. General Guidelines for Image Descriptions

leading to cognitive overload. This item should not be included in assessments for students who are blind unless appropriate accommodations, such as a tactile graphic, are included.

Does the item present situational or contextual bias?

If the skill or situation presented in the item involves situational or experiential information that students who are blind or visually impaired may not have access to, the item has visual bias. Examples include an item with a passage that centers around a sighted activity; an item that assumes students have a basic understanding of what a less commonly known animal looks like; and an item that assesses information gleaned from the use of certain colors or gestures in a piece of literature, such as understanding that a character who closes his eyes, looks down, and draws in a long breath is signaling resignation (as opposed to tiredness).

Figure 2.3. Contextual bias.

Editing symbols are used to correct writing.

Choose the example that correctly identifies each editing symbol.

<input type="radio"/> 1.	 close up	 delete	 add space	 insert
<input type="radio"/> 2.	 insert	 delete	 close up	 add space
<input type="radio"/> 3.	 insert	 close up	 add space	 delete
<input type="radio"/> 4.	 close up	 delete	 insert	 add space

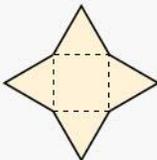
Students who are blind will most likely not be familiar with the editing symbols in figure 2.3 because these are handwritten tools that have no keyboard or braille equivalent. Items that assess this skill have visual bias and should not be included in assessments for students who are blind.

Does the item assess a sighted skill?

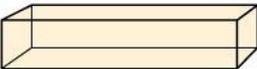
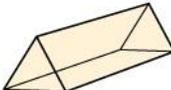
If students need sight to be able to perform the skill being assessed, the item has visual bias. Or, if the absence of appropriate supplemental tactile graphics or 3D models would cause students to need sight to perform the skill being assessed, the item has visual bias.

Figure 2.4. Sighted skill.

The diagram shows the net of a three-dimensional figure.



What figure can be made from the net?

<input type="radio"/>		<input type="radio"/>		<input type="radio"/>		<input type="radio"/>	
-----------------------	---	-----------------------	---	-----------------------	--	-----------------------	---

Part 2. General Guidelines for Image Descriptions

The item in figure 2.4 requires a visual understanding of how a 2-D object transforms into a 3-D object. When this skill is taught to students who are blind, tactile graphics and manipulatives are often used. If this item is not accompanied by appropriate tactile graphics and manipulatives, the item has visual bias and should not be included in assessments for students who are blind.

Does the image description cue the answer?

If the image description gives away the answer to the item and there is no other way to describe the image appropriately, then the item has visual bias and should not be included in assessments for students who are blind.

Figure 2.5. Description cues the answer.

Use the picture to answer the question.



Where is the cat?

- 1. under the bed
- 2. over the bed
- 3. on the bed
- 4. by the bed

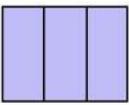
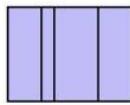
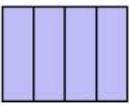
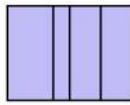
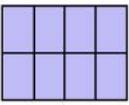
In the item shown in figure 2.5, the words used to describe the image—a cat standing on a bed—would cue the answer (“on the bed”). This item should not be included in assessments for students who are blind unless the item is accompanied by a tactile graphic.

Does more than one answer option have the same image description?

When the descriptions of two or more answer options are identical and cannot be reworded clearly to make them different, the item has visual bias and should not be included in assessments for students who are blind.

Figure 2.6. Answer options with same descriptions.

Which rectangle is cut into thirds?

- A. 
- B. 
- C. 
- D. 
- E. 

In the item shown in figure 2.6, answer options B and D would have the same image description: “A rectangle is cut into 4 unequal parts.” Although more detail could be added to each image description to describe some difference, the results would lack clarity and consistency with the other answer options, leading to outliers (e.g., “A rectangle is cut into 4 unequal parts. The first part

and the fourth part are nearly the same size. The second part is very narrow. The third part is the widest.”). However, this item could be accessible with the inclusion of tactile graphics.

When Image Descriptions Are Unnecessary

Some images in assessment items may not need image descriptions. In the following situations, image descriptions may be skipped.

The image is strictly decorative.

If the image is not referenced in the item and does not present additional information needed to answer the question, then the image does not need to be described (and may not need to be included in the item at all). However, if the image is mentioned in the item (e.g., if the directions say, “Study the picture and read the passage”), students may be confused if no image is described. In this case, a brief description such as “A picture of a plane” is necessary, even if the image is strictly decorative.

Figure 2.7. Strictly decorative image.

Read the paragraph.



It was another sunny day in Florida. It hadn't rained in three weeks. Everyone wore shorts and T-shirts. The Costello family was visiting from New York. Mr. Costello said the family enjoyed coming to Florida every year. There are always fun outdoor activities to do in Florida.

Based on the paragraph, which sentence is true about Mr. Costello?

- 1. He lives in Florida.
- 2. He likes to visit Florida.
- 3. He has never been to Florida.
- 4. He will not go back to Florida.

In figure 2.7, the image of the beach and palm tree is decorative and is not referenced in any part of the item, so no image description is needed.

Descriptive words are present for the image.

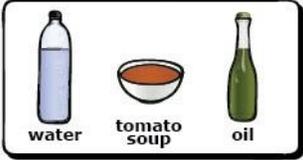
If the images in the item are labeled appropriately, giving enough information to answer the question, then further description is unnecessary.

IMPORTANT: Check that the labels are not part of the images, meaning that screen readers will be able to access the text. If the text is part of the images, the images will need to have image descriptions.

Figure 2.8. Descriptive words present.

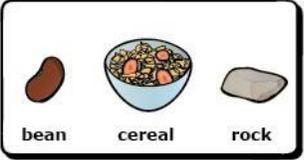
The picture shows objects sorted into two groups.

Group 1



water tomato soup oil

Group 2



bean cereal rock

Which object belongs in Group 1?

A.  sugar

B.  glass

C.  ice

D.  milk

E.  cracker

In figure 2.8, each image in the answer options is labeled with a description of what the image shows, and because that label text is not part of the images themselves, no image descriptions are needed for the answer options. The text associated with the asset images—water, tomato soup, etc.—are part of the images themselves, so the asset images need image descriptions.

Tactile Graphics

When an image is simple and composed of few parts but contains details that require precise locations or measurements (e.g., angles, shapes, lines, diagrams), a tactile graphic may be an appropriate supplement to add accessibility for students who are blind or visually impaired. An item whose images create visual bias may be accessible if the images can be presented as tactile graphics; these tactile graphics may alleviate the risk of cognitive overload or allow the skill to be assessed in a manner that is more authentic to the way the students learned it.

Image descriptions may still be necessary for these items, but the descriptions will need less detail than they would if not accompanied by a tactile graphic. The image descriptions should succinctly describe the shape and parts to act as a guide as students navigate the tactile graphic.

(Note: The image descriptions in these guidelines are written with the assumption that tactile graphics will not accompany the item. When the inclusion of a tactile graphic would significantly improve the accessibility of an item, this is noted with the item or in the image category.)

Figure 2.9. Tactile-graphic-friendly item.

The diagrams show objects being pulled by forces in the same plane.

Which object is in equilibrium under the action of the given forces?

Diagram A: A round object is pulled by two forces: 5N to the left and 5N down and to the right.

Diagram B: A round object is pulled by three forces: 2N up and to the right, 3N to the right, and 5N down and to the left.

Diagram C: A round object is pulled by three forces: 2N up and to the right, 3N down and to the right, and 5N to the left.

Diagram D: A round object is pulled by four forces: 5N up and to the right, 3N to the right, 3N to the left, and 5N down and to the left.

In the item shown in figure 2.9, the language necessary to describe the directions and angles of the arrows would be so complex that the item would have visual bias. With a tactile graphic and brief image descriptions, however, the images and the item become accessible.

Descriptions accompanying the tactile graphic:

- A. A round object is pulled by 2 forces. Clockwise from top: 5 newtons, 5 newtons.
- B. A round object is pulled by 3 forces. Clockwise from top: 2 newtons, 3 newtons, 5 newtons.
- C. A round object is pulled by 3 forces. Clockwise from top: 2 newtons, 3 newtons, 5 newtons.
- D. A round object is pulled by 4 forces. Clockwise from top: 5 newtons, 3 newtons, 5 newtons, 3 newtons.

Creating a Smoother User Experience

Screen Readers

Students will access image descriptions and the item as a whole through screen readers, so image-description writers should familiarize themselves with how screen readers read text and access image descriptions. Test the image descriptions with a screen reader to make sure that they are being read in a comprehensible manner.

Image Description Categories

There are two categories of image descriptions: alternative text (alt text) and long description (longdesc):

- a. When an image can be succinctly described within 150 characters, use alt text for the description.
- b. When an image requires a lengthier description, or when the use of bulleted or numbered lists would make the information in the image description easier to navigate, use longdesc.
 - i. An image that has a longdesc will still need introductory alt text. Keep the alt text very brief (e.g., “A picture,” “A diagram,” “A graph”) and leave the details for the longdesc. If the image is named elsewhere in the item (e.g., the directions in the item say, “Use the diagram to answer the question”), use the same term in the alt text (“A diagram.”) and longdesc (“The diagram shows . . .”).

Part 2. General Guidelines for Image Descriptions

Consistency

It is important to maintain consistency as much as possible throughout the item. Hearing different pronunciations for the same word or abbreviation within an item may interfere with students' ability to answer the question. Image descriptions should be written in a way to ensure that screen readers pronounce words, acronyms, abbreviations, and symbols the same way they are pronounced in other parts of the item, as long as this doesn't sacrifice clarity. Keep clarity and consistency with the rest of the item in mind as you make decisions about how to write an image description.

Punctuation

Punctuation plays a part in how a screen reader reads text and image descriptions. The results can vary depending on the screen reader software or the software settings. Make thoughtful decisions about punctuation in image descriptions and be consistent. Keep the following concepts in mind:

- a. Periods, colons, semicolons, and commas can cause a screen reader to pause, and they may create pauses of different lengths of time. However, some screen readers may read the name of the punctuation instead (e.g., the default setting on some screen readers will cause “;” to be read as the word “semicolon”). Test different punctuation marks within a sentence or in a list to see what works best for the phrasing of the image description. Remember to end each line with a period so the screen reader will pause before moving on to the next line.
- b. Instead of using a hyphen or en-dash between numbers to show a range in an image description, use the word “to” or “through,” depending on the context.

Emphasis (Bold, Italic, Underline)

The text of an image may include formatting for emphasis. If students need to be made aware of this emphasis, use the standard phrases “Begin emphasis” and “End emphasis” around the text in the image description (each phrase should be followed by a period in the description). If specific emphasis needs to be called out (e.g., text is underlined to signify a book title, and that aspect of the item is being assessed) replace “emphasis” with the appropriate emphasis type (“Begin underline.” and “End underline.”). Emphasis should be described sparingly.

Numbers

Numbers written as numerals in an image description will be read as the number (e.g., 37 will be read as “thirty-seven”). However, to make sure the image description conveys the correct meaning of the numbers in the item's context, keep the following concepts in mind:

- a. For negative numbers, use the word “negative” instead of using the symbol.
- b. For positive numbers, use the word “positive” in instances where there are both negative and positive numbers in the same item.
- c. For 4-digit numbers, use commas (e.g., 1,980). Some screen readers may read 4-digit numbers without commas as years (e.g., 1980 may be read as “nineteen eighty”).

Dates

Dates may be written in different formats in different items (e.g., 12/31/1999; Dec. 31, 1999; 12-31-1999). Screen readers will vary on how they read these dates. When describing a date in an image, consider the date and image in the context of the item and evaluate the skills being assessed. If reading the date is not the skill being assessed, consider interpreting the date (e.g., writing out 12/31/1999 as “December thirty-first, nineteen ninety-nine”). If the date is present elsewhere in the

Part 2. General Guidelines for Image Descriptions

item, be consistent with how it is presented; match the date in the image description to the format of the date in the rest of the item.

Currency

Screen readers vary on how they read currency. When describing currency in an image description, consider the context of the item and the skills being assessed. If reading the currency is not the skill being assessed, consider interpreting the currency (e.g., writing out \$1.49 as “one dollar and forty-nine cents”). If currency is present elsewhere in the item, be consistent with how it is presented; match the currency in the image description to the format of the currency in the rest of the item.

Abbreviations, Acronyms, Shape Names, and Symbols

Abbreviations, acronyms, shape names, and symbols may cause some challenges for screen readers. For the best screen reader experience, consider the following guidelines when writing image descriptions, while keeping in mind the importance of consistency throughout the item:

- a. Consider using the full word of abbreviations when they are present in the image (e.g., if the image shows a triangle with a side labeled “5 cm,” consider using “5 centimeters” in the image description). This decision needs to be balanced with consistency for how the abbreviation is read by screen readers in other parts of the item.
 - i. Use the full word of the unit (e.g., “centimeters”) in the image description if the item defines the abbreviation by writing it out or if the image is the only place where the abbreviation appears.
 - ii. Use the abbreviation of the unit (e.g., “cm”) in the image description if the item text uses only the abbreviation, with no written-out definition. This decision should be based on how screen readers read the text, not just how the text appears on screen.
- b. Most screen readers will read the abbreviations “a.m.” and “p.m.” following time (e.g., 5:00 a.m.) in a way that people are accustomed to speaking and hearing it, so there is no need to use the full word or space out the letters following the abbreviation.
- c. Ensure that image descriptions present acronyms in their most commonly heard forms. For example, the acronym SOW is most often spoken letter-by-letter, so the image description should space out the letters (“S O W”) to ensure screen readers read the acronym as the letters, not the word “sow.” On the other hand, the acronym POTUS is read as a word, and should thus be presented in image descriptions with the letters together (“POTUS”).
- d. Space out letters used to name shapes so they are read by screen readers as letters, not a word (e.g., Triangle ABC should be written as “Triangle A B C”). If you are using a math tool to create and describe shape names in other parts of the item, keep the language in the image descriptions consistent with how screen readers will read the math tool notations.
- e. Spell out symbols (e.g., write π as “pi”). For information about element symbols in images, see [Chemical Elements](#) in the Science section.

Part 3. Math

The image description examples presented in the Math section are written for an audience of students who are blind. Students with low vision may require less description or a different description, depending on where they are on the spectrum of vision.

Where symbols, equations, coordinates, point labels, figure names, and some abbreviations of measurement units are present in example items' text, a math tool was used to ensure that screen readers would read them as optimally as possible (e.g., the math tool causes screen readers to read "ΔABC" in the text of an answer option as "triangle A B C"). The image descriptions for these items have been written so screen readers will read the text in the image description consistently with how they read the text from the math tool. This may mean the image description's text looks different from text that appears elsewhere in the item, but it is consistent with the text that the math tool presents to screen readers. See [figure 3.13](#) and [figure 3.31](#) for examples.

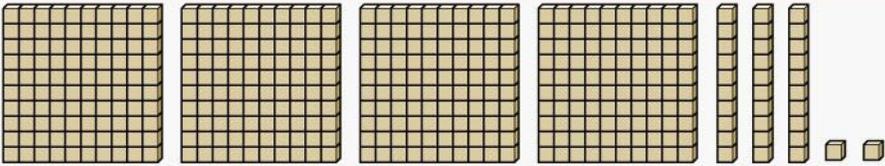
Base-Ten Blocks

In many cases, providing manipulatives or a tactile graphic of the base-ten blocks will improve the accessibility of the item and create a more authentic assessment of the students' skill.

- Use "unit cube" to describe an individual cube.
- Use "ten-cube rod" to describe a group of 10 cubes.
- Use "one-hundred-cube flat" to describe a group of 100 cubes.
- Use "one-thousand-cube cube" to describe a group of 1,000 cubes.
- Add a comma after numbers that proceed "ten-cube rod," "one-hundred-cube flat," and "one-thousand-cube cube" to add a clarifying pause between the two numbers (e.g., "6, ten-cube rods")

Figure 3.1. Base-ten blocks.

Use the blocks to answer the question.



Which number do the blocks represent?

A. 234

B. 324

C. 432

D. 702

Alt text: 4, one-hundred-cube flats. 3, ten-cube rods. 2 unit cubes.

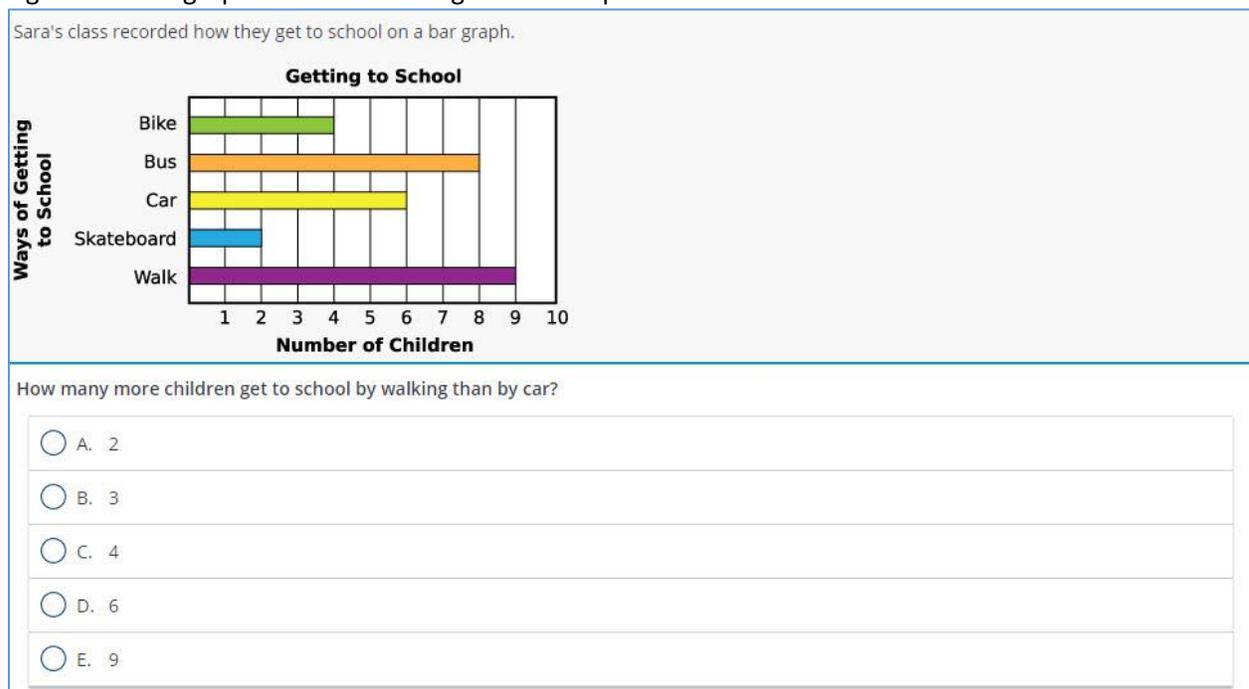
Charts and Graphs

In many cases, providing a tactile graphic of the chart or graph will improve the accessibility of the item and create a more authentic assessment of the students' skill.

Bar and Line Graphs

1. Data lands directly on labeled points:
 - a. Briefly describe the chart and give a summary if one is immediately apparent.
 - b. Describe the title and axis labels. Include number ranges, if applicable. Describe the visual attributes of the bars (e.g., dark blue, light blue) only if there is an explicit need, such as a question referring to the colors. The language used to describe the graph may differ between grade levels (e.g., you may choose to describe the axes as the “bottom” and the “side” for students in lower grades, but as the “horizontal axis” or “x-axis” and the “vertical axis” or “y-axis” for students in grades 4 and above, who may more immediately recognize those terms).
 - c. Give the number of bars or lines.
 - d. Give the data points in a bulleted list, separating the information with commas.

Figure 3.2. Bar graph with data landing on labeled points.



Alt text: A graph. **Longdesc:** The horizontal bar graph is titled Getting to School. The vertical axis shows Ways of Getting to School. The horizontal axis shows Number of Children. There are 5 bars.

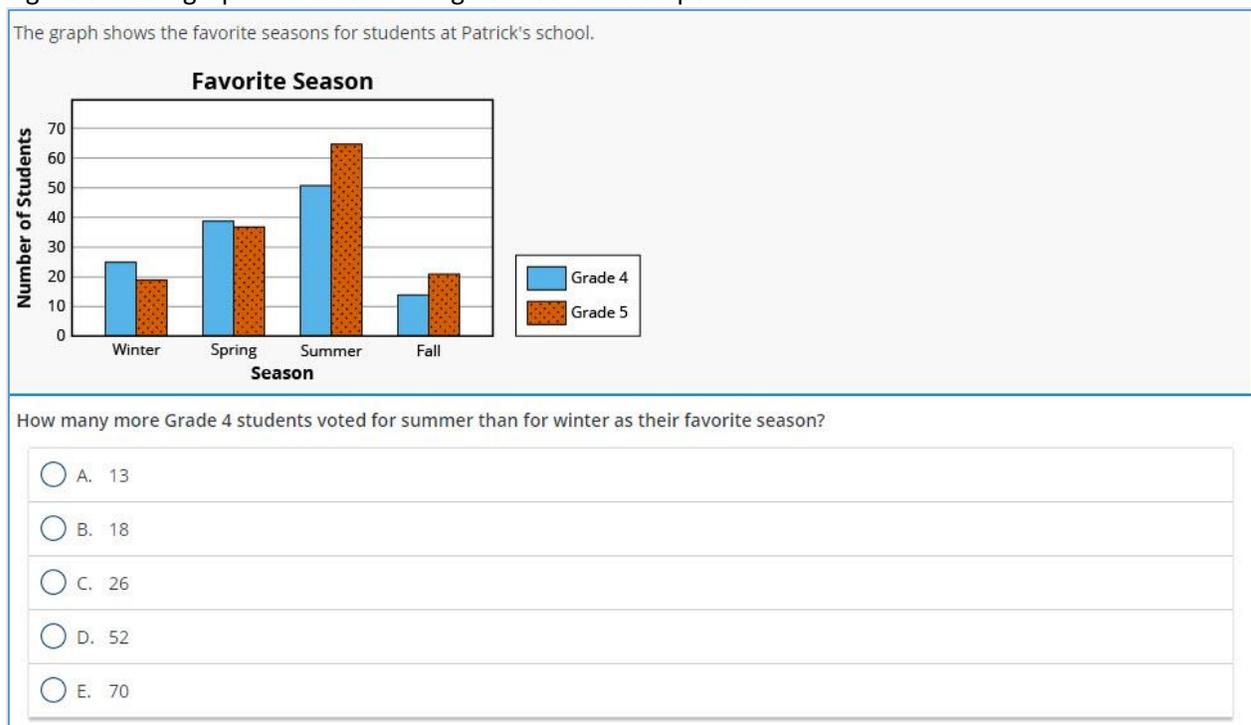
- Bike, 4 children.
- Bus, 8 children.
- Car, 6 children.
- Skateboard, 2 children.
- Walk, 9 children.

(Note: A description avoiding the terms “horizontal” and “vertical” may begin: “The bar graph is titled Getting to School. It shows Ways of Getting to School on the side, and Number of Children on the bottom.”)

2. Data lands between labeled points:
 - a. Describe the chart and give a summary if one is immediately apparent.

- b. Describe the title and axis labels. Include number ranges, if applicable. Describe the visual attributes of the bars (e.g., dark blue, light blue) only if there is an explicit need, such as a question referring to the colors. The language used to describe the graph may differ between grade levels (e.g., you may choose to describe the axes as the “bottom” and the “side” for students in lower grades, but as the “horizontal axis” or “x-axis” and the “vertical axis” or “y-axis” for students in grades 4 and above, who may more immediately recognize those terms).
- c. Give the data points in a bulleted list, separating the information with commas:
- When students do not need an exact number to answer the question, you may provide the nearest labeled number.
 - When reading the graph is the skill being assessed, explain the position of where the data point or bar lands by using language such as “halfway between 4 and 6.”
 - When calculation with the graph data is the skill being assessed, you may provide the exact values or you may choose to describe the end position in relation to surrounding numbers. Use your best judgment to decide what is appropriate within the context of each item.

Figure 3.3. Bar graph with data landing between labeled points.

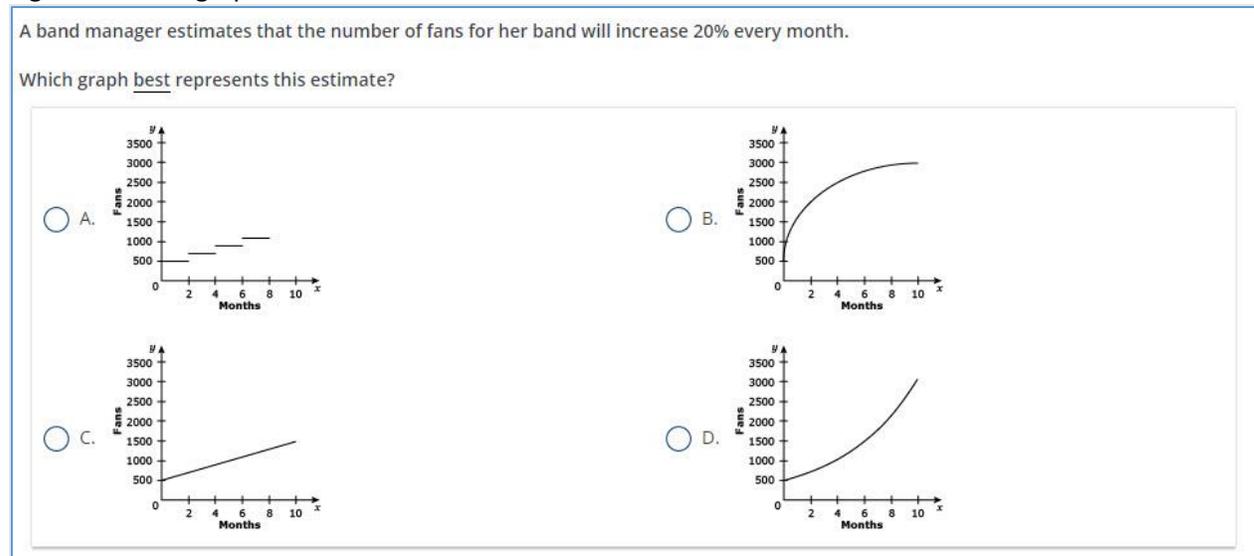


Alt text: A graph. **Longdesc:** The vertical double bar graph is titled Favorite Season. Season is on the horizontal axis. Number of Students is on the vertical axis and has lines marking every 10 students, from 0 to 70. There are 2 bars for each of the 4 seasons: 1 bar for Grade 4, and 1 bar for Grade 5.

- Winter. Grade 4, halfway between 20 and 30. Grade 5, between 10 and 20, close to the line for 20.
- Spring. Grade 4, between 30 and 40, close to the line for 40. Grade 5, between 30 and 40, close to the line for 40.

- Summer. Grade 4, between 50 and 60, close to the line for 50. Grade 5, halfway between 60 and 70.
 - Fall. Grade 4, halfway between 10 and 20. Grade 5, between 20 and 30, close to the line for 20.
3. Graphs involve different line types:
- Describe the labels on the x-axis and y-axis. Include number ranges, if applicable. The language used to describe the graph may differ between grade levels (e.g., you may choose to describe the axes as the “bottom” and the “side” for students in lower grades, but describe them as the “horizontal axis” or “x-axis” and the “vertical axis” or “y-axis” for students in grades 4 and above, who may more immediately recognize those terms).
 - Describe the shape of each line and/or the trend for each graph.

Figure 3.4. Line graphs.



- Alt text: A graph. Longdesc: The graph’s x-axis shows Months, from 0 to 10. The y-axis shows Fans, from 0 to 3,500. Four short horizontal lines step up from the bottom left: 0 to 2 months, 500 fans. 2 to 4 months, 700 fans. 4 to 6 months, 900 fans. 6 to 8 months, 1,100 fans.
- Alt text: A graph. Longdesc: The graph’s x-axis shows Months, from 0 to 10. The y-axis shows Fans, from 0 to 3,500. A line starts at (0, 750) and curves up as the value increases, quickly at first and then more slowly, to (10, 3,000).
- Alt text: A graph. Longdesc: The graph’s x-axis shows Months, from 0 to 10. The y-axis shows Fans, from 0 to 3,500. A straight line starts at (0, 500) and slopes up to (10, 1,500).
- Alt text: A graph. Longdesc: The graph’s x-axis shows Months, from 0 to 10. The y-axis shows Fans, from 0 to 3,500. A line starts at (0, 500) and curves up as the value increases, slowly at first and then more quickly, to (10, 3,000).

(Note: This item is a good candidate for providing an overarching description of the graphs’ shared characteristics before the answer option section (if the assessment platform has the functionality to present this information separately from individual graphics). This would allow the individual image descriptions to be shortened to only the unique characteristics of each graph. In this item, the answer option section could be prefaced with, “Each answer option

shows a graph. The graphs' x-axes show Months, from 0 to 10. The y-axes show Fans, from 0 to 3,500." For each answer option, the first two sentences of the longdesc could then be removed from the image description.)

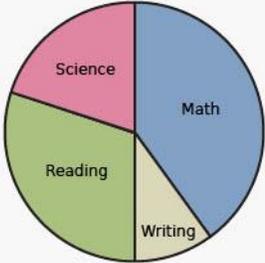
Circle Graphs

- Give the title of the graph and describe how it is divided.
- When the graph is divided into unequal parts, describe the parts from largest to smallest using a bulleted list.
- It is not necessary to describe the colors of the parts unless they are mentioned in other parts of the item.

Figure 3.5. Circle graph.

Use the graph to answer the question.

Favorite Subjects among Fourth Grade Students



Which subject did most fourth grade students choose as their favorite?

A. Science

B. Math

C. Writing

D. Reading

Alt text: A graph. **Longdesc:** The circle graph is titled Favorite Subjects among Fourth Grade Students. It is divided into 4 unequal parts. From largest to smallest, the parts are:

- Math.
- Reading.
- Science.
- Writing.

Number/Hundreds Charts

- Give the number range.
- State which numbers are circled or shaded.

Figure 3.6. Number/hundreds chart.

The shaded squares in the chart show a skip-counting pattern.

51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

What skip-counting pattern is shown in the chart?

- A. add 5
- B. add 6
- C. add 7
- D. add 8

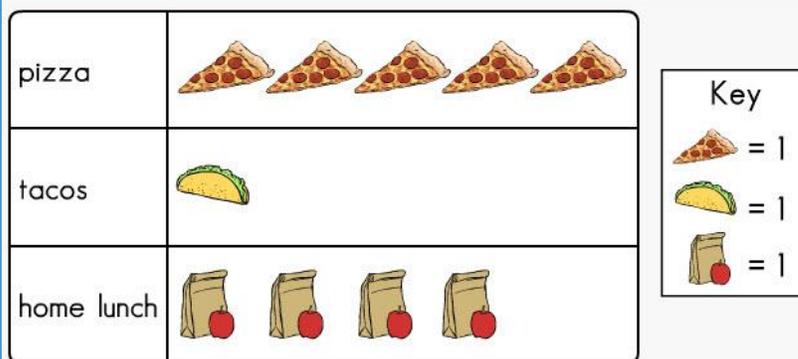
Alt text: Part of a hundreds chart shows numbers 51 through 100. These numbers are shaded: 53, 59, 65, 71, 77, 83, 89, 95.

Pictographs

- a. Provide the pictograph title (if shown) and the units.
- b. Describe the key. When the key shows a picture that is identical to what it represents, include the word “picture” to distinguish the art (e.g., “One car picture equals one car.”). When the key shows a picture that is different from what it represents, you do not need to include the word “picture” (e.g., “A key shows 1 sun equals 1 day outside.”).

Figure 3.7. Pictograph.

Use the chart to answer the question.



How many more students picked pizza than tacos?

- A. 1
- B. 4
- C. 5
- D. 6
- E. 10

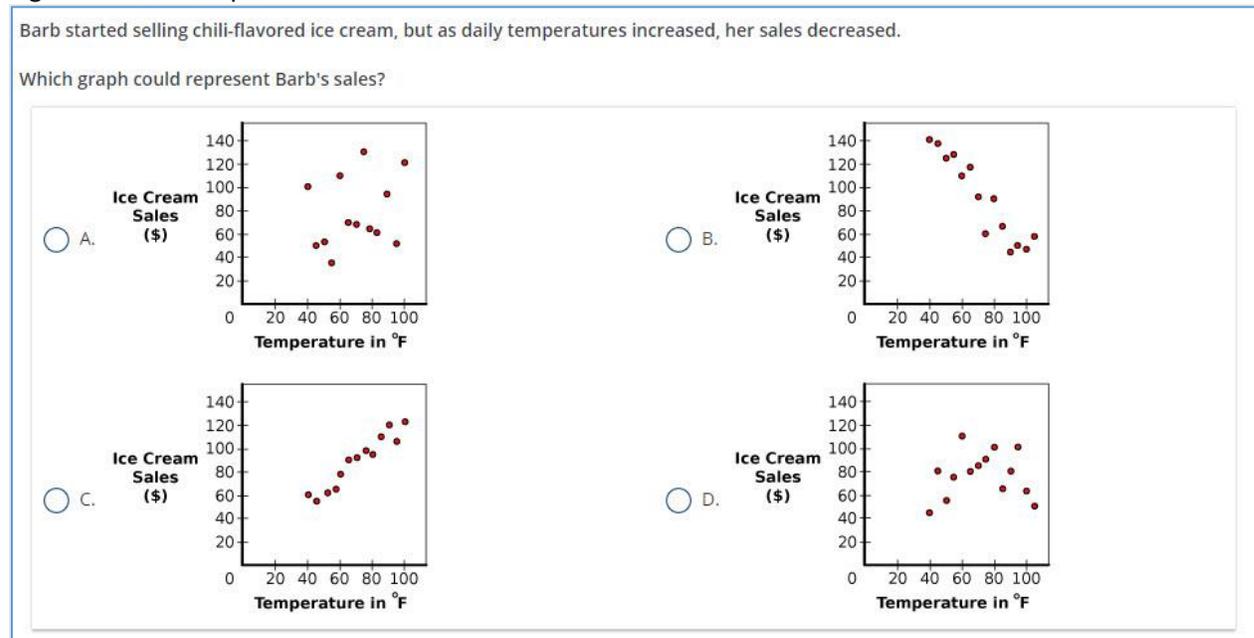
Alt text: A pictograph. **Longdesc:** The pictograph shows names of lunches and pictures of lunches. A key shows 1 pizza picture equals 1 pizza, 1 taco picture equals 1 taco, and 1 brown bag equals 1 home lunch.

- Pizza, 5 pizza pictures.
- Tacos, 1 taco picture.
- Home lunch, 4 brown bags.

Scatter Plot

- Give the title of the scatter plot.
- Describe the axes and the number of points so students receive an overview of the scatter plot. Include number ranges on the axes, if applicable.
- Describe the correlation by telling students if the points are clustered (“one area, tightly grouped”), if they show a trend, or if they are spread out.
- When the scatter plot has a trend, describe the pattern and describe the line of best fit if one is shown. A line of best fit can be described by stating how many of the points are above, on, and below the line, or by giving the slope. How you describe the line of best fit depends on the skill being assessed.
- Depending on the item, each point’s location may need to be described. Use your best judgment to determine if descriptions of the individual points would lead to cognitive overload, which would mean the image has visual bias.

Figure 3.8. Scatter plot.



- Alt text:** A scatter plot. **Longdesc:** The scatter plot shows 13 points plotted on a graph. The x-axis shows Temperature, from 0 to 100 degrees Fahrenheit. The y-axis shows Ice Cream Sales, from 0 to 140 dollars. Points are loosely scattered all over the graph.
- Alt text:** A scatter plot. **Longdesc:** The scatter plot shows 14 points plotted on a graph. The x-axis shows Temperature, from 0 to 100 degrees Fahrenheit. The y-axis shows Ice Cream Sales, from 0 to 140 dollars. Points show a downward trend.

- C. **Alt text:** A scatter plot. **Longdesc:** The scatter plot shows 13 points plotted on a graph. The x-axis shows Temperature, from 0 to 100 degrees Fahrenheit. The y-axis shows Ice Cream Sales, from 0 to 140 dollars. Points show an upward trend.
- D. **Alt text:** A scatter plot. **Longdesc:** The scatter plot shows 14 points plotted on a graph. The x-axis shows Temperature, from 0 to 100 degrees Fahrenheit. The y-axis shows Ice Cream Sales, from 0 to 140 dollars. Points are scattered in the middle of the graph.

(Note: This item is a good candidate for providing an overarching description of the graphs’ shared characteristics before the answer option section (if the assessment platform has the functionality to present this information separately from individual graphics). This would allow the individual image descriptions to be shortened to only the unique characteristics of each graph. In this item, the answer option section could be prefaced with, “Each answer option shows a scatter plot. The scatter plots show points plotted on a graph. The x-axis shows Temperature, from 0 to 100 degrees Fahrenheit. The y-axis shows Ice Cream Sales, from 0 to 140 dollars.” For each answer option, the image description would then simply state the number of points plotted and the trend.)

Tally Chart

While many tables and charts can be created using HTML that is screen reader accessible, tally charts often need to be presented as images, as the tally marks themselves are graphics.

1. Reading the tally chart is the skill being assessed:
 - a. Use descriptive language and avoid providing totals.
 - b. Group tally marks by fives (e.g., describe 13 tally marks as “2 groups of 5 and 1 group of 3”). There is no need to mention the diagonal slash.

Figure 3.9. Tally chart where reading the chart is the skill being assessed.

Use the information to answer the question.

Sarah asked 15 students to name their favorite summer activity. She wrote the responses in a list.

baseball
soccer
bike
baseball
skateboarding
skateboarding
baseball
skateboarding
soccer
baseball
soccer
swim
baseball
swim
skateboarding

Which table shows Sarah's data?

A.

FAVORITE SUMMER ACTIVITY	
Activity	Number of Students
Baseball	THL
Bike	I
Skateboarding	IIII
Soccer	III
Swim	II

B.

FAVORITE SUMMER ACTIVITY	
Activity	Number of Students
Baseball	I
Bike	II
Skateboarding	III
Soccer	IIII
Swim	THL

C.

FAVORITE SUMMER ACTIVITY	
Activity	Number of Students
Baseball	THL
Bike	IIII
Skateboarding	III
Soccer	II
Swim	I

D.

FAVORITE SUMMER ACTIVITY	
Activity	Number of Students
Baseball	II
Bike	III
Skateboarding	IIII
Soccer	I
Swim	THL

- A. **Alt text:** A tally chart. **Longdesc:** The tally chart shows Activity and Number of Students.
 - Baseball, 1 group of 5.
 - Bike, 1 group of 1.
 - Skateboarding, 1 group of 4.
 - Soccer, 1 group of 3.
 - Swim, 1 group of 2.

- B. Alt text: A tally chart. Longdesc: The tally chart shows Activity and Number of Students.
- Baseball, 1 group of 1.
 - Bike, 1 group of 2.
 - Skateboarding, 1 group of 3.
 - Soccer, 1 group of 4.
 - Swim, 1 group of 5.
- C. Alt text: A tally chart. Longdesc: The tally chart shows Activity and Number of Students.
- Baseball, 1 group of 5.
 - Bike, 1 group of 4.
 - Skateboarding, 1 group of 3.
 - Soccer, 1 group of 2.
 - Swim, 1 group of 1.
- D. Alt text: A tally chart. Longdesc: The tally chart shows Activity and Number of Students.
- Baseball, 1 group of 2.
 - Bike, 1 group of 3.
 - Skateboarding, 1 group of 4.
 - Soccer, 1 group of 1.
 - Swim, 1 group of 5.

(Note: The titles of the tally charts are omitted from the image descriptions for the sake of brevity; because the title is consistent across all answer options and the information has already been conveyed in the text of the asset, it is not necessary to restate the title in the image descriptions.)

2. Item asks the student to do something with the data (not simply interpret the total tallies in a given category):
- Provide the total amount of tally marks in numerals.

Figure 3.10. Tally chart where calculating with the data is the skill being assessed.

Use the information to answer the question.

Brad put circles, squares, and triangles in a bag. There are 12 shapes in the bag. Brad picks a shape, records the type of shape, and returns it to the bag. The tally chart shows the results of his doing this 100 times.

Circles	Squares	Triangles
## ##	## ##	## ##
##	## ##	## ##
	## ##	
	## ##	
	## ##	
	## ##	

Brad picks a shape, records it, and returns the shape to the bag 12 more times.

Based on the tally chart, which set of results is the most likely?

A. 1 circle, 1 square, 10 triangles

B. 2 circles, 8 squares, 2 triangles

C. 5 circles, 2 squares, 5 triangles

D. 4 circles, 4 squares, 4 triangles

E. 8 circles, 3 squares, 1 triangle

Alt text: A tally chart with 3 columns: Circles, Squares, and Triangles. Circles, 17 marks. Squares, 63 marks. Triangles, 20 marks.

Clocks

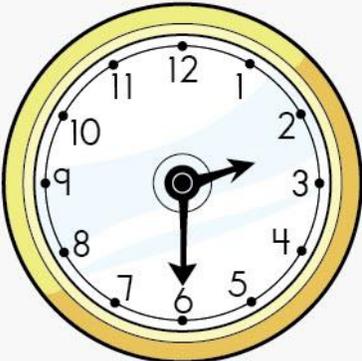
For analog and digital clocks, when the skill being assessed is not about reading time on a clock, you can write out the time (e.g., “two thirty”) in the image description if this approach will not cue the answer. Otherwise, follow the guidelines in the Analog and Digital sections.

Analog

- When describing analog clocks, consider the grade level. For lower grade levels, use the terms “short hand” and “long hand.” For higher grade levels, use “minute hand” and “hour hand.” You may also choose to use “short hour hand” and “long minute hand” for lower grades.
- When the hands point between two numbers, use the expression “between # and #.”
- When the clock has minute markers and the minute hand points between numbers, describe the minute hand’s position by referencing the minute markers (e.g., “the minute hand points to the second mark after 4”).

Figure 3.11. Analog clock.

Use the clock to answer the question.



What time is shown on the clock?

A. 2:00

B. 2:30

C. 3:00

D. 3:30

Alt text: A clock shows the short hour hand is halfway between 2 and 3. The long minute hand points to 6.

Digital

- When the skill being assessed is recognition of time, use a number-colon-number format to avoid cuing the answer.

Figure 3.12. Digital clocks.

Which clock shows six o'clock?

A. 

B. 

C. 

D. 

- A. Alt text: The digital clock shows 6 colon 0 0.
- B. Alt text: The digital clock shows 6 colon 3 0.

- C. Alt text: The digital clock shows 7 colon 0 0.
 D. Alt text: The digital clock shows 7 colon 3 0.

Coordinate Planes

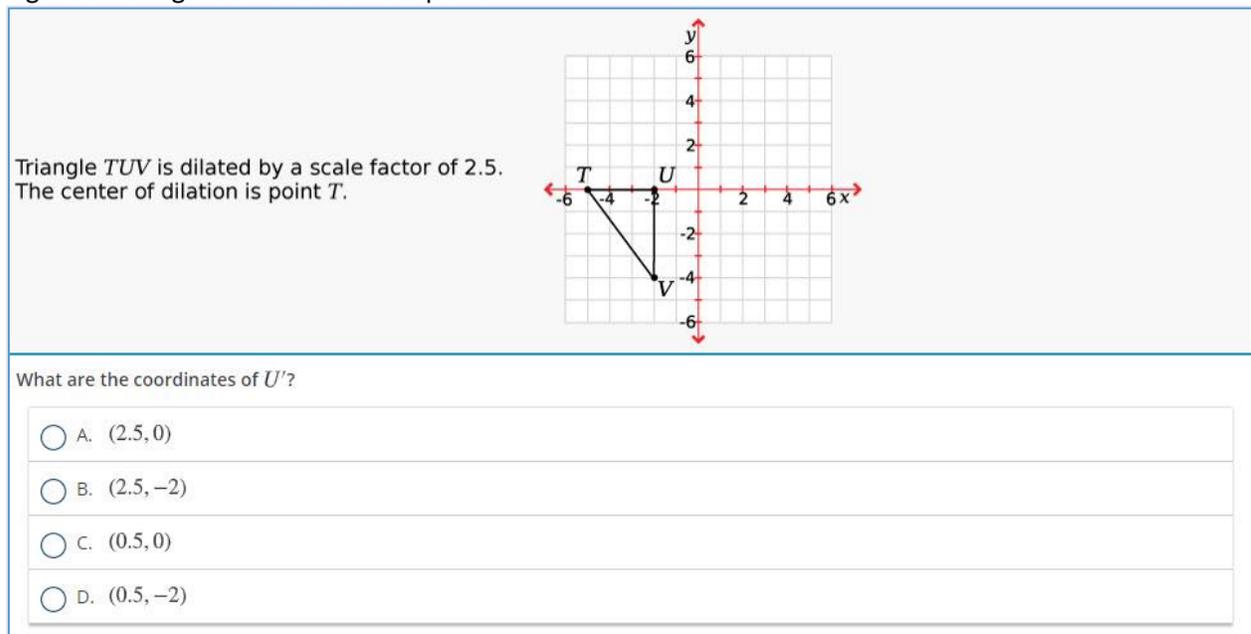
In many cases, providing a tactile graphic of the graph or figure on the coordinate plane will improve the accessibility of the item and create a more authentic assessment of the students' skill.

Where symbols, equations, coordinates, point labels, and figure names are present in example items' text, a math tool was used to ensure that screen readers would read them as optimally as possible (e.g., the math tool causes screen readers to read " ΔABC " in the text of an answer option as "triangle A B C" and causes screen readers to read the coordinate " $(3, -7)$ " as "the point 3 comma negative 7"). The image descriptions for these items have been written so screen readers will read the text in the image description consistently with how they read the text from the math tool. This may mean the image description's text looks different from text that appears elsewhere in the item, but it is consistent with the text that the math tool presents to screen readers. See [figure 3.13](#) and [figure 3.31](#) for examples.

Figures

- Tell students that the figure is on a coordinate plane.
- Introduce the type of figure or shape. Be consistent with how the screen reader will read the figure/shape names in the other parts of the item.
- Describe the points on the graph by naming the coordinates for each apex of the figure.
- Put a space between each letter used to name a shape ("Triangle A B C," not "Triangle ABC") for better screen reader behavior. However, be consistent with how a screen reader will read the name as it occurs in other parts of the item.

Figure 3.13. Figure on a coordinate plane.



Alt text: Triangle T U V is on a coordinate plane. Point T is at negative 5 comma 0. Point U is at negative 2 comma 0. Point V is at negative 2 comma negative 4.

(Note: In the text before the graph, a math tool has been used to instruct the screen reader to read “TUV” as “T U V,” so the image description uses “T U V” to ensure consistent screen reader behavior. Similarly, the comma in the image description’s coordinates is written as “comma” to be consistent with how the math tool instructs screen readers to read the coordinates in the answer options [e.g., “A. the point 2.5 comma 0”.].)

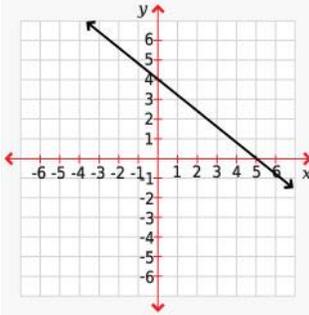
Lines

1. Basic lines:
 - a. Tell students there is a coordinate plane.
 - b. Describe the number of lines and the shape of each line.
 - c. Describe the slope of each line (positive, negative, etc.). If these terms would cue the answer, consider using phrases such as “decreases from left to right” or “increases from left to right.”
 - d. Describe the x- and y-intercepts, from left to right, by giving their coordinates. If the line crosses an axis between grid lines or between integer values, consider giving the integer coordinates of an additional point on the line.

Figure 3.14. Basic line on a coordinate plane.

Use the graph to answer the question.

The graph of a line is shown.



Which equation is parallel to the line shown on the graph?

A. $y = -1.25x + 5$

B. $y = -0.8x + 5$

C. $y = 4x + 5$

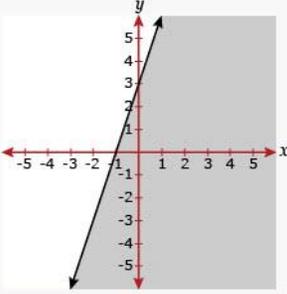
D. $y = 5x + 5$

Alt text: On a coordinate plane, a straight line with a negative slope crosses the y-axis at the point (0 comma 4) and the x-axis at the point (5 comma 0).

2. Lines include shading:
 - a. Tell students there is a coordinate plane.
 - b. Describe the number of lines, the shape of each line, and whether each line is “solid” or “dashed.”
 - c. Describe the slope of each line (positive, negative, etc.). If these terms would cue the answer, consider using phrases such as “decreases from left to right” or “increases from left to right.”
 - d. Describe the x- and y-intercepts, from left to right, by giving their coordinates. If the line crosses an axis between grid lines or between integer values, consider giving the integer coordinates of an additional point on the line.
 - e. Describe the shaded area in relation to each line, using language such as “to the right/left of the line” or “above/below the line.”

Figure 3.15. Line with shading on a coordinate plane.

Use the graph to answer the question.



Which statement describes the graph?

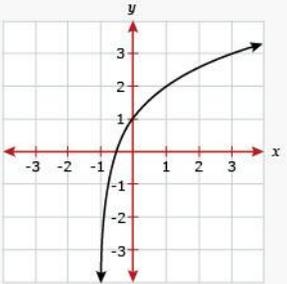
A. $y < 3x + 3$
 B. $y > 3x + 3$
 C. $y \leq 3x + 3$
 D. $y \geq 3x + 3$
 E. $y = 3x + 3$

Alt text: A graph. **Longdesc:** The graph on a coordinate plane shows a solid line with a positive slope crossing the x-axis at the point (negative 1 comma 0) and the y-axis at the point (0 comma 3). The area to the right of the line is shaded.

3. Logarithmic functions:
- Tell students there is a coordinate plane.
 - Describe the number of graphs and the shape of each graph, using the terms “curve” or “logarithmic graph.”
 - When describing asymptotes, describe the curve as “asymptotic to” an axis or line and the direction it approaches from (“right,” “left,” “above,” or “below”). If asymptote vocabulary would be a barrier to students, you can describe the axis or x- or y-value that the curve approaches (e.g., “as the curve approaches x equals negative 1”), the direction it approaches from (e.g., “from the right”), and where the curve drops, rises, or extends to (e.g., “the curve drops to negative infinity”).
 - Describe the x- and y-intercepts. When there are no intercepts or the intercepts are difficult to identify, provide the nearest point with integer coordinates.

Figure 3.16. Logarithmic function on a coordinate plane.

Use the graph to answer the question.



Which equation describes the graph?

A. $y = \log_2(x - 1) - 1$
 B. $y = \log_2(x + 1) - 1$
 C. $y = \log_2(x - 1) + 1$
 D. $y = \log_2(x + 1) + 1$

Alt text: A graph. Longdesc: The graph shows a single curve on a coordinate plane. As the curve approaches x equals negative 1 from the right, the curve drops rapidly toward negative infinity. The curve crosses the x -axis between negative 1 and 0, and crosses the y -axis at the point (0 comma 1).

OR (with asymptotic language)

Alt text: A graph. Longdesc: On a coordinate plane, a single logarithmic graph is asymptotic to x equals negative 1 from the right, crosses the x -axis between negative 1 and 0, and crosses the y -axis at the point (0 comma 1).

Parabolas and Absolute Graphs

- a. Describe graphs with two or fewer curves. When there are three curves on one graph, the description becomes too long and complex, with too many numbers and pieces of information for students to hold in their working memory, causing cognitive overload.
- b. Tell students there is a coordinate plane. When describing the graphs in terms of quadrants, state that it is a “4-quadrant coordinate plane.” If there is concern that students may not know the quadrants by number, you can substitute directional language (“upper-right quadrant,” “upper-left quadrant,” “lower-left quadrant,” “lower-right quadrant”), though that will make the description longer.
- c. Give the number of graphs and describe them in order from left to right.
- d. Describe the shape of the graph (a parabola, curve, hyperbola, etc.), or provide descriptive language if the name of the shape will be a barrier to students or cue the answer:
 - i. For a parabola, describe the direction the graph opens (“right,” “left,” “up,” or “down”).
 - ii. For other absolute graphs, describe the curve as “asymptotic to” an axis or line and give information about which quadrant(s) it is in. If asymptote vocabulary would be a barrier to students, describe the x - or y -value the curve approaches (e.g., “As the curve approaches y equals 1”), the direction it approaches from (e.g., “from below”), and where the curve drops, rises, or extends to (e.g., “the curve extends to infinity”).
- e. Describe the vertex and x - and y -intercepts. If there is no intercept (or the intercepts are difficult to identify), provide the nearest point with integer coordinates.

Figure 3.17. Parabola and absolute graphs on coordinate planes.

What is the graph of $y = \frac{k}{x^2}$, where k is a constant?

- A. Alt text: A graph. Longdesc: On a 4-quadrant coordinate plane, there is 1 parabola that opens up in quadrants 1 and 2, with a vertex at the origin (0 comma 0).
- B. Alt text: A graph. Longdesc: On a 4-quadrant coordinate plane, there is 1 curve that goes through quadrants 1 and 2. In quadrant 2, the curve is asymptotic to the negative x-axis from above. It crosses the y-axis at the point (0 comma 0.5) and curves up sharply in quadrant 1.
- C. Alt text: A graph. Longdesc: On a 4-quadrant coordinate plane, there are two curves. The first curve is in quadrant 2, is asymptotic to the positive y-axis from the left, and is asymptotic to $y = 2$ from above. The second curve is in quadrant 1, is asymptotic to the positive y-axis from the right, and is asymptotic to $y = 2$ from above.
- D. Alt text: A graph. Longdesc: On a 4-quadrant coordinate plane, there are two curves. The first curve is in quadrant 2, is asymptotic to the positive y-axis from the left, and is asymptotic to the negative x-axis from above. The second curve is in quadrant 4, is asymptotic to the negative y-axis from the right, and is asymptotic to the positive x-axis from below.
- E. Alt text: A graph. Longdesc: On a 4-quadrant coordinate plane, there is 1 curve that is in quadrants 1 and 4. In quadrant 1, it passes through the point (2 comma 9), crosses the x-axis at the point (4 comma 0), and passes through the point (8 comma negative 4) in quadrant 4.

OR (avoiding quadrant numbers and asymptote vocabulary)

- A. Alt text: A graph. Longdesc: On a 4-quadrant coordinate plane, there is one parabola that opens up in the upper quadrants, with a vertex at the origin (0 comma 0).
- B. Alt text: A graph. Longdesc: On a 4-quadrant coordinate plane, there is one curve that goes through the upper quadrants. In the upper-left quadrant, as the curve approaches the x-axis from above, it extends rapidly toward negative infinity. The curve crosses the y-axis at the point (0 comma 0.5) and curves up sharply in the upper-right quadrant.

- C. Alt text: A graph. Longdesc: On a 4-quadrant coordinate plane, there are two curves.
- The first curve is in the upper-left quadrant. As it approaches the y-axis from the left, it rises rapidly to infinity. And as it approaches $y = 2$ from above, it extends rapidly toward negative infinity.
 - The second curve is in the upper-right quadrant. As it approaches the y-axis from the right, it rises rapidly toward infinity. And as it approaches $y = 2$ from above, it extends toward infinity.
- D. Alt text: A graph. Longdesc: On a 4-quadrant coordinate plane, there are two curves.
- The first curve is in the upper-left quadrant. As it approaches the y-axis from the left, it rises rapidly toward infinity. And as it approaches the x-axis from above, it extends toward negative infinity.
 - The second curve is in the lower-right quadrant. As it approaches the y-axis from the right, it drops rapidly toward negative infinity. And as it approaches the x-axis from below, it extends toward infinity.
- E. Alt text: A graph. Longdesc: On a 4-quadrant coordinate plane, there is one curve that is in the right quadrants. In the upper-right quadrant, it passes through the point (2 comma 9), crosses the x-axis at the point (4 comma 0), and passes through the point (8 comma negative 4) in the lower-right quadrant.

Piecewise Graphs

- Tell students there is a coordinate plane.
- Describe the endpoints (open or closed circles, arrows, etc.), give the coordinates of the endpoints if available, and describe the direction of the line.
- If the graph shows more than three lines, reduce the cognitive overload by summarizing the trend and giving the left- and right-most step coordinates.

Figure 3.18. Piecewise graph on a coordinate plane.

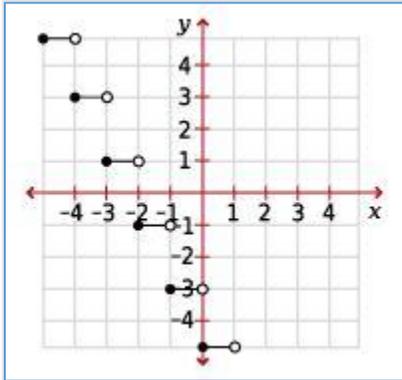
Use the graph to answer the question.	
<p>The shipping charge on a package is a function of the weight of the package, as shown on the graph.</p>	<p>What is the range of the function?</p> <p><input type="radio"/> A. all weights greater than 0 pounds</p> <p><input type="radio"/> B. all shipping charges greater than \$0</p> <p><input type="radio"/> C. weights that are positive multiples of 2 pounds</p> <p><input type="radio"/> D. shipping charges that are positive multiples of \$5 but less than \$20</p>

Alt text: A graph. Longdesc: On a coordinate plane, the graph shows Weight in pounds on the x-axis and Shipping Charge in dollars on the y-axis. A piecewise function has 3 lines.

- The first line has an open circle at the point (0 comma 5), continues horizontally at $y = 5$, and ends at an open circle at the point (2 comma 5).
- The second line has a closed circle at the point (2 comma 10), continues horizontally at $y = 10$, and ends at an open circle at the point (4 comma 10).

- The third line has a closed circle at the point (4 comma 15), continues horizontally at y equals 15, and shows an arrow instead of an endpoint.

Figure 3.19. Piecewise graph with trend-summarizing image description.



Alt text: A graph. **Longdesc:** On a coordinate plane, the step graph has 6 horizontal segments that are each 1 unit long. The left end of each segment is a closed circle. The right end of each segment is an open circle. The left-most segment goes from the point (negative 5 comma 5) to the point (negative 4 comma 5). Each segment is two units lower and one unit farther right than the previous segment. The right-most segment goes from the point (0 comma negative 5) to the point (1 comma negative 5).

Points

- Tell students there is a coordinate plane and give a brief description of it to help orient students who may be just starting to learn about coordinate planes.
- Use the origin as the point of reference (instead of the axes) to describe the points.
- If there are more than three points, provide a bulleted list with one introductory sentence.
- If a point is on an axis, say it is “on” the axis. Do not say “0 units.”

Figure 3.20. Points on a coordinate plane.

Use the graph to answer the question.

What point has the coordinates of (0, 3)?

A. *M*

B. *N*

C. *P*

D. *Q*

E. *R*

Alt text: A graph. **Longdesc:** The graph shows a coordinate plane with x - and y -axes, the origin at (0 comma 0), and 5 points: *M*, *N*, *P*, *Q*, and *R*.

- Point *M*: starting at the origin, it is on the y -axis and 3 units up.
- Point *N*: starting at the origin, it is 3 units right and 3 units up.
- Point *P*: starting at the origin, it is 3 units right and on the x -axis.
- Point *Q*: starting at the origin, it is 3 units right and 3 units down.

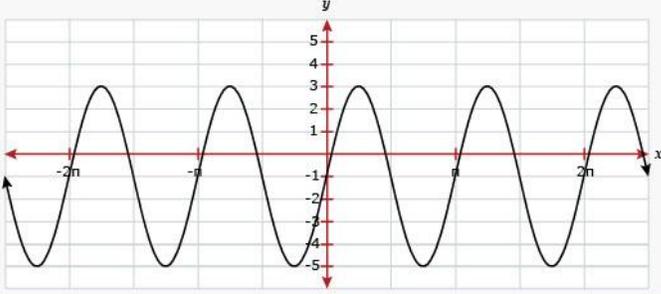
- Point R: starting at the origin, it is on the y-axis and 3 units down.

Trigonometric Functions

- Name the function, as long as it does not cue the answer.
- Give the minimum and maximum values of the sine wave.
- Describe the number of complete cycles that occur in an interval.
- Write π as “pi,” but be consistent with how screen readers will read the symbol as it occurs in other parts of the item.

Figure 3.21. Trigonometric function on a coordinate plane.

Use the graph to answer the question.



Which trigonometric function is represented by the graph?

A. $y = 4 \cos(2x) - 1$

B. $y = 8 \cos(2x) - 1$

C. $y = 4 \sin(2x) - 1$

D. $y = 8 \sin(2x) - 1$

Alt text: The graph shows a wave with a minimum value of negative 5 and a maximum value of 3. The wave completes 2 cycles from 0 to 2 pi.

Unit Circles

- Orient the student to the unit circle by describing the x- and y-intercepts.
- Focus on what students need to know in order to answer the question.
- Write out Greek symbols if they are not present in other parts of the item. If the symbols are present in other parts of the item, check how they are being read by screen readers and recreate that experience in the image description to be consistent.
- Describe angle theta in radians.

Figure 3.22. Unit circle on a coordinate plane.

Use the unit circle diagram to answer the question.

What is the value of $\sin \theta$?

A. $-\frac{\sqrt{3}}{2}$
 B. $-\frac{1}{2}$

C. $\frac{1}{2}$
 D. $\frac{\sqrt{3}}{2}$

Alt text: A unit circle diagram. **Longdesc:** The diagram shows these measurements on the circle.

- Right, on the x-axis, 0 radians.
- Top, on the y-axis, $\frac{\pi}{2}$ radians.
- Left, on the x-axis, π radians.
- Bottom, on the y-axis, $\frac{3\pi}{2}$ radians.

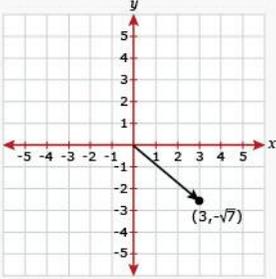
The arc length of angle θ starts at 0 and goes counterclockwise on the circle to $\frac{7\pi}{6}$ radians in the lower-left quadrant.

Vectors

- Tell students there is a coordinate plane.
- Describe the coordinates of the vector's head and tail.
- For more complex vector graphs (showing two or more vectors), state whether the vectors are connected. To reduce the cognitive load, you may also consider using the phrase "goes from (coordinates) to (coordinates)" instead of "the tail of vector x is at (coordinates) and the head is at (coordinates)."

Figure 3.23. Simple vector on a coordinate plane.

Use the vector to answer the question.



What is the magnitude of the vector?

A. $\sqrt{7}$

B. 3

C. $\sqrt{10}$

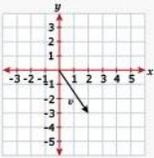
D. 4

E. $3\sqrt{7}$

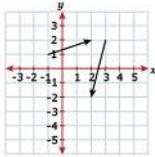
Alt text: A vector is on a coordinate plane. The tail is at the origin. The head is at the point (3 comma negative StartRoot 7 EndRoot).

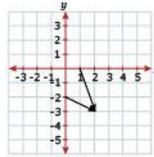
Figure 3.24. Multiple vectors on coordinate planes.

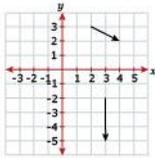
Use \vec{v} to answer the question.

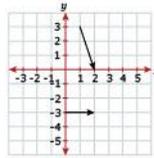


Which set of vectors has a sum that results in \vec{v} ?

A. 

B. 

C. 

D. 

Asset: **Alt text:** On a coordinate plane, vector v goes from the origin (0 comma 0) to the point (2 comma negative 3).

Answer options:

- A. Alt text: A graph. Longdesc: On a coordinate plane, 2 disconnected vectors are graphed. The first vector goes from the point (negative 1 comma 1) to the point (2 comma 2). The second vector goes from the point (3 comma 2) to the point (2 comma negative 2).
- B. Alt text: A graph. Longdesc: On a coordinate plane, 2 connected vectors are graphed. The first vector goes from the point (0 comma negative 2) to the point (2 comma negative 3). The second vector goes from the point (1 comma 0) to the point (2 comma negative 3).
- C. Alt text: A graph. Longdesc: On a coordinate plane, 2 disconnected vectors are graphed. The first vector goes from the point (2 comma 3) to the point (4 comma 2). The second vector goes from the point (3 comma negative 2) to the point (3 comma negative 5).
- D. Alt text: A graph. Longdesc: On a coordinate plane, 2 disconnected vectors are graphed. The first vector goes from the point (0 comma negative 3) to the point (2 comma negative 3). The second vector goes from the point (1 comma 3) to the point (2 comma 0).

Equations Represented as Images (Vertical Equations)

- Write the equation as a number sentence.
- Use numerals for given numbers.
- Use the appropriate mathematical term (“plus,” “minus,” “times,” or “equals”) after each number. Refer to the bottom line as “equals.”

Figure 3.25. Vertical equation.

What is the answer?

$$\begin{array}{r} 52 \\ 10 \\ + 37 \\ \hline \end{array}$$

A. 89

B. 90

C. 99

D. 100

E. 109

Alt text: 52 plus 10 plus 37 equals.

Figures and Shapes (Geometry)

In many cases, providing a tactile graphic of the graph or figure on the coordinate plane will improve the accessibility of the item and create a more authentic assessment of the students’ skill.

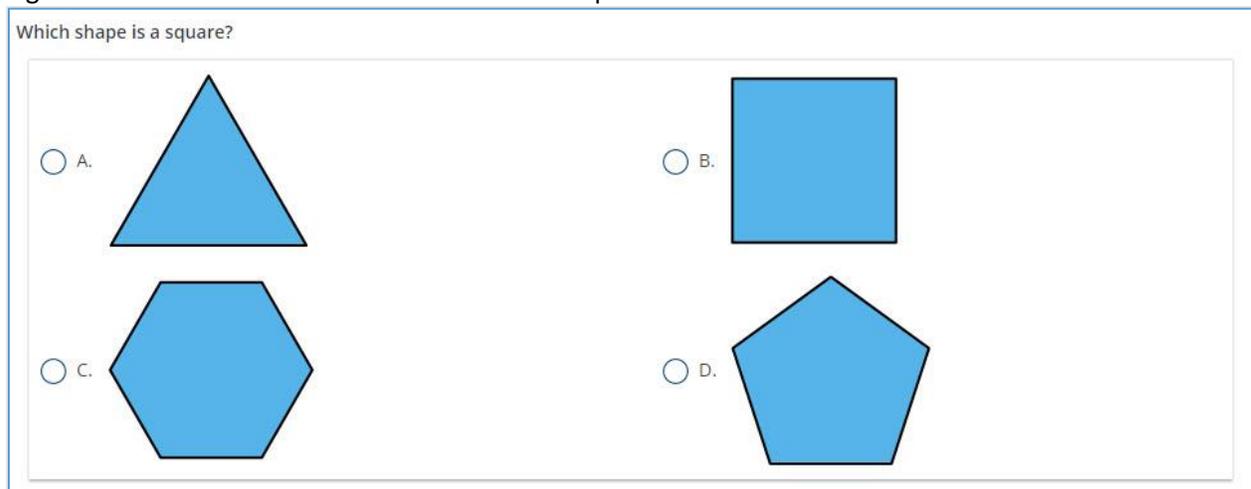
Put a space between each letter used to name a figure (“Triangle A B C,” not “Triangle ABC”) for better screen reader behavior. However, be consistent with how a screen reader will read the name as it occurs in other parts of the item.

Where symbols, equations, coordinates, point labels, figure names, Where symbols, equations, coordinates, point labels, figure names, and some abbreviations of measurement units are present in example items’ text, a math tool was used to ensure that screen readers would read them as optimally as possible (e.g., the math tool causes screen readers to read “ ΔABC ” in the text of an answer option as “triangle A B C”). The image descriptions for these items have been written so screen readers will read the text in the image description consistently with how they read the text from the math tool. This may mean the image description’s text looks different from text that appears elsewhere in the item, but it is consistent with the text that the math tool presents to screen readers. See [figure 3.13](#) and [figure 3.31](#) for examples.

2-D Shapes

1. Item involves the identification of shapes:
 - a. Describe the shape using side and/or angle details.
 - b. Note that many items that require students to identify a shape will have visual bias (e.g., when the language needed to describe the shapes is above the students’ grade level or when the image descriptions of two or more shapes are the same). Only when the shapes can be described with grade-appropriate language, by using similar structure, and with no duplication between image descriptions does the item avoid visual bias.

Figure 3.26. Identification of two-dimensional shapes.

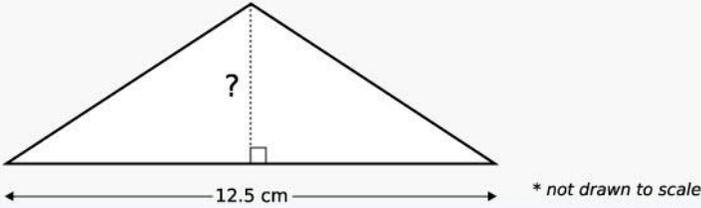


- A. Alt text: A shape with 3 sides. All sides are the same length.
 - B. Alt text: A shape with 4 sides. All sides are the same length.
 - C. Alt text: A shape with 6 sides. All sides are the same length.
 - D. Alt text: A shape with 5 sides. All sides are the same length.
2. Item involves calculation with 2-D shapes:
 - a. State the name of the shape and then give more detailed information, such as measurements and labels.
 - b. Make sure the students have all the information they need to solve the problem.

Figure 3.27. Calculation with two-dimensional shapes.

Use the information to answer the question.

The area of the triangle shown is 40.0 cm^2 .



What is the height of the triangle?

A. 3.20 centimeters

B. 6.40 centimeters

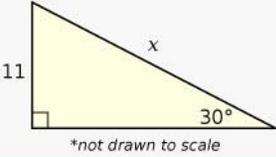
C. 13.8 centimeters

D. 27.5 centimeters

Alt text: A diagram. **Longdesc:** The diagram shows a triangle with a base of 12.5 centimeters. A line runs from the vertex opposite the base to the base, forming a right angle with the base. The line is labeled with a question mark.

Figure 3.28. Calculation with two-dimensional shapes with angle description.

Use the diagram to answer the question.



What is the value of x ?

A. 22

B. $11\sqrt{3}$

C. $11\sqrt{2}$

D. $\frac{11\sqrt{2}}{2}$

E. $\frac{11\sqrt{3}}{3}$

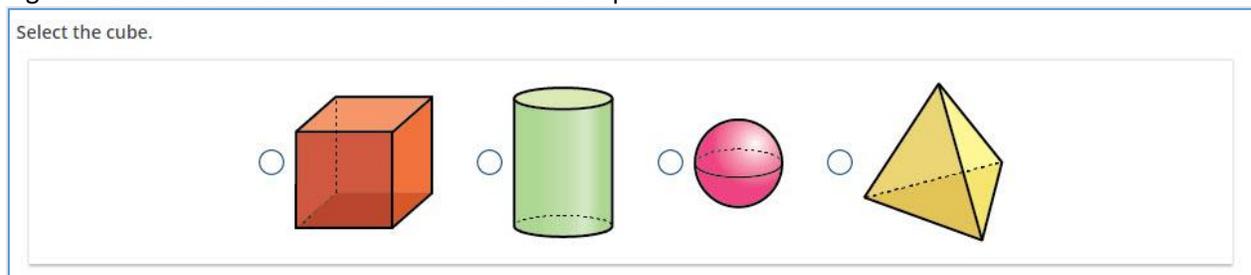
Alt text: A diagram. **Longdesc:** The diagram shows a right triangle.

- One leg (the height) is labeled 11.
- One leg (the base) is not labeled.
- One leg (the hypotenuse) is labeled x .
- The angle opposite the height is 30 degrees.

3-D Shapes

1. Item involves the identification of shapes:
 - a. Describe the shape using the definition of the shape or a close equivalent. Describing the number of sides or angle details may help. For higher grades, you can use terms such as “base,” “faces,” and “vertices” to describe 3-D shapes if the item does not require students to identify those aspects.
 - b. Note that many items that require students to identify a shape will contain visual bias (e.g., if the language needed to describe the shapes is above the students’ grade level or if the image descriptions of two or more shapes are the same). Only when the shapes can be described with grade-appropriate language, by using similar structure, and with no duplication between image descriptions does the item avoid visual bias.

Figure 3.29. Identification of three-dimensional shapes.



- A. Alt text: A shape with a flat square bottom, a flat square top, and 4 flat square sides.
 - B. Alt text: A shape like a can that has a round flat bottom, a round flat top, and one curved side that is a rectangle.
 - C. Alt text: A shape like a ball that is round with one curved side.
 - D. Alt text: A shape with a flat triangle bottom and 3 triangle sides that connect at a top point.
2. Item involves calculation with 3-D shapes:
 - a. State the name of the shape and then give more detailed information, such as measurements and labels.
 - b. Make sure the students have all the information they need to solve the problem.

Figure 3.30. Calculation with three-dimensional shapes.

John is filling the sandbox shown with sand.

Approximately how much sand will it take to fill the sandbox 0.3 meters (m) deep?

A. 1.77 m^3

B. 2.55 m^3

C. 3.54 m^3

D. 6.20 m^3

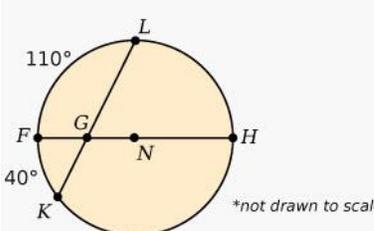
Alt text: The sandbox is in the shape of a rectangular prism. It is 3.4 meters long, 2.5 meters wide, and more than 0.3 meters tall.

Circles

1. Circles that include angles and lines:
 - a. Repeat the plain text to set up the description as needed.
 - b. Whenever the diagram includes “not drawn to scale,” pay particular attention to the actual measurements provided.
 - c. If terms such as “chord” may be a barrier to some students, include a description explaining the term.
 - d. Describe the line segments and then the arc they form.

Figure 3.31. Circles including angles and lines.

\overline{FH} is a diameter of $\odot N$.



What is $m\angle LGH$?

A. 40°

B. 55°

C. 70°

D. 85°

Alt text: Circle N. Longdesc: Line segment FH is the diameter of a circle with center N . Chord KL is a line segment that goes from point K on the circle to point L on the circle.

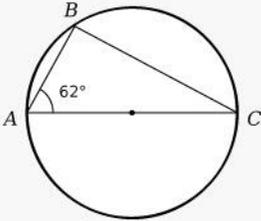
- Chord KL intersects diameter FH at point G .
- Angle FGL intercepts arc FL , which measures 110° .
- Angle FGK intercepts arc FK , which measures 40° .

(Note: The degree symbol was maintained in the image description—instead of being spelled out as “degrees”—because students also encounter the symbol in the answer options, and it is not defined elsewhere in the item.)

2. Circles that include inscribed shapes:
 - a. When the circle is named by having a center point labeled, give the name of the circle and the shape inscribed in it.
 - b. Describe lines and angles of the inscribed shape.
 - c. Sometimes it is beneficial to repeat information given in the text preceding or following the image, so the information in the image description is presented in a logical progression that may be more easily understood by a student who is blind or visually impaired.

Figure 3.32. Circles including inscribed shapes.

The diameter of the circle shown is \overline{AC} .



What is $m\angle BCA$?

A. 14°

B. 28°

C. 31°

D. 62°

Alt text: A circle is inscribed with Triangle A B C, so the vertices of the triangle are on the circle. Segment A C is a diameter of the circle. Angle C A B is 62° .

(Note: The degree symbol was maintained in the image description—instead of being spelled out as “degrees”—because students also encounter the symbol in the answer options, and it is not defined elsewhere in the item.)

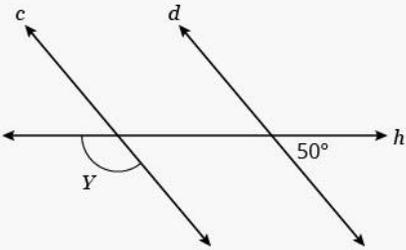
Line and Angle Relationships

- Describe each parallel line and the angles created by the intersecting line(s), starting with the upper-left angle and moving clockwise.
- Use the term “blank” to describe the angles that are not labeled in the image, but only if they are related to the skill being assessed (e.g., if only one angle is labeled where two lines intersect, there is usually no need to describe the three unlabeled angles as “blank”; describe only the one labeled angle).
- Use your best judgment to determine if the description is too long or complex to be accessible to students who are blind. If it is, the item has visual bias, and the item should not be included in assessments for students who are blind.

Figure 3.33. Line and angle relationships.

Use the diagram to answer the question.

Parallel lines c and d are cut by a transversal line h .



**not drawn to scale*

What is $m\angle Y$?

A. 40°

B. 50°

C. 90°

D. 130°

E. 180°

Alt text: A diagram. Longdesc: The diagram shows parallel lines c and d are intersected by horizontal line h. Four angles are created at each point where line h intersects the two parallel lines. Two angles are labeled.

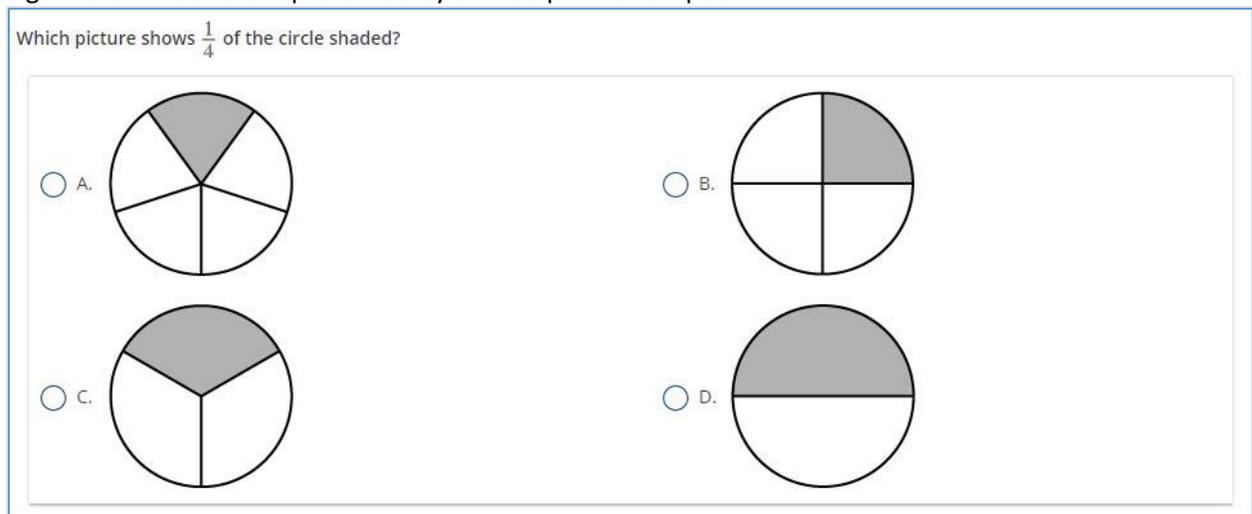
- Where line h intersects line c, the lower-left angle is labeled Y.
- Where line h intersects line d, the lower-right angle is labeled 50° .

Fractions (Represented by Shaded Parts of a Shape)

In many cases, providing a tactile graphic of the fraction represented by shaded parts of a shape will improve the accessibility of the item and create a more authentic assessment of the students' skill.

- Describe the shape.
- Describe how the shape is divided.
- Give the number of shaded parts.

Figure 3.34. Fractions represented by shaded parts of shapes.



- Alt text: A circle is divided into 5 equal parts. 1 part is shaded.
- Alt text: A circle is divided into 4 equal parts. 1 part is shaded.
- Alt text: A circle is divided into 3 equal parts. 1 part is shaded.
- Alt text: A circle is divided into 2 equal parts. 1 part is shaded.

Groups and Patterns

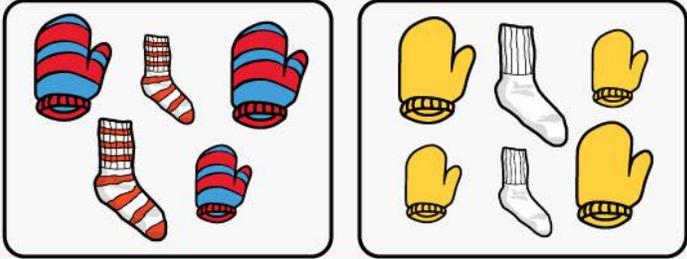
In many cases, providing a tactile graphic of the pattern will improve the accessibility of the item and create a more authentic assessment of the students' skill.

Groups

- For consistency, use the same categories and descriptions from the answer choices in the image description, provided they do not cue the answer.
- Use a bulleted list for student-controlled navigation.

Figure 3.35. Groups.

Ruby sorted the objects into two groups.



What rule did Ruby use to sort the objects?

A. large or small

B. black or white

C. striped or solid

D. socks or mittens

Alt text: Two groups of objects. **Longdesc:**

Group 1.

- 2 large blue-and-red striped mittens.
- 1 small blue-and-red striped mitten.
- 1 large red-and-white striped sock.
- 1 small red-and-white striped sock.

Group 2.

- 2 large solid-yellow mittens.
- 2 small solid-yellow mittens.
- 1 large solid-white sock.
- 1 small solid-white sock.

Patterns

1. Item involves changes within an image:
 - a. Give students an overview of the image in order to understand the pattern.
 - b. Describe the aspects of the pattern that are necessary to answer the question (e.g., in figure 3.36, there is no need to describe the dots' arrangement or their color; only the numbers of dots are needed in the image description).

Figure 3.36. Patterns represented by changes to a group.

Use the pattern to answer the question.



Which rule describes the pattern?

A. take away 1

B. take away 2

C. take away 3

D. take away 4

Alt text: Four groups of dots are shown in a pattern. The groups are: 8 dots, 6 dots, 4 dots, 2 dots.

2. Item involves linear patterns:
 - a. Give students an overview of the pattern.
 - b. When the pattern involves only single shapes or objects, list the shapes without a number (e.g., “banana, apple, orange, banana, apple, orange”). When the pattern involves more than one of the same shapes or objects in a row, use numbers in the description to reduce the cognitive load and help students focus on the pattern (e.g., “2 apples, 1 banana, 2 apples, 1 banana”).

Figure 3.37. Linear patterns.

Use the pattern of shapes to answer the question.



Which shapes come next in the pattern?

A. 

B. 

C. 

D. 

Asset: **Alt text:** The pattern shows a line of shapes: 2 triangles, 2 squares, 2 triangles, 2 squares.

Answer options:

- A. **Alt text:** A line of shapes: 3 triangles, 1 square.
- B. **Alt text:** A line of shapes: 4 triangles.
- C. **Alt text:** A line of shapes: 2 triangles, 2 squares.
- D. **Alt text:** A line of shapes: 4 squares.

Money

- State what kind of money appears in the image (e.g., “Canadian money.”).
- For Canadian money, describe coins as a “5-cent coin,” “10-cent coin,” etc.
- For U.S. money, describe coins as a nickel, dime, etc. However, if the illustrative representation of the coins shows a numerical value (e.g., the number 5 is pictured prominently on the nickel), then describe the coins as “5-cent coin,” “10-cent coin,” etc.
- If the description needs to state how many of a certain type of coin appears, use a numeral for the number of coins and the number word for the value of the coin (e.g., “2, five-cent coins”).

Figure 3.38. Money.

Rachel used these coins to buy a snack.



How much did Rachel pay for the snack?

A. \$1.03

B. \$1.28

C. \$1.38

D. \$1.43

E. \$1.47

Alt text: United States money. 2, five-cent coins. 4, twenty-five-cent coins. 3, one-cent coins. And 3, ten-cent coins.

Number Lines

In many cases, providing a tactile graphic of the number line will improve the accessibility of the item and create a more authentic assessment of the students’ skill.

Box-and-Whisker Plots

- Consider the stem. This will determine what information you can or must include in the image description.
- Include the title if there is one.
- Depending on the stem, describe the box-and-whisker plots by giving the range of the number line, the whiskers, the box, and the median value.

Figure 3.39. Box-and-whisker plot on a number line.

The box-and-whisker plot represents the number of books the students in Penelope's class read over the summer.

What was the median number of books that a student read over the summer?

A. 9

B. 18

C. 21

D. 27

Alt text: A box-and-whisker plot. **Longdesc:** The plot has a number line that goes from 0 to 36. The whiskers range from 3 to 33 books, and the box ranges from 9 to 27 books. A line divides the box at 21 books.

(Note: This item asks for the median, so the image description cannot state it outright. If the item did not ask for the median, the description could be rephrased to “. . . and the box ranges from 9 to 27 books, with a median of 21 books.”)

Fractions

- Set up the number line by providing the range of numbers.
- When fractions are the skill being assessed, describe the number line as being divided into equal parts (e.g., “A number line goes from 0 to 2. Marks divide the space between each number into 3 equal parts.”).
- When fractions are not the skill being assessed, give the divisions between integers in fractions (e.g., “A number line goes from 0 to 2. Marks divide the space between each number into thirds.”).
- When describing points at a positive number, use the smaller positive number as the anchor (e.g., “The point is at the second mark to the right of 2.”).
- When describing points at a negative number, use the larger negative number as the anchor. (e.g., “The point is at the second mark to the left of negative 1.”).

Figure 3.40. Fractions on number lines.

Which point represents the fraction $\frac{3}{4}$?

A.

B.

C.

D.

- A. Alt text: A number line. Longdesc: The number line goes from 0 to 1. Marks divide the space between each number into 4 equal parts. A point is at the first mark to the right of 0.
- B. Alt text: A number line. Longdesc: The number line goes from 0 to 1. Marks divide the space between each number into 4 equal parts. A point is at the third mark to the right of 0.
- C. Alt text: A number line. Longdesc: The number line goes from 0 to 1. Marks divide the space between each number into 5 equal parts. A point is at the first mark to the right of 0.
- D. Alt text: A number line. Longdesc: The number line goes from 0 to 1. Marks divide the space between each number into 5 equal parts. A point is at the fourth mark to the right of 0.

Inequalities

- Set up the number line by providing the range of numbers and the number of shaded sections on the number line.
- Use the terms “filled-in circle” and “open circle” to describe points.
- Refer to the ray or line segment using the phrase “the number line is shaded.”
- When both negative and positive numbers are present on the number line, specify “negative” and “positive” before each mentioned number.

Figure 3.41. Inequalities on number lines.

Which graph shows this solution set?

$y < -4$ or $y > 2$

A. 

B. 

C. 

D. 

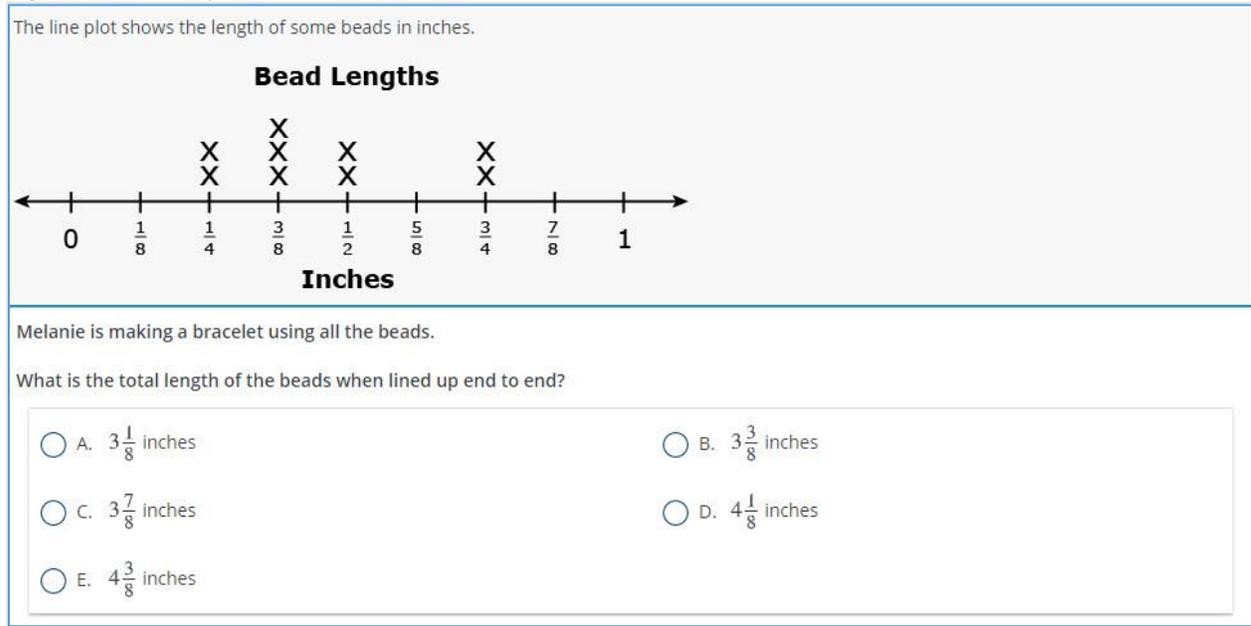
E. 

- A. Alt text: A number line. Longdesc: The number line goes from negative 4 to positive 2 and has 1 shaded section. At negative 4, there is a filled-in circle. At positive 2, there is an open circle. Between negative 4 and positive 2, the number line is shaded.
- B. Alt text: A number line. Longdesc: The number line goes from negative 4 to positive 2 and has 1 shaded section. At negative 4 and positive 2, there are open circles. Between negative 4 and positive 2, the number line is shaded.
- C. Alt text: A number line. Longdesc: The number line goes from negative 4 to positive 2 and has 1 shaded section. At negative 4 and positive 2, there are filled-in circles. Between negative 4 and positive 2, the number line is shaded.
- D. Alt text: A number line. Longdesc: The number line goes from negative 4 to positive 2 and has 2 shaded sections. At negative 4 and positive 2, there are filled-in circles. The number line is shaded to the left of negative 4 and to the right of positive 2.
- E. Alt text: A number line. Longdesc: The number line goes from negative 4 to positive 2 and has 2 shaded sections. At negative 4 and positive 2, there are open circles. The number line is shaded to the left of negative 4 and to the right of positive 2.

Line Plots

- Set up the number line by providing the title, units, and range of numbers.
- From left to right, list the number of marks at each point, first stating the number of marks and then stating the number on the number line.
- Use a bulleted list to organize the data.

Figure 3.42. Line plot on a number line.



Alt text: A line plot. Longdesc: The line plot is titled Bead Lengths. It goes from 0 to 1 inch.

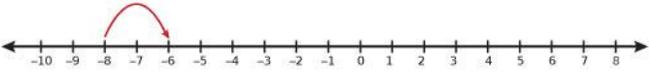
- 2 marks at 1-fourth.
- 3 marks at 3-eighths.
- 2 marks at 1-half.
- 2 marks at 3-fourths.

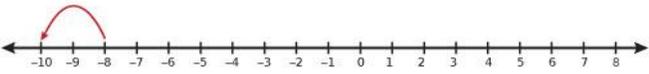
Skip Counting

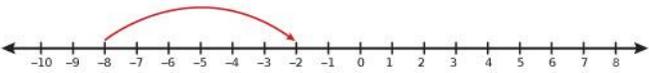
- Describe the skip-counting pattern by indicating the number of skips and the intervals.
- When both negative and positive numbers are present on the number line, specify “negative” and “positive” before each mentioned number.

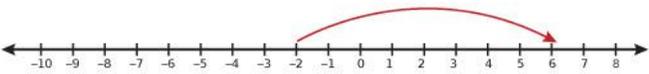
Figure 3.43. Skip counting on number lines.

Which number line shows how to find the sum of $-8 + (-2)$?

A. 

B. 

C. 

D. 

- A. Alt text: An arrow on a number line skips once, going from negative 8 to negative 6.
- B. Alt text: An arrow on a number line skips once, going from negative 8 to negative 10.
- C. Alt text: An arrow on a number line skips once, going from negative 8 to negative 2.
- D. Alt text: An arrow on a number line skips once, going from negative 2 to positive 6.

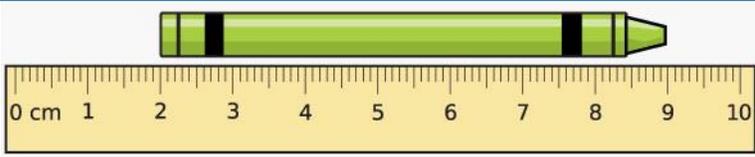
Rulers

In many cases, providing a tactile graphic will improve the accessibility of a ruler item and create a more authentic assessment of the students' skill.

- Describe the ruler based on its units. When the object extends past a whole unit, make sure to describe the mark units (e.g., "a centimeter ruler with marks showing each tenth of a centimeter").
- Indicate the start and endpoint of the object being measured.
- If the object extends past a whole unit, list the number of marks before or after the closest number.
- Ruler items whose objects start at 0 and go to a whole number have visual bias, because stating the endpoint of the object in the image description will cue the answer.

Figure 3.44. Ruler.

Use the ruler to answer the question.



What is the length of the crayon to the nearest centimeter (cm)?

A. 2 cm

B. 7 cm

C. 9 cm

D. 70 cm

E. 90 cm

Alt text: A picture showing a crayon measured with a centimeter ruler. The crayon begins at 2 centimeters and ends at 9 centimeters.

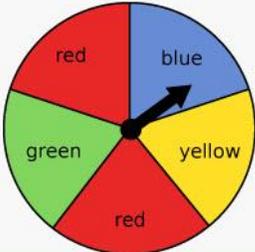
Spinners

In many cases, providing a tactile graphic of the spinner will improve the accessibility of the item and create a more authentic assessment of the students' skill.

- Describe how many parts the spinner is divided into and whether the parts are equal or unequal.
- List the different parts if knowledge of the parts is necessary to answering the question. If the parts are unequal, list them from largest to smallest.
- You do not need to repeat information given in the setup of the item. However, sometimes it is helpful for students to have all of the image's information together in the image description.

Figure 3.45. Spinner with equal-sized pieces.

The spinner is divided into 5 equal sections. Leah is going to spin the arrow one time.



What is the probability that the spinner will land on a green section?

A. 20%

B. 25%

C. 40%

D. 50%

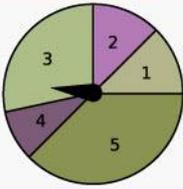
E. 67%

Alt text: A spinner divided into 5 equal sections. 1 section is green.

(Note: In the image description of figure 3.45, the image description repeats some information given in the text of the item in order to keep together the information that is relevant to answering the question.)

Figure 3.46. Spinner with unequal-sized pieces.

Use the spinner to answer the question.



Which number will the spinner stop on LEAST often?

A. 1

B. 2

C. 3

D. 4

E. 5

Alt text: A spinner. **Longdesc:** The spinner is divided into 5 unequal parts, labeled 1 through 5.

From largest to smallest, the parts are:

- 5, which takes up almost half the spinner.
- 3, which takes up a little more than a quarter of the spinner.
- 1 and 2, which are equal in size and each take up about 1-eighth of the spinner.
- 4, which is a little smaller than parts 1 and 2.

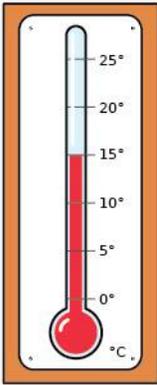
Thermometers

In many cases, providing a manipulative or a tactile graphic of the thermometer will improve the accessibility of the item and create a more authentic assessment of the students' skill.

- Set up the thermometer by providing the range of numbers, the units, and the intervals.
- Describe the temperature level by saying at which mark the liquid in the thermometer stops.
- If the liquid stops between labeled marks, give the nearest labeled marks the liquid stops between (e.g., "The red liquid stops between 65 and 66 degrees.").
- If the liquid stops at unlabeled marks between labeled marks (e.g., the thermometer is labeled every 5 degrees), state how many unlabeled marks past the lower labeled mark the liquid stops. (e.g., for 22 degrees on a thermometer showing a mark for every degree but a label only for every 5 degrees, the description may include, "Marks are labeled every 5 degrees. The red liquid stops between 20 degrees and 25 degrees, two marks past 20 degrees.").

Figure 3.47. Thermometer.

Use the thermometer to answer the question.



What temperature, in degrees Celsius ($^{\circ}\text{C}$), does the thermometer show?

A. 5°C B. 10°C

C. 15°C D. 20°C

E. 25°C

Alt text: The thermometer shows temperatures from 0 degrees to 25 degrees Celsius. Marks show every 5 degrees. The red liquid stops at 15 degrees Celsius.

Venn Diagrams

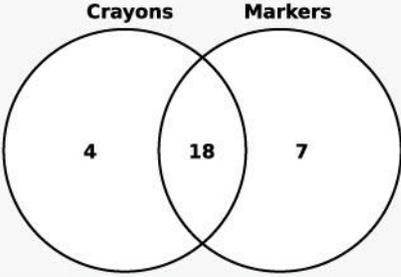
In many cases, providing a tactile graphic of the Venn diagram will improve the accessibility of the item and create a more authentic assessment of the students' skill.

Double and Triple

- Give an overall description of the Venn diagram, focusing on the data, not on the appearance.
- List the contents of each circle and then the area of overlap, using narrative descriptions.
- Provide the data in brief statements.
- When the illustrations included in the Venn diagram are strictly decorative, they do not need to be described.

Figure 3.48. Double Venn diagram.

The diagram shows how many students used crayons, markers, or both to make their artwork.



What is the total number of students who used crayons?

A. 4

B. 7

C. 11

D. 18

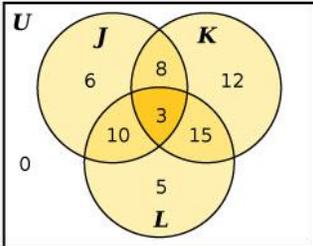
E. 22

Alt text: The diagram shows 2 overlapping circles labeled Crayons and Markers. Crayons has 4. Markers has 7. The area of overlap has 18.

Figure 3.49. Triple Venn diagram.

Use the Venn diagram to answer the question.

All students taking a performing arts class is the universal set.
 J = students taking Orchestra
 K = students taking Band
 L = students taking Dance



How many students are taking exactly 2 performing arts classes?

A. 23

B. 33

C. 36

D. 56

E. 59

Alt text: A Venn diagram. **Longdesc:** The Venn diagram shows 3 overlapping circles labeled J, K, and L. The set has 0 students who do not take performing arts classes. Some students are in one class, some are in two classes, and some are in all three classes.

- Orchestra only, 6 students.
- Band only, 12 students.
- Dance only, 5 students.
- Overlap of Orchestra and Band, 8 students.
- Overlap of Band and Dance, 15 students.
- Overlap of Dance and Orchestra, 10 students.
- Overlap of Orchestra, Band, and Dance, 3 students.

Universal Sets and Shading

- Focus on the data in the Venn diagram, not on the appearance.
- Describe the shaded area first so students know what to listen for.
- List the contents of each circle and then the area of overlap, using narrative descriptions.
- Provide the data in brief statements.
- If the item is comparing different shading of the same data presented in a Venn diagram, it is unnecessary to give all the data details for each description. Instead, focus on the differences between the images. (See figure 3.50.)

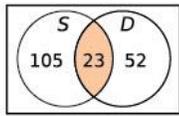
Figure 3.50. Venn diagrams with universal sets and shading.

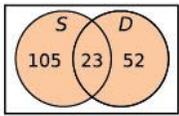
Use the information to answer the question.

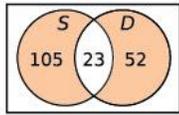
At a store in Kansas, 280 customers were surveyed to find out which snack they enjoy. One customer is chosen at random.

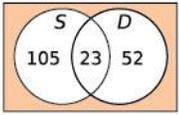
Let S be the event that the customer enjoys salted peanuts.
Let D be the event that the customer enjoys dry-roasted peanuts.

Which Venn diagram is shaded to represent the event $S \cap D$?

A. 

B. 

C. 

D. 

- Alt text:** A Venn diagram. **Longdesc:** The Venn diagram shows 2 overlapping circles, S and D . The shaded area is the area of overlap. Circle S has 105, circle D has 52. The area of overlap has 23.
- Alt text:** A Venn diagram. **Longdesc:** The Venn diagram shows 2 overlapping circles, S and D . The shaded area is the circles and their area of overlap. Circle S has 105, circle D has 52. The area of overlap has 23.
- Alt text:** A Venn diagram. **Longdesc:** The Venn diagram shows 2 overlapping circles, S and D . The shaded area is both circles where they do not overlap. S has 105, circle D has 52. The area of overlap has 23.
- Alt text:** A Venn diagram. **Longdesc:** The Venn diagram shows 2 overlapping circles, S and D . The shaded area is the universal set outside the circles. Circle S has 105, circle D has 52. The area of overlap has 23.

Visual Bias in Math Item Types

The items and image types presented in this section have visual bias and should not be included in assessments for students who are blind. In some cases, the item's accessibility may be improved by providing a tactile graphic or other accommodation.

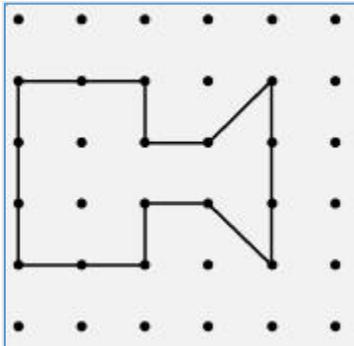
Complexity

The more complex an item is—or the more complex an image description needs to be to describe an image accurately and clearly—the more likely it is that the description will cause cognitive overload. Consider the student audience when evaluating items for bias due to complexity.

1. Geoboards:

- a. Because geoboards typically show an irregular shape requiring a long and complex image description that would usually lead to cognitive overload, these images have visual bias.

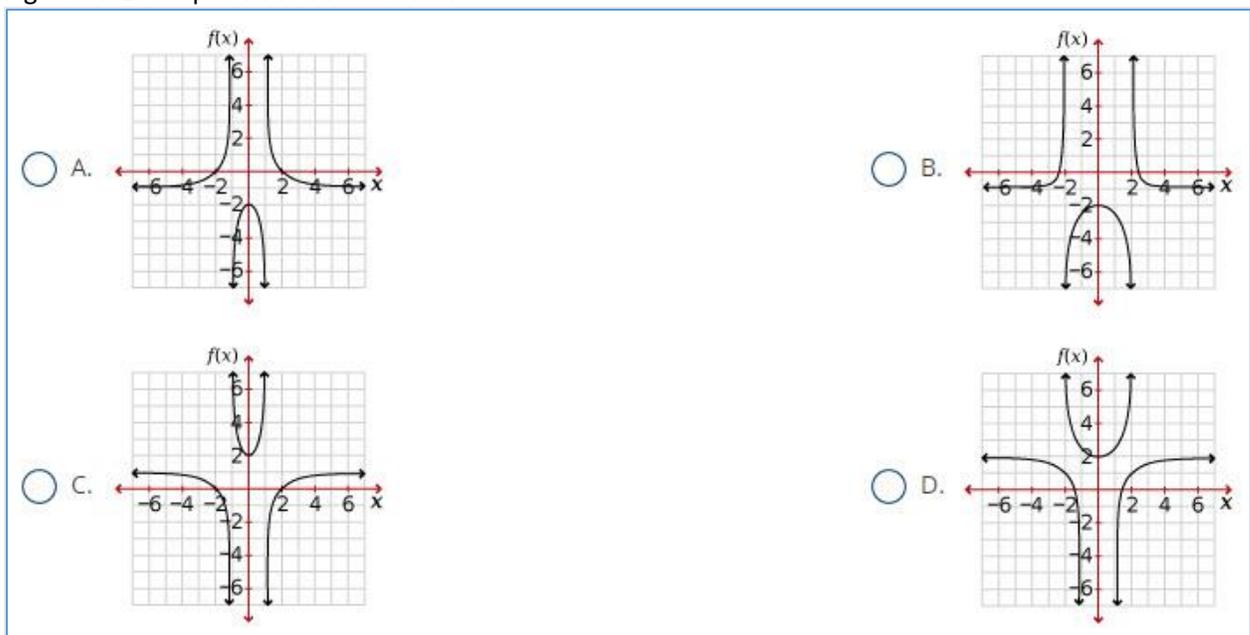
Figure 3.51. Geoboard.



2. Graphs with three or more curves:

- a. When there are three curves on one graph, the image description becomes too complex, with too many numbers and pieces of information for students to hold in their working memory (cognitive overload). These images have visual bias.

Figure 3.52. Graphs with three curves.



3. Items with a large amount of data for students to track:

- a. When items require students to keep track of a large amount of data to understand the question or answer options, this leads to cognitive overload. These items have visual bias. Providing a tactile graphic that students could constantly reference may improve an item's accessibility.

Figure 3.53. Large amounts of data to track.

Line k shown intersects the parallel lines m and n .

Which series of statements proves that $\angle 1 \cong \angle 4$?

<p><input type="radio"/> A.</p> <ul style="list-style-type: none"> $m\angle 1 + m\angle 2 = 360^\circ$ Linear Angles $m\angle 2 = m\angle 5$ Alt. Int. Angles $m\angle 1 + m\angle 5 = 360^\circ$ Substitution $m\angle 5 + m\angle 4 = 360^\circ$ Linear Angles $m\angle 1 - m\angle 4 = 0^\circ$ Subtraction $m\angle 1 = m\angle 4$ Algebra $\angle 1 \cong \angle 4$ Angle Congruence 	<p><input type="radio"/> B.</p> <ul style="list-style-type: none"> $\angle 1 \cong \angle 3$ Vertical Angles $\angle 3 \cong \angle 5$ Alt. Int. Angles $\angle 5 \cong \angle 4$ Linear Angles $\angle 1 \cong \angle 4$ Transitive Property
<p><input type="radio"/> C.</p> <ul style="list-style-type: none"> $m\angle 1 + m\angle 2 = 180^\circ$ Linear Angles $m\angle 2 = m\angle 5$ Alt. Int. Angles $m\angle 1 + m\angle 5 = 180^\circ$ Substitution $m\angle 5 + m\angle 4 = 180^\circ$ Linear Angles $m\angle 1 - m\angle 4 = 0^\circ$ Subtraction $m\angle 1 = m\angle 4$ Algebra $\angle 1 \cong \angle 4$ Angle Congruence 	<p><input type="radio"/> D.</p> <ul style="list-style-type: none"> $\angle 1 \cong \angle 6$ Alt. Int. Angles $\angle 6 \cong \angle 4$ Vertical Angles $\angle 1 \cong \angle 4$ Transitive Property

Counting Squares for Perimeter or Area

Many irregular shapes have visual bias when students need to find the perimeter or area, especially when the sides are not labeled with lengths. In those cases, students are expected to count and add squares—a visual skill unless a tactile graphic is included.

Figure 3.54. Counting squares for perimeter.

Use the shapes to answer the question.

Which shape has the smallest perimeter?

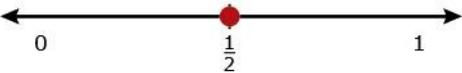
<p><input type="radio"/> A.</p>	<p><input type="radio"/> B.</p>
<p><input type="radio"/> C.</p>	<p><input type="radio"/> D.</p>

Number Lines with Equivalent Fractions

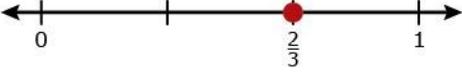
With items of this type, students who are sighted can quickly find the equivalent fractions by seeing which points line up on the number lines. This gives students who are sighted a strong advantage over students who cannot make this visual comparison, so these items have visual bias.

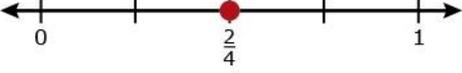
Figure 3.55. Number lines with equivalent fractions.

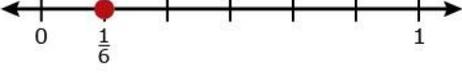
Choose all the number lines that show equivalent fractions.

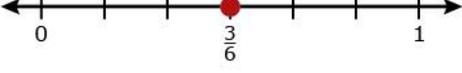
A. 

B. 

C. 

D. 

E. 

F. 

Rotation

Item rotation is a visual skill that is not easily accessible to students who are blind. These items have visual bias.

Figure 3.56. Rotation.

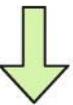
Use the picture to answer the question.



Kaleigh rotates the shape 180°.

Which picture shows how it looks after she rotates it?

A. 

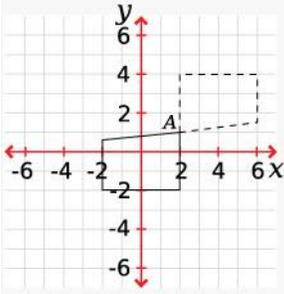
B. 

C. 

D. 

Figure 3.57. Transformation on a coordinate plane.

The graph shows a pre-image and an image (dashed lines) after two reflections.



Which correctly describes this transformation?

A. a reflection over $y = 0$, then over $x = 2$

B. a reflection over $y = 1$, then over $x = 2$

C. a reflection over $y = 2$, then over $x = 0$

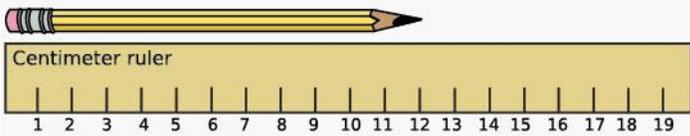
D. a reflection over $y = 2$, then over $x = 1$

Ruler Items When Measured Object Starts at 0 and Ends at a Whole Number

In these items, the image description would immediately cue the answer (the number at which the item ends). There is no other effective way to describe the image. For images with objects that start at a number other than 0, or that end between labeled numbers and reference marks in their descriptions, image descriptions can be written.

Figure 3.58. Ruler with object starting at 0 and ending at whole number.

A ruler is used to measure a pencil.



Estimate the length of the pencil.

A. 19 centimeters

B. 16 centimeters

C. 15 centimeters

D. 12 centimeters

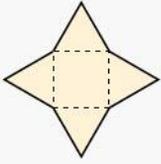
E. 10 centimeters

Shapes

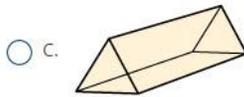
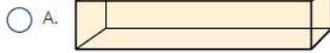
1. 3-D figures—Determining a 3-D figure from a net:
 - a. These items require an understanding of how a 2-D object transforms into a 3-D object. In the absence of tactile graphics or 3-D models, these items have visual bias.

Figure 3.59. Net to three-dimensional figure.

The diagram shows the net of a three-dimensional figure.



What figure can be made from the net?

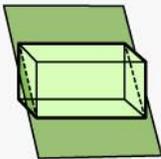


2. 3-D figures—Determining a 2-D cross-section of a 3-D figure:

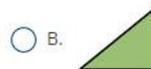
- a. This type of item requires a visual understanding of how a 2-D object transforms into a 3-D object. Because this is a visual exercise, these items have visual bias and should not be included in assessments for students who are blind unless manipulatives and tactile graphics are also provided.

Figure 3.60. Cross-section of three-dimensional figure.

The right rectangular prism is sliced by a plane as shown.



What is the shape of the cross-section?



3. Shapes—Combining to make a new shape:

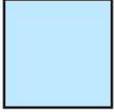
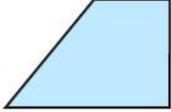
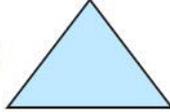
- a. This item type assesses a visual skill, so it has visual bias.

Figure 3.61. Combining shapes to make new shape.

Use the shape to answer the question.



Which two shapes combine to form the shape shown?

4. Shapes—Matching:

- a. This item type asks students to use visual skills to identify the shape. In the following example, describing the asset shape as a “round clock” and naming each of the shapes would test a different skill (knowing that the word “round” means “a circle shape”). Items of this type have visual bias.

Figure 3.62. Matching shapes.

Use the clock to answer the question.



What shape is the clock?

A. 
 B. 

C. 
 D. 

Visual Comparison

The visual comparison of the qualities of two objects, such as length, is a sighted skill. Therefore, items of this type have visual bias.

Figure 3.63. Comparing lengths of objects.

Select the pencil that is the shortest.

A. 

B. 

C. 

D. 

Part 4. Reading and Language Usage

The image description examples presented in the Reading and Language Usage section are written for an audience of students who are blind. Students with low vision may require less description or a different description, depending on where they are on the spectrum of vision.

Blanks

Although fill-in-the-blank sentences are usually accessible, they can have visual bias; these items are more cognitively demanding for students who are visually impaired because the students must hold the incomplete sentences in their minds and insert each answer option from memory, unlike students who are sighted. To help alleviate the visual bias, it is better for each answer option to include the entire completed sentence with the word option inserted either on screen or through alt text. In figure 4.1, alt text applied to the first answer option would allow students using screen readers to hear, “Bring. Please bring something for Show and Tell.”

- When students need to fill in information (e.g., they must choose the answer option that fits best in the blank), use the term “blank” for the line.

Figure 4.1. Blanks.

Read the sentence.



Which word completes the sentence correctly?

bring

brings

brought

brung

Alt text: The sentence is missing a word. It reads: Please blank something for Show and Tell.

Circle/Pie Graphs

In many cases, providing a tactile graphic of the circle graph will improve the accessibility of the item and create a more authentic assessment of the students’ skill.

- Give the title of the graph and describe how it is divided.
- When the graph is divided into unequal parts, describe the parts from largest to smallest using a bulleted list.

- c. It is not necessary to describe the colors of the parts unless they are mentioned in other parts of the item.

Figure 4.2. Circle/pie graph.

Read the pie graph.

John's January Reading

Reading Type	Relative Size (Largest to Smallest)
mysteries	1
textbooks	2
magazines	3
biographies	4
cookbooks	5

Based on the pie graph, which type of reading did John spend the LEAST time on in January?

1. cookbooks

2. magazines

3. mysteries

4. textbooks

Alt text: A pie graph. Longdesc: The pie graph is titled John's January Reading and shows 5 types of reading. In order from largest pie piece to smallest pie piece, the reading types are:

- Mysteries.
- Textbooks.
- Magazines.
- Biographies.
- Cookbooks.

Forms

Simple Forms

- a. Give a general description of the form by stating what type of form it is and that it has places where information needs to be provided.
- b. Describe a blank as a "blank line."

Figure 4.3. Simple form.

Read the information.

Registration Form for Dog Day Care

Dog's Name _____ Owner's Name _____

Will the dog sit on command? – Yes – No

Will the dog come when called? – Yes – No

Has the dog had a medical checkup? – Yes – No

Does the dog play well with other dogs? – Yes – No

Which question on the registration form would best help to determine a dog's health?

1. Will the dog sit on command?

2. Will the dog come when called?

3. Has the dog had a medical checkup?

4. Does the dog play well with other dogs?

Alt text: A form. **Longdesc:** The form is titled Registration Form for Dog Day Care and includes blanks and a checklist.

Dog's name, blank line. Owner's name, blank line.

Will the dog sit on command? Yes or No.

Will the dog come when called? Yes or No.

Has the dog had a medical checkup? Yes or No.

Does the dog play well with other dogs? Yes or No.

Complex Forms

- a. Give the title of the form and an overview of what information the form requires.
- b. Use "Title" and "End title" to ensure students will be able to find the title easily.
- c. Use the verb "provide" when a blank or box needs to be filled out. If there are multiple blanks requesting information, use a bulleted list after "provide" to help organize and present the information.
- d. Use the verb "select" when the form's choices have checkboxes.
- e. Use the same capitalization shown in the image to indicate the hierarchy of the information.

Figure 4.4. Complex form.

Read this section from an employment application.

Company Employment Application

Daytime Telephone Number □□□-□□□-□□□□		E-mail Address	
Last Name		First Name	Middle Init.
Street or Mailing Address			Apartment No.
City		State	Zip Code
Have you ever worked for the company before? (If yes, please answer the following questions)		Yes	No
What was your position?			
What dates did you hold this position?			
Who was your supervisor?			

Which information is required only for applicants who are former employees of the company?

1. telephone number

2. e-mail address

3. mailing address

4. position held

Alt text: An application. **Longdesc:** Title. Company Employment Application. End title. The form shows empty boxes where information needs to be provided. It also has a list of questions to answer.

Provide this information:

- Daytime Telephone Number.
- E-mail Address.
- Last Name, First Name, and Middle Initial.
- Street or Mailing Address and Apartment Number.
- City, State, and Zip Code.

Have you ever worked for the company before? Select Yes or No. (If yes, please answer the following questions.)

- What was your position?
- What dates did you hold this position?
- Who was your supervisor?

Labeled Sentence Parts

Sentences with Labeled Blank Spaces

- First identify the labels to provide students with context and then give the sentence.
- When choosing the names for the lines (e.g., “lines,” “blanks,” “spaces”), be consistent with the language used in the other parts of the item.

Figure 4.5. Sentence with labeled blank spaces.

Read the sentence with blank spaces.	
_____	rolled _____ across the street
A	B
_____	.
C	
Which action would <u>best</u> complete the sentence?	
<input type="radio"/>	1. Put the word <u>And</u> in blank space A.
<input type="radio"/>	2. Put the words <u>The ball</u> in blank space A.
<input type="radio"/>	3. Put the word <u>clear</u> in blank space B.
<input type="radio"/>	4. Put the words <u>and down the hill</u> in blank space C.

Alt text: A sentence with blank spaces labeled A, B, and C mixed in with the words. The sentence is: Blank space A rolled blank space B across the street blank space C.

(Note: In the image description of figure 4.5, the term “blank space” is used to be consistent with the language in the answer options.)

Sentences with Labeled Parts for Editing

- Give students the full sentence without any distractions.
- Identify the labels.
- Use a list so students can easily navigate from one label to the next.

Figure 4.6. Sentence with labeled parts for editing.

Read the sentence.	
Mr. <u>patel</u>	teaches <u>spanish</u> , <u>music</u> , and <u>art</u> at my <u>brother's</u> <u>high</u> <u>school</u> .
A	B C D E F G
Which underlined words should be capitalized?	
<input type="radio"/>	1. A, B
<input type="radio"/>	2. A, C, D
<input type="radio"/>	3. B, C, D, E
<input type="radio"/>	4. E, F, G

Alt Text: A sentence. **Longdesc:** The sentence has 7 underlined words labeled A through G. The sentence reads: Mr. patel teaches spanish, music, and art at my brother’s high school. These words are underlined.

- A, patel.
- B, spanish.
- C, music.
- D, art.
- E, brother’s.
- F, high.
- G, school.

Passages with Images

A description of a passage’s image might already be stated in the passage’s text. Use your best judgment to determine whether or not the information in the text should be repeated in the image description for fairness (e.g., if text describing the image is scattered throughout the passage, it might be better to consolidate that information in the image description, in order to give an experience that is similar to the experience of students who see the image).

In some cases, providing a tactile graphic of the image will improve the accessibility of the passage and create a more authentic assessment of the students’ skill.

Picture (Photograph or Illustration)

- Give a brief description of the image. The level of detail necessary will vary, depending on the passage and item. An item that directs students toward the image or asks the student to compare information found in the passage with the image will require greater detail in the image description.
- State the caption when one accompanies the image. The caption needs to be included in the image description only if it is part of the image itself. If the caption is text outside the image, screen readers will read it separately.
- It is unnecessary to state the credit for the image in the image description.

Figure 4.7. Passage with ice cream photograph; caption is part of the image.

Read the passage.	
<p style="text-align: center;">Ice Cream through the Ages</p> <p>Today’s scholars believe that ice cream originated sometime before 200 BCE. Records show that Roman emperors enjoyed a cool treat made from ice sweetened with honey. In China, around 600 CE, the emperors ate a frozen delicacy made from flavored milk. According to legend, Marco Polo brought this recipe back to Italy. At first, only nobles and people who could afford it had the opportunity to eat ice cream. George Washington and Thomas Jefferson had their own recipes. Over time, as technology improved, ice cream became available to everyone.</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;">Make Your Own Pineapple Sorbet!</p> <p>1 lb frozen pineapple chunks 1 cup water 1 cup coconut milk or cream Honey to taste</p> <p style="text-align: center;">Blend all ingredients and freeze.</p> </div>  <p>Today, ice cream is often served in a cone.</p>	<p>What is <u>most</u> likely the purpose of the photo and caption?</p> <p><input type="radio"/> 1. to illustrate how modern ice cream is different</p> <p><input type="radio"/> 2. to show how flavorings for ice cream have changed</p> <p><input type="radio"/> 3. to develop a connection between ice cream and sorbet</p> <p><input type="radio"/> 4. to suggest that ice cream is better now than it was in the past</p>

Alt text: A photo and a caption. Longdesc: The photo shows a scoop of ice cream in an ice cream cone. Caption: Today, ice cream is often served in a cone.

Sidebar

- Give the title of the sidebar using “Title” and “End title.”
- Give the full text of the sidebar and describe any images that are present in it, unless they are purely decorative.

Figure 4.8. Passage with sidebar.

Read the passage.

Today's scholars believe that ice cream originated sometime before 200 BCE. Records show that Roman emperors enjoyed a cool treat made from ice sweetened with honey. In China, around 600 CE, the emperors ate a frozen delicacy made from flavored milk. According to legend, Marco Polo brought this recipe back to Italy. At first, only nobles and people who could afford it had the opportunity to eat ice cream. George Washington and Thomas Jefferson had their own recipes. Over time, as technology improved, ice cream became available to everyone.



Today, ice cream is often served in a cone.

Make Your Own Pineapple Sorbet!

1 lb frozen pineapple chunks
 1 cup water
 1 cup coconut milk or cream
 Honey to taste

Blend all ingredients and freeze.

How does the sidebar help the reader understand the passage?

1. It provides a recipe for one of the earliest forms of ice cream.

2. It reveals why ice cream has remained popular throughout history.

3. It suggests that the making of ice cream is not limited to historical figures.

4. It supports the idea that the ingredients for ice cream are not exactly healthful.

Alt text: A sidebar. Longdesc: Title. Make Your Own Pineapple Sorbet! End title.

- 1 pound frozen pineapple chunks.
- 1 cup water.
- 1 cup coconut milk or cream.
- Honey to taste.

Blend all ingredients and freeze.

Sentence Corrections

Edited sentences can be described in a number of ways, depending on what the edits are. Use your best judgment to determine the description that is easiest to understand. However, if interpreting editing symbols is the skill being assessed, then the item has visual bias because students who are blind or visually impaired will most likely not be familiar with them; editing symbols are handwritten tools that have no keyboard or braille equivalent. If the skill being assessed is correctly revising a sentence, though, the item is likely accessible.

- a. Describe the original sentence without the edits and then describe the edited sentence with the edits.

Figure 4.9. Sentence corrections stating original sentences and edited sentences.

Which sentence has been edited to avoid repeated words?

1. The family brought their dogs to ~~to~~ the park.

2. The family brought their ^{three} ~~four~~ dogs to the park.

3. The family brought their dogs to the ^{neighborhood} ~~^~~ park.

4. The family ^{brings} ~~brought~~ their dogs to the park.

- A. Alt text: Original sentence: The family brought their dogs to to the park. Edited sentence: The family brought their dogs to the park.

- B. Alt text: Original sentence: The family brought their four dogs to the park. Edited sentence: The family brought their three dogs to the park.
 - C. Alt text: Original sentence: The family brought their dogs to the park. Edited sentence: The family brought their dogs to the neighborhood park.
 - D. Alt text: Original sentence: The family brought their dogs to the park. Edited sentence: The family brings their dogs to the park.
- b. When the stem or other part of the item calls out the specific editing action that has been performed (e.g., in figure 4.10, “the word crossed out” is stated in the stem), describe the edit performed in addition to the original sentence and the edited sentence.

Figure 4.10. Sentence correction stating original sentence, edit performed, and edited sentence.

Read the sentence.
<p style="margin: 0;">you</p> <p style="margin: 0;">Hopefully, I will see ya later.</p>
<p>Why is the word crossed out?</p>
<input type="radio"/> 1. It was spelled wrong.
<input type="radio"/> 2. It was not an interesting word.
<input type="radio"/> 3. It should have been capitalized.
<input type="radio"/> 4. It did not give enough information.

Alt Text: An edited sentence. Longdesc: Original sentence: Hopefully, I will see ya later. Edit performed: The word ya is crossed out and you is written above it. Edited sentence: Hopefully, I will see you later.

Sequence of Events Charts (Plot Diagrams)

- a. Use a numbered list for the separate events.
- b. Use language consistent with the stem (e.g., in figure 4.11, the image description uses the term “box” because that term is used in the item’s text).

Figure 4.11. Sequence of events chart.

Read the chart.

The boxes show the order of some of the events from the story.

```

graph TD
    A[The three pigs begin building their houses.] --> B[The wolf blows down the straw house.]
    B --> C[The wolf blows down the stick house.]
    C --> D[ ]
  
```

Which event from the story belongs in the final box?

1. The pigs plan to visit each house.

2. The wolf asks to be allowed inside.

3. Each pig chooses a different building material.

4. The wolf learns he cannot blow down a brick house.

(Note: This item’s passage of “The Three Little Pigs” has been omitted from the screenshot.)

Alt text: 4 boxes. Longdesc:

- Box 1. The three pigs begin building their houses.
- Box 2. The wolf blows down the straw house.
- Box 3. The wolf blows down the stick house.
- Box 4. Empty.

Timelines

In many cases, providing a tactile graphic of the timeline will improve the accessibility of the item and create a more authentic assessment of the students’ skill.

- a. Give the title, if one is included in the graphic, using “Title” and “End title.”
- b. Use a bulleted list to show the events on the timeline.
- c. Ignore illustrations unless they provide additional necessary information or are mentioned in other parts of the item.

Figure 4.12. Timeline.

Read the timeline.

According to the timeline, which list is in chronological order?

1. paper money, scales for weighing, sawmill

2. moveable-type printing, modern glassmaking, sawmill

3. moveable-type printing, eyeglasses, magnetic compass

4. paper money, magnetic compass, moveable-type printing

Alt text: A timeline. Longdesc: Title. Early Inventions. End title.

- 1023, paper money.
- 1045, moveable-type printing.
- 1182, magnetic compass.
- 1268 to 1289, eyeglasses.
- 1295, modern glassmaking.
- 1328, sawmill.
- 1366, scales for weighing.

Venn Diagrams

In many cases, providing a tactile graphic of the Venn diagram will improve the accessibility of the item and create a more authentic assessment of the students' skill.

- a. Focus on the data in the Venn diagram, not on its appearance.
- b. List the contents of each circle and then the area of overlap, using narrative descriptions.
- c. Provide the data in brief statements.
- d. When the illustrations included in the Venn diagram are strictly decorative, they do not need to be described.

Figure 4.13. Venn diagram.

Use the diagram to answer the question.

How are great horned owls and robins different?

1. Robins lay eggs.

2. Robins build nests.

3. Great horned owls eat insects.

4. Great horned owls care for their young.

Alt text: A Venn diagram. **Longdesc:** The Venn diagram has two overlapping circles. One circle is labeled Great Horned Owls. The other circle is labeled Robins.

- Circle 1, Great Horned Owls: eat mice and rats, hooked beak, use other birds' nests.
- Circle 2, Robins: eat seeds and insects, build nests.
- Area of overlap: lay eggs, care for young.

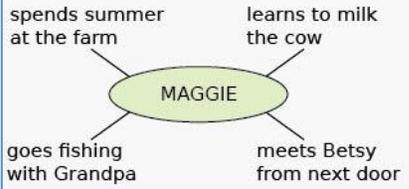
Webs (Word Association or Word Map)

- Describe the center circle and give the number of connections.
- Describe the surrounding circles. A bulleted list—as opposed to a list within a single sentence—may help make it clearer where the text of one circle ends and the next text begins.

Figure 4.14. Word web.

Use the web to answer the question.

This web organizes information from a book titled Maggie's Summer by Fiona Nickleby.



What information is the web organizing?

1. information about the author

2. information about the vocabulary

3. information about the events in the story

4. information about the setting of the story

Alt text: A web. Longdesc: The web has a center circle, Maggie, connected to 4 labels.

- spends summer at the farm.
- learns to milk the cow.
- meets Betsy from next door.
- goes fishing with Grandpa.

Visual Bias in Reading and Language Usage Item Types

The items and image types presented in this section have visual bias and should not be included in assessments for students who are blind. In some cases, the item’s accessibility may be improved by providing a tactile graphic or other accommodation.

Identifying Editing Symbols

Students who are blind or visually impaired will most likely not be familiar with editing symbols because these are handwritten tools that have no keyboard or braille equivalent. Items that assess this skill have visual bias.

Figure 4.15. Identifying editing symbols.

Editing symbols are used to correct writing.

Choose the example that correctly identifies each editing symbol.

1.  close up  delete # add space  insert

2.  insert  delete # close up  add space

3.  insert  close up # add space  delete

4.  close up  delete # insert  add space

Identifying Uppercase or Lowercase Letters

Screen readers do not usually describe the case of the letters, so students relying on screen readers would be unable to answer this type of question when the letters are in plain text. When the letters are images, any effective image description would contain the words “uppercase” or “lowercase,” cuing the answer. Therefore, these items have visual bias.

Figure 4.16. Identifying an uppercase letter.

Which letter is uppercase?

<input type="radio"/> I	<input type="radio"/> p
<input type="radio"/> h	<input type="radio"/> f

Using a Picture to Identify the Correct Preposition

These items often have visual bias because either the language needed to describe the image contains the preposition being tested, cuing the answer, or the language becomes overly complex in an attempt to avoid using the preposition.

Figure 4.17. Using a picture to identify the correct preposition.

Use the picture to answer the question.

	Where is the cat?
	<input type="radio"/> 1. under the bed
	<input type="radio"/> 2. over the bed
	<input type="radio"/> 3. on the bed
	<input type="radio"/> 4. by the bed

Part 5. Science

The image description examples presented in the Science section are written for an audience of students who are blind. Students with low vision may require less description or a different description, depending on where they are on the spectrum of vision.

Where element symbols, equations, scientific labels, and some abbreviations of measurement units are present in the example item's text, a tool was used to ensure that screen readers would read them as optimally as possible (e.g., a tool was used to ensure that screen readers would read the element symbol "Au" in the text of an answer option as "Upper A u"). The image descriptions for these items have been written so screen readers will read the text in the image description consistently with how they read the text from the tool. This may mean the image description's text looks different from text that appears elsewhere in the item, but it is consistent with the text that the tool presents to screen readers. See [figure 5.2](#) and [figure 5.14](#) for examples.

Chemical Elements

When to Use the Element Name

- Use the full element name in the image description when other parts of the item also use the element name or when the image is the only place the symbol appears. You may decide to also include the symbol after the full name.

Figure 5.1. Chemical elements using the element names.

Use the first four rows of the periodic table to answer the question.

1	1																2	
1	H 1.008																	He 4.00
2	3	4																10
	Li 6.94	Be 9.01																Ne 20.2
3	11	12																18
	Na 23.0	Mg 24.3																Ar 39.9
4	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
	K 39.1	Ca 40.1	Sc 45.0	Ti 47.9	V 50.9	Cr 52.0	Mn 54.9	Fe 55.8	Co 58.9	Ni 58.7	Cu 63.5	Zn 65.4	Ga 69.7	Ge 72.6	As 74.9	Se 79.0	Br 79.9	Kr 83.8

Which common Earth element is most likely to be found in a new star?

A. hydrogen (H)

B. lithium (Li)

C. beryllium (Be)

D. iron (Fe)

Alt text: The periodic table. **Longdesc:** The first four rows of the periodic table are shown. The following elements are included.

- Hydrogen (Upper H). Atomic number 1, atomic mass 1.008, period 1, group 1.
- Lithium (Upper L i). Atomic number 3, atomic mass 6.94, period 2, group 1.
- Beryllium (Upper B e). Atomic number 4, atomic mass 9.01, period 2, group 2.
- Iron (Upper F e). Atomic number 26, atomic mass 55.8, period 4, group 8.

(Note: In figure 5.1, the image description mentions only the elements in the periodic table that appear in the answer options. For more information about describing periodic tables, please see the [Periodic Table of the Elements](#) section.)

When to Use the Element Symbol

- The image description should use the element symbol when other parts of the item also use the element symbol.
- When writing the element symbol, you may choose to add a space between the letters of the symbol to allow for better screen reader behavior. Additionally, you may choose to specify whether the letters of the symbol are uppercase or lowercase. Keep consistency in mind when making this choice to ensure that what students hear in the image description matches what they hear in other parts of the item.

Figure 5.2. Chemical elements using element symbols.

Use the information to answer the question.

Electronegativity of Elements

1	1																			2	
1	H 2.1																				He --
2	3	4																			10
	Li 1.0	Be 1.5																			Ne --
3	11	12																			18
	Na 0.9	Mg 1.2																			Ar --
4	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36			
	K 0.8	Ca 1.0	Sc 1.3	Ti 1.5	V 1.6	Cr 1.6	Mn 1.5	Fe 1.8	Co 1.8	Ni 1.8	Cu 1.9	Zn 1.6	Ga 1.6	Ge 1.8	As 2.0	Se 2.4	Br 2.8	Kr 3.0			

Legend:

- 3 — Atomic Number
- Li — Atomic Symbol
- 1.0 — Electronegativity

Which pairs of elements form a metallic bond, an ionic bond, and a covalent bond, in that order?

A. C and F, Mg and Mg, C and H

B. Na and Na, Cl and F, Na and F

C. Ca and Cl, C and C, K and O

D. Zn and Zn, Na and Cl, B and F

Alt text: The periodic table. **Longdesc:** The first four rows of the periodic table are shown. The following elements are included.

- Upper H. Atomic number 1, period 1, group 1, electronegativity 2.1.
- Upper B. Atomic number 5, period 2, group 13, electronegativity 2.0.
- Upper C. Atomic number 6, period 2, group 14, electronegativity 2.5.
- Upper O. Atomic number 8, period 2, group 16, electronegativity 3.5.
- Upper F. Atomic number 9, period 2, group 17, electronegativity 4.0.
- Upper N a. Atomic number 11, period 3, group 1, electronegativity 0.9.
- Upper M g. Atomic number 12, period 3, group 2, electronegativity 1.2.
- Upper C l. Atomic number 17, period 3, group 17, electronegativity 3.0.
- Upper K. Atomic number 19, period 4, group 1, electronegativity 0.8.
- Upper C a. Atomic number 20, period 4, group 2, electronegativity 1.0.
- Upper Z n. Atomic number 30, period 4, group 12, electronegativity 1.6.

(Note: In figure 5.2, the image description mentions only the elements in the periodic table that appear in the answer options. For more information about describing periodic tables, please see the [Periodic Table of the Elements](#) section.)

Chemical Models

In many cases, providing a tactile graphic of the chemical model will improve the accessibility of the item and create a more authentic assessment of the students' skill.

Atomic Models

- Give an overview of the model, including any labels.
- Describe the contents of the center. Use the term "nucleus" unless that term cues the answer, in which case use "center." The term "center" should be used if that term is used elsewhere in the item.
- Describe the energy levels, working from the interior to the exterior. Use the term "energy level," not "shell," unless "shell" is used elsewhere in the item.
- Use the terms "circle with a negative sign," "circle with a positive sign," and "circle with no sign" when there is no key identifying what these symbols mean. If the model uses the abbreviations "E," "P," and "N," use the full words in the image description ("electron," "proton," "neutron"), unless the words cue the answer.

Figure 5.3. Atomic models.

An isotope of beryllium has an atomic number of 4 and an atomic mass of 6.

Which model represents an isotope of beryllium?

- Alt text:** An atomic model. **Longdesc:** The model is labeled Model A and shows a nucleus and 2 energy levels. The model's nucleus has 4 circles with positive signs. The inner energy level has 3 circles with negative signs. The outer energy level has 2 circles with positive signs and 1 circle with no sign.
- Alt text:** An atomic model. **Longdesc:** The model is labeled Model B and shows a nucleus and 2 energy levels. The model's nucleus has 4 circles with positive signs and 2 circles with no signs. The inner energy level has 2 circles with negative signs. The outer energy level has 2 circles with negative signs.
- Alt text:** An atomic model. **Longdesc:** The model is labeled Model C and shows a nucleus and 2 energy levels. The model's nucleus has 3 circles with positive signs and 4 circles with no signs.

signs. The inner energy level has 2 circles with negative signs. The outer energy level has 1 circle with a negative sign.

- D. **Alt text:** An atomic model. **Longdesc:** The model is labeled Model D and shows a nucleus and 2 energy levels. The model's nucleus has 2 circles with negative signs and 5 circles with no signs. The inner energy level has 1 circle with a positive sign and 1 circle with no sign. The outer energy level has 1 circle with a positive sign.

(Note: This item is a good candidate for providing an overarching description of the models' shared characteristics before the answer option section (if the assessment platform has the functionality to present this information separately from individual graphics). This would allow the individual image descriptions to be shortened to only the unique characteristics of each model. In this item, the answer option section could be prefaced with, "Each answer option shows a model with a nucleus, 2 energy levels, and circles. Each circle in the models has either a negative sign, a positive sign, or no sign." The image description for each answer option would then start with the model's name and the description of its nucleus.)

Orbital Notation/Electron Configuration

Electron configuration descriptions for larger atoms can easily lead to cognitive overload. Providing a tactile graphic of the electron configuration will improve the accessibility of the item and create a more authentic assessment of the students' skill.

- Give an overview of the image, stating there are boxes and arrows and giving the number of boxes each S and P has.
- Describe what each box contains, using a bulleted list. To be succinct, use the terms "up" and "down" instead of "arrow pointing up/down."
- When multiple boxes are associated with a letter, preface each box's contents with a box number (e.g., "Box 1," "Box 2"). If all boxes associated with a letter show the same configuration, summarize all the boxes for brevity.

Figure 5.4. Electron configuration.

Use the diagrams to answer the question.

1 H 1.008							2 He 4.00
3 Li 6.94	4 Be 9.01	5 B 10.8	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.0	10 Ne 20.2
11 Na 23.0	12 Mg 24.3	13 Al 27.0	14 Si 28.1	15 P 31.0	16 S 32.1	17 Cl 35.5	18 Ar 39.9

Electron Configuration of an Element

What element has this electron configuration?

A. boron (B)

B. sodium (Na)

C. magnesium (Mg)

D. aluminum (Al)

(Note: For guidelines on how to describe the period table in Diagram 1, please see the [Periodic Table of the Elements](#) section.)

Diagram 2: Alt text: An electron configuration of an element. Longdesc: The electron configuration is an orbital diagram with boxes and arrows pointing up or down. Each S has one box, and each P has three boxes.

- 1 S. 1 up, 1 down.
- 2 S. 1 up, 1 down.
- 2 P. The three boxes each have 1 up, 1 down.
- 3 S. 1 up, 1 down.
- 3 P. Box 1, 1 up. Box 2 and Box 3 have no arrows.

Structural Formulas

Only the simplest structures should be presented to students with only an image description. More complex structures will have visual bias because of cognitive overload unless they are accompanied by tactile graphics. Even items showing the simplest structures would benefit from the addition of a tactile graphic.

- When a structural formula is linear:
 - Refer to the elements from left to right.
 - Use the symbol instead of the full name of the element.
- When a structural formula is clustered:
 - Reference the element in the middle first, and then move from left to right to describe the elements around it, **OR** move in a clockwise direction to describe the elements around it. Choose the pattern that presents the information as clearly and concisely as possible.
 - Use the symbol instead of the full name of the element.
- When a structural formula is a ring:
 - Describe the overall shape of the structure.
 - Describe the details of the structure, starting with the ring and then moving left to right or moving clockwise, depending on what is clearest within the item.
 - When referencing the elements of the ring, use both the element name and the element symbol for clarity.
- Describe the bonds as “has a single/double/triple bond with.”
- Keep in mind that you may not need to describe every detail of the structure, depending on the skill being assessed. Be as concise as possible within the context of the item.

Figure 5.5. Structural formulas with clustered and linear elements.

These compounds are examples of alcohols.

$\text{CH}_3 - \text{CH} - \text{OH}$ CH_3	$\text{CH}_3 - \text{CH}_2 - \text{OH}$	$\begin{array}{c} \text{OH} \quad \text{OH} \\ \quad \\ \text{CH}_2 - \text{CH}_2 \end{array}$
---	---	--

Which is the basic unit common to alcohols?

<input type="radio"/> A. $-\text{OH}$
<input type="radio"/> B. $-\text{CH}_2$
<input type="radio"/> C. $-\text{CH}_3$
<input type="radio"/> D. $-\text{CH} - \text{CH}_3$
<input type="radio"/> E. $-\text{CH}_2 - \text{CH}_2$

Alt text: A diagram. Longdesc: The diagram shows 3 compounds.

- Compound 1. Upper C Upper H has single bonds with Upper C Upper H subscript 3, Upper C Upper H subscript 3, and Upper O Upper H.
- Compound 2. Upper C Upper H subscript 3 has a single bond with Upper C Upper H subscript 2, which has a single bond with Upper O Upper H.
- Compound 3. Upper C Upper H subscript 2 has a single bond with Upper C Upper H subscript 2. Each Upper C Upper H subscript 2 has a single bond with a different Upper O Upper H.

Containers

In many cases, providing a tactile graphic of the container will improve the accessibility of the item and create a more authentic assessment of the students' skill.

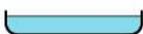
Beakers and Flasks

- State the number of containers to set up the description.
- Describe the shape of the containers. Make sure to use grade-appropriate language.
- Focus on the most important qualities for the knowledge or skill being assessed (e.g., in figure 5.6, it is the surface area of the water).
- When the measurement of the liquid is shown, state the measurement unless this will cue the answer.

Figure 5.6. Containers, including beakers and flasks.

A student has four containers. The student pours one pint of water into each container and leaves the containers uncovered in a warm room. The student plans to check the containers at the same time the next day.

Which container will have the most water remaining?

A. 

B. 

C. 

D. 

- Alt text: A shallow pan-shaped container with a wide body and wide opening. The water fills the pan nearly to the top and has a large surface area.
- Alt text: A beaker-shaped container with a medium-width body and medium opening. The water fills the beaker halfway and has a medium surface area.
- Alt text: A flask-shaped container with a medium body and narrow opening. The water fills the flask halfway and has a medium surface area.
- Alt text: A flask-shaped container with a triangular body that angles to a narrow opening. Water fills the flask more than halfway and has a small surface area.

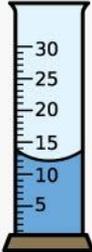
Graduated Cylinders

- Describe the graduated cylinder, including the range of measurement and the interval of the marks.

- b. When reading the graduated cylinder is the skill being assessed, describe the curve of the liquid, beginning with the sides and then giving the low point of the curve. When the item is assessing a different skill, you may give the exact measurement instead (the middle point of the meniscus).

Figure 5.7. Graduated cylinder.

Use the graduated cylinder to answer the question.



What is the volume of the liquid in the graduated cylinder?

A. 10 milliliters

B. 11 milliliters

C. 12 milliliters

D. 13 milliliters

E. 14 milliliters

Alt text: A graduated cylinder. **Longdesc:** The graduated cylinder shows volume from 0 to 30 milliliters. Marks in milliliters show every 5 milliliters. The surface of the liquid in the cylinder curves down. At both sides of the cylinder, the liquid is at 14 milliliters. The low point of the liquid's curve is at 12 milliliters.

Cycles

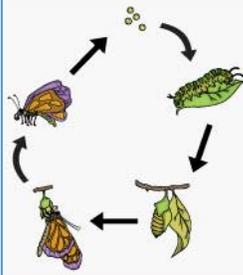
In many cases, providing a tactile graphic of the cycle will improve the accessibility of the item and create a more authentic assessment of the students' skill.

Life Cycles

- Give an overview of the image if one is not already provided in the preceding text.
- Describe a lettered cycle in alphabetical order.
- List the stages in the cycle, starting from the beginning and moving clockwise.
- Describe the chrysalis stage as "pupa," but be consistent with the term used in other parts of the item. Describe the caterpillar stage as "larva," but also include the word "caterpillar" to be comprehensive.

Figure 5.8. Life cycle.

Use the diagram to answer the question.



What is happening at the arrow between the adult stage and egg stage?

- A. The eggs transform into a butterfly.
- B. The eggs are laid by an adult butterfly.
- C. The eggs result from the butterfly transforming again.
- D. The eggs are a by-product of an adult emerging from the chrysalis.

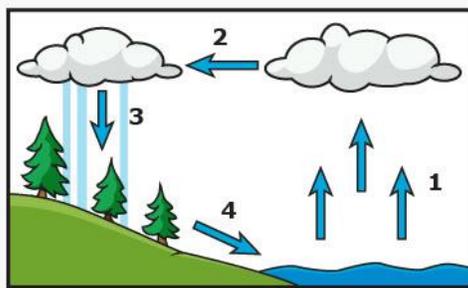
Alt text: A diagram. **Longdesc:** The diagram shows a butterfly development cycle. Arrows point from one stage to the next in a circle. The cycle shows these stages: eggs, a caterpillar or larva, a chrysalis, a butterfly emerging from a chrysalis, and a butterfly. An arrow points from the butterfly back to the eggs.

Water Cycles

- Give an overview of the image if one is not already provided in the preceding text.
- Describe a lettered cycle in alphabetical order.
- When an item is not assessing students' knowledge of the names of each stage in the cycle, include the stage names in the description along with a description of what is physically happening.

Figure 5.9. Water cycle.

Use the simple version of the water cycle that students drew to answer the question.



Which part of the water cycle requires energy from the Sun for evaporation to occur?

- A. 1
- B. 2
- C. 3
- D. 4

Alt text: A diagram. **Longdesc:** The diagram shows a hill sloping down to a body of water and clouds in the sky. Arrows representing parts of the water cycle are labeled 1 through 4.

- 1, arrows pointing from the body of water to a cloud in the sky.
- 2, an arrow pointing from the cloud above the body of water to a rain cloud over the hill.

- 3, an arrow in the rain, pointing down from the rain cloud to the top of the hill.
- 4, an arrow pointing from the top of the hill down to the body of water.

Diagrams

When describing diagrams, it is important to consider the skill being assessed and the language used in other parts of the item. You often do not need to describe every detail of the diagram. By focusing on the similarities and differences or the changes between parts of the diagram, you can communicate the information necessary to make the item accessible.

In many cases, providing a tactile graphic of the diagram will improve the accessibility of the item and create a more authentic assessment of the students' skill.

Astronomy—Orbits

- Give an overview of the entire diagram.
- Provide details of the diagram, focusing on the aspects of the image that students will use to answer the question, as well as any details called out in distractors. The more decorative aspects of a diagram do not need to be described.
- When comparing images (e.g., in a diagram flow), highlight what is different and what is similar. Describe the details of each image in the same order each time.
- When describing the tilt of an axis, you can describe it in relation to the other bodies in the diagram (“toward” or “away from”), or by using the terms “vertical” and “horizontal.” If students may not know the terms “horizontal” and “vertical,” you can describe the axis position as “an axis that goes straight up and down” and “an axis that goes side to side.”

Figure 5.10. Astronomy diagram showing orbit.

Use the diagram of the Sun and Earth to answer the question.

Which statement best describes the northern hemisphere of Earth at position A?

A. It is winter everywhere in the northern hemisphere.

B. It is nighttime everywhere in the northern hemisphere.

C. The northern hemisphere has the most daylight hours per day compared to other positions in Earth's orbit.

D. The northern hemisphere has the highest average temperatures compared to other positions in Earth's orbit.

Alt text: A diagram. **Longdesc:** The diagram shows Earth at 4 different positions in its orbit counterclockwise around the Sun.

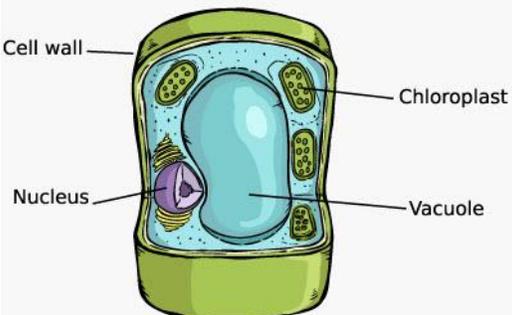
- Position A is to the right of the Sun, with Earth’s axis and the northern hemisphere tilted away from the Sun.
- The second position is behind the Sun, with Earth’s axis tilted neither toward nor away from the Sun, and the northern and southern hemisphere equally facing the Sun.
- The third position is to the left of the Sun, with Earth’s axis and the northern hemisphere tilted toward the Sun.
- The fourth position is in front of the Sun, with Earth’s axis tilted neither toward nor away from the Sun, and the northern and southern hemisphere equally facing the Sun.

Biology—Cell Structure

- Cell diagrams may have visual bias, depending on the context of the question. Each cell diagram should be considered individually, with particular consideration given to whether the language in the image description would lead to cognitive overload.
- When a cell structure item does not have visual bias, describe the labeled parts of the image and describe the overall shape of the cell if it is related to the skills being assessed. It is usually not necessary to describe the diagram in detail.

Figure 5.11. Biology diagram showing cell structure.

This is a simplified diagram of a cell in a multicellular organism.



Cell wall

Chloroplast

Nucleus

Vacuole

What is NOT a characteristic of this cell?

A. It has cell-to-cell communication with adjacent cells.

B. It can release oxygen as a product of its life processes.

C. It has specialized structures to change its length and apply force.

D. It has the same number of chromosomes as other cells in the organism.

Alt text: A diagram showing four labeled parts of a rectangular cell: cell wall, chloroplast, vacuole, and nucleus.

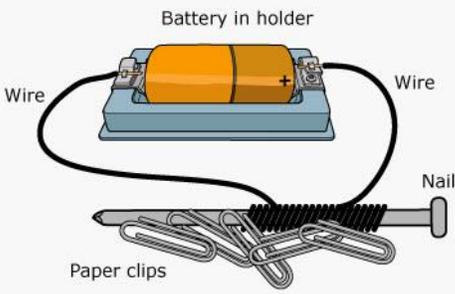
Physics

- Circuits using illustration:
 - Give an overview of the components of the circuit.
 - Describe whether the circuit is complete or open.
 - Describe the elements of the circuit in order, using the vocabulary shown in other parts of the item, if applicable.

Figure 5.12. Physics diagram showing a circuit using illustration.

Use the information to answer the question.

Students make a complete circuit.



Which energy transformation is taking place in this circuit?

A. Electrical energy is transformed into light energy.

B. Electrical energy is transformed into sound energy.

C. Electrical energy is transformed into chemical energy.

D. Electrical energy is transformed into electromagnetic energy.

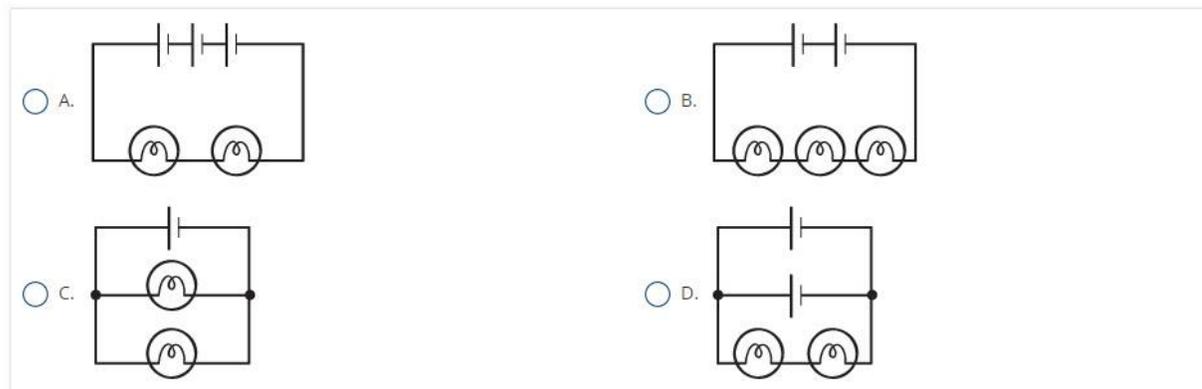
Alt text: A diagram. **Longdesc:** The diagram shows a nail connected to a 1-cell battery by a wire. The wire runs from the positive end of the battery, wraps around the nail, and ends at the negative end of the battery. Paper clips are sticking to the nail.

2. Circuits using symbols:
 - a. Give an overview of the components of the circuit using circuit vocabulary: “series,” “parallel,” “bulbs,” and “battery cells.”
 - b. Specify whether the circuit is a series circuit, a parallel circuit, or both.
 - c. When describing battery cells, specify the number of batteries shown.

Figure 5.13. Physics diagram showing a circuit using symbols.

Assume that all bulbs shown in the circuits are identical.

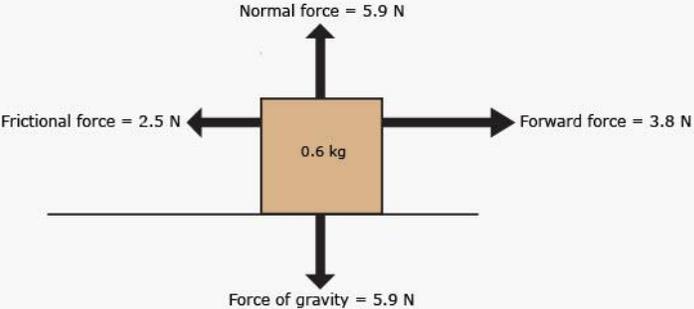
In which circuit will the bulbs be the brightest?



- A. **Alt text:** A series circuit with 2 bulbs connected to a battery with 3 cells.
 - B. **Alt text:** A series circuit with 3 bulbs connected to a battery with 2 cells.
 - C. **Alt text:** A parallel circuit with 2 bulbs connected to a battery with 1 cell.
 - D. **Alt text:** A circuit with 2 bulbs in series connected to 2 battery cells in parallel.
3. Force on an object:
 - a. Give an overview of the image if one is not already provided in the preceding text.
 - b. Give the name of the force (if shown), the direction of the force, and the amount of force (if shown).

- c. When more than one force is acting on an object, start at the top and describe them in clockwise order.
- d. When the amount of force is shown by the length of the arrows, describe this by stating which force is greater.

Figure 5.14. Physics diagram showing force on an object.

Use the information to answer the question.	
<p>Students are investigating the effect of multiple forces acting on an object. They measure and diagram the forces acting on a 0.6 kg wooden block.</p> 	<p>What is the net force on the wooden block?</p> <p><input type="radio"/> A. 1.3 N backward</p> <p><input type="radio"/> B. 1.3 N forward</p> <p><input type="radio"/> C. 6.3 N backward</p> <p><input type="radio"/> D. 6.3 N forward</p>

Alt text: A diagram. **Longdesc:** The diagram shows a 0.6-kilogram wooden block with 4 forces acting on it.

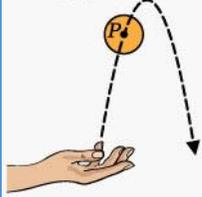
- Normal force, up, 5.9 newtons.
- Forward force, right or forward, 3.8 newtons.
- Force of gravity, down, 5.9 newtons.
- Frictional force, left or backward, 2.5 newtons.

(Note: The tool used to make the abbreviations for the units of measure in the text of the item causes screen readers to read the abbreviations as the full word (“kilogram” and “newtons”), so for consistency, the full word of the units of measure are also used in the image description.)

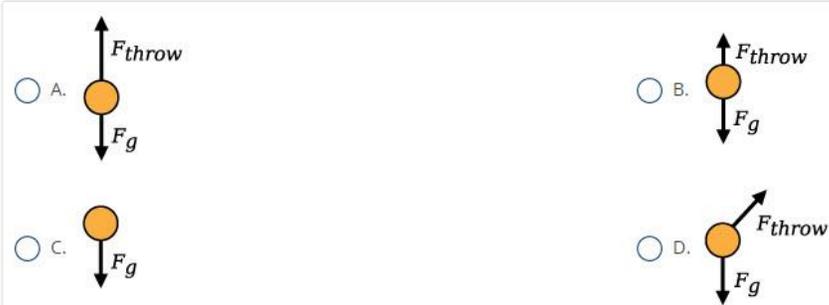
4. Free-body diagrams:
 - a. Give an overview of the image if one is not already provided in the preceding text.
 - b. Describe the direction of the arrows representing force.
 - c. When multiple force arrows appear in the diagram, describe which force is greater.
 - d. When multiple free-body diagrams appear in an item, provide the details in a consistent order for each description to highlight the differences between them.

Figure 5.15. Physics diagram showing force on a free body.

A ball is thrown upward with a force of F_{throw} . Assuming no air resistance, the ball will follow the parabolic path shown. Point P is the position of the ball slightly before it reaches maximum height.



Which free-body diagram represents the force(s) on the ball at point P , where F_g is the force of gravity?



Asset: Alt text: The parabolic path moves up and to the right of the throw.

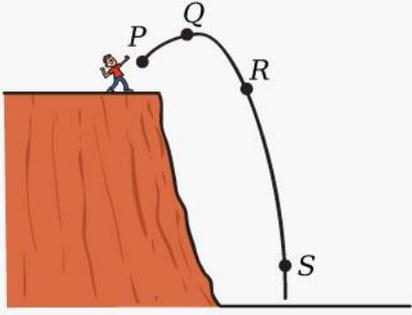
Answer options:

- A. Alt text: Force of throw is up. Force of gravity is down. Force of throw is greater than force of gravity.
 - B. Alt text: Force of throw is up. Force of gravity is down. Force of gravity is greater than force of throw.
 - C. Alt text: No force of throw. Force of gravity is down.
 - D. Alt text: Force of throw is up, toward the right. Force of gravity is down. Force of throw and force of gravity are equal.
5. Kinetic energy:
- a. Give an overview of the image if one is not already provided in the preceding text. Name the points.
 - b. Describe where the points are on the curved path.
 - c. Use language from the item to describe the path of the line in relation to its surroundings.

Figure 5.16. Physics diagram showing kinetic energy.

Use the information to answer the question.

A boy throws a rock while standing on a cliff. The path of the rock is shown in the picture.



Where is the potential energy of the rock greatest?

A. position *P*

B. position *Q*

C. position *R*

D. position *S*

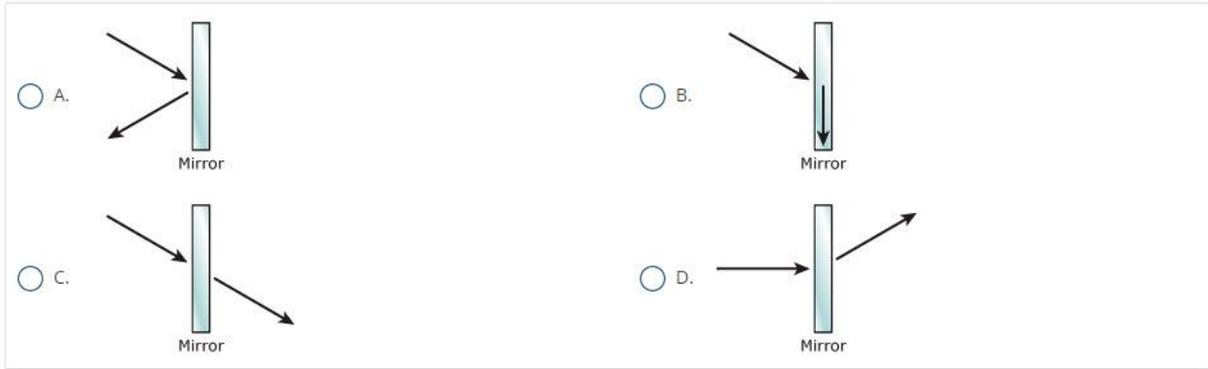
Alt text: A picture. **Longdesc:** The picture shows the path curves away from the boy, first up and to the right, and then down and to the right, landing on the ground below the cliff. The path has 4 labeled points: P, Q, R, and S.

- Point P is at the beginning of the curved path, closest to the boy.
 - Point Q is just before the top of the curved path.
 - Point R is on the falling part of the curved path.
 - Point S is near the bottom of the curved path, just above the ground.
6. Light, sound, and water—Rays or waves hitting an object:
- a. Give an overview of the image if one is not already provided in the preceding text. Include the description of the ray or wave and the object it meets.
 - b. Describe the path and angle (or diagonal) of the ray or wave before and after hitting the object.
 - c. When the item is about sound waves, also describe the shape of the wave.

Figure 5.17. Physics diagram showing ray of light hitting an object.

A teacher shows students ways that the path of a ray of light can change by shining a light on a mirror.

Which diagram shows how a mirror changes the path of a ray of light?



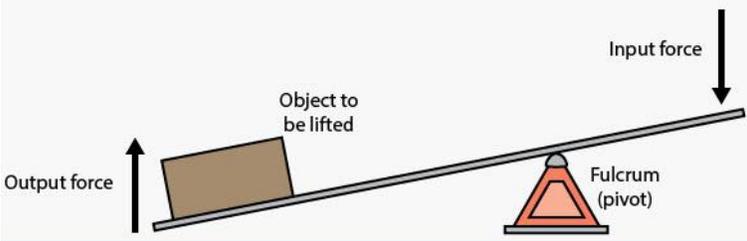
- A. **Alt text:** A diagram. **Longdesc:** The diagram shows the path of the incoming light ray hits the mirror at a downward right diagonal. The path of the reflected ray returns at a downward left diagonal.

- B. Alt text: A diagram. Longdesc: The diagram shows the path of the incoming light ray hits the mirror at a downward right diagonal. The path of the ray goes straight down within the mirror.
- C. Alt text: A diagram. Longdesc: The diagram shows the path of the incoming light ray hits the mirror at a downward right diagonal. The path of the ray continues through the mirror at the same downward right diagonal.
- D. Alt text: A diagram. Longdesc: The diagram shows the path of the incoming light ray hits the mirror straight on, going right. The path of the ray continues through the mirror at an upward right diagonal.
7. Systems—Levers:
- Give an overview of the system if one is not already provided in the preceding text.
 - Describe the position of the fulcrum in relation to the ends of the beam.
 - Be consistent with the language used in other parts of the item.
 - Include the arrows in the description.
 - Depending on the language in the item and the grade level, you may decide to use the term “pivot” instead of “fulcrum.”

Figure 5.18. Physics diagram showing a lever system.

Use the information to answer the question.

The diagram shows a lever system.



How does this lever system function?

A. The lever system increases the mass of the object to be lifted.

B. The lever system increases the amount of work required to lift an object.

C. The lever system divides the input force to produce a smaller output force.

D. The lever system uses the weight of the object due to gravity to lift the object.

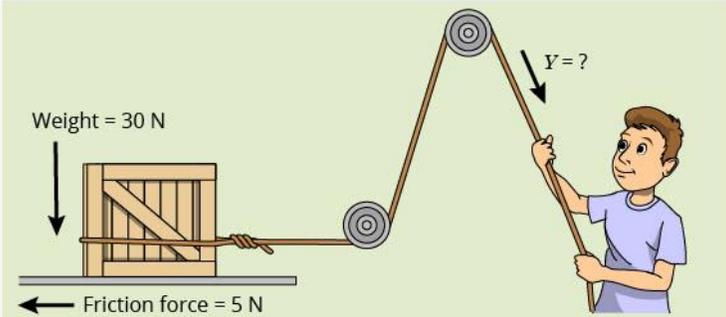
Alt text: A diagram. Longdesc: The diagram shows the lever system is a beam balancing on a fulcrum (pivot), with one end of the beam weighed down by an object to be lifted. The fulcrum is closer to the end of the beam without the object, and the shorter end of the beam is raised in the air. An arrow next to the object points up, indicating output force. An arrow on the raised end points down, indicating input force.

8. Systems—Pulleys:
- Describe the number of pulleys, or wheels, and the way the rope connects the pulleys.
 - It may be necessary to describe the size of the pulleys or the number of sections of rope.
 - When comparing pulley systems, identify the differences between the pulley systems rather than describing each system in detail.

Figure 5.19. Physics diagram showing a pulley system.

Use the information to answer the question.

A person pulls a crate with a rope through a pulley system, as shown in the diagram. The crate moves with a constant velocity when the person pulls with a force of Y .



What is the magnitude of force Y in newtons (N)?

A. 5 N

B. 25 N

C. 30 N

D. 35 N

Alt text: A diagram. **Longdesc:** The diagram shows a crate on a table being pulled by a person using a rope and a pulley system with two wheels. One end of the rope is tied around the crate. The other end of the rope stretches out from the crate, goes under a pulley wheel, goes up and over the other pulley wheel, and then goes down to the person pulling the rope.

- The person is pulling down on the end of the rope with a force of Y equals blank.
- The weight of the box is pushing down on the table with a force of 30 newtons.
- A friction force of 5 newtons is acting on the crate in the direction opposite the direction the crate is moving.

Diagrams That Convey Change

In many cases, providing a tactile graphic of the diagram will improve the accessibility of the item and create a more authentic assessment of the students' skill.

- Give an overview of the diagram if one is not already provided in the preceding text.
- Explain the differences between the diagrams, describing the elements of the diagrams in the same order each time.
- Be consistent with the language used in other parts of the item.

Figure 5.20. Diagram conveying change.

Use the information to answer the question.

In the experiment shown, a cylinder is filled with air, and an airtight piston is pulled up out of the cylinder. The resulting pressure is measured on the attached gauge.

According to the data, when the volume of a cylinder is tripled, what happens to the pressure?

A. Pressure increases.

B. Pressure is one-third.

C. Pressure is unchanged.

D. Pressure decreases slightly.

E. Pressure decreases nine times.

Alt text: An experiment. **Longdesc:** The diagram of the experiment shows a cylinder with a piston in 3 different positions, labeled A, B, and C. The cylinder is about 20 centimeters high.

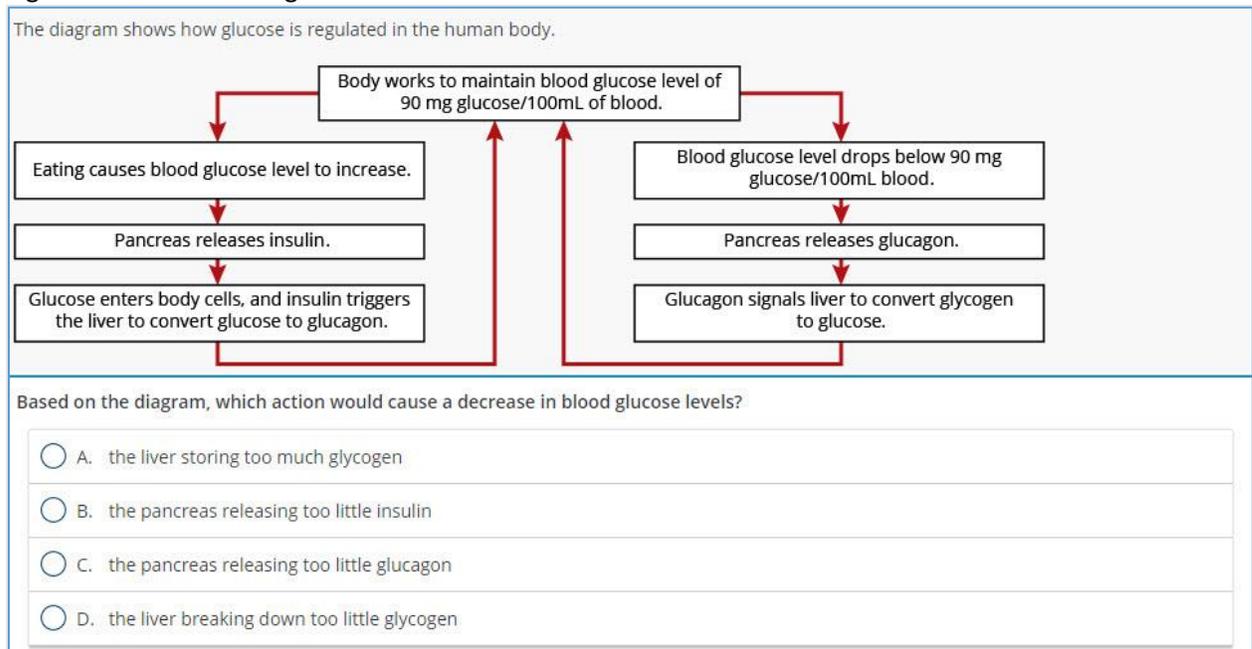
- Position A: Piston is 2 centimeters from the bottom of the cylinder. Pressure is 9.
- Position B: Piston is 6 centimeters from the bottom of the cylinder. Pressure is 3.
- Position C: Piston is 18 centimeters from the bottom of the cylinder. Pressure is 1.

Process Diagrams and Flowcharts

In many cases, providing a tactile graphic of the diagram will improve the accessibility of the item and create a more authentic assessment of the students' skill.

- Give an overview of the diagram or flowchart if one is not already provided in the preceding text.
- Use a numbered list to organize a step-by-step process.
- For process diagrams that seem to combine more than one cycle, you can break the diagram into separate cycles to make the image description easier to understand.

Figure 5.21. Process diagram.



Alt text: A diagram. **Longdesc:** The process diagram shows two possible cycles of glucose entering the bloodstream after eating a meal. They both start with Body works to maintain blood glucose level of 90 milligrams glucose per 100 milliliters of blood.

Cycle 1.

1. Eating causes blood glucose level to increase.
2. Pancreas releases insulin.
3. Glucose enters body cells, and insulin triggers the liver to convert glucose to glycogen. This leads back to Body works to maintain blood glucose level of 90 milligrams glucose per 100 milliliters of blood.

Cycle 2.

1. Blood glucose level drops below 90 milligrams glucose per 100 milliliters blood.
2. Pancreas releases glucagon.
3. Glucagon signals liver to convert glycogen to glucose. This leads back to Body works to maintain blood glucose level of 90 milligrams glucose per 100 milliliters of blood.

Geology

In many cases, providing a tactile graphic of a geology diagram or model will improve the accessibility of the item and create a more authentic assessment of the students' skill.

Fossils

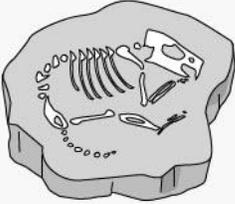
- a. Begin with "The fossil shows" when the word "fossil" is mentioned in the item.
- b. Describe the shape or the distinguishing parts of the skeleton that are pictured in the fossil. The level of detail necessary will vary, depending on the context of the item.
- c. When describing the skeleton, be aware of the impact of incidental learning. Students who are visually impaired or blind may not have had the same amount of exposure to a range of animals as other students, and therefore they may not have prior knowledge of the appearance or shape

of less common animals. An item that requires students to identify less common animals may have visual bias.

- d. When the item asks students to match an image to an imprint (meaning the images in the answer options are identical to the imprint of the fossil), the item may have visual bias. Also, if the image cannot be described in a way that would allow students to eliminate all but one answer option, then the item has visual bias.

Figure 5.22. Fossils.

Kiko is in the science room where this fossil is displayed at school.



Which plant or animal is most like this fossil?

A. rat

B. fish

C. snail

D. tree leaf

Alt text: A fossil shows a small skeleton with a head, a short body, legs, and a tail.

Geologic Faults

- Give an overview of the diagram if one is not already provided in the preceding text.
- Describe the fault planes as “inclined” or “vertical.” If these terms may be a barrier to students, consider replacing “inclined” with “angled” and replacing “vertical” with “straight up and down.” You may also consider using both terms together, as shown in the image description for figure 5.23.
- When arrows are used to indicate the movement of the plates, describe the movement by using the terms “up” and “down” (and “over” or “under,” as needed) or “horizontally,” relative to the other side. If the term “horizontally” may be a barrier to students, consider replacing it with the term “sideways” or using both terms together.

Figure 5.23. Geologic faults.

Use the diagrams to answer the question.

Three Basic Fault Types

A

B

C

Which type of fault is shown in Diagram C?

A. normal fault

B. reverse fault

C. strike-slip fault

D. convergent fault

Alt text: Three diagrams. **Longdesc:** The diagrams show three basic fault types.

- Diagram A: Two plates shift past each other along an inclined, or angled, fault plane. One side of the fault plane moves down.
- Diagram B: Two plates shift past each other along an inclined, or angled, fault plane. One side of the fault plane moves up.
- Diagram C: Two plates shift past each other along a vertical, or straight-up-and-down, fault plane. Each side of the fault plane moves horizontally, or sideways, in a direction opposite the movement of the other side.

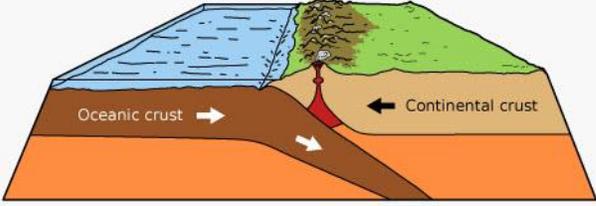
Graphic Plates

- Give an overview of the picture if one is not already provided in the preceding text.
- Be consistent with the language used in other parts of the item. Pay particular attention to the answer options—if the image description uses the language from some answer options but not others, it may immediately cue which are correct or incorrect.

Figure 5.24. Graphic plates.

Use the information to answer the question.

The diagram shows the movement of two tectonic plates.



Which statement best identifies the diagram?

A. This is a geological hot spot because volcanoes are formed by rising magma.

B. This is a transform plate boundary because a coastal mountain range is formed.

C. This is a divergent plate boundary because oceanic crust is formed at the trench.

D. This is a convergent plate boundary because the plates are moving toward each other.

Alt text: A diagram. **Longdesc:** The diagram shows the Oceanic crust and the Continental crust meeting at a coast. The Oceanic crust extends beneath the Continental crust. Arrows indicate that the Oceanic crust and the Continental crust are moving toward each other. A trench is shown in the water above where the two crusts meet. On land, a coastal mountain range is located in the Continental crust. A volcano is pictured in the coastal range, with magma extending down from the tip of its cone, through the Continental crust, to the Oceanic crust beneath.

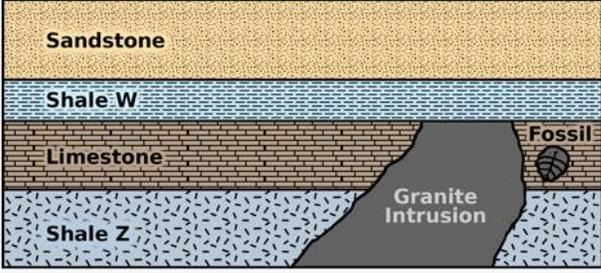
Layers

- Give an overview of the layers if one is not already provided in the preceding text.
- Be consistent with the language used in other parts of the item.
- List the layers, starting at the surface and moving down.
- Describe only the aspects of the diagram that are needed to understand and answer the question using the skills being assessed by the item. If the physical features of each layer are not needed, consider not describing them in order to avoid cognitive overload.
- When reading the image's key is not the skill being assessed, you may want to interpret the key/image in the image description in order to reduce the cognitive load.

Figure 5.25. Geologic layers.

Use the information to answer the question.

The diagram shows a geologic cross section.



Which rock layer is most likely the oldest?

A. Sandstone

B. Limestone

C. Shale Z

D. Granite Intrusion

Alt text: A diagram. **Longdesc:** The diagram of a geologic cross section shows 4 horizontal layers in the earth and an intrusion. Starting at the surface and going down into the earth, the layers are:

1. Sandstone.
2. Shale W.
3. Limestone. There is a fossil in the Limestone layer.
4. Shale Z.

A Granite Intrusion is present in the Limestone and Shale Z layers. It appears like a wide vertical stripe that runs through these two bottom layers.

Graphs

Science graphs may be treated differently from Math graphs because the associated items often assess an understanding of a conceptual trend, rather than how to read data on a graph.

In many cases, providing a tactile graphic of the graph will improve the accessibility of the item and create a more authentic assessment of the students' skill.

Line Graphs

- a. Give an overview of the graph, including the labels for the x- and y-axes (or "horizontal" and "vertical" axes) if shown.
- b. Describe the overall shape of the line by using general descriptions such as "increases," "decreases," "curves," and "starts to level off."
- c. If data points are shown, describe the data. Use a range if the data is not precise.

Figure 5.26. Line graphs without data points.

Use the diagram to answer the question.

The diagram shows fossils found in rock layers.

Which graph best illustrates the sea level changes represented by fossils in the diagram?

Asset: Alt text: A diagram. Longdesc: The diagram shows how long ago rock layers were formed and the types of plant fossils found in those rock layers.

- 50 million years ago, plants on land.
- 100 million years ago, plants in shallow sea.
- 150 million years ago, plants in deep sea.
- 200 million years ago, plants in shallow sea.
- 250 million years ago, plants in deep sea.

Answer options:

- A. Alt text: A graph. Longdesc: The graph shows Sea Level in meters and Millions of Years Ago. As millions of years ago increases, sea level increases from nearly 0, reaches a peak, decreases a little, and then increases again.
- B. Alt text: A graph. Longdesc: The graph shows Sea Level in meters and Millions of Years Ago. As millions of years ago increases, sea level increases from nearly 0, reaches a peak, and then decreases to nearly 0 again.
- C. Alt text: A graph. Longdesc: The graph shows Sea Level in meters and Millions of Years Ago. As millions of years ago increases, sea level increases from nearly 0, reaches a peak, decreases a little, increases again to a peak, and then decreases to nearly 0 again.
- D. Alt text: A graph. Longdesc: The graph shows Sea Level in meters and Millions of Years Ago. As millions of years ago increases, sea level begins high above 0, decreases quickly to a low point, and then increases again.
- E. Alt text: A graph. Longdesc: The graph shows Sea Level in meters and Millions of Years Ago. As millions of years ago increases, sea level begins a little above 0 and increases steadily.

Figure 5.27. Line graphs with data points.

Use the information to answer the question.

The graph shows the effect of a forest fire on the number of bird species in a forest.

Years since Last Fire	Number of Species
7	55
13	70
25	110
57	38
111	37
300	38

Which statement about biodiversity in a forest does the evidence in the graph best support?

A. Each fire has a permanent effect on biodiversity.

B. Having more fires in the area results in more benefit to the biodiversity of birds.

C. Fires affect the biodiversity of birds more than the biodiversity of other organisms.

D. Fires have a positive effect on the biodiversity of the area if the fires happen on the right time scale.

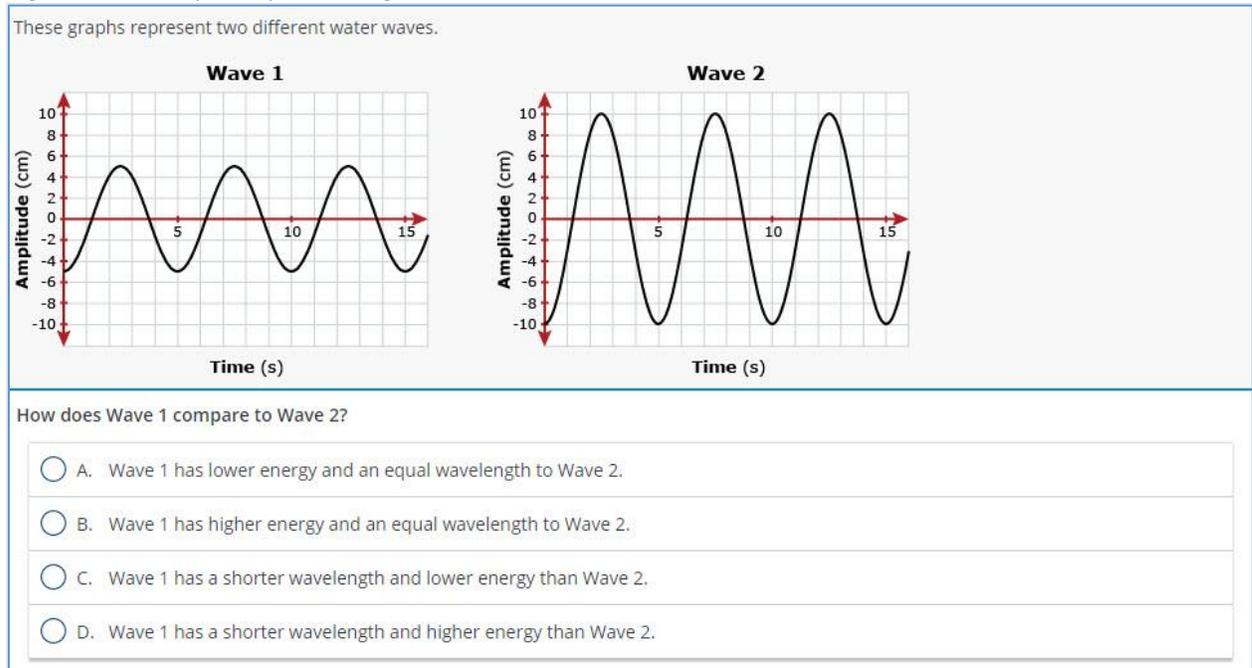
Alt text: A graph. **Longdesc:** The line graph has a horizontal axis labeled Years since Last Fire and a vertical axis labeled Number of Species. The line starts at 7 years with 55 species, increases to a peak at 25 years, decreases until 57 years, and then levels off. It has these data points.

- 13 years, 70 species.
- 25 years, 110 species.
- 57 years, 38 species.
- 111 years, 37 species.
- 300 years, 38 species.

Wave Graphs—Light, Sound, Water

- a. Describe the axes of the graphs with their labels, if given.
- b. When reading the graph is not the skill being assessed, describe wavelength and period.
- c. When multiple graphs are being compared, describe their similarities and/or differences.

Figure 5.28. Graphs representing waves of water.



Alt text: Two graphs. **Longdesc:** The first graph shows Wave 1, and the second graph shows Wave 2. In both graphs, the x-axis shows Time in seconds, from 0 to 15, and the y-axis shows Amplitude in centimeters, from negative 10 to positive 10. Wave 2 is taller than Wave 1.

- Wave 1 rises to 5 centimeters and then falls to negative 5 centimeters. It repeats this pattern once every 5 seconds, for a total of 3 waves on the graph.
- Wave 2 rises to 10 centimeters and then falls to negative 10 centimeters. It repeats this pattern once every 5 seconds, for a total of 3 waves on the graph.

Maps

In many cases, providing a tactile graphic of the map will improve the accessibility of the item and create a more authentic assessment of the students' skill. Only the simplest maps may be accessible through image description alone to students who are blind.

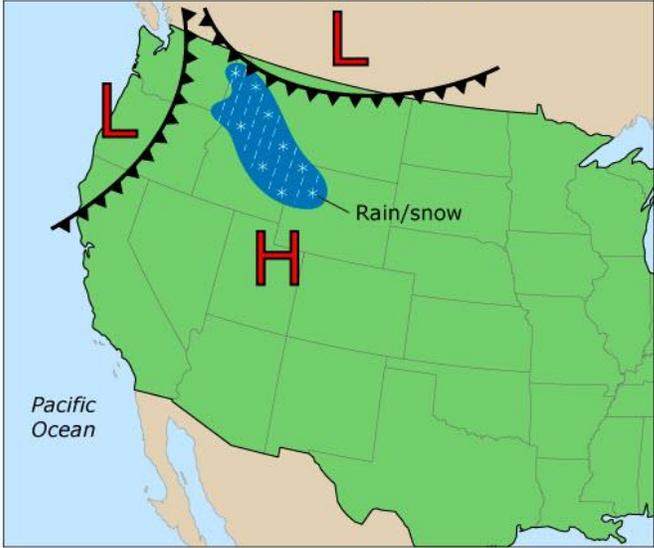
- Give an overview of the map if one is not already provided in the preceding text.
- Describe the key if one is present.
- Drill down into the details of the image, using subject-specific vocabulary (e.g., "latitude," "longitude"). You may want to focus on the idea being conveyed through the image (e.g., in figure 5.29, wind direction and air pressure) instead of giving all the details in the map.
- When a compass is pictured, you may use these directions to help specify details on the map.
- Be consistent with the language used in other parts of the item.

Figure 5.29. Map.

Use the information to answer the question.

The map shows the interaction of air masses and the weather near a student's town. The student wants to know why certain weather conditions form.

Why does the interaction of the air masses on the map result in rain and snow in the labeled area?



A. The low-pressure air masses bring cold, moist air from the ocean, causing precipitation when the air hits the high-pressure mass.

B. The high-pressure air mass evaporates water from lakes and rivers, causing precipitation when the low-pressure systems move inward.

C. The low-pressure air masses carry ice from northern glaciers, and it melts and falls as precipitation when it collides with the hot high-pressure air mass.

D. The high-pressure air mass forces hot, moist air from the upper atmosphere downward toward the low-pressure systems, and the moist air falls as precipitation.

Alt text: A map. **Longdesc:** The weather map shows two low-pressure air masses moving toward a high-pressure air mass in the western United States. One low-pressure air mass is coming from the Pacific Ocean in the west, and the other is coming from land in the north. Rain and snow are formed where these low-pressure air masses meet the high-pressure air mass.

Periodic Table of the Elements

In many items featuring the periodic table of the elements (PTE), providing a tactile or braille PTE will improve the accessibility of the item and create a more authentic assessment of the students' skill. Many items involving the PTE require students to reference it to analyze patterns and trends in periods and groups. A tactile or braille PTE will help alleviate the cognitive overload that may occur from an item that presents the PTE through an image description alone. Care should be taken that the inclusion of a tactile or braille PTE does not cue the answer to the question.

- Provide a brief introduction stating that the PTE is shown, and describe in detail only the elements that are highlighted or given in the answer options, stem, or asset. Use this order when describing element information that is in the PTE image and relevant to the skill being assessed: element name, symbol, atomic number, atomic mass, period, group, electronegativity, and/or other information provided.
- Describe elements of the PTE in order of atomic number. However, when each answer option provides a single element, describe the elements in the PTE in the order they appear in the answer options. When each answer option shows various combinations of elements, use the atomic number order.
- When referring to the elements, maintain consistency with the use of their full names or symbols in the other parts of the item. Do not use the full name of the element if only the symbol is used in the

rest of the item. For more information about when to use an element's symbol and when to use its full name, please see the [Chemical Elements](#) section.

- d. Identify what the numbers in the PTE represent if doing so will not cue the answer to the question. When in doubt, consult a content specialist.

Figure 5.30. Periodic table of the elements.

Use the periodic table to answer the question.

Periodic Table																						
1	2															16	17	18				
1	H															He						
2	Li	Be															B	C	N	O	F	Ne
3	Na	Mg															Al	Si	P	S	Cl	Ar
4	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr				
5	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe				
6	Cs	Ba	*	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn				
7	Fr	Ra	**	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cp	Uut	Uuq	Uup	Uuh	Uus	Uuo				

* Lanthanide series
** Actinide series

Which bond has the LEAST covalent character?

A. Al-S

B. Se-S

C. Sr-S

D. Cd-S

Alt text: The periodic table. Longdesc: The periodic table of the elements is shown. The following elements are included.

- Upper A l. Atomic number 13, period 3, group 13, electronegativity 1.5.
- Upper S. Atomic number 16, period 3, group 16, electronegativity 2.5.
- Upper S e. Atomic number 34, period 4, group 16, electronegativity 2.4.
- Upper S r. Atomic number 38, period 5, group 2, electronegativity 1.0.
- Upper C d. Atomic number 48, period 5, group 12, electronegativity 1.7.

Punnett Squares

In many cases, providing a tactile graphic of the Punnett square will improve the accessibility of the item and create a more authentic assessment of the students' skill. If an item presents more than one Punnett square, the combination of the image descriptions and the item's content will likely cause cognitive overload unless the item is accompanied by a tactile graphic.

When the Punnett Square Is Empty

- Describe the squares as having "empty boxes."
- Describe the top of the square from left to right, and describe the left side of the square from top to bottom.
- Use the terms "uppercase" and "lowercase" to describe the letters.

Figure 5.31. Punnett square with empty boxes.

Use the information to answer the question.

In pea plants, blue flowers are dominant to white flowers. A student grows 100 pea plants from blue parent plants. Information about the parent plants is shown in the Punnett square.

	B	b
B		
b		

How many of the 100 offspring plants should have white flowers?

A. 0

B. 25

C. 75

D. 100

Alt text: A Punnett square. **Longdesc:** The Punnett square shows a square with 4 empty boxes. Across the top of the square from left to right are uppercase B and lowercase b. Along the left side of the square from top to bottom are uppercase B and lowercase b.

When the Punnett Square Interior Is Filled In

- Describe the top of the square from left to right, and describe the left side of the square from top to bottom, depending on what is shown.
- Describe what is in each box, using the terms “uppercase” and “lowercase” to describe the letters.

Figure 5.32. Punnett square with filled-in boxes and one side labeled.

The genotype of one parent is missing from this Punnett square.

	<i>TT</i>	<i>Tt</i>
<i>T</i>	<i>TT</i>	<i>Tt</i>
<i>T</i>	<i>TT</i>	<i>Tt</i>

Which term describes the genotype of the missing parent?

A. dominant

B. heterozygous

C. homozygous

D. recessive

Alt text: A Punnett square. **Longdesc:** The Punnett square shows a square with four boxes filled in with genotypes. The genotype across the top of the square is missing. Along the left side of the square from top to bottom are uppercase T and uppercase T. The filled-in boxes of the square show these genotypes.

- Top-left box: uppercase T and uppercase T.
- Top-right box: uppercase T and lowercase t.
- Bottom-left box: uppercase T and uppercase T.
- Bottom-right box: uppercase T and lowercase t.

Pyramids and Webs

In many cases, providing a tactile graphic of the pyramid or web will improve the accessibility of the item and create a more authentic assessment of the students' skill.

Pyramid

- Give an overview of the pyramid, including the title and number of levels.
- Using a bulleted list, describe the details of the levels, starting from the bottom (the "base") and moving up to the top (the "peak").
- The level of detail necessary will vary, depending on the context of the item. Describe only what is necessary to answer the question.

Figure 5.33. Pyramid.

Use the information to answer the question.	
<p>The ecological pyramid represents the relative amount of available energy at each trophic level in a marine ecosystem.</p> <p>Marine Ecosystem Energy Pyramid</p> <p>Level 4 — 1 unit</p> <p>Level 3 — 10 units</p> <p>Level 2 — 100 units</p> <p>Level 1 — 1000 units</p>	<p>How does the law of conservation of energy apply to this ecosystem?</p> <p><input type="radio"/> A. The energy from Level 4 will eventually be passed back to the organisms in Level 1.</p> <p><input type="radio"/> B. There is a greater amount of energy available to the organisms in Level 4 than in Level 1.</p> <p><input type="radio"/> C. Some energy from each level is released as heat, but the total amount of energy remains the same.</p> <p><input type="radio"/> D. Producers in the lowest level obtain energy from the Sun, and other organisms obtain energy by eating producers.</p>

Alt text: An ecological pyramid. Longdesc: The pyramid is titled Marine Ecosystem Energy Pyramid, and it shows 4 levels. Each level shows organisms and units of energy. From the base to the peak, the levels are:

- Level 1, plankton. 1,000 units.
- Level 2, crabs and snails. 100 units.
- Level 3, small fish. 10 units.
- Level 4, large fish. 1 unit.

Webs and Chains

- Focus on the relationship between the organisms instead of the diagram's structure.
- Approach the food web from the top (the organism not consumed by others). Use a list to organize the information.
- Alternatively, for food chains (organisms in a row, separated by arrows), use directional words like "from" and "to" (e.g., "The arrows point from the grasses to the marmot, and from the marmot to the grizzly bear.").
- When an image includes above-grade or specialized terms (e.g., less familiar species names), the image description may need to include additional information to help students who are blind or visually impaired—students who are sighted might be able to access this information by seeing the image, giving them an unfair advantage. Including this additional information is acceptable as long as the knowledge of those terms is not the skill being assessed.

Figure 5.34. Food web.

The food web shows the feeding relationships of some of the organisms in the Florida Everglades ecosystem.

If humans hunt most of the great blue herons in this ecosystem, which event will most likely happen to the other species in the food web?

A. Mud turtles will decrease in number, because they will lose habitat.

B. Mosquitoes will decrease in number, due to an increase in predation.

C. Carp and alligators will decrease in number, due to a decrease in food.

D. Bladderworts and orchids will decrease in number, because of more competition.

Alt text: A food web. **Longdesc:**

- Alligator consumes Great blue heron (bird), Carp (fish), and Mud turtle.
- Great blue heron consumes Carp.
- Carp consumes Mosquito and Bladderwort (plant).
- Mud turtle consumes Bladderwort.
- Mosquito consumes Butterfly orchid (plant).

(Note: Some of the organisms were given additional information—a heron was identified as a bird, a carp as a fish, and bladderwort and butterfly orchid as plants. Without this additional identification, students who are blind or visually impaired may not know what these species are, and their peers who are sighted would have an unfair advantage.)

Visual Bias in Science Item Types

The items and image types presented in this section have visual bias and should not be included in assessments for students who are blind. In many cases, the item's accessibility may be improved by providing a tactile graphic or other accommodation.

Complexity is often the reason Science items have visual bias. If the image needs so much description that students would be unable to keep track of the information, or if the image description requires language too complex for the targeted grade, the image has visual bias.

Complex Chemical Models and Structural Formulas

These structures are highly visual in nature and require a lot of information to describe them. The effort to track and remember the details presented only in an image description would likely lead to cognitive overload, especially when more than one structure appears in the item. However, providing a tactile graphic could make these images potentially accessible.

1. Lewis Dot Structures/Electron Dot Structures

Figure 5.35. Lewis dot structure.

The table shows the number of valence electrons for some elements.

Element	Number of Valence Electrons
H	1
C	4
Cl	7

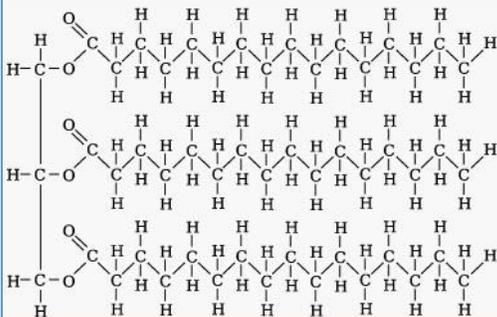
What is the Lewis structure for chloroform (CHCl_3)?

- A. :Cl:H:Cl:C:Cl:
- B. $\begin{array}{c} \text{:Cl:} \\ \text{:Cl:H:Cl:} \\ \text{:C:} \end{array}$
- C. $\begin{array}{c} \text{:Cl:} \\ \text{H:C:Cl:} \\ \text{:Cl:} \end{array}$
- D. $\begin{array}{c} \text{:C:} \\ \text{:C:H:Cl:Cl:Cl:} \end{array}$

2. Macromolecules

Figure 5.36. Model of a macromolecule.

Use the diagram to answer the question.

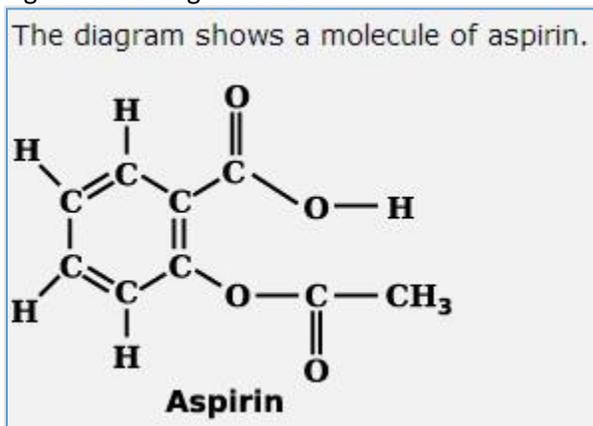


Which type of macromolecule does the diagram represent?

- A. a lipid
- B. a protein
- C. a nucleic acid
- D. a carbohydrate

3. Ring structures

Figure 5.37. Ring structure.

**Complex Diagrams**

1. Diagrams requiring significant detailed description for differentiation:
 - a. When a diagram requires a large amount of detailed description in order for students to be able to differentiate between parts or images, the diagram has visual bias. The cognitive lift for students having to process and retain the details of the description is much heavier than the lift for sighted students to visually gain the same information (e.g., in figure 5.38, the image is deceptively simple in design, but describing the appearances of the labeled parts in enough detail to compare them would lead to cognitive overload). However, providing a tactile graphic could make these images potentially accessible.

Figure 5.38. Diagram requiring detailed differentiation.

Use the information to answer the question.	
<p>This drawing is of an animal cell.</p>	<p>Which cell part can be identified in this diagram as the nucleus?</p> <p><input type="radio"/> A. 1</p> <p><input type="radio"/> B. 2</p> <p><input type="radio"/> C. 3</p> <p><input type="radio"/> D. 4</p> <p><input type="radio"/> E. 5</p>

2. Moon phases:
 - a. Moon phases with more than two pictured phases have visual bias. The effort to track and remember the details of each phase and compare them to the other phases would likely lead to cognitive overload. In addition, sighted students have personal experience with this concept, gained through incidental learning, that their peers who are blind or visually impaired have not had, which compounds the visual bias.

Figure 5.39. Diagrams of Moon phases.

These are the phases of the Moon.

Which shows the Moon at the First Quarter phase?

A.
 B.

C.
 D.

3. Pulley comparison diagrams:

- a. Complex versions of these diagrams would require a lot of information to describe them. The effort to track and remember the details presented only in an image description would likely lead to cognitive overload, especially when more than two pulleys appear in the item. Providing a tactile graphic could make these images potentially accessible, but care should still be taken to evaluate the item for potential cognitive overload.

Figure 5.40. Diagram of pulleys requiring comparisons.

Use the diagrams to answer the question.

If a person needed to lift a 300-kilogram object using a mass of only 50 kilograms, which pulley system could be used to lift the mass?

A. system A
 B. system B
 C. system C
 D. system D
 E. system E

Complex Maps

Reading maps is a highly visual skill. For all but the simplest maps, there is visual bias in presenting a map with only an image description. In many cases, providing a tactile graphic of the map will improve the accessibility of the item and create a more authentic assessment of the students' skill.

Figure 5.41. Complex map.

Use the map of Florida to answer the question.

Sea level has changed throughout geological history. Many scientists predict that global climate change will result in a change in current sea level.

Land Elevations in Florida

Key

- Below 1.5 meters
- 1.5–3.5 meters
- Above 3.5 meters

80.5 km

Adapted from United States Environmental Protection Agency

Which region of Florida is **LEAST** likely to experience widespread impact from a rise in sea level?

A. northern Florida

B. southern Florida

C. eastern Florida

D. western Florida

Multiple Graphics with Data

Items that incorporate multiple graphics from which students need to identify and interpret data and trends have visual bias due to cognitive overload. Providing a tactile graphic could make these images potentially accessible, but care should still be taken to evaluate the item for cognitive overload.

Figure 5.42. Multiple graphics with data.

The diagram represents how glucose is regulated in the human body. The graph represents the blood glucose level of an individual over a 6-hour period.

Body works to maintain blood glucose level of 90 mg glucose/100mL of blood

Eating causes blood glucose level to increase

Insulin released by pancreas

Glucose enters body cells and insulin triggers the liver to convert glucose to glucagon

Blood glucose level drops below 90 mg glucose/100mL blood

Glucagon released by pancreas

Glucagon signals liver to convert glycogen to glucose

Blood Glucose Level (mg glucose/100 mL blood)

Time (hours)

Which action explains the blood glucose pattern represented in the graph?

A. The liver stored too much glycogen.

B. The pancreas did not release enough insulin.

C. The pancreas did not release enough glucagon.

D. The liver did not break down enough glycogen.

Part 6. Resources

NWEA Contact Information

For questions about content or technical issues with this document, please send a message to AccessFeedback@nwea.org.

Additional Resources

The National Center of Accessible Media (NCAM) at WGBH

<https://www.wgbh.org/foundation/what-we-do/ncam>

NCAM Image Description Resources

<https://www.wgbh.org/foundation/ncam/tools-and-resources/image-description-resources>

MathSpeak and MathSpeak Rules

<https://www.seewritehear.com/learn/mathspk-and-mathspeak-rules/>

National Center on Accessible Educational Materials

<http://aem.cast.org/>

American Printing House Tactile Graphic Image Library

<https://imagelibrary.aph.org/portals/aphb/>



Trusted by educators to assess more than nine million students around the world each year, NWEA is recognized for offering a world-class assessment—the most stable assessment scale in K–12 education. NWEA partners to help all kids learn, supporting educators with assessment solutions that accurately measure student growth and guide them to individualized learning options.

NWEA.org | 503-624-1951 | 121 NW Everett St., Portland, OR 97209

©2021 NWEA. All rights reserved. No part of this document may be modified or further distributed without written permission from NWEA. NWEA, MAP, and Partnering to help all kids learn are trademarks of NWEA in the US and in other countries. The names of other companies and their products mentioned are the trademarks of their respective owners.

We are providing links to the third-party website(s) contained in this material only as a convenience, and the inclusion of links to the linked site does not imply any endorsement, approval, investigation, verification, or monitoring by us of any content or information contained within or accessible from the linked site. NWEA does not control the accuracy, completeness, timeliness, or appropriateness of the content or information on the linked site. If you choose to visit the linked site, you will be subject to its terms of use and privacy policies, over which NWEA has no control. In no event will NWEA be responsible for any information or content within the linked site or your use of the linked site. By continuing to the linked site you agree to the foregoing.