

Cambium Assessment
(formerly AIR Assessment)

NGSS Assessment Style Guide

Modified from the Smarter Balanced Style Guide

9-7-2023

Note: The presentation of the sample items and selections in this document approximates but does not exactly reflect the appearance of the test content that students will view on the computer screen. The final presentation of content will depend on the user interface (UI) of the online delivery system.

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Table 1. Abbreviations used in Style Guide

Style Guide Abbreviations	
Abbreviation	Spelled-Out Term
CBT	computer-based testing
<i>CMOS</i>	<i>Chicago Manual of Style</i>
CMYK	cyan-magenta-yellow-black (a four-color model used in printing)
CR item	constructed-response item
Dpi	dots per inch
JPEG	Joint Photographic Experts Group (a format for compressing images used for print or screen)
PBT	print-based testing
PNG	portable network graphics (a format using lossless compression for images used for screen presentation)
RGB	red-green-blue (a three-color model used in screen presentation)
SR item	selected-response item
TEI	technology-enhanced item
TIFF	tagged image file format (a format for compressing images used for print presentation)
UI	user interface

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A. Computer-Based Testing

Computer-based testing (CBT) differs from traditional print-based testing (PBT). Traditional style conventions applied to printed test forms must be modified for computer-based test forms because not all print-based style conventions are appropriate for display on a computer screen.

For example, the Verdana font has been chosen because it was specifically designed to be used in place of Times New Roman and other serif fonts that often appear in printed test forms. Verdana characters are slightly larger than characters in other fonts, and the ample space between the characters makes them easy to distinguish at low screen resolutions.

Layout Considerations

The presentation of content in computer-based test forms depends on the user interface (UI) in the online delivery system. The guidelines in this section should be applied to the extent possible once the online delivery system is identified.

Content panes

Students should have the option of viewing content in one pane that is the full size of the computer screen or in sub-panes that divide the screen horizontally or vertically. For example, students should be able to view a selection on the screen by itself or on the screen with an item.

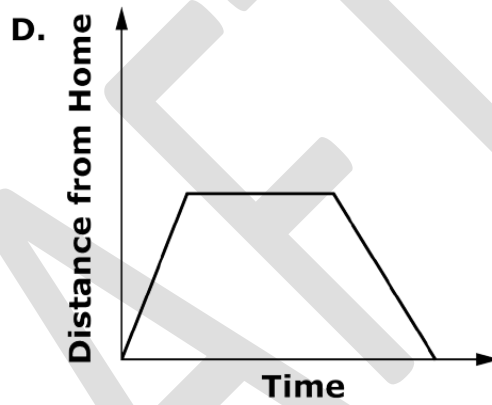
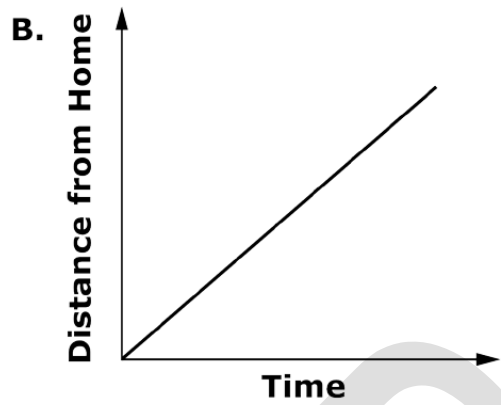
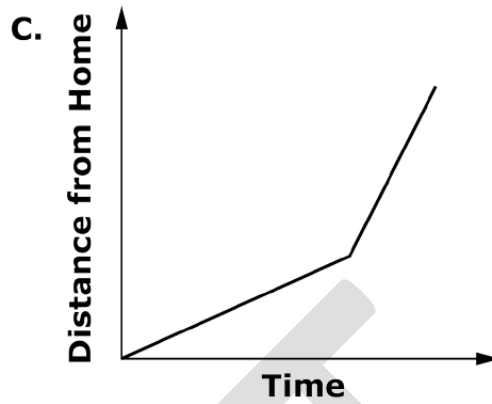
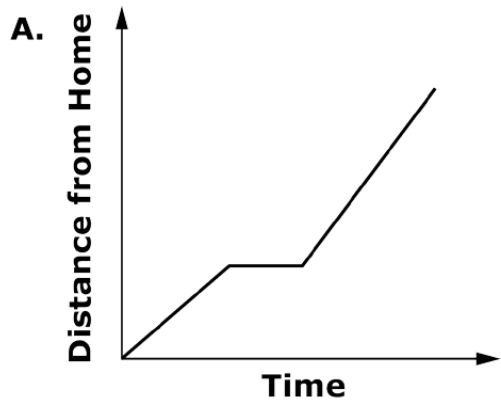
The sizes of content panes depend on the amount of space allotted in the UI for viewing content. For example, content panes will be larger in a UI in which 80% of the viewing area is used for content and 20% is reserved for headers, navigation tools, and other non-content elements than in a UI in which 70% of the viewing area is used for content and 30% is reserved for non-content elements.

Scrolling

Students should not have to use horizontal scrolling to view test content in its entirety. The following guidelines are designed to minimize the need for scrolling:

- Lay out content across the computer screen rather than in columns.
- Display each item on the screen by itself.
- Allow students to view a selection on the screen by itself or on the screen with an item. This eliminates the electronic equivalent of turning a page to flip between the selection and the items.
- Similar options should be provided for viewing a cluster. Students should be able to view the graphic on the screen by itself or on the screen with an item in the cluster.
- Whenever possible, arrange graphic options in a two-over-two box (stacked) layout.

Which graph shows that Noel walked home from school at a constant rate?



Line Breaks

The locations of line breaks depend on the operating system on the computer as well as the size of the monitor being used to view test content. Hard line breaks should not be inserted unless absolutely necessary because lines of text do not necessarily break at the same locations from computer to computer.

B. General Font and Alignment Specifications

Table 2 shows general font and alignment specifications for different text elements. See “Selected-Response Items” in this section for information about option alignment.

Note: All text should be displayed on a white background.

Table 2. General font and alignment specifications for text elements in test forms

Content	Font	Alignment
Items	14 pt. Verdana	Left aligned
Part headings in items	14 pt. Verdana Bold	Left aligned
Boxed text	14 pt. Verdana	<ul style="list-style-type: none">• Box: left aligned• Text: longest line centered in box; other lines left aligned on longest line.
Emphasis terms	14 pt. Verdana Bold	n/a

Note: At this time, Verdana is specified as the primary font for test content. However, another font may be chosen upon further analysis of the effects that fonts have on readability and students’ ability to retain information.

C. Stimulus Specifications

The stimulus of a cluster describes a scientific phenomenon and provides the student with the necessary context around that phenomenon to answer the associated items. Phenomena and data provided should be at least 3 years old. This allows time for new information and findings to be vetted and to make their way to the general public.

A stimulus always starts with text. Pictures, graphics, and other materials never start a stimulus.

Phenomenon

The phenomenon is a scientific observation or an engineering problem around which the cluster is based. The phenomenon should be stated as the first sentence(s) of the stimulus, followed by two hard returns.

Example phenomenon:

Fog appears and disappears over the course of a morning in the Willamette Valley in Oregon.

Task Statement

The task statement concludes the stimulus by telling the student exactly what he or she is expected to do in the cluster. The task statement is preceded with "Your Task" in bold, followed by two hard returns.

Example task statement:

Your Task

In the questions that follow, you will develop an explanation for the appearance and disappearance of fog.

Note: A standalone item with a stimulus does not have a task statement ("Your Task").

Stimulus Layout

If the stimulus contains information that students will consistently reference when working through the items in the cluster, the writer should select a split-screen layout that allows the stimulus to appear on the left and the items on the right. If the stimulus only serves as an introduction to the phenomenon, the writer should select a single screen layout. Animations, graphics, and other stimulus material should be sized to avoid the need for horizontal scrolling. If it becomes difficult to limit the size of an animation or another element of the stimulus, a single screen layout may be selected to avoid horizontal scrolling.

Wording should be consistent throughout the stimulus and cluster. For example, do not use "steam" and "vapor" interchangeably.

D. Interaction Types

Science assessments consist of various types of interactions, including selected-response (SR) items, constructed-response (CR) items, and technology-enhanced items (TEIs). In test forms, items are numbered sequentially, beginning with number 1.

This section provides general global style conventions and specifications for items. See Part II for content specific conventions and for information about TEIs.

Stems

The stem of an interaction may include multiple parts. When the stem includes setup information and a question/prompt, two hard returns should separate the setup and the question/prompt.

The sky appears to be different colors throughout the day.

What causes the color change?

Selected Response Interactions

All SR interactions consist of a stem and options. The format of the stem and options varies among items based on content. (See "Options" in this section for formats of options.)

Stems:

- Stem: the part of the SR item that precedes the options
- Closed stem: a stem that is a complete sentence and ends with a period or question mark
- Open stem: a stem that consists of a sentence fragment and becomes a complete sentence when combined with each option.

Closed stems

When the interaction stem is closed, the options are either complete sentences or sentence fragments. Options that are complete sentences begin with a capital letter and end with a punctuation mark.

How would a fish population affect the stream ecosystem?

- A. Fish would lower the water temperature.
- B. Fish would produce oxygen from the water.
- C. Fish would block sunlight, increasing plant growth.
- D. Fish would produce waste, providing nutrients to plants.

Options that are fragments begin with a lowercase letter (unless the first word is a proper noun or adjective) and do not end with a punctuation mark.

The traits of populations in the forest ecosystem have changed over time.

What caused the traits to change?

- A. natural selection
- B. lack of mutations
- C. unlimited resources
- D. asexual reproduction

The treatment of options that are imperative sentences depends on whether the implied subject of the sentence in each option is "you." If it is, the options are treated as complete sentences. If it is not, the options are treated as fragments.

Subject is implied "you":

What should you do next in the experiment?

- A. Water the plants.
- B. Label the volumes.
- C. Cut the plant stems.
- D. Record plant heights.

Subject is not implied "you":

What should Fiona do next in the experiment?

- A. water the plants
- B. label the volumes
- C. cut the plant stems
- D. record plant heights

Open Stems

When the item stem is open, both the stem and the options are fragments that, when combined, form complete sentences. The fragment in the stem does not end with a punctuation mark. Regardless of whether the options are complete sentences or fragments, they begin with a lowercase letter (unless the first word is a proper noun or adjective) and end with a punctuation mark.

The independent variable of the investigation is

- A. volume.
- B. height.
- C. mass.
- D. time.

In open-stem items, the options should not repeat large quantities of text. The stem must be long enough to provide context for the options. There is **no** punctuation at the end of an open stem (i.e., dash or colon).

The tussock moths obtain energy in cellular respiration by

- A. taking in water.
- B. releasing oxygen.
- C. breaking down glucose.
- D. inhaling carbon dioxide.

Options

Although all SR items have options, the number and format of these options vary from item to item based on content. The number of correct answers among the options also varies.

- In the case of a multiple choice interaction, options are identified with consecutive uppercase letters.

What is one purpose of ATP molecules in plant and animal cells?

- A. to increase the rate of diffusion across cell membranes
- B. to decrease the rate of chemical reactions
- C. to store energy used for cell processes
- D. to pass genetic traits to offspring

- In the case of a multiple select interaction, options are preceded by open boxes, which students can click on to select the correct answers.

Select **all** the cell structures found in animal cells.

- cell membrane
- mitochondria
- chloroplast
- cell wall
- nucleus

Option alignment and order

Table 3 provides general guidelines for the alignment and order of options in SR items.

Note: Options derived from a stimulus, such as a selection or graphic, are ALWAYS arranged in the same order in which they appear in the stimulus. This guideline supersedes all other guidelines listed in Table 3.

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Table 3. Guidelines for the alignment and order of options in SR items

Option Alignment and Order			
Option Type	Alignment	Order	Example
Graphic options	<ul style="list-style-type: none"> Graphic: left aligned Option letter: top aligned or vertically centered on graphic (use best judgment) 	Arranged for best visual presentation (use best judgment)	n/a
Numeric options	Decimal aligned: <ul style="list-style-type: none"> stand-alone numbers decimal values numbers that precede or follow symbols: 40°, \$20.00 numbers that precede labels: 6 ties, 12 bananas numbers that precede units of measure: 15 kilograms, 30 cm 	Arranged in ascending or descending order	What percentage of students prefer strawberry yogurt to blueberry yogurt? A. 25% B. 50% How long, in centimeters, is each necklace? A. 9 cm B. 12 cm
	Fractions: <ul style="list-style-type: none"> Fraction: left aligned Option letter: vertically centered on fraction 	Arranged in ascending or descending order	How many cups of sugar does the student need to make two cakes? A. 1/2 B. 1/4
	Times of day: <ul style="list-style-type: none"> Decimal aligned on colon 	Arranged in ascending or descending order	At what time does the student eat lunch? A. 11:30 a.m. B. 1:00 p.m.

Table 3. Guidelines for the alignment and order of options in SR items (*cont.*)

Option Type	Alignment	Order	Example
Text options	Left aligned	Words: arranged in ascending or descending order by word length	What large molecule is made of many small amino acid molecules? A. lipid B. protein C. carbohydrate
	Left aligned	Phrases and sentences: arranged by length, longest to shortest or vice versa; if more than one line of text is used as separate paragraphs (such as a title followed by a description), the length of the first line of text is considered (e.g., the title)	Which statement describes DNA? A. It is a macromolecule. B. It is found in the nucleus. C. It makes up chromosomes.

Note: Options are not arranged in the prescribed order when doing so cues the answer to the item.

Constructed-Response Interactions

CR items consist only of item stems. The stems are complete sentences written as imperative commands.

Explain how the amount of sunlight affects the growth of plants.
Use information from Investigation 1 to support your answer.

Describe how meteorologists predict the weather.
Use information from the Weather Patterns map in your description.

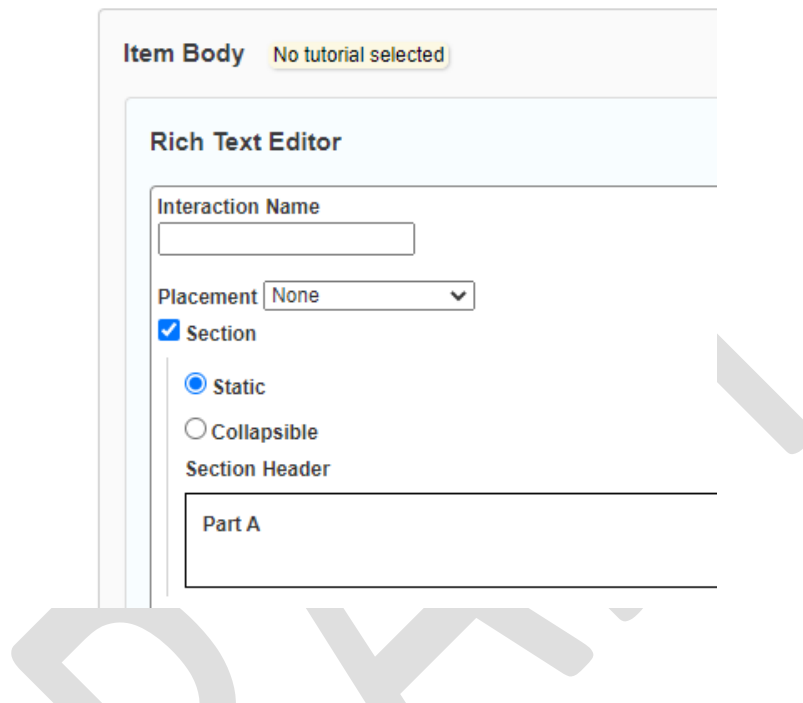
Bullets in Items

- Bullets are used for student action items—what a student must do to earn points, as listed in the rubric.
- Do not use a bullet if there is only one directive in an item.
- Always use bullets to denote multiple directives.

Parts in Items

Some items are divided into parts labeled with consecutive lettered headings that are followed by two hard returns. In headings, the word *part* and the part letter are capitalized and bold. In item text, the word *part* is lowercase and the part letter is capitalized. Parts may comprise a mix of interaction types or multiple interactions of the same interaction type.

The part label headings ("Part A," "Part B," etc.) are entered into the header section of the editor, not into the text box.



Item Body No tutorial selected

Rich Text Editor

Interaction Name

Placement None

Section

Static

Collapsible

Section Header

Part A

Web Preview:

Part A

Select a testable, scientific question that can be answered by performing an experiment with the setup shown in the Hanging Magnets Experiment picture.

- Ⓐ How does the distance between the magnets affect the force?
- Ⓑ How does the orientation of the magnets affect the force?
- Ⓒ Will the force between the magnets always exist?

Part B

Use the table to select the properties you want to hold constant and the properties you want to change when you run your experiment to answer the question you chose in part A.

E. Graphics in Items

Introductory Statements

Descriptive terms

A graphic in an item should not be referred to as a *graphic*; instead, use a more descriptive term, such as *graph*, *table*, or *diagram*. The graph, table, or diagram should be labeled with a Figure or Table number. Any references in the stimulus or items should use this label rather than the title.

Figure 1. Bird's Nest in Tree

Use Figure 1 to describe ...

Table 1. Population of Zebra in the Serengeti

Use Table 1 to predict ...

Above and below

Do not use the terms *above* and *below* to refer to the location of a graphic; instead, use terms such as *this*, *that*, *an*, and *the*.

An equation is shown.

$$\square + 12 = 42$$

Select the variables that make the equation true.

Introductory statements in the item stems

Graphics positioned within items are aligned to the **center** and introduced as part of the item stem using the Figure or Table number.

Figure 1 shows a diagram of photosynthesis.

Table 1 shows characteristics of two populations of coyote.

An introductory statement that is part of an item stem should be as descriptive as possible; however, a sentence such as "See Figure 3" is acceptable when a more descriptive introduction is not available or appropriate.

Acceptable:

See Figure 3.

Preferred:

Figure 3 shows food relationships among some organisms in the forest ecosystem.

Note: In SR items, stem text will be used before the graphic to introduce the item. The graphic will appear next. The graphic will be followed by any remaining stem text, including the question part of the stem. The options will appear last.

Referring to Text from Graphics in Items

Items sometimes refer to table column headings, labels, and other text in graphics. Use the guidelines that follow to determine the appropriate treatment of text from graphics that is referred to in items. Note that these guidelines apply only to the treatment of graphic text in items, not to the text in the graphic itself. (See Part III for information about the treatment of text in graphics.)

- Text from graphics is not enclosed in quotation marks.
- Titles and headings appear in regular type and follow the same capitalization used in the graphic.

Which unit should be used for the measurements in the column titled Volume of Water?

- Labels and other text appear in regular type but do not necessarily follow the same capitalization used in the graphic. Use the guidelines that follow to determine whether to capitalize labels and other text from graphics.
- Capitalize labels that precede letters or numbers if the label is capitalized in the graphic.

Data from the experiment are shown.

Trial	Speed (m/s)
1	10
2	15
3	25
4	20

Why did Trial 1 have an outcome that was different from the outcome in Trial 3?

- Capitalize labels that are proper nouns.
- Lowercase labels that are common nouns.

Jesse walks three dogs in his neighborhood. Chart 1 shows the number of times he walked each dog last week.

Chart 1

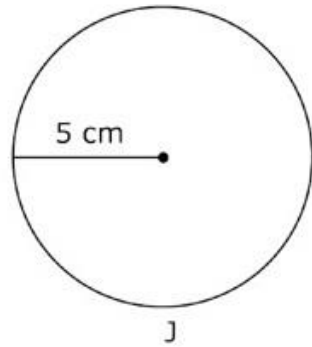
Dog	Number of Times Walked
Schnauzer	5
Beagle	4
Labrador retriever	10

How many more times did Jesse walk the Labrador retriever than he walked the schnauzer?

- Elements are not capitalized when written out (i.e. hydrogen, oxygen)

- Lowercase labels that are lowercase or not shown in the graphic.

The radius of circle J is 5 centimeters.



The radius of circle K is twice as long as the radius of circle J. What is the **diameter**, in centimeters, of circle K?

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F. Excerpts and Citations

Excerpts and citations for external sources should be formatted as shown below. Use quotation marks for titles of articles; italicize titles of longer works such as periodicals, journals, and books; and underline web addresses, but make sure there is no live link.

Source 1: Excerpt from "Light as a Broad-Spectrum Antimicrobial" by Peter Gwynne and Maurice Gallagher. Published in the academic journal *Frontiers in Microbiology*, 2018 (adapted from original).

Research exists regarding the use of light as a sterilizing agent in food and water processing, much of it based around UV light. UV, however, penetrates poorly, limiting its application to surface decolonization. Although UV light is powerful, visible light wavelengths may be better in application.

Source 2: Excerpt from "Ultraviolet Disinfection of Drinking Water" by the Government of Western Australia Department of Health. Published on the website <https://ww2.health.wa.gov.au>, 2016 (adapted from original).



UV light will only travel in a straight line, so any obstruction will reduce its efficiency. Water that has not been filtered can contain iron, manganese, and other particles that can either absorb or scatter UV light, reducing the effectiveness of the system. Bacteria that are able to pass through—protected by shadows created by dirt, debris, or other particles—may be able to survive treatment.

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G. Scoring Assertion Specifications

Item writers create scoring assertions to outline the criteria used to score the item. Scoring assertions should capture the features of the student response that receive credit *and* the inference that the test developer would like to make from that evidence. The example below shows several scoring assertions for a multi-interaction item. For each assertion, the test developer describes the features of the student response that receive credit (“The student [selected, identified, etc.] ...”), then links that feature to an inference about student understanding (“providing evidence of [an ability to, an understanding of, etc.]”).

Your response earned **2** points of a possible **2**

Score Rationale	
The student selected distance as affecting the force, providing evidence of an ability to form a conclusion based on the data in the egg drop experiment.	
The student ran three trials keeping the mass of the box the same, providing evidence of an understanding of how to control variables in the egg drop experiment.	

The assertion includes several parts:

- The boiler plate language of “The student...” and “...providing evidence of an...”
- The action the student took in the item (e.g., selected, placed, moved, etc.)
- Some language from the standard/performance expectation showing alignment
- Some language referring to the specific task/phenomenon for the interaction

Assertions should be brief and clearly display action, alignment, and inference.

If there is dependent scoring present, some reference to that should be included:

[The student selected a distance or a factor based on their selection in part B...](#)

Each cluster must have the **minimum** number of assertions when it goes into the Locked Operational Pool. To accomplish this, clusters should be created and revised to have at least two more assertions than the minimum to account for interactions and assertions being changed, collapsed, or rejected throughout the review process.

- **Minimum** number of assertions for final operational version of a cluster:
 - Elementary: 5
 - Middle: 7
 - High: 7
- **Recommended minimum** number of assertions for working drafts/versions of a cluster:
 - Elementary: 7
 - Middle: 9
 - High: 9

H. Exemplar Conventions

When to Create Exemplars

There are three main reasons to create exemplars.

1. There must be an exemplar created for each point value before an item can be web approved.
 - a. Considering that clusters can have a larger number of possible point combinations, we propose that each exemplar created after the first exemplar adds the next consecutive assertion. See example below.
2. There should be an exemplar for each dependent scoring possibility, or one example in the case of infinite possibilities.
 - a. The dependent assertion exemplar should highlight the specific dependency. We recommend that each exemplar have the minimum number of assertions marked as true (only respond to the parts relevant to the dependency), so that it is easier to highlight the specific assertions and interactions involved in the dependency. This will likely mean that most dependency exemplars will be 1 point.
3. Exemplars can be created to highlight responses that are not scoring properly.
 - a. The reviewer should leave a comment in ITS that explains why the exemplar was created.

“The dependent scoring in part B does not work as described in the assertion text. See CR1Review_PartB for the response that should receive credit but does not.”

- b. The exemplar should be deleted when the issue is resolved.

Naming Conventions

Each exemplar should begin with a tag that indicates what type of exemplar it is, followed by a short description.

- Standard
 - This denotes “normal” scoring.
 - Follow with the point value:
 - Standard_2pt
 - Standard_FullCredit
- Dependency
 - This denotes that the exemplar relates to dependent scoring.
 - Follow with what part or parts are involved in the scoring, as well as a short description if there are several dependencies in those same parts.
 - Dependency_PartAB
 - Dependency_PartABC_greater
 - Dependency_PartA
- Review
 - This denotes a response that a reviewer had specific concerns about.
 - Begin with the review level in which the issue was found.
 - CR1Review_1pt
 - CR1Review_PartABC_greater

Example from Staging Site – IAT Sandbox 18402

Name	Points	Actions
Standard_FullCredit	3	View Delete
Standard_2pt	2	View Delete
Standard_1pt	1	View Delete
Dependency_PartAB	1	View Delete
Dependency_PartABC_greater	1	View Delete
Dependency_PartABC_equal	1	View Delete
CR1Review_1pt	1	View Delete
No response	0	View Delete

Exemplar: Standard_2pt

Saved By: Matthew_Davis

Date Saved: 4/22/2020 2:04:25 PM

Approved: No

Score response when exemplar was saved:

Your response earned 2 points of a possible 3

Score Rational	
The student entered a value of 5.	✓
The student entered a value of 7 for y, or a value that corresponds to the value of x entered in part A.	✓
The student selected $x < y$ or a selection corresponding to their values in parts A and B.	✗

I. Option Rationales (Formative, specific projects only)

IAT Options

- Multiple Choice: Select only one option.
- Multiple Select: Select two or more options.

Formatting Rationales

- Rationales for correct answers start with: "Key - ..."
- All rationales provide a brief reasoning for why the response is a key or distractor relative to the prompt.

Multiple Choice Example

How does energy flow through the ecosystem?

- A. The algae produce their own food.
Key - The algae are producers and, therefore, make their own food.
- B. The salmon makes its own energy.
The salmon is a consumer and must get its energy from eating other organisms.
- C. The sculpin relies on the salmon for energy.
The sculpin is eaten by the salmon.
- D. The mollusk produces energy from the salmon.
The mollusk is not eaten by the salmon.

Multiple Select Example

Select the **three** fossils of organisms that lived more than 300 mya (million years ago).

- Fossil 1
This fossil is found in the rock layer at the top of the column, which means the organism lived less than 30 mya.
- Fossil 2
Key - This fossil is found in the second rock layer from the bottom of the column, which means that the organism lived 450–500 mya.
- Fossil 3
Key - This fossil is found in the bottom rock layer of the column, which means the organism lived over 550 mya.
- Fossil 4
This fossil is found in the second rock layer from the top of the column, which means the organism lived less than 100 mya.
- Fossil 5
Key - This fossil is found in the bottom of the rock layer of the column, which means the organism lived over 550 mya.

J. Paper Style

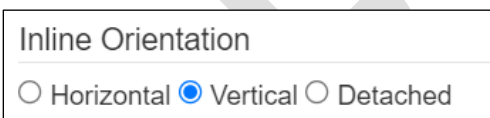
Compatible Item Types

ETC, MC, MS, Table Match, EQ

In most cases, language should be edited as little as possible to make the directions appropriate for paper use. However, the goal for the students is to make the testing experience as similar to the online experience as possible, so in some cases, the addition of directions is recommended in order to clarify instructions for interactions that are clearer online.

ETC Interactions

- Instead of “Click on the blank boxes and select ...” stems should read “Select the word or phrase ...” or “Select a word or phrase ...”
 - If there are multiple ETCs in one interaction, use “Select a word or phrase in each box to ...” or similar. It needs to be clear that only one selection in each grouping should be made. In causal chains especially (depending on the style), it needs to be clear that only one statement should be selected for each step. In these cases, “in each box” should be included in the stem for clarity.
 - In the ETC interaction, change the options to orient vertically. They should appear vertically in a box rather than next to each other horizontally.



Inline Orientation

Horizontal Vertical Detached

- For ranking interactions, use “Fill in the bubbles to rank”
- For interactions in which it is not obvious that students should make only one selection for each step—such as flowcharts or tables—add the statement “Make only one selection for each step.” “Step” may be replaced with an appropriate term for the interaction.
 - This statement is added because online, once students make a selection, that is the only selection shown, so they cannot accidentally select another choice. On paper, students may accidentally fill in multiple bubbles in the same step. The addition of this wording reduces the likelihood that students would make this mistake, therefore making the experience closer to the online testing experience.

MC and MS Interactions

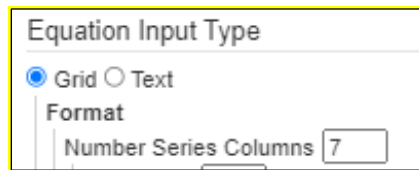
- Wording should match online wording.
- For choice interactions with graphics as options that are all vertical, consider changing the options to 2x2 (two rows with two options each).

Table Match Interactions

- Wording should be changed to “Fill in the bubbles to select/identify/etc.”
- If the online version of a table match allows only one box to be checked per row or column and this would not be obvious to the student viewing the item on paper, add verbiage to make this clearer, e.g., “Fill in one bubble in each row.”

Equation Interactions

- Check that the stem makes sense, given the appearance of the EQ on paper, and edit if needed. Include "Enter a number in each blank box." In the EQ Paper Renderer, always include 7 digits (columns), for **all** grade levels. This is consistent with the Math team's paper style.



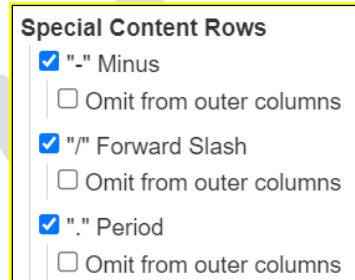
Equation Input Type

Grid Text

Format

Number Series Columns

- Make the bubbles match what is available in the online rendering as much as possible. That is, if subtraction, decimal, and/or fraction/division is allowed in the online version, include these for paper as well (note, however, that multiplication and addition are not available for paper). If they are not allowed for online, do not include them for paper. Machine scoring for paper works the same way as the scoring in the grub, so we can allow students to enter expressions on paper the same way we do for online.



Special Content Rows

"-." Minus
 Omit from outer columns

"/" Forward Slash
 Omit from outer columns

"." Period
 Omit from outer columns

Graphics

All graphics will be converted to grayscale. Ensure that graphics render appropriately. Graphics that require students to differentiate between colors should be avoided when possible. If the item refers to the colors in stems or options, but colors are not labeled in the graphics, labels should be added. Check any color graphics with the monochromacy view on the Coblis website (<https://www.color-blindness.com/coblis-color-blindness-simulator/>) to see whether edits are needed (e.g., adding patterns if colors appear the same in grayscale).

Example: Figure 1 shows parent flowers and offspring of various colors, and those colors are not labeled in the graphic. The question relating to Figure 1 is written as:

Describe the inheritance pattern of the flowers shown in Figure 1.

- A. Yellow flowers inherit their color from their parents.
- B. Orange flowers inherit their color from their parents.
- C. Blue flowers develop their color based on the environment.
- D. White flowers develop their color based on the environment.

Labels should be added to Figure 1 to clarify the color of each flower in the diagram because the colors cannot be determined in grayscale.

K. Preferred Editorial Styles

Spelling and Plurals

Common nouns

The plurals of most nouns are formed by adding *s*: boys, trees. Exceptions to this rule include the following:

- The plurals of words that end in *ch*, *j*, *s*, *sh*, *ss*, *x*, or *z* are formed by adding *es*: churches, biases, wishes, classes, foxes, waltzes.
- The plurals of words that end in a consonant and *y* are formed by changing *y* to *i* and adding *es*: babies, realities.
- The plurals of words that end in *o* are formed by adding *es* or *s*: heroes, potatoes, egos, cellos.
- The plurals of words that end in *f* or *fe* are usually formed by changing *f* to *v* and adding *es*: hooves, lives, but dwarfs, roofs.

Note: Many nouns have irregular plural forms (child/children, deer/deer, die/dice). When in doubt about the form or spelling of a plural, consult a dictionary.

Compound nouns

The plural of a hyphenated compound noun is usually formed by adding *s* to the main noun in the compound: brothers-in-law, courts-martial.

For solid, or closed, compound nouns, plurals are formed the regular way: classrooms, cupfuls, stopwatches.

The plurals of open compound nouns are formed by pluralizing the main noun: attorneys general, centers of industry.

Proper nouns

The plurals of proper nouns are usually formed by adding *s* or *es*. The plural of a proper noun ending in *y* takes an *s* (Monday/Mondays, the Smith family/the Smiths).

Letters, numbers, and abbreviations

The plurals of capital letters used as words, numerals used as nouns, and abbreviations are usually formed by adding *s*. To avoid confusion, the plurals of lowercase letters are formed by adding an apostrophe and an *s*.

Juan received all Bs on his report card.
the 1880s
DVDs
x's and y's

Possessives

Singular nouns

The possessive of most singular nouns, both common and proper, is formed by adding an apostrophe and an *s*. This includes words that end with an unpronounced *s* and names with an ending pronounced *eez*.

the marquis's quarters
Albert Camus's novels
Euripides's works

However, a noun that is singular in meaning but plural in form takes an apostrophe only.

this species' characteristics
Hocking Hills' nicest campground

Plural nouns

The possessive of most plural nouns is formed by adding an apostrophe only.

the Joneses' house
the Martinezes' son
but
children's literature
women's rights

Letters and numbers

The possessive of letters and numbers is formed by adding an apostrophe and an s.

LBJ's diary
1980's worst flood

Joint vs. separated possession

When closely linked nouns are considered a single unit and "possess" the same thing, only the second noun takes an apostrophe and an s.

my mom and dad's house
Amelia and Brianne's teacher

When the things being possessed are not the same, both nouns take an apostrophe and an s.

my mom's and dad's birth certificates
Cleveland's and Chicago's rail systems

Compound Terms

compound noun: two or more nouns combined to form a single noun

compound modifier: a modifier that consists of two or more words

- An *open compound* is written as two words: real estate, sand dollar.
- In a *hyphenated compound*, the words are joined by a hyphen: self-esteem, half-baked.
- A *solid compound* is written as one word: playground, textbook.
- Avoid compound modifiers like "fish-eating bird." Instead use "a bird that eats fish."

Compound modifiers

Compound modifiers are usually hyphenated before a noun and open after a noun.

an open-ended question; a question that is open ended
a well-read student; a student who is well read
a 250-page book; a book that is 250 pages long
a sixteen-ounce bottle; a bottle that holds sixteen ounces

There are a few exceptions to this rule:

- When the compound modifier is a common open compound noun, it should be hyphenated only to prevent ambiguity.

high school teacher
real estate listing
but
short-story writer
real-number theory

- When the first modifier in the compound is an adverb that ends with *-ly*, the compound is open.

highly paid assistant
hotly contested campaign

- When the compound is made up of a number and an abbreviated unit of measurement, the compound is open.

a 5 km race
a 3 m wall

- When a phrase is used as a modifier, it is usually hyphenated before a noun and open after a noun.

over-the-counter medicine; medicine sold over the counter
an up-to-date form; a form that is up to date

- When the second part of a compound modifier is omitted, a space follows the hyphen.

fifteen- and twenty-year mortgages
micro- and macro-evolution
but
third-, fourth-, and fifth-grade students

Prefixes and suffixes

Words that are formed with common prefixes and suffixes (*anti-*, *bi-*, *mid-*, *multi-*, *non-*, *over-*, *post-*, *pre-*, *re-*, *sub-*, *un-*, *under-*, *-fold*, *-less*, and *-like*) are usually closed.

Bivalve
Catlike
Multipurpose
Noninvasive

However, a hyphen should be used

- before a numeral or a capitalized word: post-1800, mid-September.
- before a compound term: non-self-sufficient.
- to separate combinations of letters that might be hard to read: anti-intellectual, de-ice, lava-like.

Use an en dash instead of a hyphen in a compound adjective when one of its elements consists of an open compound: post–World War II.

Capitalization

Proper nouns and adjectives are always capitalized.

Personal names and titles

All personal names (first, middle, last) are capitalized, as are initials, nicknames, and the suffixes Jr. and Sr. Do not set off a suffix with commas. Include a space between the initials in a personal name except when the initials are used alone.

Susan B. Anthony
Ivan the Terrible
E. B. White
Martin Luther King Jr.
LBJ

A person's title or office is capitalized only when it directly precedes a personal name and is part of the name.

President Lincoln; the president
Professor Johnson; the professor
Reverend Jackson; the reverend
General Grant; the general

When a title is used in apposition to a personal name (meaning it is used as a description rather than as part of the name), it is lowercase.

American president Lincoln
former president Bush
the Southern-born reverend Jackson

Kinship names

Kinship names are lowercase unless they directly precede or replace a personal name. When kinship names are used in apposition to personal names, they are lowercase.

My mom and dad have been married for 30 years.
Did you write to Aunt Kelly?
Can I have a cookie, Mom?
My kids love their aunt Kelly.

Racial and Ethnic names

Names of ethnic and racial groups are capitalized, as are adjectives derived from them. Do not hyphenate compound terms.

African Americans; African American poetry
Asians; Asian influence; an Asian American
Caucasians; Caucasian population

Geographic names

Proper names and nicknames are capitalized.

New York City
the Big Apple

Directional nouns are lowercase when they are used to indicate direction but capitalized when they refer to a distinct region.

a north wind; North African countries; in northern Africa

a southern climate; southern Ohio; the South; South America
eastern Illinois; the East Coast

Trademark and brand names

Use generic terms whenever possible. When using a brand name that is trademarked, capitalize the name but do not include the trademark symbol.

Post-it Notes; sticky notes
Kleenex; tissue

Titles of Works

Capitalization

Use headline style capitalization for titles of works. Capitalize the first and last words of the title and all interior words except

- articles (a, an, the).
- coordinate conjunctions (and, but, for, or, nor).
- prepositions, regardless of length, unless they are functioning as nouns, adjectives, or adverbs.
- the word *as*.
- scientific terms/names that begin with a lowercase letter (pH) or are lowercase in running text (*E. coli*).

Driving through Vermont
"The Ins and Outs of Trail Running"
"Reading for Fun"
Turn Up the Volume
A Primer on Soil pH

Hyphenated compounds in titles

Use the following guidelines for capitalizing a hyphenated compound in a title:

- Capitalize the first element of the hyphenated compound.
- Capitalize any subsequent elements unless they are articles, coordinating conjunctions (and, but, for, or, not), or prepositions.
- If the first element is a prefix or combining form that could not stand by itself as a word (anti, pre), do not capitalize the second element unless it is a proper noun or proper adjective.
- Capitalize the second number in a hyphenated number or fraction that is spelled out.

Heights of Sixth-Grade Students
Teacher-to-Teacher Initiatives
E-learning for Students
The Animals of Sub-Saharan Africa
Twenty-First-Century Skills
The Two-Thirds Majority

Tense

Present tense is the default tense. Some sentences will be in future and past tense.

Treatment of Terms

Note: See “Treatment of Numbers” in Part III for information about the preferred treatment of numbers.

Avoid the use of these words and phrases on science assessments:

- believe
- create
- prove (science does not work to prove hypotheses or theories true—this is a mischaracterization of how science works)
- truth (science is asymptotic to truth)
- above and below (referring to tables or graphics)
- of the following

Emphasis terms

Emphasis terms are boldface at all grade levels.

Select **all** the questions you could ask to help solve the dilemma.

Select **two** characteristics that can be hereditary.

However, avoid using qualifying terms like “best,” “most likely,” etc. In the rare instances when these terms are used, they should be boldface.

Which is the **most likely** reason the population of deer decreased?

Letters as letters

Letters referred to as letters in text are italicized.

Liam has 2 plant pots labeled with the letter *E*, 2 plant pots labeled with the letter *F*, and 2 plant pots labeled with the letter *G*.

Contractions

Contractions can be used in selections and other material from outside sources (e.g., stimuli). However, contractions are not used in items.

Options

The term “option” is never used in a prompt.

Incorrect: “Select the option” or “Which option”

Correct: “Select the [sentence, element, design, etc.]” or “Which [sentence, element, design, etc.]”

Abbreviations

Note: Except for abbreviated units of measure and forms of address, abbreviations are rarely used in items. Abbreviations are used in graphics when space is an issue.

Acronyms and initialisms

acronym: an abbreviation based on the initial letters of a term and pronounced as a word (NASA, OPEC)

initialism: an abbreviation based on the initial letters of a term and pronounced by spelling out each letter (AARP, DNA)

Acronyms and initialisms are usually set in all capital letters without periods. When an acronym or initialism is preceded by an indefinite article, the choice of a or an is based on the pronunciation of the abbreviation.

an HMO
an AARP newsletter
a DNA sample
a NASA initiative
an OPEC worker

Unless an acronym or initialism is extremely well known (e.g., IRS, PTA, NATO), spell it out the first time it is used and enclose the abbreviated form in parentheses after the spelled-out term.

The grade-level expectations (GLEs) for science are listed below.
The GLEs for English Language Arts (ELA) are listed in the next section.

Latin abbreviations

Use Latin abbreviations only in parenthetical text. The abbreviations most commonly used are e.g. (for example), etc. (and so on), and i.e. (that is). In text, these abbreviations are set in regular type.

Unapproved resource materials (cell phones, dictionaries, etc.) are not allowed during test sessions. Reference books (i.e., dictionaries, thesauri) are not allowed during test sessions.

Taxonomic/Systematic conventions

Genus and species names should always be written in italics, including where they appear in figures and tables.

Tyrannosaurus
Tyrannosaurus rex
T. rex

Genus and species abbreviations are written in a combination of italicized and non-italicized text.

cf. *Tyrannosaurus*
Tyrannosaurus cf. *rex*
Tyrannosaurus sp.
Tyrannosaurus spp.
Tyrannosaurus insertae sedis

Names for other systematic groups should not be written in italics (e.g., Plantae, Animalia, Abelisauroidae, Dromaeosauridae)

Genotypes

Genotypes and single allele letters should be italicized.*

Gg
BB
dd

*except when text formatting is not available within an interaction type (e.g., table input boxes)

Genes

- **Genotypes:** A genotype is the combination of alleles of a single gene. An allele is one of multiple possible forms of a gene. In organisms with two sets of chromosomes, an individual receives one allele from each of its two parents. For example, if one parent pea plant has the genotype *YY* for the gene for pea color and the other has the genotype *yy*, the offspring will receive one *Y* allele from the first parent and one *y* allele from the second parent, so it will have the genotype *Yy*, as determined by a Punnett square.
- **Phenotypes:** A genotype results in a specific phenotype, the physical trait in the organism. For example, a pea plant with the genotype *YY* would have yellow peas, while a pea plant with the genotype *yy* would have green peas. The offspring phenotypes are yellow and green, respectively. Because the *Y* allele is dominant to the *y* allele, a genotype of *Yy* results in a yellow phenotype.
- A pedigree chart represents the phenotypes of individuals in a family. Symbols in pedigrees should be clear and legible for students with colorblindness. Each generation should be labeled, e.g., "Parents" (or "P") and "Offspring" or "F1."
- Genotypes and single allele letters should be italicized except when text formatting is not available within an interaction type (e.g., table input boxes).

Genotype examples: *Gg*, *BB*, *dd*
Allele examples: *G*, *g*

- Phenotypes should **not** be capitalized or italicized.

yellow, green

- Nucleotides, the individual molecules in DNA and RNA sequences, should **not** be capitalized or italicized. Abbreviated nucleotides should be capitalized but **not** italicized.

adenine, thymine, cytosine, guanine, uracil
A, T, C, G, U

- Capitalize DNA and RNA. Always lowercase the "m" in mRNA, even if it is at the beginning of a sentence or part of a title.

mRNA is transcribed from DNA.

- Do **not** italicize chromosome names. Do **not** capitalize the word "chromosome" when naming them. Capitalize lettered chromosomes only.

There is a mutation in a gene on chromosome 20, but no mutations occur in the X chromosome.

- Full gene names should **not** be capitalized or italicized. Italicize gene symbols.
 - For example, the gene insulin-like growth factor 1 has the symbol *IGF1*.
- Follow scientific literature for appropriate capitalization of gene symbols. Note that different species may have different capitalization rules. For example, humans have the *IGF1* gene, while mice have the *Igf1* gene. However, the protein in both cases is capitalized as IGF1.

Proteins

- Protein names and amino acids should **not** be italicized.
- If a protein name uses the same abbreviation as the gene, ensure that other language is used to differentiate them to avoid assessing a student on recognizing the italics and understanding their meaning.

Use: "The mutation in the *IGF1* gene results in a change in the structure of the IGF1

protein.”

Do **not** use: “The mutation in *IGF1* results in a change in the structure of IGF1.”

- Amino acids should **not** be capitalized, but amino acid symbols should have the first letter capitalized.

alanine, cysteine, aspartic acid
Ala, Cys, Asp

- Use en-dashes in between groups of nucleotides or amino acid sequences (DNA). Do **not** leave blank spaces in between to show groupings.

GCA–TGC–GAC
Ala–Cys–Asp

- Codon charts show the amino acids, or codons, that are encoded by mRNA sequences. These can be in the form of a table or a wheel.
 - Because codon charts showing codons for DNA also exist, the title or the stem should specify that the chart is for mRNA for clarity. Because the chart cannot be read by TTS as a table would, the chart should be titled as a figure instead of a table.

Figure 1. mRNA Codon Chart

Geographic abbreviations

The names of states are spelled out in running text. Abbreviations are used where a zip code follows or in other contexts in which abbreviations are appropriate (e.g., acknowledgments, graphics, tables, lists). In these cases, use the two-letter postal abbreviations without periods.

Spell out United States when it is used as a noun; either the abbreviation U.S. or US may be used as an adjective.

The campus is in Westerville, Ohio.
Please mail the documents to PO Box 121, Cloverdale, VT, 00111.
the president of the United States (*not* the president of the US)
the U.S. Treasury Department

Time

Use capital letters without periods in indicate eras. (Note that BC and BCE follow the date, while AD and CE precede the date.)

55 BC
AD 1066

Months are spelled out in running text but may be abbreviated in graphics. Use the following abbreviations:

Jan.	May	Sept.
Feb.	June	Oct.
Mar.	July	Nov.
Apr.	Aug.	Dec.

Days of the week are spelled out in running text but may be abbreviated in graphics. Use the following abbreviations:

Sun. Thurs.

Mon. Fri.

Tues. Sat.

Wed.

Times of day: Lowercase letters followed by periods are used for a.m. and p.m.

millions of years ago (or million years ago): mya

500 mya

1 mya

billions of years ago (or billion years ago): bya

- gya (giga-annum) can be used but is likely to be less familiar to students.

4.5 bya

4.5 gya

light year: ly

Part II: Specific Style by Interaction Type

DRAFT

A. Multipart Items

Many items within a cluster will have more than one interaction for the student to complete. The types of interactions can differ throughout the item or the item can consist of one type of interaction repeated.

- Each interaction heading, or “part heading,” is title case and **bolded** before the stem of the interaction.
- There should be two hard returns between the part heading and the stem.

Part A

Select a testable, scientific question that can be answered by performing an experiment with the setup shown in Figure 1.

Note: The preamble sentences “The following question has two parts. First, answer part A. Then, answer part B.” are no longer used for our science items.

For the stem of subsequent interactions, do not refer back to the student’s response to previous interactions (“... you chose in part A”) unless there is dependent scoring. This referencing suggests that the student can get credit for pairing parts A and B correctly without selecting the correct answer to the question for part A.

Use:

Which given evidence supports the answer to part A?

OR

Which statement provides a reason for the answer to part A?

B. Multiple Selection (Multi-Select) Interactions

Multi-select items are selected response items that allow the student to choose more than one option.

Note: For multiple choice interactions, see “Selected-Response Interactions” in Part I.

Task Directions

- For all elementary and middle school interactions use “Select (number of options) ...” The number should be spelled out and **bolded**.

Select **four** statements that describe predator-prey relationships.

- For some high school interactions, the exact number of selections may be omitted.

Select **all** the statements that describe predator-prey relationships.

Options

- If options are one word or phrase, use lowercase; no punctuation is necessary.
- Option order:
 - In the order they appear in a stem graphic or table
 - In ascending order, if numeric options
 - Alphabetically or ascending or descending order, if all options are one word
 - By ascending or descending order, if phrases
 - If graphics only, arrange in a logical order

Human Readable Rubric

The human readable rubric outlines correct responses to the item.

Example:

A full-credit (1 point) response includes

The student selected:

- “the flower is red”
- AND
- “the flower is blue”

C. Edit Task Inline Choice (ETC) Interactions

ETC items allow students to select a response from a dropdown menu in order to complete a sentence or a cell in a table.

Task Directions

For one dropdown box, use: "Click on the blank box and select the word/phrase ..."

For two or more dropdown boxes, use: "Click on each blank box and select a word/phrase ..."

OR

"Click on the first blank box and select the word/phrase Then, click on the second blank box and select the word/phrase"

Note: When the student is directed to complete a model, causal chain, steps in a process, or similar task, do not use the phrases "in order" or "in sequence" as that is implied in the directive (the student would not be completing a chain of causality if the steps were out of sequence). (But see note in section H, External Copy Interactions.)

Options

The number of options in each dropdown will vary from dropdown to dropdown and from item to item based on content.

Dropdown options that are full sentences should have initial caps and end punctuation. In tables and other graphics, dropdown options that are fragments should have initial caps and no end punctuation.

The options within the dropdowns should be ordered using the same guidelines as multiple choice and multi-select interactions, most commonly in ascending length.

Human Readable Rubric

Example:

A full-credit (1 point) response includes

The student selected:

- "increased" for the first blank

AND

- "increased" for the second blank

OR

- "decreased" for the first blank

AND

- "decreased" for the second blank

Exemplar: Include the correctly completed sentence, diagram, or table.

D. Table Interactions

Table Match Interactions

Table match interactions allow the student to select cells within a table to show a relationship between the column header and the row header.

Task Directions

- Use: "Select the boxes to identify each organism's role in the ecosystem." OR "Select the boxes to show the order of the steps of (process) ..."
- When there is more than one correct answer combination in an item, the following guideline **may** be included:
 - There may be more than one correct answer.
- When it is unclear that a student can and should select more than one box, the following guideline should be included:
 - You may select more than one box for each part ...

Tables

- Column and row headings may contain text or graphics. When graphics are present, it is preferable for a text label or descriptor to be present.
- In the directions, refer to the first column first (when possible).
- If the text in the column or row heading is a complete sentence, it should begin with a capital letter and end with the proper punctuation.
- If a column or row heading is a phrase or one word, it should begin with a capital letter and should not end with a period.
 - The subsequent words of a phrase should not be capitalized, unless the phrase is a proper noun or adjective.
- Within an item, column headings must all follow either title case/capitalization or sentence case. Within an item, row headings must all follow either title case/capitalization or sentence case.
- Title and sentence case/capitalization should be used consistently. Column and row headings should be in one of the following orders when they appear:
 - In the order they appear in a stem graphic or stem table
 - In ascending or descending order if all options are one word
 - By length (ascending/descending) if phrases
 - If graphics only, arrange in logical order
- Column headings should be bolded, centered, and boxed and have no shading.
- Row headings should be normal weight text and have no shading.
 - Left align row headings when one or more headings have more than one word
 - Center row headings that are a single word or number

Human Readable Rubric

- Use quotes to reference the row and column headings in the interaction.
- Row and column heading references are capitalized as they are in the interaction.
 - Row and column headings with no text should be described. Example: the picture of a new moon
- Example:

A full-credit (1 point) response includes

The student selected:

- "Blue" and "Green" for "Reflected"

AND

- "Orange" and "Yellow" for "Absorbed"

AND

- Nothing else

Exemplar: Include a correctly completed table.

Table Input Interaction

Table input interactions allow the student to enter numbers, symbols, and/or words into the cells of a table.

Task Directions

- Use: "Enter the [number, value, etc.] in the blank box."
- Let the student know if there is more than one correct answer.

Note: For table specifications, see the "Table" section of "Table Match Interaction."

Human Readable Rubric

Example:

A full-credit (1 point) response includes

The student entered:

- "8" for column 2, row 2

AND

- "12" for column 3 row 3

Exemplar: Include a correctly completed table.

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E. Hot Text Interactions

Hot text interactions allow the students to click on text to “select” it.

Task Directions

- Use “Select the [words, sentences, etc.] that ...”

Human Readable Rubric

Example:

A full-credit (1 point) response includes

The student selected:

- “nucleus”

AND

- “cell wall”

DRAFT

F. Graphic Response Interactions

Graphic response or “grid” interactions allow students to drag/ drop, draw dots or lines, and/ or use hot spots to complete a diagram or model.

Note: See the “Graphs” section of Part IV for graph specifications.

Task Directions

- Response boxes contained in the grid background are referred to as “blank boxes” in task directions and guidelines.
- References to “correct,” “appropriate boxes,” etc., in the task directions and guidelines should be avoided.
- To help the student navigate the various components of the item, use consistent language in the stem, palette objects, and answer space.
 - For example, if the item is about Jupiter, the various components of the item should use the word “Jupiter” and not the more general reference to “planet.”
 - If the palette objects are referred to as “birds” in the task directions, they should be referred to as “birds” in the guidelines as well.
 - This consistency should be extended to the scoring assertion rationales.
- Whenever possible, refer to the material in the answer space in specific terms (“in the picture,” “in the table,” “in the graph,” etc.). Do not use the terms “graphic,” “image,” or “answer space.”
- References in the stem to diagram headings and grid background titles should be in the same capitalization as in the headings and titles but should not be bolded.
- Whenever possible, refer to the palette objects and groups of palette objects in specific terms (e.g., “chemical elements”).
 - Reference to two or more palette objects should be lowercased.
 - If the palette objects are just pictures, lowercase the references to them in the stem.
 - Reference to a specific palette object in the stem should use the same capitalization as in the palette object labels.
- If it is not possible to refer to palette objects in specific terms, then:
 - A palette object that includes a picture, with or without a label, is referred to in the item as an “object/picture/diagram.”
 - A palette object that is text only can be referred to as a “label/name.”
 - A mixed collection of palette objects can be referred to as “object/label.”
 - **Do not** use the term “palette object.”
- **Palette Bar Drag and Drop Interactions:** For interactions where palette objects appear in the left palette bar, use the verb and preposition “Place ... in ...” in task directions. Also, refer to boxes with dashed lines as “blank boxes.” (Note: Do not use the term “drag.”)
- **Pre-placed Drag and Drop Interactions:** For interactions where palette objects are preset in the gray pre-placed box in the grid background, use the verb and preposition “Move ... into ...” in task directions. Also, refer to boxes with dashed lines as “blank boxes.” (Note: Do not use the term “drag.”)
 - Pre-placed interactions should **not** have a Delete tool. The student will not be able to get the palette object back once it is deleted, so the tool is not needed.
- **Hotspot Interactions:** Interactions that allow students to select multiple words, text graphics, etc. on the background in order to complete their machine scored constructed response. For these interactions, use the verb “Select ...” in task directions.
- **Hotspot Bar Graph Interactions:** Interactions that allow students to construct a bar graph. For these interactions, use “Click on a line to show where the top of each bar should be” in the task directions.
 - Note: Bar graph interactions should have only ‘select’ hotspots. Do not add ‘hover’ hot spots for any grade level. This is consistent with CAI math item development.
- **Graphing Interactions:** Interactions that require the student to use the “Add Point,” “Connect Line,” and/or “Add Arrow” tools. For these interactions, use the verb “Use ...” in

the task directions; also, use the term "tool," not "button" (e.g., "Use the Add Point tool to ...").

- Note: Interactions that contain the "Connect Line" and/or "Add Arrow" buttons must also have the "Add Point" button. Buttons should be in the following order: Delete, Add Point, Connect Line, Add Arrow (single), Add Arrow (double).
- When applicable, the following guidelines should be included:
 - "Use only **one** [palette object] in each blank box you fill in."
 - Note: this is used in all drag and drop items in which only one answer is required or fits in each blank box. Also, the word "one" should be bolded.
 - "The [palette objects] may be used once, more than once, or not at all."
 - "The [palette objects] may be used more than once."
 - "Not all [palette objects] may be used."
 - Note: this is used when the number of palette objects equals or exceeds the number of blank boxes.
- The guidelines above may vary in language in order to reference specific aspects of an interaction.
 - Use specific references to the object, rather than the word "object," when possible. If not possible, use "object."
 - For items that have only labels and no objects, use "label."
 - For items that have only one box to fill in, use "the blank box."

Human Readable Rubric

- It is not necessary to use quotes for references to palette objects or graphic labels in written rubrics.
- Palette objects with text are capitalized as their labels are capitalized, and are not described as "the 'Maple Tree' object."
- Palette objects or response box locations with no text should be described. Example: "the picture of a new moon."
- Example:

A full-credit (2 point) response includes

The student placed:

- Only the red bird in the smallest birdhouse region

AND

- Only the black bird on the power lines OR on the roof

- Exemplar: Include a snapshot of the correct response.

G. Simulation Interactions

Simulation interactions allow the student to investigate a phenomenon by selecting variables to get output data. Some simulations are accompanied by animations.

Task Directions

Simulation directions should be as clear and simple as possible.

- State the task clearly and concisely.
- Use either “controlled experiment” or “investigation” when discussing the type of activity the student is using the simulation for.
- Include the directive to either “Click on Start to [run a trial, see the results, etc.]” or “Click on Run to [run a trial, see the results, etc.]” depending on whether the button says “Start” or “Run.”
- State the number of trials that can be run.
- A guideline should always be included informing the student as to whether they can delete trials using the trash can icon or not.
- Provide the student enough direction that they will provide the information needed for scoring.

Examples (prompt only):

Use the simulation to gather measurements that can be used to predict the weather.

Use the simulation to test prototypes for the design.

Example (prompt with guidelines):

Use the simulation to conduct a controlled experiment to determine what makes the balloon float.

- You will be limited to **five** trials.
- Click on Start to run a trial.
- Click on the trash can at the end of the row to delete a trial and generate new data.
- You will be scored only on the trials present in the simulation table.

Layout

Simulations can be in a stimulus or item. Layouts of the simulation will vary due to content being investigated.

Animations

Animations within a simulation should follow the standard animation guidelines. Animations should be as short as possible in order to decrease the amount of time spent on the simulation by the student. Use the directive to “Click on the small gray arrow to start the animation ...” OR “Click on the small gray arrow to watch [Earth revolve around the sun, the rabbit come out of its hole, etc.]”

- Animations within a stimulus should be no wider than 350 pixels to avoid horizontal scrolling.

Output Table

Output tables should follow the same format and style of data tables presented in text.

Human Readable Rubric

- Students are scored on their decisions during the investigation.
- The combination of variables needed for each score point should be listed.
- Example:

A full-credit (3 point) response includes

The student ran trials with the following variables:

- "blue," "heavy," and "square"
- AND
- "yellow," "heavy," and "square"
- AND
- "blue," "light," and "square."
- Exemplar: Include a snapshot of a correct output data table.

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H. External Copy Interactions

External copy items allow the student to select text from the stimulus to copy into the answer space.

Task Directions

- Include the directive "Click on each pencil icon and select [an event, a step]."
- Include the guideline "Click on the circular arrow that follows any selection you would like to change."
 - This should be the first bulleted guideline, followed by any appropriate optional guidelines listed below.
- Optional guidelines include:
 - "The [first, last, etc.] [event, step] is provided."
 - "The possible [events, steps] are out of order."
 - "Not all of the events will be used."

Selection Table

- Possible steps or events are listed in a table that is one cell with a table title. The table is centered in the item.
- The steps or events are listed with bullets and are ordered according to length.

Example:

Complete the events to model... Click on each pencil icon and select an event.

- Click on the circular arrow that follows any selection you would like to change.
- The first event is provided.
- The possible events are out of order.
- Not all of the events will be used.

Possible Events

- | |
|---|
| <ul style="list-style-type: none">• The possible events or steps are listed in length order.• They are in sentence case.• The list is left aligned. |
|---|

Human Readable Rubric

The human readable rubric outlines correct responses to the item.

Example:

A full-credit (1 point) response includes

The student selected:

- "the flower is red"
- AND
- "the flower is blue"

E. Equation (EQ) Editor Interactions

Equation (EQ) Editor interactions allow the student to enter numbers, symbols, etc. into the answer space by either typing them manually or by using the built-in keyboard.

Task Directions

- Use “Enter the [equation, number, value, etc.] in the blank box.”

Human Readable Rubric

Example:

A full-credit (1 point) response includes

The student entered the equivalent of:

- “10.512”

AND

- “5k - 20y”

Keyboard

The keyboard is tailored to what the student needs to complete each interaction. Always include the absolute minimum number of buttons that the student will need.

The default keyboard includes a number pad, two fraction buttons, operators, and inequality symbols (see Default graphic below). *Always remove the standalone fraction button.* Also, remove the inequality symbols if they will not be used. This leaves the standard keyboard with the number pad, one fraction button, and the operators (see Standard—Revised Default graphic below).

Default

The screenshot displays the 'Configurator' interface for the Equation Editor. On the left, there are several settings: 'Interaction Name' (a text input field), checkboxes for 'Place in Passage', 'Section', 'Tutorial', 'ASL Video', and 'HVR', a 'Configurator' button, and dropdown menus for 'Add Row', 'Add Tab', 'Add Button', and 'Version'. The 'Keyboard Style' is set to 'floating' and 'Show Keyboard' is checked. On the right, the 'Editor' preview shows a top bar with an 'Answer Box' and buttons for '+' and 'x'. Below this is a navigation bar with left and right arrows and a delete icon. The main keyboard area contains a grid of buttons: a 3x3 grid for numbers 1-9, a row for 0, a decimal point, and a fraction button; a row for '+', '-', 'x', '÷', and 'Delete'; a row for '<', '=', '>', and 'Delete'; and a final 'Delete' button at the bottom left.

Standard—Revised Default

Interaction Name

Place in Passage

Section

Tutorial

ASL Video

HVR

Configurator

Add Row :

Add Tab :

Add Button :

Version :

Keyboard Style :

Show Keyboard :

Editor

+ x Answer Box

← → ↶ ↷ ✕

1	2	3	+	-	×	÷	Delete
4	5	6					
7	8	9					
0	.	$\frac{\square}{\square}$					
Delete							

Operators at Different Grade Levels

- To change the operators on the keyboard, click “Add Row.”

Operators for grades K–5

- This is the default. It can be selected as “Operations.”
- The multiplication symbol is x.

ASL Video

HVR

Configurator

Add Row :

Add Tab :

Add Button :

Editor

← → ↶ ↷ ✕

1	2	3	+	-	x	÷	Delete
4	5	6					
7	8	9					
0	.	$\frac{\square}{\square}$					
Delete							

Operators for grades 6–12

- Select “Operations_After_Grade_6.”
- The multiplication symbol is *.

The image shows a software configurator interface. On the left, there are two unchecked checkboxes: "ASL Video" and "HVR". Below them is a grey button labeled "Configurator". Underneath the button are three labels with dropdown menus: "Add Row :" with a dropdown showing "Operations_After_Grade_6", "Add Tab :" with an empty dropdown, and "Add Button :" with an empty dropdown. On the right, a calculator keypad is displayed. It has a top row with left and right arrow buttons, undo and redo buttons, and a delete button. The keypad itself has rows of buttons for digits 1-3, 4-6, 7-9, 0, a decimal point, and a fraction template button. Below the keypad is a "Delete" button.

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F. Data Exploration Interactions (TUVA Graphs)

Task Directions

Graph 1 allows you to select which data to place along the x - and y -axes. You may make several graphs as part of your investigation of the data.

- To make a graph, click on an attribute and then click in the blank box that represents either the x - or y -axis.
- You can change the way the graphed data appear by using the toolbar at the top.
- You may place more than one attribute on each axis by dragging the attribute to the small "+" sign to the left of or below the current attribute.
- To change your selection, click on the small "x" to remove an attribute from that axis, and then add a new one.

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A. Treatment of Numbers

Note: This section provides GENERAL guidelines for the treatment of numbers. These guidelines are applicable to ALL content areas.

Words vs. Numerals

Use **words** for

- Numbers zero through nine, with the exceptions in this section.
- Numbers that appear as the first word in a sentence (content specialist determines exceptions).

Acceptable

10 mice are white.

Preferred

Ten mice are white.

OR

There are 10 white mice.

Use **numerals** for

- numbers 10 and above.
- numbers that precede abbreviated units of measure.
- numbers that precede or follow symbols: 10%, \$20.00.
- numbers that appear in equations/expressions.
- numbers used to solve mathematical problems.
- numbers included in parts of published works: volume 2, chapter 4.
- dates and years: 1000 BC; December 1, 1975.
- times of day that precede the abbreviations a.m. and p.m.: 11 a.m., 3:00 p.m.
- telephone numbers.

In lists and series of numbers, use either words or numerals consistently.

Pat observes the following insects: 10 ants, 5 flies, and 2 crickets.

A circle graph is divided into five sections labeled 3, 6, 9, 12, and 15.

Note: The content specialist determines whether to use words or numerals when guidelines for the treatment of numbers contradict one another.

Ordinals

- Spell out ordinals first through ninth.
- Use numerals for ordinals 10th and above; when numerals are used, suffixes are set on the baseline, not in superscript.
- In lists and series of ordinals, use either words or numerals consistently.

The student finished the race in second place.

The 25th customer to enter the store today will win a prize.

Commas in Numbers

Use a comma in

- numbers with five or more digits: 50,000.
- numbers with four digits only if other numbers in the item have five or more digits.

The teacher has driven his car a total of 28,000 kilometers in three years. He drove 6,000 kilometers the first year.

- numbers written as words: one million, eighty-seven thousand, three hundred twenty-two.

Do **not** use a comma in

- numbers with four digits (unless other numbers in the item have five or more digits).

The teacher drove her car 836 kilometers in August, 1027 kilometers in September, and 914 kilometers in October.

- compound measures, such as height measurements: 12 meters 50 centimeters—not 12 meters, 50 centimeters. (Note: In most cases, use 12.5 meters.)

Values Less Than One

- Use singular units of measure with values less than one: 0.25 gram, not 0.25 grams.
- Include a zero before the decimal point in decimal values less than one: 0.15, not .15.

Negative Numbers

- Use a mid-point en dash to indicate negative numbers. Which point has the coordinates (2, -5)?

Fractions

The content specialist determines whether fractions are spelled out or expressed as numerals.

- As words, fractions are hyphenated as nouns, adjectives, and adverbs. Two-thirds of the students in the class ride the bus.
- As numerals, fractions are stacked vertically and appear at 90% of the base text size:
14 pt. = 12.6 pt.

A student gave $\frac{1}{4}$ of her sandwich to her friend.

Percentages

- Use the word percent after a number word. Five percent of the dogs have spots.
- Use the word percentage, not percent, as a stand-alone term. What percentage of the cats are white?
- Use the percent symbol after a numeral: 5%. (See “Symbols and Special Characters” in Part V for the preferred styles for symbols and special characters.)

Of the marbles in the jar, 40% are red and 60% are blue.

Exponents

Exponents and other superscripted characters are scaled to 70% of the base text size: 14 pt. = 9.8pt.

$$s^2 \times 7 = 28$$

Ratios

Use a colon in ratios. Do **not** insert a space before *or* after the colon.

The ratio of solute to red solvent is 1:4.

Coordinates and Ordered Pairs

- Enclose coordinates and ordered pairs in parentheses.
- Include a comma, followed by a space, after the first number.

Point A has the coordinates (3, 4).

- Include a space after the name of a point that precedes coordinates or ordered pairs.

Line m begins at point A (2, 5) and ends at point B (-1, -3).

Dates

- *Abbreviated years:* Avoid abbreviating years whenever possible. When a year is abbreviated, the first two numbers are replaced by an apostrophe (not an opening single quotation mark): the blizzard of '76.
- *Months and days:* In running text, dates are written in the following form: February 10, 2012.
- *Centuries:* Centuries are spelled out and lowercase: the twenty-first century, nineteenth-century literature.
- *Decades:* Decades can be spelled out or expressed as numerals; if spelled out, they are lowercase: the nineties, the 1990s. (Note that no apostrophe is used in the plural form of decades.)
- *Eras:* Eras are expressed as numerals: 55 BC, AD 1066. (Note that BC and BCE follow the date, while AD and CE precede the date. All four abbreviations are uppercase with no periods.)

Times of Day

The content specialist determines how to present times of day in individual test items. The following conventions should be applied based on the presentation selected:

- Use numerals with the abbreviations a.m. and p.m. (Note that the abbreviations are lowercase with periods.) It is redundant to include phrases such as "in the morning," "in the afternoon," or "at night" after a.m. or p.m.

The student wants to see a movie that starts at 4:10 p.m.

- Spell out numbers used with the term "o'clock."

The student leaves for school at eight o'clock.

- To avoid confusion, spell out the terms noon and midnight (in place of 12 a.m. or 12 p.m.).

The student works from 6:30 p.m. to midnight.

B. Equations / Expressions and Patterns

General Guidelines

- In general, equations and patterns are 14 pt. Verdana; however, the font sometimes varies for equations and patterns that include symbols.
- In introductory statements, use the term “equation” or “expression” to refer to an equation or expression. Do not use the term “number sentence.”
- Use the term “pattern” to refer to patterns of numbers and patterns of symbols.
- Use the term “step” to refer to the position of a term in a pattern: the fifth step in the pattern.
- In items, equations are center-aligned and can be given the headings “Equation 1,” “Equation 2,” etc.
- See “Graphics and Other Stimuli in Items” in Part I for additional guidelines.

Variables and Symbols

- In general, variables are lowercase and italicized. (However, variables in provided formulas can be uppercase or lowercase, as tradition and context dictate.)

Solve for x .

formula for area: $A = lw$

- In **grades 3–5**, use boxes to indicate missing/unknown values in equations.
- In **grades 6 and above**, use variables or boxes to indicate missing/unknown values in equations.

$$6 + n = 12$$

- In all grades, use a question mark or underscored blank space to indicate missing terms in patterns. (The content specialist determines whether to underscore the question mark.)

$$2, 4, ?, 8, 10$$

Operational Symbols

See “Symbols and Special Characters” in Part IV for a complete list of operational symbols used in Mathematics as well as the preferred styles for symbols and special characters used in item text and graphics. See “Words vs. Symbols” in this section for information about using words and symbols to identify geometric objects in running text.

Multiplication symbols.

- In grades 3–5, use the multiplication symbol.

$$8 \times 7$$

- In grades 6 and above, use the product dot or do not include a symbol. (Do not use the \times symbol, except in scientific notation, to avoid confusing with the variable x .)

$$8 \bullet 7$$
$$(10 - 2)(7)$$

- In all grades, use the multiplication symbol in scientific notation.

$$5.02 \times 10^6$$

C. Units of Measure

When to Abbreviate

- Spell out units on their first usage in a cluster stimulus or in an item stem followed by the abbreviation in parentheses.
- Abbreviate units thereafter in item stems or options.

Stephanie has 15 pieces of string. Each piece is 5 meters (m) long. How many meters of string does Stephanie have altogether?

- A. 25 m
- B. 50 m
- C. 75 m
- D. 100 m

- Spell out units in tables (See "Units of Measure" in Part IV for additional information.)
- Abbreviate units in graphics. (See "Units of Measure" in Part IV for additional information.)

Abbreviations

Note: Do not include periods in abbreviated units of measure.

Metric Units

Table 4 shows the correct abbreviations for metric units of measure.

Table 4. Abbreviations for metric units of measure

Unit	Abbreviation
Millimeter	mm
Centimeter	cm
Meter	m
Kilometer	km
Milligram	mg
Gram	g
Kilogram	kg
Milliliter	mL
Liter	L

kilogram-meter per second = kg·m/s

Here is a link to SI units to use as a resource:

<https://www.nist.gov/pml/weights-and-measures/metric-si/si-units>

Hyphenated abbreviations used with numbers as modifiers are not hyphenated.

Example: a 10 m pole, a 10-meter pole

Temperature Units

Table 5 shows the correct abbreviations for units of temperature.

Table 5. Abbreviations for units that measure temperature

Unit	Abbreviation	Unit	Abbreviation
degrees Celsius	°C	degrees Fahrenheit	°F
Kelvin	K		

Note: Degrees Fahrenheit is preferred when discussing weather or body temperature.

Time Units

Table 6 shows the correct abbreviations for units of time.

Table 6. Abbreviations for units that measure time

Unit	Abbreviation	Unit	Abbreviation
Day	day	Hour	hr
Minute	min	Month	mo
Second	s	Year	yr

Plural Units

- Do not add an "s" for plurals of abbreviated units.

Melissa is making 10 identical saltwater solutions. She needs 100 milliliters (mL) of distilled water to make 1 solution. How many milliliters of distilled water does she need to make 10 solutions?

- A. 10,000 mL
- B. 1,000 mL
- C. 100 mL
- D. 10 mL

- Use a singular verb with physical quantities. How many grams (g) of silver is produced?

Punctuation and Spacing

- Do not include periods in abbreviated units: cm, s, cm, m/s²
- Do not include commas in compound measures, such as height measurements: 12 meters 50 centimeters—not 12 meters, 50 centimeters. (Note: In most cases, use 12.5 meters.)
- Include a space between numerals and abbreviated units, except in temperatures: 30 cm, but 90°F.
- In temperatures, do **not**
 - include a space between the numeral and degree symbol, or between the degree symbol and the unit: 0°C.
 - use a degree symbol with the abbreviation for kelvin: 223K not 223°K.
 - There is also NO space between number and degree symbol or directional in longitude or latitude measurements: 90°N.

Square and Cubic Units

- When units are spelled out, spell out the terms square and cubic.
- When metric units are abbreviated, use superscript to show square and cubic units.

The student drew a square with a side length of 6 centimeters (cm). What is the area, in square centimeters (cm²), of the student's square?

- A. 15 cm²
- B. 30 cm²
- C. 36 cm²
- D. 54 cm²

- When customary units are abbreviated, use sq and cu for units.

83 sq m

Conversions

The content specialist determines whether to include conversions in items.

- When included, conversions are enclosed in brackets after the punctuation mark at the end of the stem. The conversion itself includes no punctuation.

What is the volume of the rectangular prism?
[1000 milliliters (mL) = 1 liter (L)]

- Use an equal sign in conversions that involve units of measure; always position the value with the smallest unit on the left side of the equal sign.

What is the area, in square meters (sq m)?
[100 centimeters (cm) = 1 meter (m)]

- Use the term "represents" in conversions that involve scales or that assign a value to a graphic.

What is the total area of the grid? [" represents 1 unit]

Pi

If an approximation for pi is desired to be given in a particular item, the value of pi should also be enclosed in brackets at the end of the item stem. However, the value is stated as a sentence that ends with a period.

What is the height of the cylinder? [Use 3.14 for π.]

D. Preferred Language

Conditional (“if”) Clauses

Recast conditional clauses (e.g., “If this happens ...?”) when possible. If a conditional clause cannot be avoided, position it at the end of the sentence.

Let $x = 7$. What is the value of y ?

not

If $x = 7$, what is the value of y ?

The pattern continues. Which shape will be in step 25?

not

If the pattern continues, which shape will be in step 25?

Table vs. Chart

- Use “table” when data are organized and related in some way.

The student recorded the measurements in the Volume of Water vs. Height of Plants table.

- Use “chart” when data are not organized to emphasize comparison among discrete items or related in any way (e.g., data that are listed).

The Fancy Pens chart lists the types and colors of pens the student can buy.

Percent vs. Percentage vs. %

- Use the word “percent” after a number word.
- Use the word “percentage” as a stand-alone term: a percentage of students.
- Use the percent symbol after a numeral.

A student has 20 folders. Each folder is either red, green, or yellow. Twenty percent of the folders are red. Forty percent of the folders are green. What percentage of the folders are yellow?

- A. 20%
- B. 30%
- C. 40%
- D. 50%

Constructed-Response Items

- Include units of measure in the stem so that students are not penalized for omitting units from their responses. Also, CR stems should be worded as imperatives (e.g., “Calculate the area”), not questions (e.g., “What is the area?”).

Calculate the area, in square meters (sq m), of the garden.

- In sentences that refer to item parts, the word “part” is lowercase and the part letter is capitalized.

Identify the statement that supports the choice in part A.

- The content specialist determines the language of statements that ask students to justify their answers.

Show your work. Explain your reasoning.

Show or explain how you got your answer.

Show or explain how you know your answer is correct.

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Note: The specifications in this section are for all graphics, including graphics used in technology-enhanced interactions (TEIs).

A. Text Elements

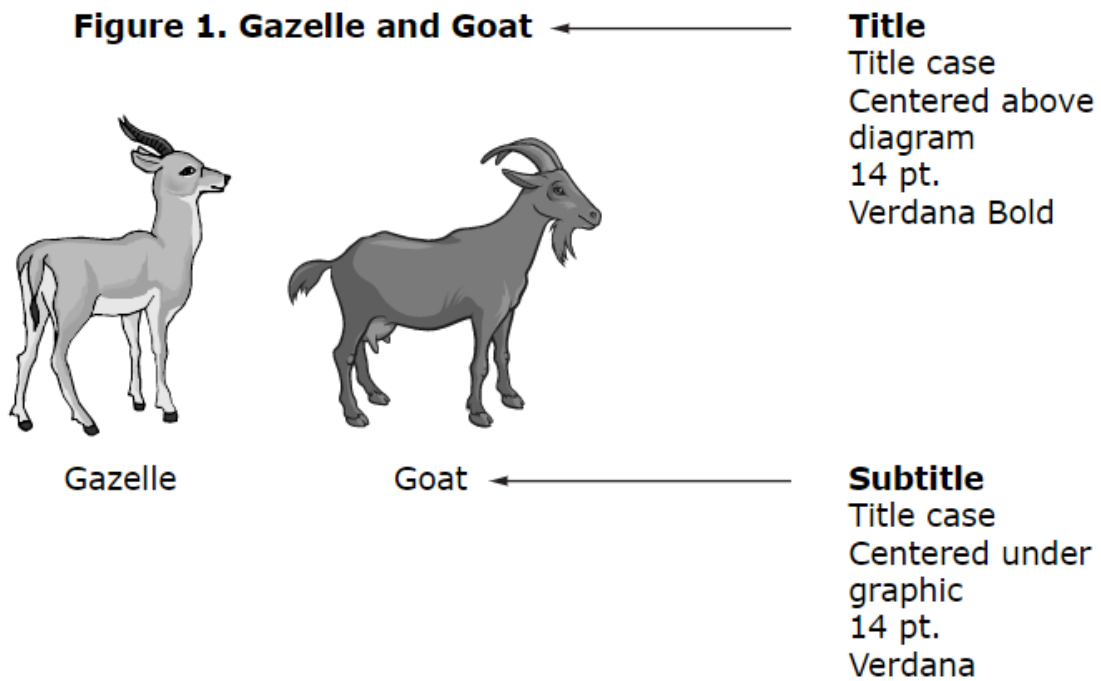
This section provides specifications for text elements that appear in graphics.

Text Size

All noted text label sizes are the size they should render.

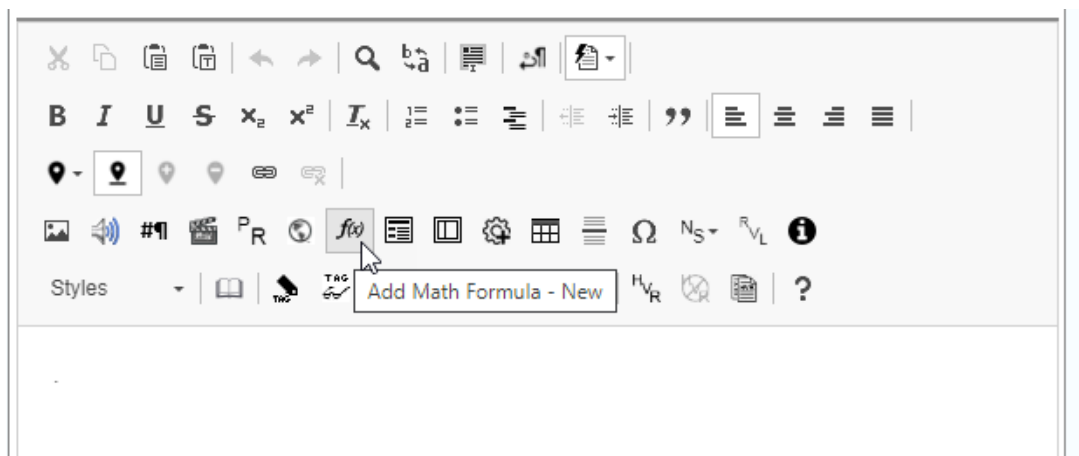
Example: To appear as 14 pt. in Web Preview, the SVG file needs to be scaled up 133%. So, size 14 pt. font $\times 1.33 = \sim 18.62$ pt. font size within the graphics file.

Example of title and subtitles:

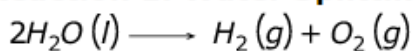


Chemical Equations

Chemical equations are created in the Add Math Formula editor in the Rich Text editor.



Reaction 1. Water Splitting



Reaction 2. Ozone Equilibrium



- Do not italicize parts of the reaction, including states of matter.
- States of matter [(l), (g), (s)] should not be subscript.
- Spaces around operators and the arrow (e.g., "2H₂O + O₂," not "2H₂O+O₂") should appear in the rendered image even if they are not entered into the editor.
- Do not include a space after coefficients (e.g., "2H₂O," not "2 H₂O").

Fonts

In general, text in graphics is Verdana. However, exceptions are made for graphics that require a special look (e.g., advertisements, posters). Table 7 shows general font specifications for different text elements in graphics.

Table 7. General font specifications for text elements in graphics

Font Specifications	
Text Element	Font
Title	<ul style="list-style-type: none">- 14 pt. Verdana Bold- Title case
Headings (e.g., axes headings, column headings)	<ul style="list-style-type: none">- 14 pt. Verdana Bold- Title case
Labels and text	<ul style="list-style-type: none">- 14 pt. Verdana- Sentence case
Credit lines	<ul style="list-style-type: none">- 10 pt. Verdana- Lowercase

Note: At this time, Verdana is specified as the primary font for test content.

However, another font may be chosen upon further analysis of the effects that fonts have on readability and students' ability to retain information.

Symbols and Special Characters

The table that follows shows the preferred styles for symbols and special characters. These specifications apply both to symbols in graphics and symbols in text, with the exceptions noted.

- In graphics, the size and style (e.g., boldface, italic) of a symbol depends on where it appears in the graphic. For example, a symbol that is part of a title is 14 pt. and boldface. Use Table 7 in the previous section to determine the correct size and style of symbols.
- In items, symbols are the same size and style as the surrounding text.

Table 8. General font specifications for symbols and special characters in graphics and text

Font Specifications for Symbols and Special Characters		
Symbol/Character	Font	Description
&	Verdana	- Ampersand - Do not use in science
©	Verdana	- Copyright symbol - Used in acknowledgments and credit lines
\$2.00 50¢	Verdana	- Dollar sign/cent symbol - Used in dollar amounts
%	Verdana	- Percent symbol - Used in percentages
'	Verdana	- Smart (curly) apostrophe - Used in possessives
'	Verdana	- Prime mark - Used to indicate prime numbers
‘	Verdana	- Okina - Glottal stop used to spell Hawai‘i
0°C 45° angle	Verdana	- Degree symbol - Used in temperatures and angle measures - No space between number and degree symbol or between degree symbol and unit of measure
+	Verdana	- Addition symbol - Used in equations/expressions
–	Verdana	- En dash - Used as subtraction symbol in equations/expressions; also used in number ranges and with negative numbers
×, •	Verdana	- Multiplication symbol and product dot - Used in equations/expressions

Table 8. General font specifications for symbols and special characters in graphics and text (*cont.*)

Font Specifications for Symbols and Special Characters		
Symbol/Character	Font	Description
÷	Verdana	<ul style="list-style-type: none"> - Division symbol - Used in equations/expressions
=	Verdana	<ul style="list-style-type: none"> - Equal sign - Used in equations/expressions
$\frac{1}{2}$	Verdana	<ul style="list-style-type: none"> - Vertically stacked fraction - Scaled to 90% of text size: 16 pt. = 14.4 pt.; 14 pt. = 12.6 pt.
π	Symbol Std.	<ul style="list-style-type: none"> - Pi - Not italicized - Used in equations/expressions
~	Verdana	<ul style="list-style-type: none"> - "Similar to" symbol - Used to indicate similar lines, shapes, and angles
(4, 3)	Verdana	<ul style="list-style-type: none"> - Coordinates and ordered pairs - Enclosed in parentheses - Comma, followed by space, after first number
1:2	Verdana	<ul style="list-style-type: none"> - Ratio - No space before <i>or</i> after colon
$V = l \times w \times h$	Verdana	<ul style="list-style-type: none"> - Variables - Uppercase or lowercase, as tradition and context dictate - Italicized - Used in equations/expressions and formulas
x, y	Verdana	<ul style="list-style-type: none"> - x-axis and y-axis labels - Lowercase - Italicized - Used to label x- and y-axes in line graphs, scatter plots, and coordinate grids

Table 8. General font specifications for symbols and special characters in graphics and text (*cont.*)

Font Specifications for Symbols and Special Characters		
Symbol/Character	Font	Description
A, B, C	Verdana	<ul style="list-style-type: none"> - Point label - Boldface, italicized, uppercase letter (in graphics only; see "Points" in Part IV for point labels in text) - Used to label points and other geometric objects
1st, 2nd	Verdana	<ul style="list-style-type: none"> - Ordinals - Positioned on baseline (not superscripted)
13 ²	Verdana	<ul style="list-style-type: none"> - Superscript - Scaled to 70% of text size: 16 pt. = 11.2 pt.; 14 pt. = 9.8 pt. - Raised by 33% with a baseline shift of +6
H ₂ O	Verdana	<ul style="list-style-type: none"> - Subscript - Scaled to 70% of text size: 16 pt. = 11.2 pt.; 14 pt. = 9.8 pt. - Lowered by 33% with a baseline shift of -6
9:00 a.m. 3:00 p.m.	Verdana	<ul style="list-style-type: none"> - Used to indicate times of day - Lowercase (not small caps)
100 BC/BCE AD/CE 1800	Verdana	<ul style="list-style-type: none"> - Used to indicate eras, epochs, etc. - Uppercase (not small caps)

Note: Symbols and special characters are used at the content specialist's discretion.

B. Graphic Size

Graphics should be

- large enough for students to read text and view content.
- small enough to fit in the viewing area on the computer screen. Students should not have to use horizontal scrolling to see an entire graphic.
- free of excess white space. Condense graphics as much as possible without compromising legibility and font size.

About Image Dimensions

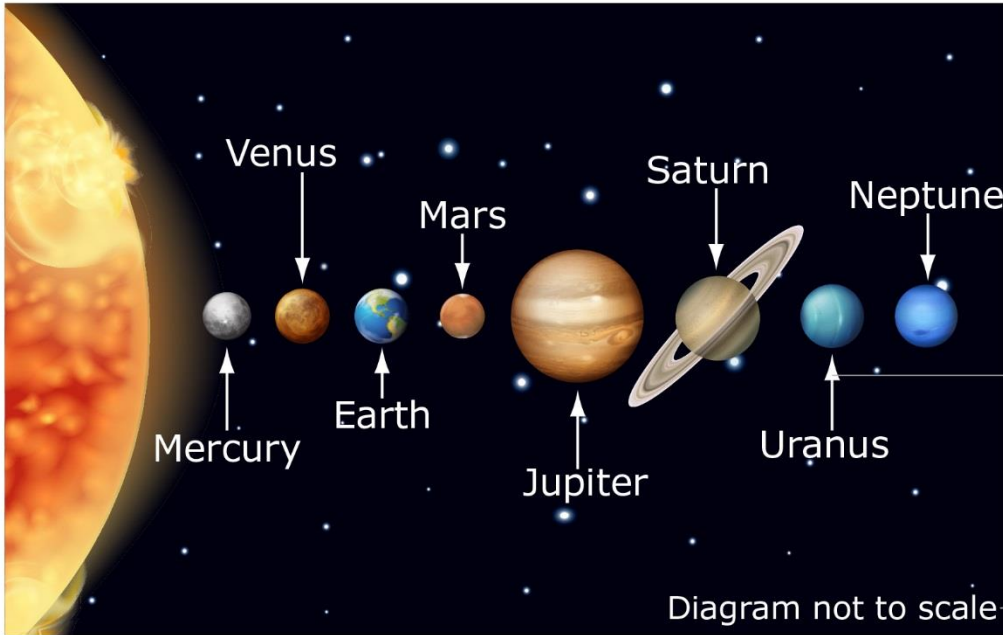
The table below provides the recommended maximum image dimensions (in pixels) you should use for each item layout in order to avoid forcing students to view the item's content on a standard 1024 x 768 monitor. These dimensions should not be regarded as absolute restrictions but as suggested guidelines to consider when inserting images in IAT.

	Stem Max Image Width	Stem Max Image Height	Passage Max Image Width	Passage Max Image Height
Layout 1	600	590		
Layout 2	400	450		
Layouts 3 & 4	400	450		
Layout 5	600	400		
Layout 6	600	400		
Layout 8				
Layout 12				
Layout 13				
Layout 14	600	450		
Layout 15				
Layouts 11 & 17	360	250	590	590
Layout 21	570	250	400	590
Layout 22				
Layout 23	960	250	980	250
Layout 24 & 29	600	250	380	590
Layout 25	670	250	290	590
Layout 26	470	250	500	590
Layout 27 & 28	270	250	700	590
Layout 32 & 33	960	700		
Layout WAI	960	700	960	700

Scaled Graphics

Graphics that are not drawn to the correct scale are labeled with the phrase "Diagram not to scale." Note that "Diagram not to scale" is not punctuated.

Solar System



Title
Title Case
Centered above
diagram

Label
14 pt. Verdana
Sentence Case

Arrows
See "Arrows" in
this section for
specifications

Scale Line
12 pt. Verdana
Sentence Case

DRAFT

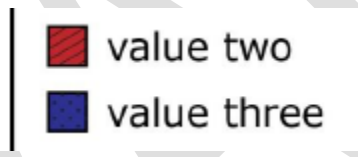
C. Graphic Colors

Although color can be used to enhance the appearance of graphics, it should be used sparingly (at the content specialist's discretion). The use of color introduces special considerations for students with color-vision deficiencies. Use the guidelines that follow to help avoid creating graphics that present challenges for these students.

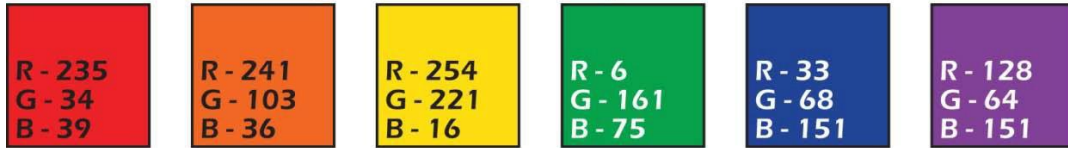
- Do not design graphics that require students to rely solely on color to obtain information.
- Consider combining colors with pattern fills to assist students who might have trouble using color alone to differentiate graphic elements, such as bars on a graph.
- Use a color-vision deficiency simulator, such as Vischeck or Coblis, to check colors in graphics for possible issues.
- Use the limited color palette shown in the top row of the diagram that follows. The other rows in the diagram show how the colors in the limited palette appear to students with certain color-vision deficiencies.

Color Contrast

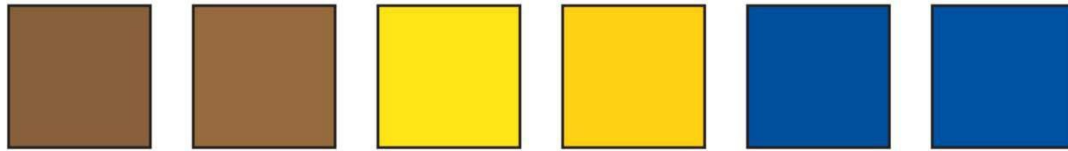
- Colors selected for a graphic, image, chart, or plot should have enough contrast within the various color palettes (page 68) to be easily differentiated.
- Objects and labels should be contrasted against the rest of the image so that they are easy to see.
- Patterns should have contrast that makes them easy to see and distinguish from one another.
 - Example: *Not enough contrast*. The pattern on the red block is not easy to see. The pattern on the blue block is very hard to see.



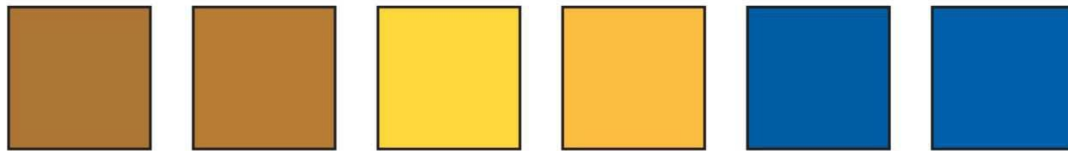
"Normal" Color Vision (Limited Color Palette)



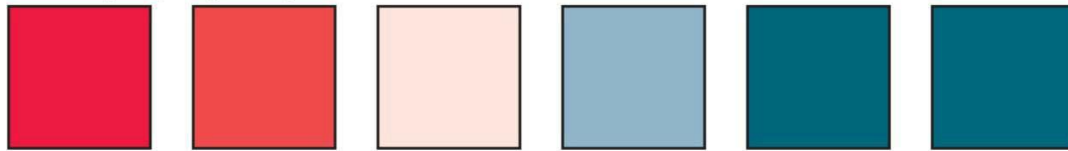
Protanopia



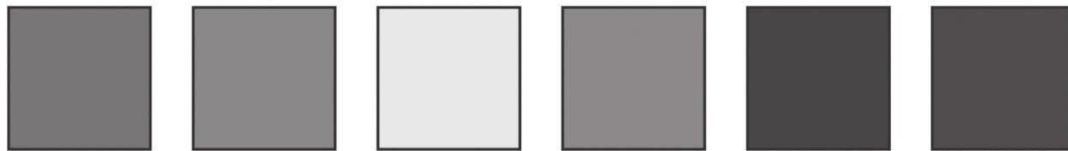
Deuteranopia



Tritanopia (very rare)



Achromatopia (very rare)



D. Common Graphic Elements

This section provides specifications for elements that often appear in graphics.

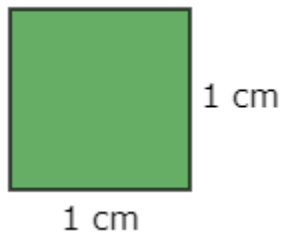
Note: Within individual graphics, the sizes of elements such as points, tick marks, and tallies may be adjusted as needed to emphasize or to de-emphasize certain content in a graphic.

Alignment

Graphics within both the stimulus and the items should be centered on the page.

Units of Measure

In graphics, units are abbreviated or expressed as symbols. (See Part IV for the correct abbreviations of units.) The abbreviated unit or symbol is not preceded by the word *in*.

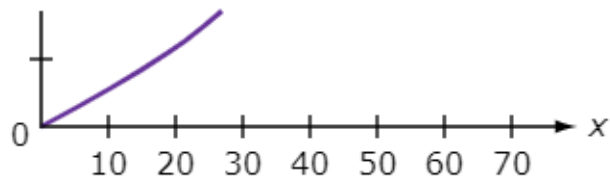
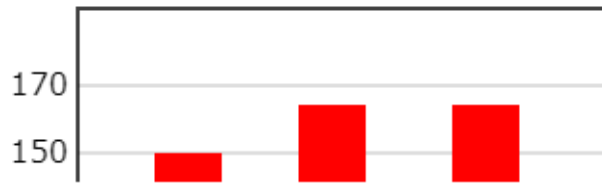


Total Ticket Sales (\$)



In graphs and tables, units are enclosed in parentheses after titles or headings.

Heights of Players (cm)



Time Spent Exercising (minutes)

In tables, do not include the unit in both the column/row heading and in the individual cells in the column/row.

Incorrect:

Shots Made

Game	Shots Made (%)
1	65%
2	70%

Correct:

Shots Made

Game	Shots Made (%)
1	65
2	70

The diagram that follows shows some specifications for diagrams.

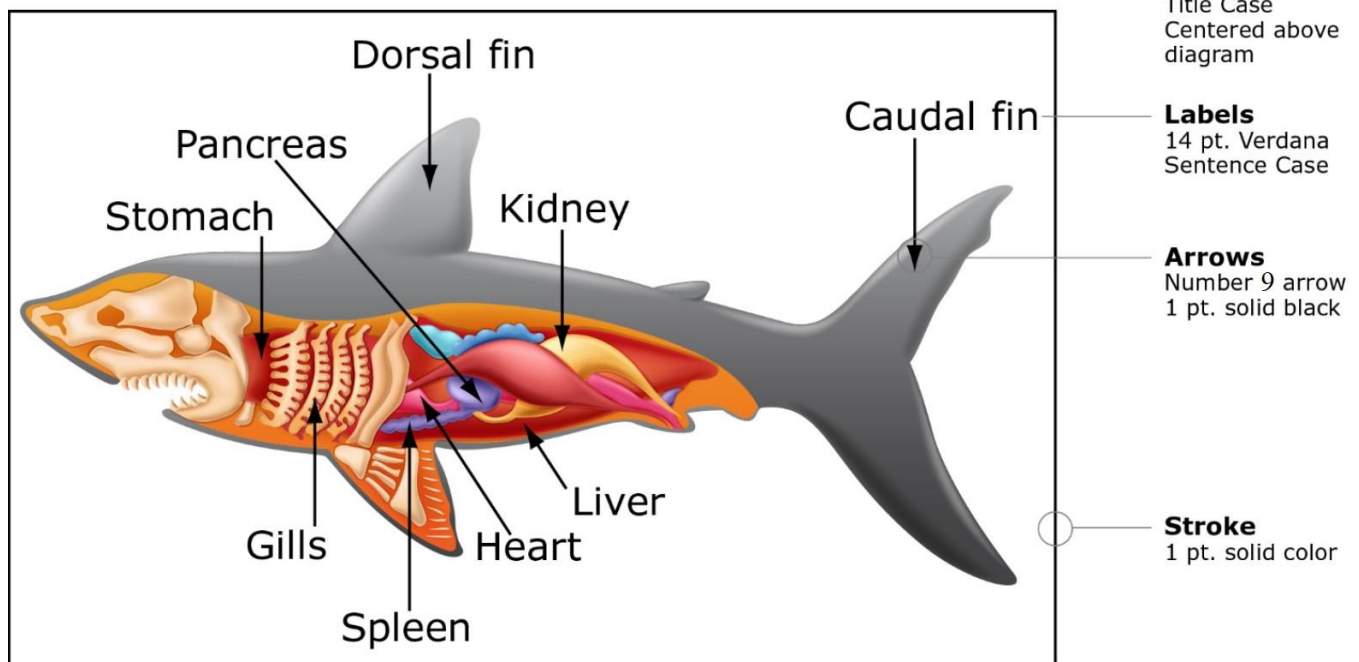
- A diagram is art used to describe a scientific system; therefore, the diagram must be scientifically accurate, in realistic perspective, and in scale.
- Tabletops are indicated only by a horizontal line at the back of the table. It is generally not necessary to show the legs or front edge of the table. The tabletop is labeled as "Tabletop" without an arrow.
- Diagrams describing a controlled experiment setup should show the system being investigated with both the manipulated and responding variables.
- All the materials of an experiment do not need to be in the diagram.
- Students, when appropriate, may be included in a diagram but the students must be realistic and grade appropriate.
- Text in diagrams should be phrases, not sentences.
- Any diagram in an item that comes from a diagram in the stimulus should be the same.
- Graphics and diagrams are centered.

Arrows

The diagrams that follow show specifications for arrows and arrowheads used in graphics to label diagrams.

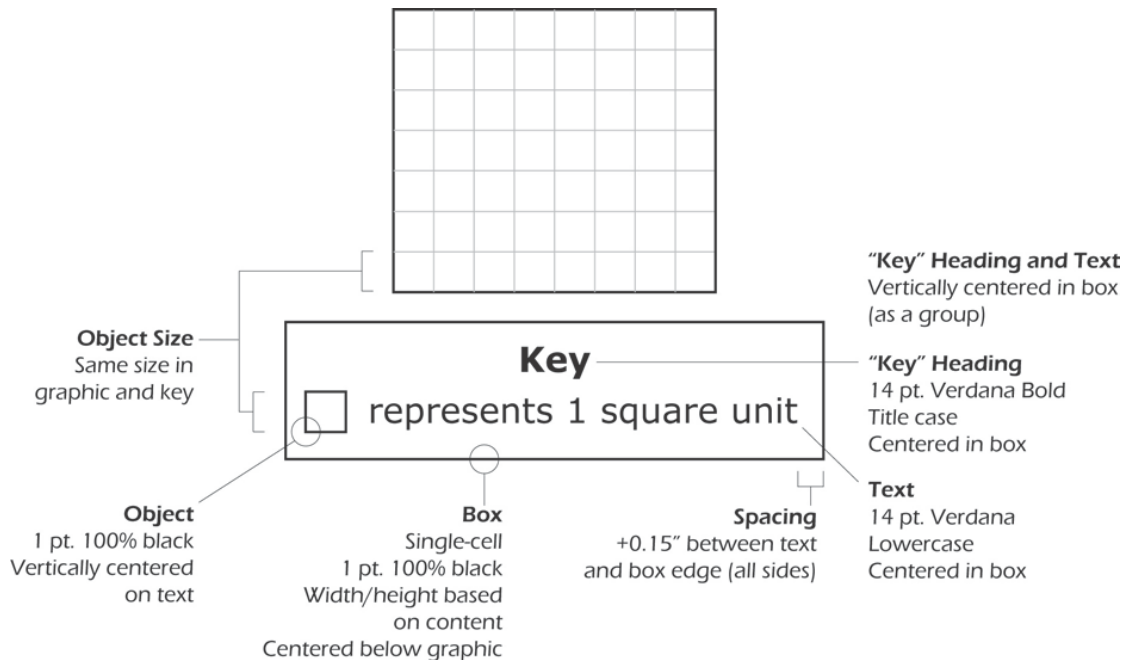
- Use number 9 arrowhead in Illustrator.
- The arrowhead of the leader from the label to the object being labeled should touch the outer rim of the object being labeled, not inside the object unless what is being labeled is inside an object. For example, a beaker partially filled with a liquid with an arrow labeling the liquid.
- Arrows may be any size or shape as needed in a specific diagram.
- **Curvy arrows are no longer used in science assessments. We are still working to pull together some accurate examples.**

Internal Anatomy of a Shark



Keys and Scales

Keys and scales are used to provide information that helps students understand graphics. The diagram that follows provides specifications for keys and scales that appear in graphics.

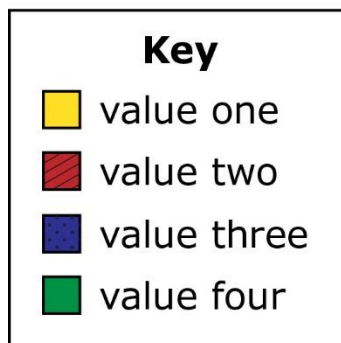


Key vs. Scale

Use a key to provide students with information that helps them identify parts of a graphic or interpret information in a graphic. Use a scale to provide students with ratios and conversions.

In the diagrams that follow, Example 1 tells students the values of graphic elements (e.g., bars in a graph, parts of a shape) filled with colors and patterns; Example 2 tells students how to interpret information in a stem-and-leaf plot; and Example 3 provides students with a ratio for converting centimeters to kilometers.

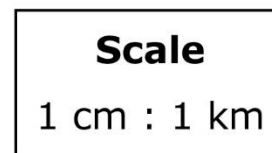
Example 1: Patterns



Example 2: Stem-and-Leaf Plot



Example 3: Scale/Ratio



E. Photographs and Raster Images

Table 9 provides general specifications for scanning photographs and raster images. Certain specifications differ for computer-based testing (CBT) and print-based testing (PBT). Raster images should not be converted to a different form like .svg.

Table 9. CBT and PBT specifications for photographs and raster images

Specifications for Photographs and Raster Images	
Specification	Requirements
File format	- CBT: SVG, PNG - PBT: SVG, PNG
Image resolution	- CBT: 72 dpi - PBT: 300 dpi
Color mode	- CBT: RGB - PBT: CMYK
Dimensions	- Based on test content
File Size	- < 1 Mb

Note: Always obtain a high-resolution image that meets the requirements for both CBT and PBT.

Image Improvement

All scanned images should be optimized to represent an ideal tonal range. When scanning images, eliminate any trace of moiré patterns (the line screens that appear when a printed image is scanned). Use the following techniques to help minimize the appearance of moiré patterns:

- Scan images at a 45° angle.
- Set the scanning software to compensate for line screens.
- Apply the Gaussian Blur filter in Adobe Photoshop.

Credit Lines

A credit line must be included for all images taken from copyrighted sources and those with Creative Commons licenses, including print publications, the Internet, stock photo agencies or discs, and other commercial and noncommercial sources. For images that do not appear in selections, credit lines should appear as shown in the examples below. (For information about images that appear in selections, see "Acknowledgments" in Part III.) All photographs and raster images should be enclosed in a box, as shown below.

A credit line should be added by the graphics team as a caption that is part of the image. Credit lines should not be done in the IAT Editor.

Copyright is represented by the copyright symbol. Creative Commons licenses are represented by text in the format of "Licensed under CC BY-SA 2.0," indicating the type of Creative Commons license the image has.

For any license before Creative Commons 4.0, the credit line should include the name of the image. In instances where there are multiple images and one is a 4.0 or later and another is 3.0 or earlier, list the image name for both to be consistent within the item.

The Copyright Attribute in ITS should include the original name of the image, the owner of the image/copyright or license holder, a link to the original image, and a link to the copyright or license type.



Box

1 pt. 100% black
Width/height based on
content

Credit Lines

10 pt. Verdana
Lowercase
Format: copyright symbol
followed by name of
copyright holder
Right aligned with right
edge of image

© [Copyright holder]



Box

1 pt. 100% black
Width/height based
on content

Credit Lines

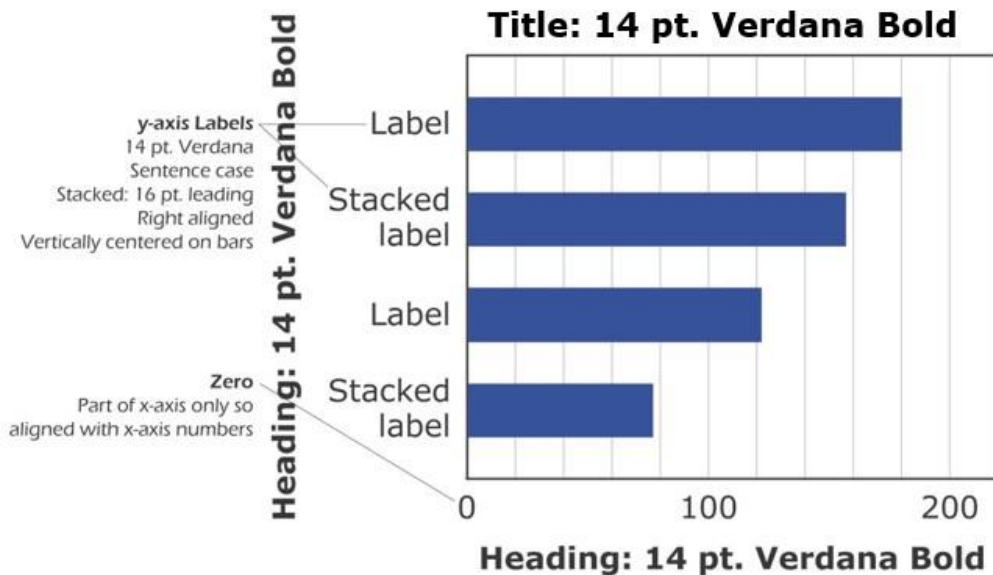
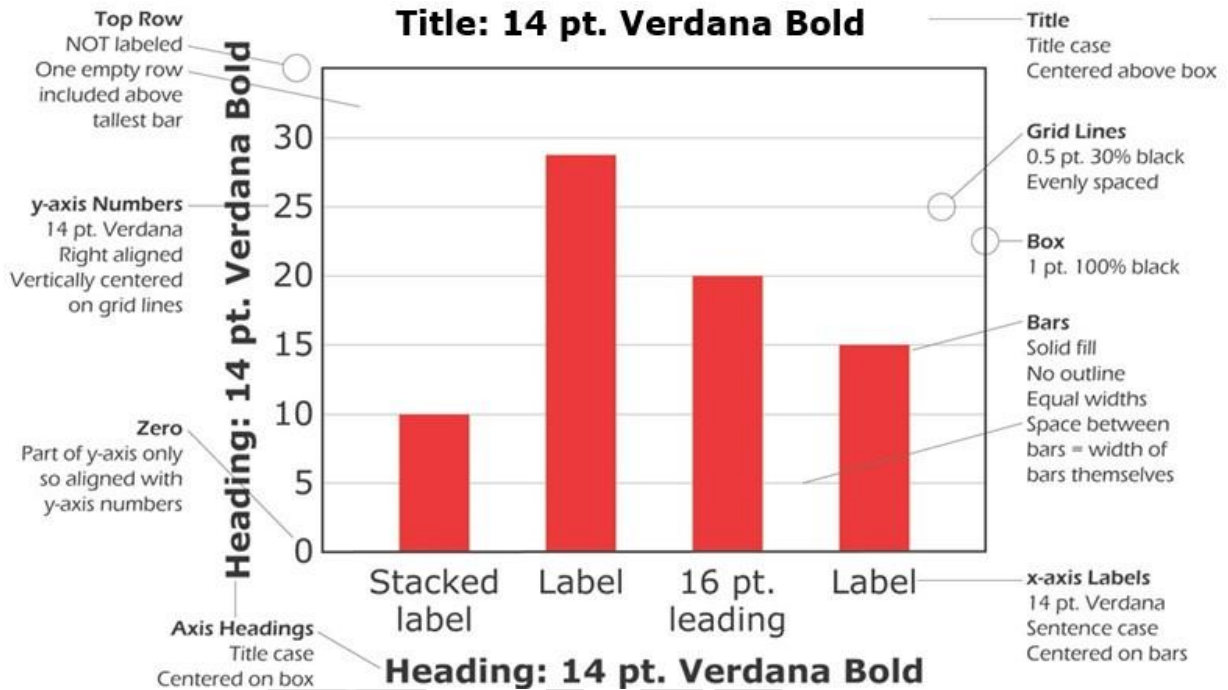
10 pt. Verdana
Lowercase
Format: "Licensed under"
followed by the specific
license type and the name
of the license holder

Licensed under CC BY-SA 4.0 from
Dominicus Johannes Bergsma

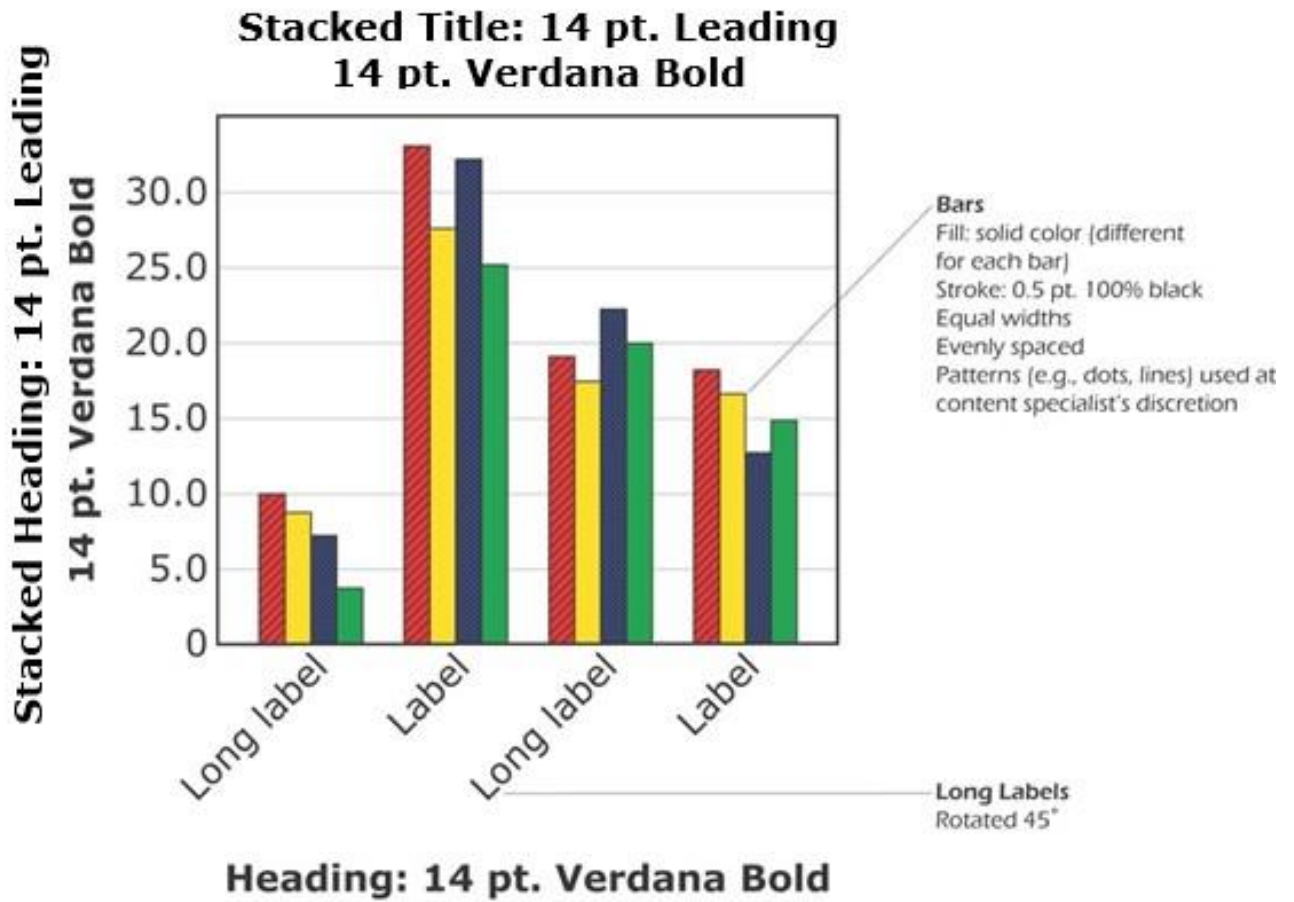
F. Graphs

The diagrams in this section provide specifications for bar graphs, histograms, circle graphs, line graphs, and scatter plots.

Bar Graphs



Multibar Graphs

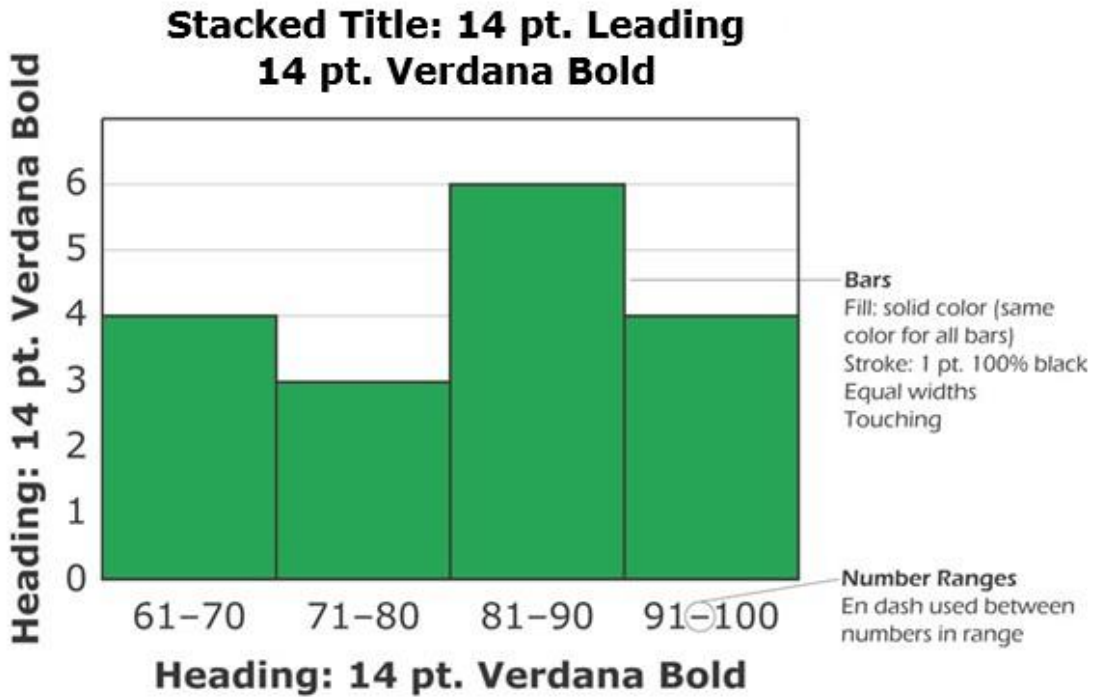


Key

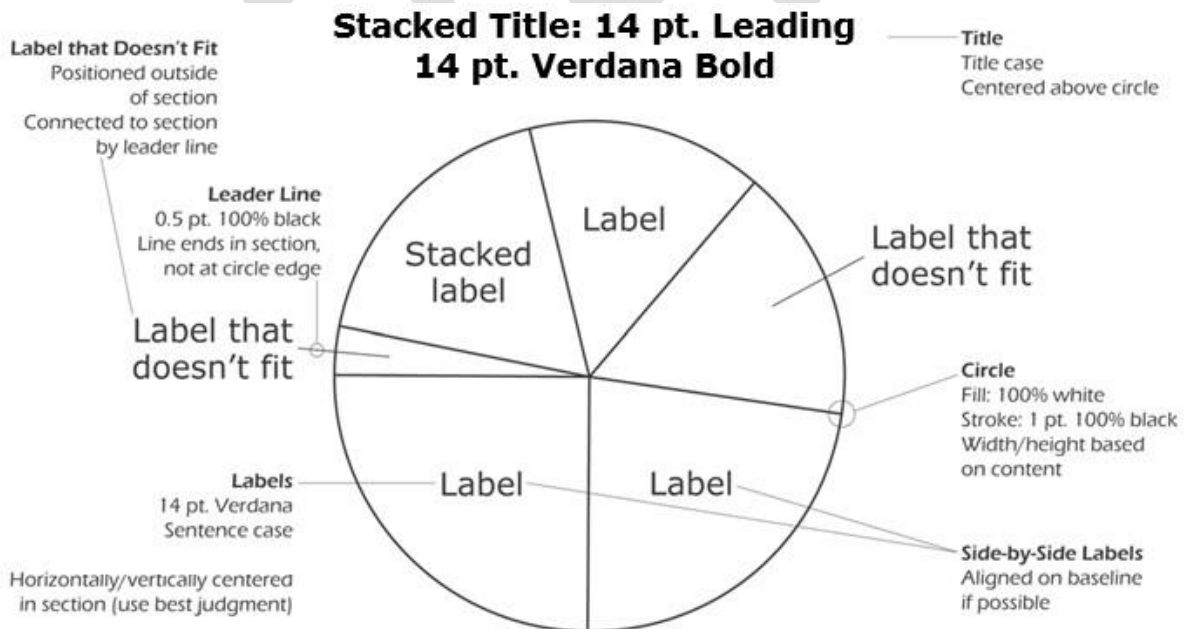
	value
	value
	value
	value

Key
All multibar graphs have keys. See "Keys and Scales" in this section for specifications.

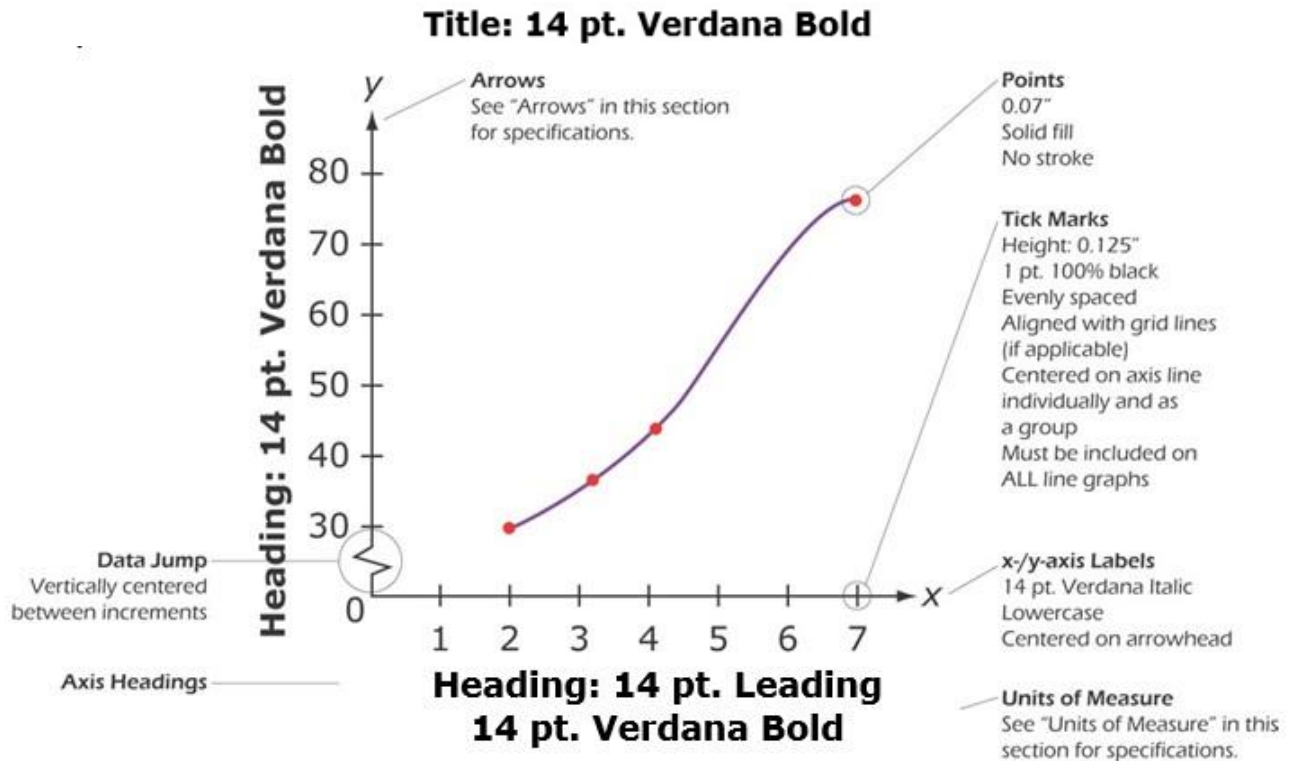
Histograms



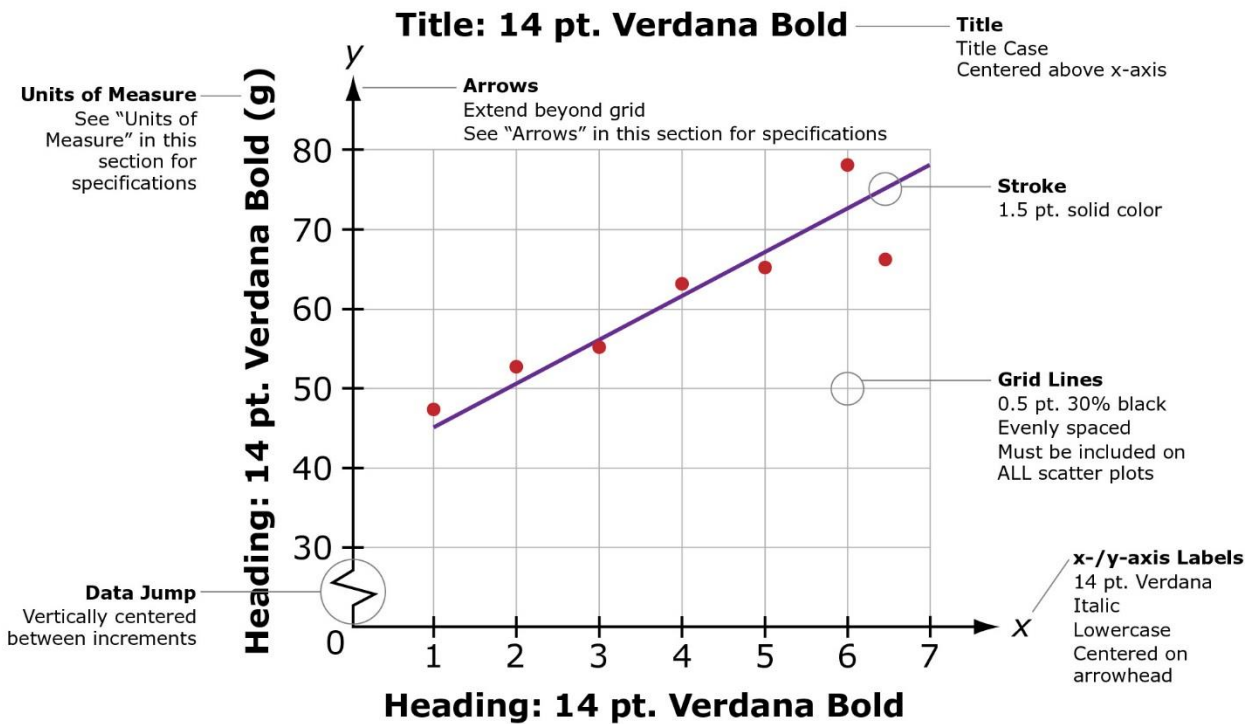
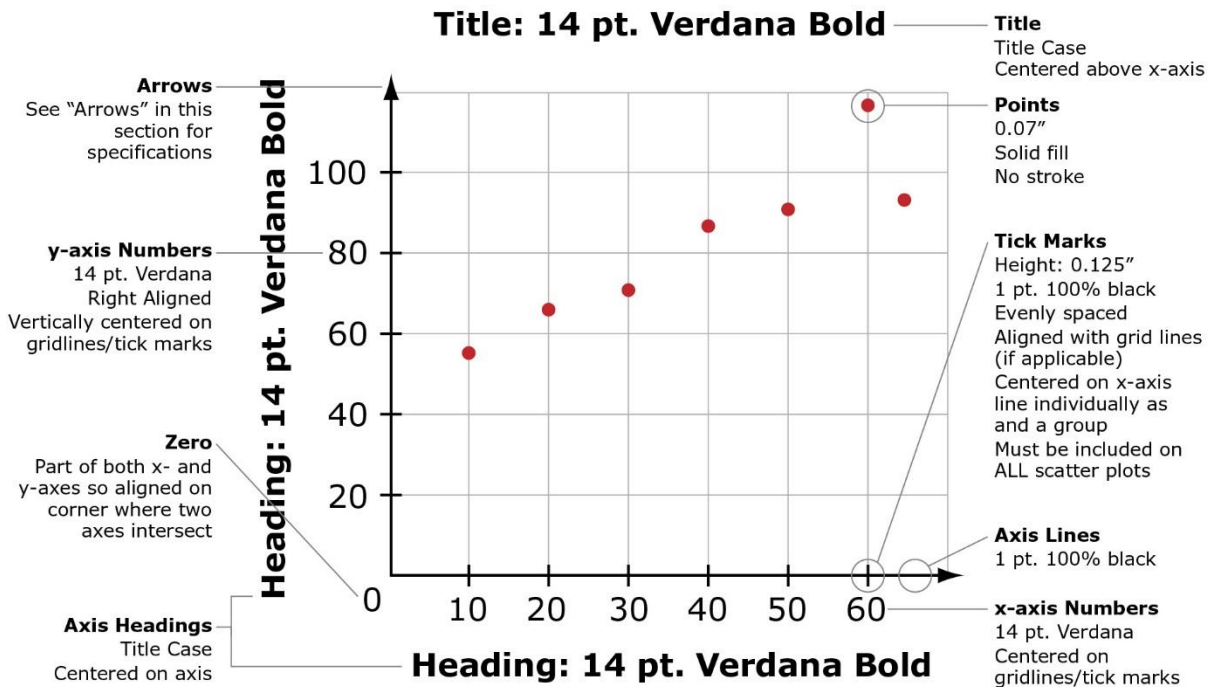
Circle Graphs



Line Graphs



Scatter Plots



G. Tables and Charts

The diagrams in this section provide specifications for tables and charts, including pictographs and tally charts.

Text Alignment in Tables

Left align text within a cell when there is more than one word.

Table 1. Title

Text entry here	
Longer text entry here	
Each sentence cased	

Center text within a cell when there is:

- a single word or number
- a combination of words and numbers
- a combination of fractions and mixed numbers

Fractions and Mixed Numbers
Centered

Fractions	Mixed Numbers
$\frac{1}{3}$	7
$2\frac{3}{5}$	$\frac{1}{4}$
$\frac{3}{16}$	300.00

In columns with numbers only, center the widest number and align other numbers on the ones place or decimal point.

Table 2. Title

Longest number centered	100	52.8
Rest aligned on ones, decimal, or symbol	2	325.25
	22	1.5

In columns with currency only, center the widest value, then:

- Align the dollar signs.
- Align dollar amounts on the decimal point.

Table 1. Title

Dollar signs left-aligned	\$12,540.00
Dollar amounts aligned on the decimal point	\$ 25.00

Tables

**Stacked Title: 14 pt. Leading
14 pt. Verdana Bold**

Heading	Stacked Heading: 14 pt. Verdana Bold
14 pt. Verdana	\$ 10.00
Sentence case	\$ 40.00
Stacked text entry	\$100.00

Title
Title case
Centered above table

Column Headings
Title case
Stacked: 18 pt. leading
Horizontally/vertically centered in cell

Stroke
1 pt. 100% black

Text/Numbers
See "Text Alignment in Tables" in this section for specifications.

0.15"
Column Width
+0.15" between widest entry in column and table rules
See "Text Alignment in Tables" for row height specifications.

Note: If a cell entry begins with a numeral followed by text, lowercase the first word of the text, just as if the number were spelled out, e.g., use "10 grams," as you would if it were "Ten grams."

Title: 14 pt. Verdana Bold

Heading (\$)	10	20	30	40	50
Stacked Heading: 14 pt. Verdana Bold	5	6	7	8	9

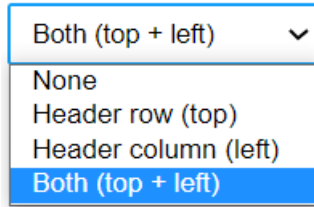
Row Headings
Title case
Vertically centered in cell
See "Text Alignment in Tables" in this section for additional alignment specifications.

Units of Measure
See "Units of Measure" in this section for specifications.

NOTE: ALL TABLES, EXCEPT FOR MATCHING ITEM TABLES, REQUIRE TITLES. TABLES ARE ALL CENTERED.

Tables can have columns as headers, rows as headers, or both columns and rows as headers. This is determined in the Table Properties. The first column header (top-left cell) can be left blank if appropriate for the content of the table. If this cell is left empty, then both columns and rows must be headers.

Headers







Title: 14 pt. Verdana Bold

	Title Case Column Heading 1	Title Case Column Heading 2
Sentence case row heading 1	3	4
Sentence case row heading 2	5	6

Pictographs

Favorite Kinds of Apples

Apple	Number of Votes
Washington	
Golden	
Granny Smith	
Fuji	

Objects

Evenly spaced
Widest group centered;
other groups left aligned
on widest group
Vertically centered

Row Height

All rows equal heights
(height based on size
of objects)

Column Width

+0.15" between widest row
in column and table rules

0.15"



Key

All pictographs have keys. See "Keys and Scales" in this section for specifications.

Note: People and animals should NOT be represented as half symbols in pictographs.

Tally Charts

Title: 14 pt. Verdana Bold

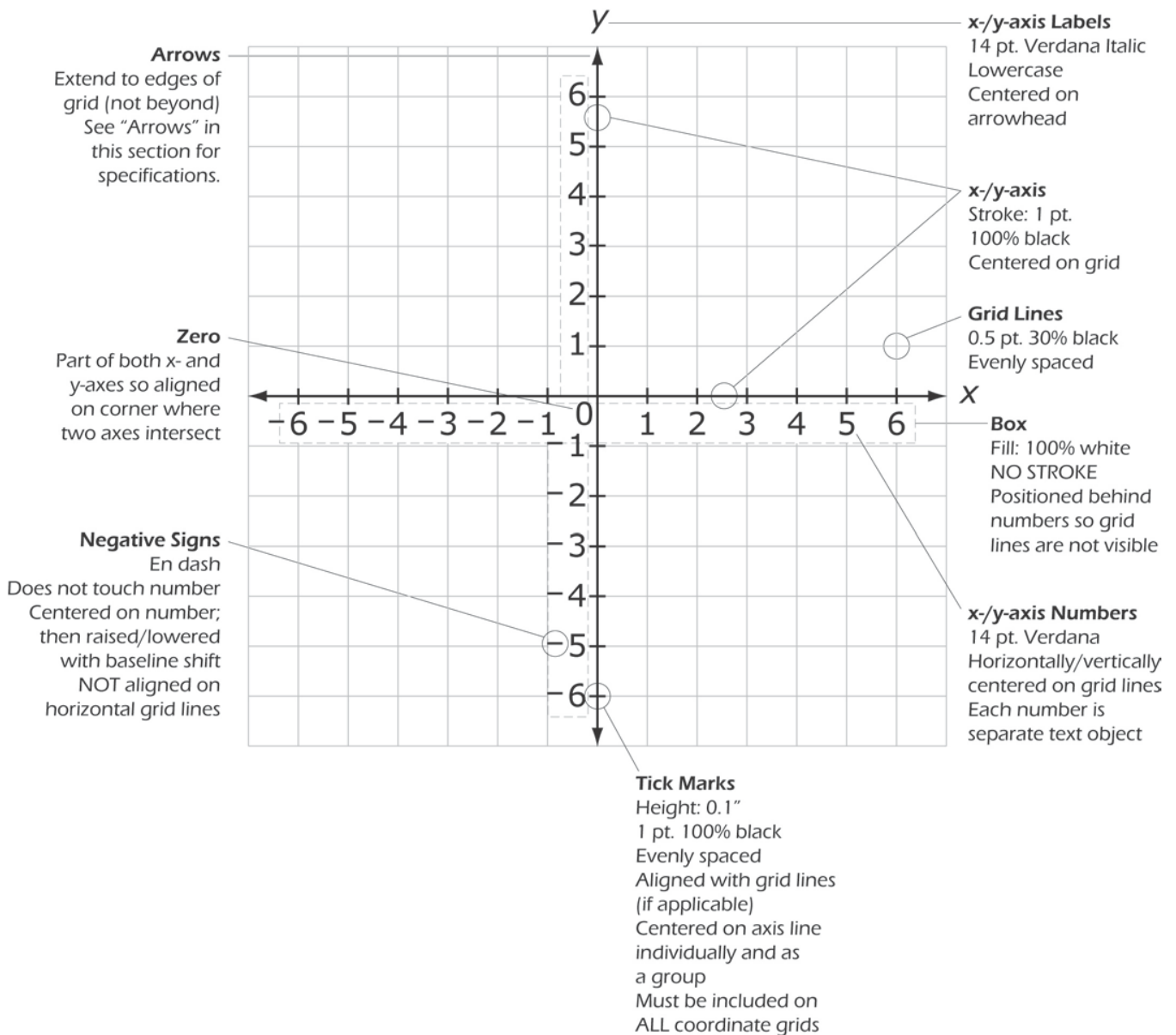
Heading	Heading: 14 pt. Verdana Bold
Text	
Text entry	
14 pt.	
Verdana	
Sentence case	

Tally Marks
Height: 0.25"
1 pt. 100% black
Evenly spaced
Widest entry centered;
other entries left aligned
on widest entry
Vertically centered

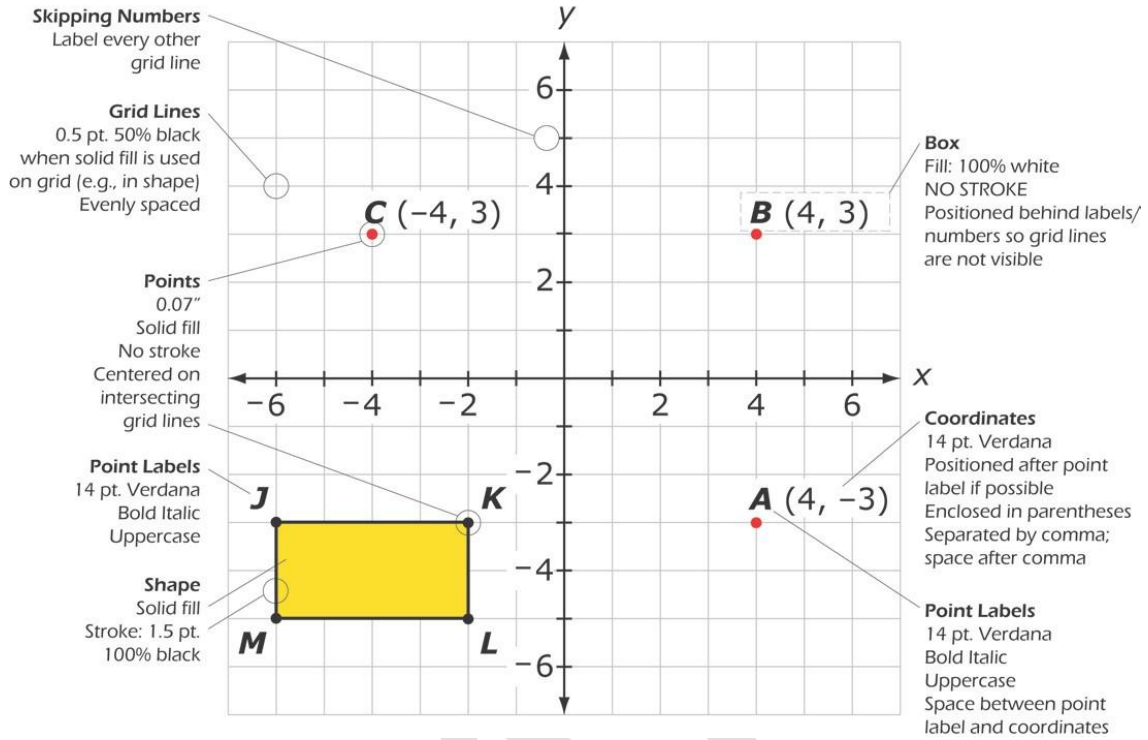
DRAFT

H. Coordinate Grids

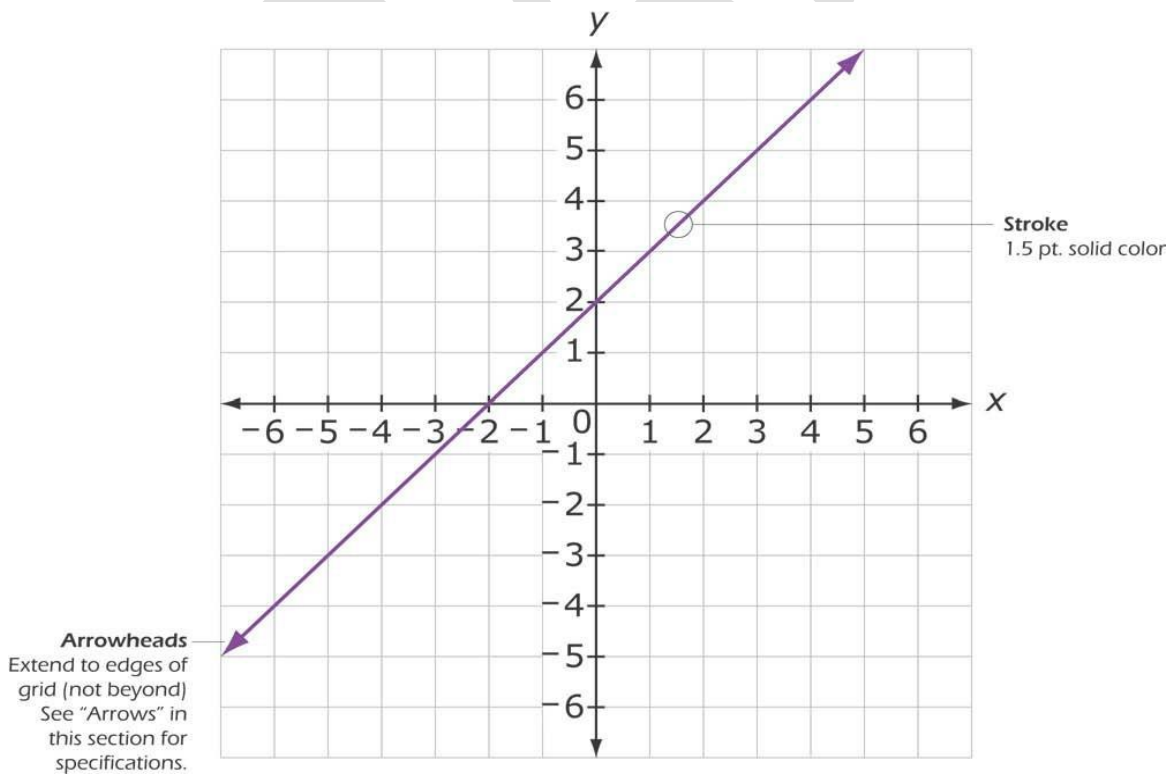
The diagrams in this section provide specifications for coordinate grids, including coordinate grids with plotted points, lines, and shapes.



Plotted Points and Shapes



Plotted Lines

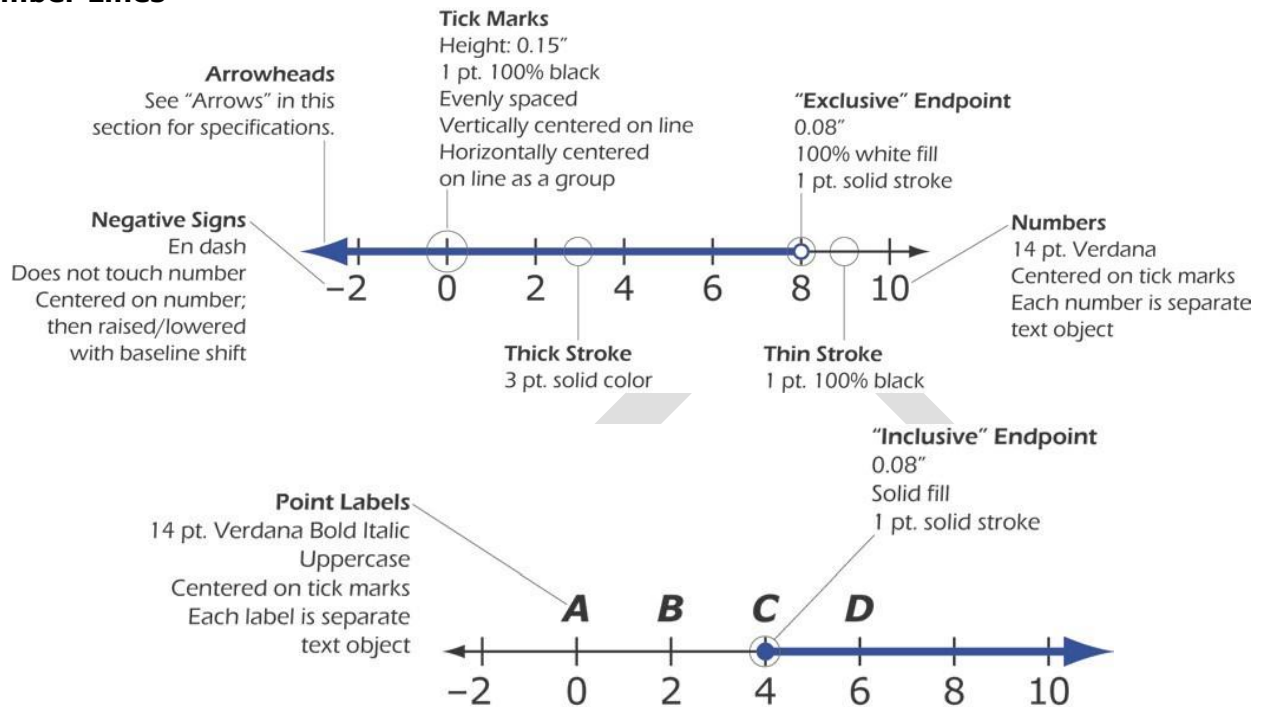


Note: Use graphing software to ensure that lines are accurately plotted on coordinate grids.

I. Other Types of Graphics

The diagrams in this section show specifications for miscellaneous graphics, including number lines, box-and-whisker plots, line plots, stem-and-leaf plots, spinners, maps, and graphic organizers.

Number Lines

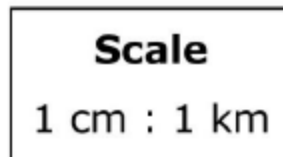


Maps

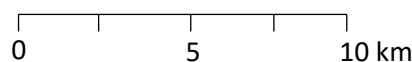
- Grayscale: Water is white. Land is gray.
- Labels for bodies of water and lines of latitude and longitude are italicized.
- Labels for land are not italicized.
- Borders and lines of latitude and longitude should have their opacity reduced if they are not the focus of what is being shown on the map.
- Map symbols are identified with a key.
- Include a compass rose:



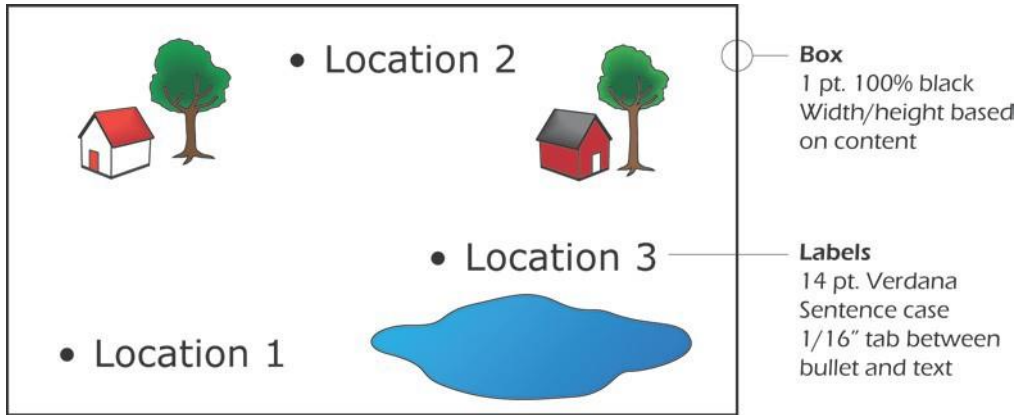
- Styles of map scales—See "Keys and Scales" section for specifics.
 - Scale ratio



- Line scale



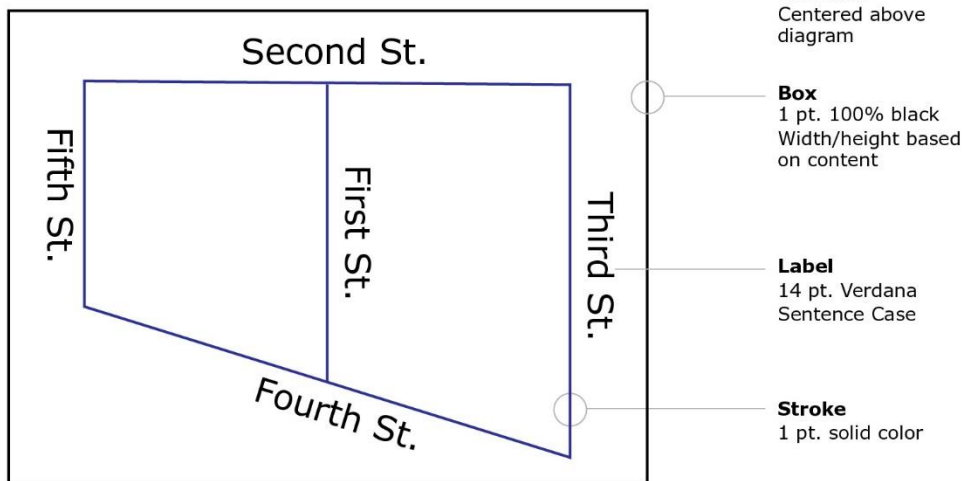
Examples:



Scale
1 cm : 25 km

Scale
See "Keys and Scales" in this section for specifications.

Title: 14 pt. Verdana Bold



Scale
1 cm represents 1 km

Scale
See "Keys and Scales" in this section for specifications

J. Animations

- Graphics for animations and simulations follow NGSS graphics style guidelines.
 - Animation art style should not be different from those produced for APG static images.
- Dimensions for animations and simulations:
 - In a stimulus: animation can be no wider than 350 pixels to eliminate horizontal scrolling.
 - In a simulation: dimensions are predetermined by the item layout.
- Animations, graphics, and simulations must have file sizes that keep the entire item or cluster's file size under 500 kb.
- Animations and simulations should be short and succinct as to reduce the amount of test time spent running them.
- For animations (not simulations), include the directive "Click on the small gray arrow to start the animation ..." OR "Click on the small gray arrow to watch [Earth revolve around the sun, the rabbit come out of its hole, etc]."

DRAFT

Appendix A: Word List

DRAFT

Word List

This appendix provides guidelines for the capitalization, hyphenation, and spelling of terms. See "Compound Terms" in Part I for additional guidelines.

A

AD (uppercase; precedes date)

a.m. (lowercase)

B

BC/BCE (uppercase; follows date)

big bang theory (lowercase)

C

criterion (singular), criteria (plural)

cutout (n, adj), cut out (v)

D

data are (plural)

E

Earth, in reference to the planet (not used with the article the)

earth, in reference to earth material (used with the article the)

eastern hemisphere (lowercase)

equator (lowercase)

F

fall (season)

Force is greater, not larger: According to Sir Isaac Newton's Law of Universal Gravitation, all objects that have mass are attracted to each other. Mass is the measure of an object's matter (what it's made up of). The greater an object's mass, the greater its gravitational force.

flowchart (per Webster's)

fresh water (n), freshwater (adj)

full-size (adj)

H

the Hawaiian Islands, but the island of Hawaii

high-pressure (adj), high pressure (n)

K

kinetic energy (KE)

L

landfall

Law – uppercase in terms like “Newton’s First Law” or “Coloumb’s Law”

life cycle

life-span

light year

lightbulb

M

moon

N

northern hemisphere (lowercase)

P

potential energy (PE)

R

rain forest (n)

round-trip (n, adj)

S

salt water (n), saltwater (adj)

setup (n), set up (v)

solar system

southern hemisphere (lowercase)

spring (season)

summer

sun

T

tide pool

tidewater

timeline

U

underwater (adj, adv)

W

western hemisphere (lowercase)

DRAFT

Appendix B: Resources, Research, and Bibliography

DRAFT

Recommended Resources

The style conventions and specifications in this document are based largely on information from the sources listed in this section. Refer to these sources for additional information.

Chicago Manual of Style and Words into Type

First published in 1906, the Chicago Manual of Style (CMOS) is one of the oldest and most comprehensive editorial style guides available. The sixteenth edition, published in 2010, was updated in consultation with a broad range of scholars and professionals in the fields of academics and publishing.

Different style guides have different uses. For example, the Associated Press Stylebook is used primarily by journalists, the Publication Manual of the American Psychological Association is used for social science publications, and the MLA Handbook for Writers of Research Papers is most commonly used by writers of research papers in the humanities. CMOS is widely used in educational, scholarly, and trade publishing, as is Words into Type, another well-respected general-purpose style manual. Both CMOS and Words into Type provide broader coverage of mechanical issues, grammar, and usage than the more specialized style manuals listed above.

Merriam-Webster's Collegiate Dictionary

Because hundreds of new words are added to the English language each year, and preferences regarding issues such as spelling and hyphenation change over time, it's important that publishing professionals use a recent edition of a good dictionary. Merriam-Webster's Collegiate Dictionary is not only one of the most popular dictionaries on the market (as the best-selling dictionary in the United States) but is also recommended by CMOS and used by many educational and academic publishers.

Garner's Modern American Usage

Bryan A. Garner wrote the grammar-and-usage chapter of CMOS, and his usage book is an appropriate companion to CMOS, significantly expanding on the usage guidelines provided in chapter 5 of CMOS. Garner's Modern American Usage is considered one of the best books available on contemporary usage. Garner takes a prescriptive approach, which means that his usage guidelines are based on established norms and rules for the way language should be used.

The Copyeditor's Handbook: A Guide for Book Publishing and Corporate Communications

Amy Einsohn, the author of The Copyeditor's Handbook, has twenty years of experience as a professional editor and teacher of copyediting classes and is highly regarded in the copyediting community. Her book, which addresses the ABCs of copyediting, editorial style, and language editing, is intended to be used as a tool for self-instruction or a textbook for copyediting classes. The Copyeditor's Handbook has been recommended by current and former editors at CMOS, including Carol Fisher Saller and Margaret Mahan.

Support for Selected Style Preferences

Emphasis Terms

The treatment of various elements of style, including emphasis terms, varies according to the preferences of the user, but it is recommended that emphasis terms in test items be set in boldface. The publication *Considerations for the Development and Review of Universally Designed Assessments*¹ cites the following arguments for and against the various treatment options for emphasis text:

- Standard typeface, uppercase and lowercase, is more readable than italic, slanted, small caps, or all caps (Tinker, 1963).
- Text printed completely in capital letters is less legible than text printed completely in lowercase, or normal mixed-case text (Carter, Dey, and Meggs, 1985).
- Italic is far less legible and is read considerably more slowly than regular lowercase (Worden, 1991).
- Boldface is more visible than lowercase if a change from the norm is needed (Hartley, 1985).

Ten style guides from Smarter Balanced states and the consortium were evaluated. Seven of the ten recommended the use of boldface for emphasis terms, whereas one recommended underscoring, another recommended small caps, and the last did not specify. Designers of online content agree that “[o]n the Web, the most common and effective method [for emphasizing text] is the use of a bold face from the current font family.”²

In addition, the application of a particular treatment to a style element could prove confusing if repeated to represent another style element: In the Smarter Balanced Style Guide, underscoring is used to designate vocabulary terms. That, combined with the fact that the use of two treatment styles for a single element can appear overpowering, reinforces the recommendation that boldface alone be used for emphasis terms. This recommendation is also supported by the Test Accessibility and Modification Inventory (TAMI).³

Exponents and Superscript

These elements should be smaller than running text and should not be separated from the preceding text by a space. It is recommended that exponents and superscript characters be smaller than running text (scaled to 70% of base print size). Increasing the size of running text around such characters is not feasible, and increasing the size of the characters themselves introduces a risk that students will misinterpret the characters as running text and not as exponents or superscripts.

1 Thompson, S. J., Johnstone, C. J., Anderson, M. E., and Miller, N. A. (2005, November). *Considerations for the Development and Review of Universally Designed Assessments* (Center on Educational Outcomes Tech. Rep. 42). Retrieved February 6, 2012, from www.cehd.umn.edu/nceo/OnlinePubs/Technical42.htm

2 Hume, A. (2005, December). *The Anatomy of Web Fonts*. Retrieved February 13, 2012, from [//www.sitepoint.com/anatomy-web-fonts](http://www.sitepoint.com/anatomy-web-fonts)

3 Beddow, P. A. (2009). *Test Accessibility and Modification Inventory: Quantifying and Improving the Accessibility of Tests and Test Items*. Presented at the CCSSO 2009 National Conference on Student Assessment. Retrieved February 6, 2012, from http://peabody.vanderbilt.edu/Documents/pdf/PRO/TAMI_CCSSO_Beddow.pdf

The general accessibility guidelines include discussion of magnification tools. In addition, the accessibility spoken/audio business rules provide guidelines on how mathematical notation is to be presented in spoken form. The magnification tools and spoken support should allow students with visual impairment to access all the information available on screen.

In regard to ordinals, it is recommended to use 1st, 2nd, 3rd, etc., rather than 1st, 2nd, 3rd. In this way, the exponent size consideration is avoided, and ordinals are as easily read as other running text on a page.

Typeface: Verdana

It is recommended to use Verdana for onscreen testing materials, for its readability as compared to Times New Roman and Arial. Although other fonts are available that are specially designed to further enhance readability, these custom fonts may not be as widely available on student computers and may require the test delivery system to supply the font as part of system installation.

Serif fonts (e.g., Times New Roman), which are popular in print, can appear pixilated and blurred onscreen. In contrast, "the straight, low contrast, open strokes of a sans-serif font, such as Verdana, will always leave a good impression on-screen."⁴ Verdana, which was designed for the screen, offers a generous amount of white space both between and within (glyphs) the characters. Currently, it is the most commonly used font on the Web, owing to its marked legibility on screen.

DRAFT

Preparation of Materials for Persons Who Have Color Vision Deficiencies

Color is one of the most important aspects of visual communication and can be employed to generate interest or to communicate ideas or feelings. Yet colors for an audience with members who have color discrimination problems should be selected carefully to avoid conveyance of unintended meaning. This is especially true in educational and testing materials. Many of these materials rely on good color perception for the interpretation of graphs, charts and illustrations. Yet even the most carefully thought-out graphic may lead the user to an incorrect answer because of poor color selection.

- **Select colors carefully.** Besides black and white, most color blind individuals can only see two colors, blue and caramel (golden brown). Red, yellow, orange, and green take on shades of caramel; purple takes on shades of blue when viewed by a person with colorblindness.
- **Less is more.** Too many colors used thoughtlessly can confuse and negate the message of a graphic. Settle on four or fewer colors and stick with them. Black and white are counted as colors when designing graphics, even though they are not usually considered colors when talking about vision.
- **Use contrasting colors.** Contrast is an important influence on the legibility of graphics, especially for persons with color discrimination problems. Substantial contrast, i.e., the use of dark values with light values, between the color of the foreground and the background should be employed. High contrast makes materials easier to read by both persons with colorblindness and those with typical vision. Light letters on a dark background or dark letters on a light background are most legible, but remember the actual colors of those combinations are important.

Contrasting Colors Appropriate for Persons with Color Perception Difficulties (in order of best contrast value)

- Use black and white.
- Use dark blue and white.
- Use black and bright yellow.
- Use dark blue and bright yellow.
- Use dark brown and white.
- Use pale blue and black.
- Use yellow and purple.

Notice that yellow is recommended as a common color for graphics to be used by persons with poor color discrimination. This is because yellow maintains luminance longer than any other color. Even though it is perceived as a light caramel color by persons with color blindness, it holds its brightness longer than any other hue, and therefore maintains its contrast when paired with a dark color.

Color Combinations to Be Avoided

- Avoid gray with any color, even another value of gray.
- Avoid red with any color except white or blue.
- Avoid green with any color except white.
- Avoid brown with any color except white or blue.
- Avoid purple with any color except yellow or white.
- Avoid orange with any color except blue or white.
- Avoid two values of the same color, such as light blue and dark blue.
- Avoid a neutral color with any other neutral color.

The importance of proper attention to color selection cannot be overlooked when developing tests for individuals or groups that have color vision or color perception deficiencies.

Source:

Allman, C. B. (2009). *Making tests accessible for students with visual impairments: A guide for test publishers, test developers, and state assessment personnel*. (4th ed.). American Printing House for the Blind.

DRAFT

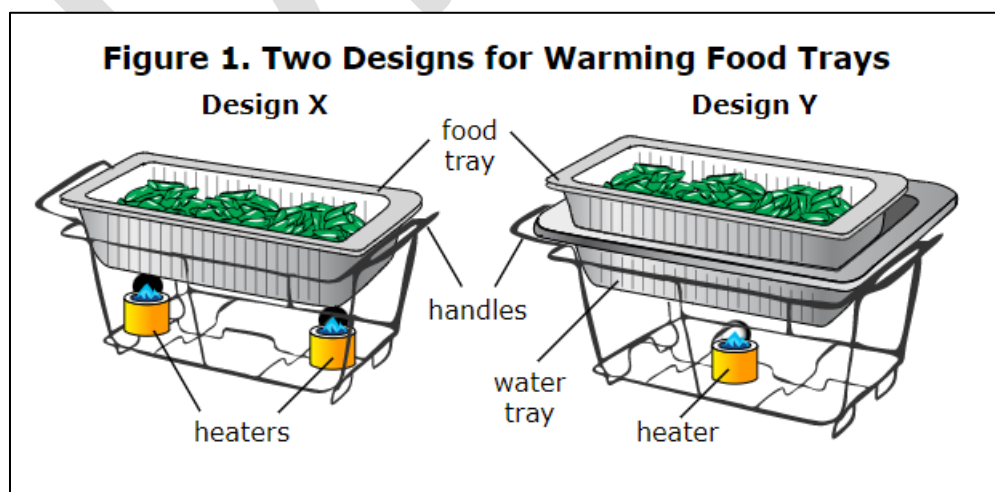
Braille and Screen Reader Accommodations

Graphics are often necessary to convey information or data in science assessments. However, students with visual impairments can have difficulty accessing the information. Students with visual impairments can have a broad range of test experiences based on their accommodations. Braille accommodations can include:

- Taking an online adaptive Braille test
- Taking an online adaptive test with a screen reader
- Taking a printed Braille test

For items intended for Braille and screen reader accommodations, the following considerations should be made:

- **Graphics**
 - In addition to the preparations made for color vision accommodations, graphics intended for Braille should have low complexity. Use labels only as necessary and ensure that sufficient space is included to avoid having labels and images too close together when tactile graphics are created. Because text labels are converted to a series of Braille dots in tactile graphics, avoid the use of dots in the graphic itself.
- **Image descriptions/alt text**
 - Embossed Braille typically includes tactile graphics as an alternative for students with Braille accommodations, but some students require a screen reader to speak text and information to them. For this reason, image descriptions, or alt text, are required for all graphics in items that are designated for Braille and screen reader use.
 - Descriptions must include any information about the graphic that is required for completing interactions in the item but should not key any interaction. The text should include vocabulary and be at a reading level appropriate for the grade level of the item's PE.
 - Example of a picture description, written for Figure 1 in IAT Sandbox 17690: "The title of the figure is Figure 1, Two Designs for Warming Food Trays. The figure shows two metal food trays with food in them. They are held up by metal wire holders that have handles on the sides. The tray on the left is labeled Design X, and the tray on the right is labeled Design Y. Design X has two heaters with blue flames underneath the tray. One heater is near the left edge of the tray and the other heater is near the right edge of the tray. Design Y has one heater with a blue flame under the center of the food tray and a tray of water between the heater and the food tray."



*note: graphic not to current NGSS style.
Do not use as a style reference for graphics.

- **Process for adding alt text**
 - These descriptions need to be available in both embossed Braille files as well as Braille TTS for screen readers. Descriptions should be written by the Braille vendor and approved by Content before the vendor adds them to the embossed files. Following completion of embossed Braille, Content will send the descriptions to the TTS team to add them to the Braille TTS.
- **Tables**

This section includes tables in stimuli, stems, and interactions (simulation, table match, etc.).

 - Tables should be kept brief, and complete sentences should be avoided. Low complexity is especially important for lower grade levels.
 - Text in headers must be brief. Limit text to two rows of text per header.
 - Do not use graphics or math formulas as column or row headers.
 - All cells in the body of the table must have content (e.g., ?, N/A, -). Blank cells are not read by screen readers.

Table 1. Example

Trial	Temperature (°C)	Altitude (km)
1	15	3
2	5	5
3	0	?

- **Interaction types**
 - Appropriate for Braille use
 - Choice interactions
 - Edit task interactions
 - Equation interactions
 - Table match interactions—but headers should be kept brief
 - Simple simulations without graphics (online Braille only)
 - Not appropriate for Braille use
 - Animations cannot be tagged with Braille TTS, and therefore cannot be used by screen readers.
 - Simulations cannot be used for printed Braille tests.
 - Avoid use of grid interactions. Some simple grids can be used for online Braille but are not accessible for screen readers. Grids also cannot be used for printed Braille tests.
 - External copy interactions

Dash Use

Avoid using combinations of em dashes, en dashes, and hyphens in the same item (Braille consideration). Use one style of dash within an item to be consistent.

Items using equations can use negative signs as long as the dashes within the text are consistent (negative numbers within text are mid-point en dash).



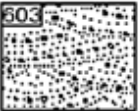



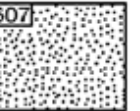

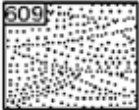

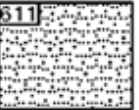
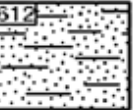
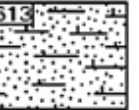






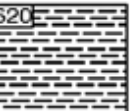

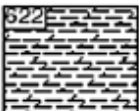
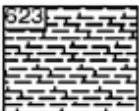



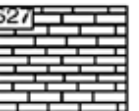


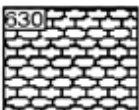







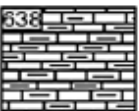

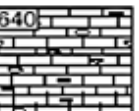
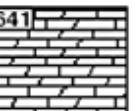
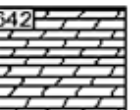
- Hyphen -
- Negative –
- En dash –
- Em dash —

Rock Patterns

Use patterns to identify different rock types in rock layers. Three pages of the Patterns.pdf guide are included here. Refer to the full guide for more rock patterns. The most recent/clean version is available [online](#). Path for ShareFile/Citrix Files: Team Resources > Science > Style Guide > Patterns for Rock Layers 2023.pdf

Sedimentary and Lithology Patterns

(Series 600) 1 of 2

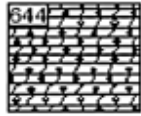
						
601 Gravel or conglomerate 1	602 Gravel or conglomerate 2	603 Crossbedded gravel or conglomerate	604 Till or diamicton	605 Breccia 1	606 Breccia 2	607 Massive sand or sandstone
						
608 Bedded sand or sandstone	609 Crossbedded sand or sandstone 1	610 Crossbedded sand or sandstone 2	611 Ripple-bedded sand or sandstone	612 Argillaceous or shaly sandstone	613 Calcareous sandstone	614 Dolomitic sandstone
						
615 Loess	616 Silt, siltstone, or silty shale	617 Calcareous siltstone	618 Dolomitic siltstone	619 Sandy or silty shale	620 Clay or clay shale	621 Cherty shale
						
622 Dolomitic shale	623 Calcareous shale or marl	624 Carbonaceous shale	625 Oil shale	626 Chalk	627 Limestone	628 Clastic limestone
						
629 Fossiliferous clastic limestone	630 Nodular or irregularly bedded limestone	631 Limestone, irregular (burrow?) fillings of saccharoidal dolomite	632 Crossbedded limestone	633 Cherty crossbedded limestone	634 Cherty and sandy crossbedded clastic limestone	635 Oolitic limestone
						
636 Sandy limestone	637 Silty limestone	638 Argillaceous or shaly limestone	639 Cherty limestone 1	640 Cherty limestone 2	641 Dolomitic limestone or limy dolomite	642 Dolomite

Sedimentary and Lithology Patterns

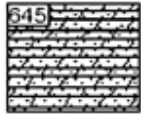
(Series 600) 2 of 2



643
Crossbedded
dolomite



644
Oolitic dolomite



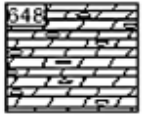
645
Sandy dolomite



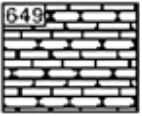
646
Silty dolomite



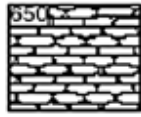
647
Argillaceous
or shaly dolomite



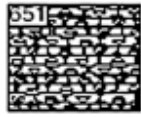
648
Cherty dolomite



649
Bedded chert 1



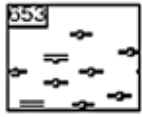
650
Bedded chert 2



651
Fossiliferous
bedded chert



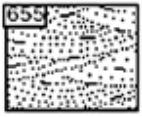
652
Fossiliferous rock



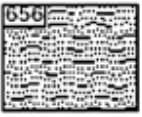
653
Diatomaceous
rock



654
Subgraywacke



655
Crossbedded
subgraywacke



656
Ripple-bedded
subgraywacke



657
Peat



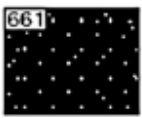
658
Coal



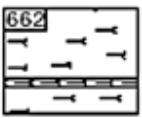
659
Bony coal or
impure coal



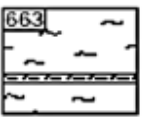
660
Underclay



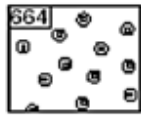
661
Flint clay



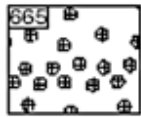
662
Bentonite



663
Glauconite



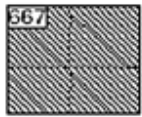
664
Limonite



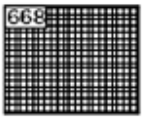
665
Siderite



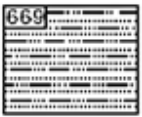
666
Phosphatic rock



667
Gypsum



668
Salt



669
Interbedded
sandstone and
siltstone



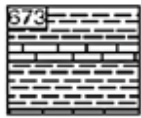
670
Interbedded
sandstone and
shale



671
Interbedded ripple-
bedded sandstone
and shale



672
Interbedded shale
and silty limestone
(shale dominant)



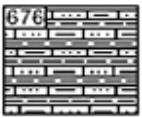
673
Interbedded shale
and limestone
(shale dominant) 1



674
Interbedded shale
and limestone
(shale dominant) 2



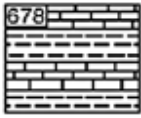
675
Interbedded calcareous
shale and limestone
(shale dominant)



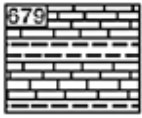
676
Interbedded
silty limestone
and shale



677
Interbedded
limestone and
shale 1



678
Interbedded
limestone and
shale 2



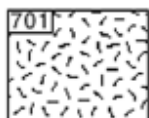
679
Interbedded
limestone and shale
(limestone dominant)



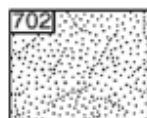
680
Interbedded
limestone and
calcareous shale

Metamorphic, Igneous and Vein-Matter Lithology Patterns (Series 700) 1 of 1

Metamorphic lithology patterns (701–710)



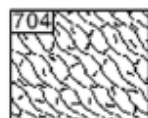
701
Metamorphism



702
Quartzite



703
Slate



704
Schistose or
gneissoid granite



705
Schist



706
Contorted schist



707
Schist and gneiss



708
Gneiss



709
Contorted gneiss

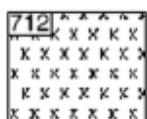


710
Soapstone, talc,
or serpentinite

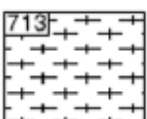
Igneous and vein-matter lithology patterns (711–733)



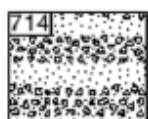
711
Tuffaceous rock



712
Crystal tuff



713
Devitrified
tuff



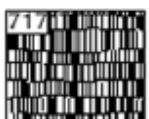
714
Volcanic breccia
and tuff



715
Volcanic breccia
or agglomerate



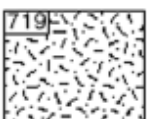
716
Zeolitic rock



717
Basaltic flows



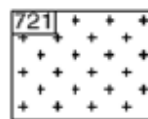
718
Granite 1



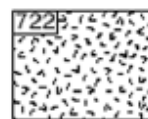
719
Granite 2



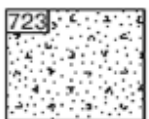
720
Banded
igneous rock



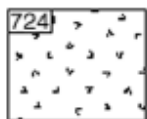
721
Igneous rock 1



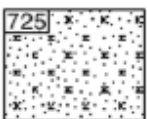
722
Igneous rock 2



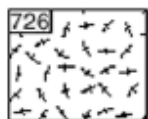
723
Igneous rock 3



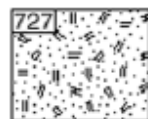
724
Igneous rock 4



725
Igneous rock 5



726
Igneous rock 6



727
Igneous rock 7



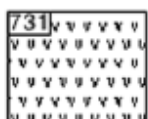
728
Igneous rock 8



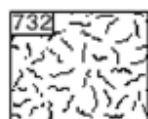
729
Porphyritic rock 1



730
Porphyritic rock 2



731
Vitrophyre



732
Quartz

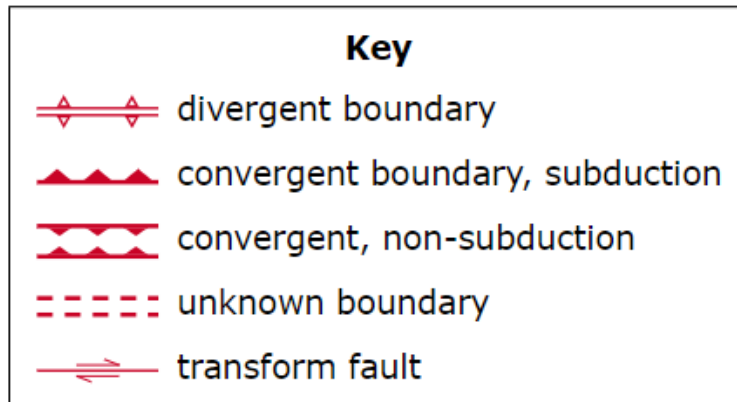


733
Ore

Tectonic Plate Boundaries

Symbols used on maps to represent different types of plate boundaries are based on the FGDC Digital Cartographic Standard for Geologic Map Symbolization document (USGS.gov).

Color: Red is typically used to represent active boundaries, and black is typically used to represent ancient/inactive boundaries. However, the color should be based on what is most easily seen on the map for the student's reference. Whether a boundary is active or not active should be noted in the key or text if the characteristic is necessary.



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⁴ Hume, *The Anatomy of Web Fonts*