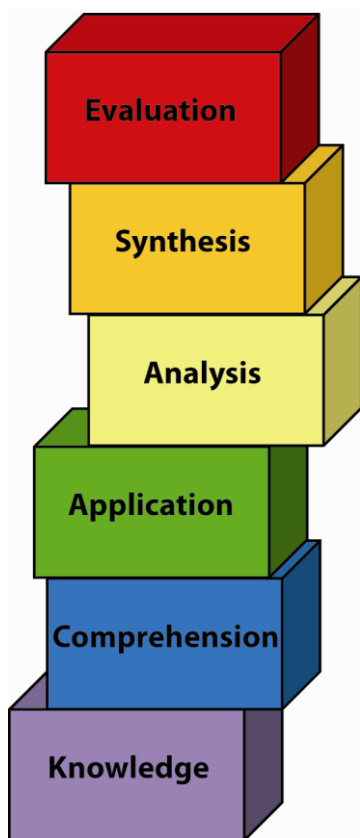




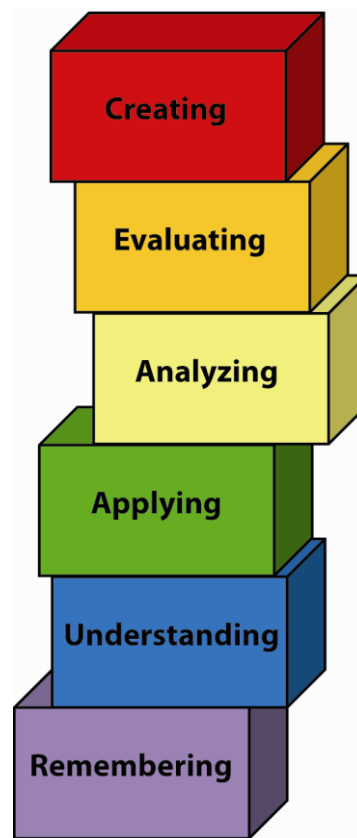
Understanding Depth of Knowledge and Cognitive Complexity Keystone Exam Review of Items

One of the steps in the item-review process involves Pennsylvania educators' review of items for cognitive complexity (that is, the nature of thinking required). One model for classifying thinking into cognitive levels of complexity is Bloom's Taxonomy. Bloom's Taxonomy was first presented in 1956 through the publication *The Taxonomy of Educational Objectives: The Classification of Educational Goals, Handbook I: Cognitive Domain*. This taxonomy identifies six levels within the cognitive domain, from the simple recall or recognition of facts, at the lowest level, through increasingly more complex levels up to evaluation, at the highest level.

During the late 1990s, the original Bloom's Taxonomy was revised (Anderson and Krathwohl, 2001). In the 2001 version of Bloom's Taxonomy, the names of the six major cognitive process categories or levels were revised to indicate action (verbs) rather than non-action (nouns) as noted in the graphic below.



Bloom's Taxonomy (1956)



Revised Taxonomy (2001)

More recently, depth-of-knowledge levels created by Norman Webb from the Wisconsin Center for Education Research have also been used in the review of items for cognitive demand. Webb's definition of depth of knowledge is the degree or complexity of knowledge that the content curriculum standards and expectations require. Therefore, when reviewing items for depth of knowledge, the item is reviewed to determine whether



it is as demanding cognitively as what the actual content curriculum standard expects. In the case of the Pennsylvania Keystone items, the item meets the criterion if the depth of knowledge of the item is in alignment with the depth of knowledge of the Assessment Anchor as defined by the Eligible Content.

Webb's Depth of Knowledge includes four levels; they range from basic recall (at the lowest level) to extended thinking (at the highest level). Examples of verbs that represent each level in Webb's Depth of Knowledge can be found in the information that follows. However, verbs alone do not determine the depth of knowledge. Rather, depth of knowledge is determined by the extent to which students need to know the content before they can respond to a given item.

Since Bloom's Taxonomy (1956) is familiar to many teachers, information comparing Bloom's Taxonomy and Webb's Depth of Knowledge is provided to Pennsylvania educators during the review of the Keystone items. The comparison serves as a bridge for between the teachers' understanding of Bloom's Taxonomy and their understanding of Webb's Depth of Knowledge.



Depth of Knowledge Guidelines for Review of Algebra I

Committees of Pennsylvania educators review each Keystone Exam item, not only to determine whether the item measures what it is intended to measure, but also to determine whether the item aligns with the cognitive level or depth of knowledge of the Assessment Anchor as defined by the Eligible Content. The information below provides a definition of the four depth-of-knowledge levels. A sample Keystone item is also provided as appropriate for depth-of-knowledge levels 1, 2, and 3. The charts at the end of the section also provide a comparison between Bloom's Taxonomy and Webb's Depth of Knowledge for mathematics (Algebra I, Algebra II, and Geometry). Examples of verbs (i.e., action words) are included. Using this information as well as the charts, Pennsylvania educators are asked to determine the depth of knowledge of each item and to verify that the depth of knowledge of each item is in alignment with the depth of knowledge of the Assessment Anchor as defined by the Eligible Content.

Definitions of Webb's Depth of Knowledge (DOK)

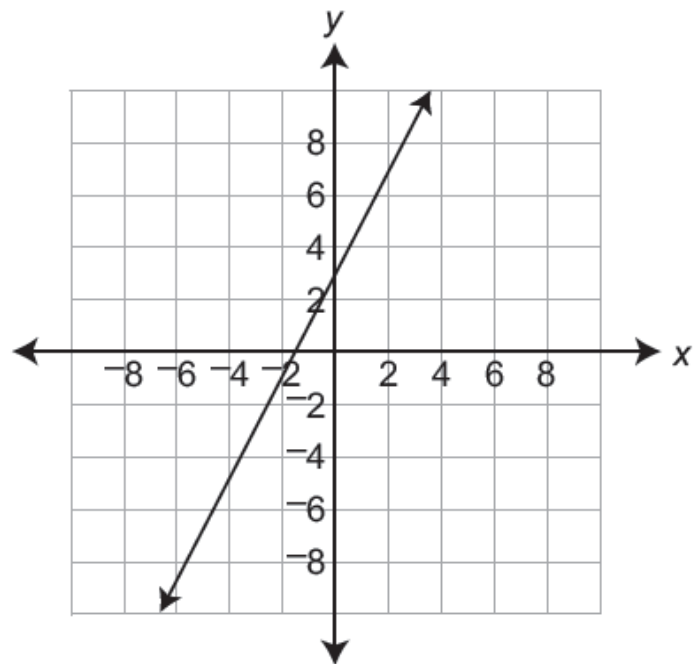
Algebra I—DOK Level 1

Level 1 (Recall) requires recalling information such as a fact, definition, term, or simple procedure, as well as performing a simple algorithm or applying a formula. In mathematics, a one-step, well-defined, and straight algorithmic procedure should be included at this lowest DOK level. Other key words that signify Level 1 include "identify," "recall," "recognize," "use," and "measure."

A sample Algebra I DOK Level 1 test item is shown on the right. Verbs such as "describe" and "explain" could be classified at different DOK levels, depending on what is to be described and explained. In the case of this sample item, students are asked to describe the graph using an equation in slope-intercept form, which is provided to students on a reference sheet in the exam. This Level 1 item requires students to look at the graph and determine the slope, identify the y-intercept, and substitute these values into the slope-intercept formula, without any further calculations. (Determining the slope and y-intercept of a given graph is considered a routine procedure for students enrolled in Algebra I.) In this particular item, "describing" is not referring to processes a student uses but instead is referring to the identification of an equation that represents the given graph.

DOK Level 1 Sample: Standard A1.2.2.1.3

A graph of a linear equation is shown below.



Which equation describes the graph?

- A. $y = 0.5x - 1.5$
- B. $y = 0.5x + 3$
- C. $y = 2x - 1.5$
- * D. $y = 2x + 3$



Algebra I—DOK Level 2

Level 2 (*Skill/Concept*) requires the engagement of some mental processing beyond a habitual response. A Level 2 item requires students to make some decisions as to how to approach the problem or activity, whereas Level 1 requires students to demonstrate a rote response, perform a well-known algorithm, follow a set procedure (like a recipe), or perform a clearly defined series of steps. Key words that generally distinguish a Level 2 item include “classify,” “organize,” “estimate,” “make observations,” “collect and display data,” and “compare data.” These actions imply more than one step. For example, to compare data requires identifying characteristics of objects or phenomena first and grouping or ordering the objects next. Some action verbs such as “explain,” “describe,” or “interpret” could be classified at different levels depending on the object of the action (see DOK Level 1 sample item). For example, interpreting information from a simple graph, or reading information from the graph, are also at Level 2. Interpreting information from a complex graph that requires some decisions on what features of the graph need to be considered and how information from the graph can be aggregated is at Level 3.

Level 2 activities are not limited only to number skills but may also involve visualization skills and probability skills. Other Level 2 activities include noticing or describing non-trivial patterns; explaining the purpose and use of experimental procedures; carrying out experimental procedures; making observations and collecting data; classifying, organizing, and comparing data; and organizing and displaying data in tables, graphs, and charts.

A sample Algebra I DOK Level 2 test item is shown on the right. This item is Level 2 because students are asked to demonstrate the solution set to a system of inequalities, which requires students to interpret the inequalities to identify which lines represent the limits of each inequality and whether these limits are inclusive or exclusive. Even if a student decides to solve the problem empirically, the student needs to make astute judgments about which coordinate points to use to assess the validity of each answer option.

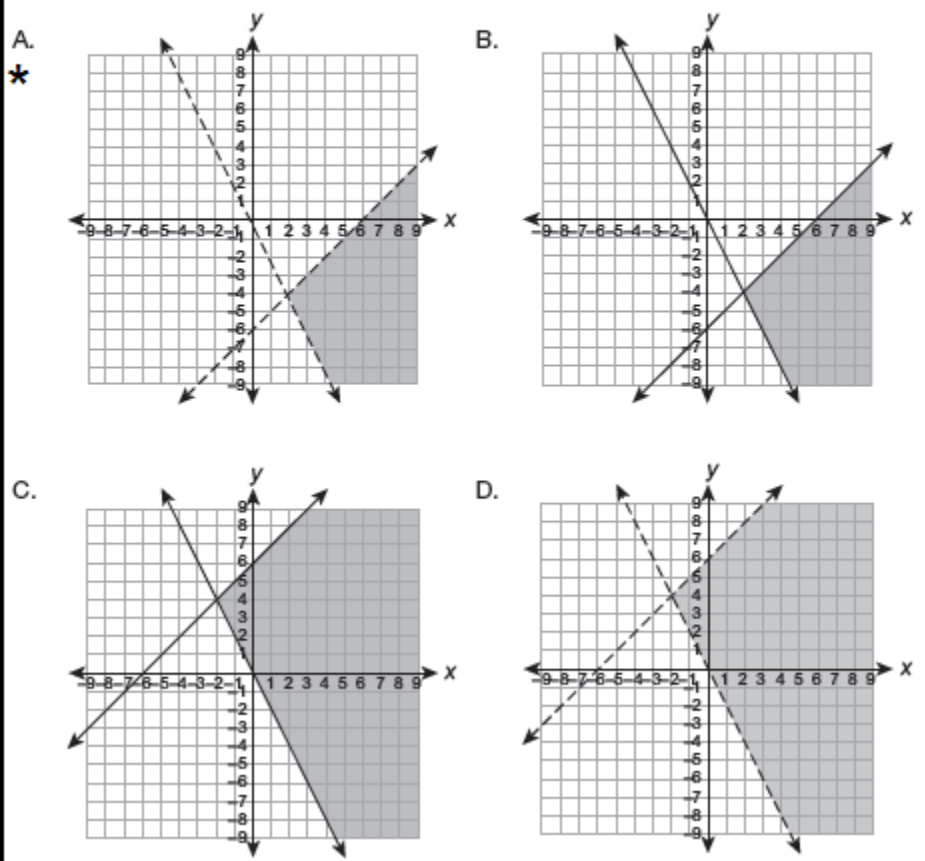
DOK Level 2 Sample: Standard A1.1.3.2.1

A system of inequalities is shown below.

$$y < x - 6$$

$$y > -2x$$

Which graph shows the solution set of the system of inequalities?





Algebra I—DOK Level 3

Level 3 (Strategic Thinking) requires reasoning, planning, using evidence, and a higher level of thinking than the previous two levels. In most instances, requiring students to explain their thinking is at Level 3. Activities that require students to make conjectures are also at this level. The cognitive demands at Level 3 are complex and abstract. The complexity does not result from the fact that there are multiple answers, a possibility for both Levels 1 and 2, but because the task requires more demanding reasoning. An activity, however, that has more than one possible answer and requires students to justify the response they give would most likely be at Level 3. Other Level 3 activities include drawing conclusions from observations, citing evidence and developing a logical argument for concepts, explaining phenomena in terms of concepts, and deciding which concepts to apply in order to solve a complex problem.

A sample Algebra I DOK Level 3 test item is shown on the right. This is a Level 3 item because students need to use abstract reasoning to explain why a certain point on the graph gives the maximum profit. Although this could be done empirically, there are over 30,000 pairs of integer coordinate points to substitute into the profit equation. An appropriate explanation requires reasoning skills by making use of observations about the equations, the graph, and the given price points to justify why the specified point represents the maximum profit.

DOK Level 3 Sample: Standard A1.1.3

An apple farm owner is deciding how to use each day's harvest. She can use the harvest to produce apple juice or apple butter. The information she uses to make the decision is listed below.

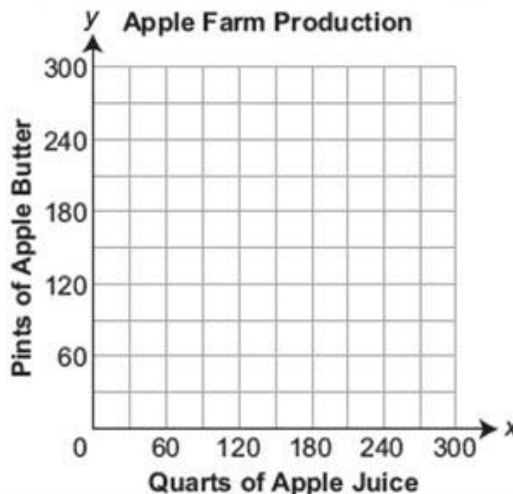
- A bushel of apples will make 16 quarts of apple juice.
- A bushel of apples will make 20 pints of apple butter.
- The apple farm can produce **no more than 180 pints** of apple butter each day.
- The apple farm harvests **no more than 15 bushels** of apples each day.

The information given can be modeled with a system of inequalities. When x is the number of quarts of apple juice and y is number of pints of apple butter, two of the inequalities that model the situation are $x \geq 0$ and $y \geq 0$.

A. Write 2 more inequalities to complete the system of inequalities modeling the information.

inequalities: _____

B. Graph the solution set of the inequalities from part A below. Shade the area that represents the solution set.



The apple farm makes a profit of \$2.25 on each pint of apple butter and \$2.50 on each quart of apple juice.

C. Explain how you can be certain the maximum profit will be realized when the apple farm produces 96 quarts of apple juice and 180 pints of apple butter.



Algebra I—DOK Level 4

Level 4 (Extended Thinking) requires complex reasoning, planning, developing, and thinking, most likely over an extended period of time. The extended time period is not a distinguishing factor if the required work is only repetitive and does not require applying significant conceptual understanding and higher-order thinking. For example, if a student has to take the water temperature from a river each day for a month and then construct a graph, this would be classified as a Level 2. However, if the student is to conduct a river study that requires taking into consideration a number of variables, this would be a Level 4. At Level 4, the cognitive demands of the task should be high and the work complex. Students should be required to make several connections—relate ideas *within* the content area or *among* content areas—and have to select one approach among many alternatives on how the situation should be solved, in order to be at this highest level. Level 4 activities include designing *and* conducting experiments and projects, developing and proving conjectures, making connections between a finding and related concepts and phenomena, combining and synthesizing ideas into new concepts, and critiquing experimental designs.

Note: Multiple-choice and constructed-response items can be written at a depth-of-knowledge Level 4; however, to design an item in this format is difficult, as it would require research, investigation, and application, often over an extended period of time (e.g., performance-based tasks, portfolios, research studies/projects).



Bloom's Taxonomy—Algebra I

Categories (1956)	Definition	Examples of Action Words*
Knowledge	Student remembers, or recalls, appropriate previously learned information.	Define, identify, name, select, state, order, (involves a one-step problem)
Comprehension	Student translates, comprehends, or interprets information based on prior learning.	convert, estimate, explain, express, factor, generalize, give example, identify, indicate, locate, picture (involves two or more steps)
Application	Student selects, transfers, and uses data and principles to complete a task or problem with minimum direction.	apply, choose, compute, employ, interpret, graph, modify, operate, plot, practice, solve, use (involves three or more steps)
Analysis	Student distinguishes, classifies, and relates assumptions, hypotheses, evidence, or structure of a statement or question.	compare, contrast, correlate, differentiate, discriminate, examine, infer, maximize, minimize, prioritize, subdivide, test
Synthesis	Student originates, integrates, and combines ideas into a product, plan, or proposal that is new to him or her.	arrange, collect, construct, design, develop, formulate, organize, set up, prepare, plan, propose, create experiment and record data
Evaluation	Student appraises, assesses, or critiques on a basis of specific standards and criteria.	appraise, assess, defend an estimate, evaluate, judge, predict, rate, validate, verify

Webb's Depth of Knowledge—Algebra I

Categories	Definition	Examples of Action Words*
Recall	Student recalls facts, information, procedures, or definitions.	define, identify, name, select, state, order (one-step problem)
Basic Application of Skill/Concept	Student uses information, conceptual knowledge, and procedures.	apply, choose, compute, employ, interpret, graph, modify, operate, plot, practice, solve, use (two or more steps)
Strategic Thinking	Student uses reasoning and develops a plan or sequence of steps; process has some complexity.	compare, contrast, correlate, differentiate, discriminate, examine, infer, maximize, minimize, prioritize, subdivide, test
Extended Thinking	Student conducts an investigation; needs time to think and process multiple conditions of the problem or task. (The item/task generally requires several days or weeks to complete.)	arrange, collect, construct, design, develop, formulate, organize, set up, prepare, plan, propose, create experiment and record data

*Some action words (verbs) can be classified at different depth-of-knowledge levels, depending on the context of the item and the complexity of the action.



Depth of Knowledge Guidelines for Review of Biology

Committees of Pennsylvania educators review each Keystone Exam item, not only to determine whether the item measures what it is intended to measure, but also to determine whether the item aligns with the cognitive level or depth of knowledge of the Assessment Anchor as defined by the Eligible Content. The information below provides a definition of the four depth-of-knowledge levels. The charts at the end of the section also provide a comparison between Bloom's Taxonomy and Webb's Depth of Knowledge for biology. Examples of verbs (i.e., action words) are included. Using this information as well as the charts, Pennsylvania educators are asked to determine the depth of knowledge of each item and to verify that the depth of knowledge of each item is in alignment with the depth of knowledge of the Assessment Anchor as defined by the Eligible Content.

Definitions of Webb's Depth of Knowledge

Biology—DOK Level 1

Level 1 (Recall) requires the recall of information, such as a fact, definition, term, or simple procedure, as well as performance of a simple science process or procedure. Level 1 only requires students to demonstrate a rote response, use a well-known formula, follow a set procedure (like a recipe), or perform a clearly defined series of steps. A simple procedure is well defined and typically involves only one step. Verbs such as "identify," "recall," "recognize," "use," "calculate," and "measure" generally represent cognitive work at the recall level. Simple word problems that can be directly translated into and solved by a formula are considered Level 1. Verbs such as "describe" and "explain" could be classified at different depth-of-knowledge levels, depending on the complexity of what is to be described and explained.

A student answering a Level 1 item either knows the answer or does not; that is, the item does not need to be "figured out" or "solved." If the knowledge necessary to answer an item automatically provides the answer to it, then the item is at Level 1. If the knowledge needed to answer the item automatically is not provided in the stem, the item is at least at Level 2. Some examples that represent, but do not constitute, all Level 1 performance are as follows:

- Recall or recognize a fact, term, or property.
- Represent in words or diagrams a scientific concept or relationship.
- Provide or recognize a standard scientific representation for simple phenomenon.
- Perform a routine procedure, such as measuring length.

A sample Biology Level 1 test item is shown below. Verbs such as "observe" could be classified at different levels, depending on what is being observed. For this sample item, students are asked to select the statement that best describes a scientific observation. This Level 1 item requires students to recognize the scientific definition of an observation among statements that define other scientific terminology. In this sample item, "observation" is not referring to a procedure students use, but instead is referring to an identification the best definition.

DOK Level 1 Sample: Bio.B.3.3.1

Which statement **best** describes a scientific observation?

- * A. It is knowledge of the natural world gained through the human senses.
- B. It presents a prediction that confirms the data collected for an investigation.
- C. It is an interpretation of a natural phenomenon based on many human experiences.
- D. It summarizes a hypothesis that is supported by evidence from repeated experiments.



Biology—DOK Level 2

Level 2 (Skills and Concepts) requires the engagement of some mental processing beyond recalling. The content knowledge or process involved is **more complex** than in Level 1. Items require students to make some decisions as to how to approach the question or problem. Key words that generally distinguish a Level 2 item include “classify,” “organize,” “estimate,” “make observations,” “collect and display data,” and “compare data.” These actions imply **more than one step**. For example, to compare data requires first identifying characteristics of the objects or phenomena first and grouping or ordering the objects next. Level 2 activities include making observations and collecting data; classifying, organizing, and comparing data; and organizing and displaying data in tables, graphs, and charts. Some action verbs such as “explain,” “describe,” or “interpret” could be classified at different depth-of-knowledge levels, depending on the complexity of the action. For example, interpreting information from a simple graph, which requires reading information from the graph, is a Level 2. An item that requires interpretation from a complex graph, such as making decisions regarding features of the graph that need to be considered and how information from the graph can be aggregated, is at Level 3. Some examples that represent, but do not constitute all, Level 2 performance are as follows:

- Specify and explain the relationship between facts, terms, properties, or variables.
- Describe and explain examples and non-examples of science concepts.
- Select a procedure according to specified criteria and perform it.
- Formulate a routine problem, given data and conditions.
- Organize, represent, and interpret data.

A sample Biology Level 2 test item is shown below. For this sample item, students are asked to interpret information in a data table and to apply their understanding of inheritance to predict all the possible phenotypes of the mother if a child has type A blood and the father of the child has type AB blood. This Level 2 item requires students to determine the outcomes of four possible genetic crosses by interpreting the multiple allele combinations shown in the data table.

DOK Level 2 Sample: Bio.B.2.1.1

Use the table below to answer the question.

Blood Types	
Genotype(s)	Phenotype
ii	O
I ^A I ^A , I ^A i	A
I ^B I ^B , I ^B i	B
I ^A I ^B	AB

Blood type is inherited through multiple alleles, including I^A, I^B, and i. A child has type A blood. If the father has type AB blood, what are all the possible phenotypes of the mother?

- A. phenotypes O or A
- B. phenotypes A or AB
- C. phenotypes A, B, AB
- *D. phenotypes O, A, B, AB



Biology—DOK Level 3

Level 3 (Strategic Thinking) requires reasoning, planning, using evidence, and a higher level of thinking than the previous two levels. The cognitive demands at Level 3 are complex and abstract. The complexity does not result only from the fact that there could be multiple answers, a possibility for both Levels 1 and 2, but because the multi-step task requires more demanding reasoning. In most instances, requiring students to explain their thinking is at Level 3; requiring a very simple explanation or a word or two should be at Level 2. An activity that has more than one possible answer and requires students to justify the response they give would most likely be a Level 3. Experimental designs in Level 3 typically involve more than one dependent variable. Other Level 3 activities include drawing conclusions from observations, citing evidence and developing a logical argument for concepts, explaining phenomena in terms of concepts, and using concepts to solve non-routine problems. Some examples that represent, but do not constitute all, Level 3 performance are as follows:

- Identify research questions and design investigations for a scientific problem.
- Solve non-routine problems.
- Develop a scientific model for a complex situation.
- Form conclusions from experimental data.

A sample Biology Level 3 test item is shown below. For this sample item, students are asked to interpret scientific information to complete a Punnett square and then provide an explanation and a prediction. This Level 3 item requires students to apply their knowledge of co-dominance to construct, evaluate, and make predictions related to coat color in cattle. The cognitive demands at Level 3 are complex and often abstract. The complexity does not result from the fact that there are multiple answers but because the task requires more demanding reasoning related to patterns of inheritance.

DOK Level 3 Sample: Bio.B.2.1.1

A cattle farmer genetically crosses a cow (female) with a white coat with a bull (male) with a red coat. The resulting calf (offspring) is roan, which means there are red and white hairs intermixed in the coat of the calf. The genes for coat color in cattle are co-dominant.

Part A: Although a farm has cattle in all three colors, the farmer prefers roan cattle over white or red cattle. Use the Punnett square to show a cross that would produce only roan offspring.

Part B: Explain how a roan calf results from one white- and one red-coated parent. In your explanation, use letters to represent genes. Be sure to indicate what colors the letters represent.

Part C: Predict the possible genotypes and phenotypes of the offspring produced from two roan cattle.



Biology—DOK Level 4

Level 4 (Extended Thinking) requires high cognitive demands and complexity. Students are required to make several connections—relate ideas within the content area or among content areas—and have to select or devise one approach among many alternatives to solve the problem. Many on-demand assessment instruments will not include any assessment activities that could be classified as Level 4. However, standards, goals, and objectives can be stated in such a way as to expect students to perform extended thinking. “Develop generalizations of the results obtained and the strategies used and apply them to new problem situations,” is an example of a grade 8 objective that is a Level 4. Many, but not all, performance assessments and open-ended assessment activities requiring significant thought will be Level 4.

Level 4 involves complex reasoning, experimental design and planning, and probably will require an extended period of time either for the science investigation required by an objective, or for carrying out the multiple steps of an assessment item. However, the extended time period is not a distinguishing factor if the required work is only repetitive and does not require applying significant conceptual understanding and higher-order thinking. For example, if a student is asked to take the water temperature from a river each day for a month and then construct a graph, this would be classified as a Level 2 activity. However, if the student conducts a river study that requires taking into consideration a number of variables, this would be a Level 4. Some examples that represent, but do not constitute all, Level 4 performance are as follows:

- Based on data provided from a complex experiment that is novel to the student, deduct the fundamental relationship between several controlled variables.
- Conduct an investigation, from specifying a problem, to designing and carrying out an experiment, to analyzing its data and forming conclusions.

Note: Multiple-choice and constructed-response items can be written at a depth-of-knowledge Level 4; however, to design an item in this format is difficult, as it would require research, investigation, and application, often over an extended period of time (e.g., performance-based tasks, portfolios, research studies/projects).

Note: “Knowledge” can refer both to content knowledge and knowledge of scientific processes. This meaning of knowledge is consistent with the *National Science Education Standards* (NSES), which terms “Science as Inquiry” as its first Content Standard.



Bloom's Taxonomy—Biology

Categories (1956)	Definition	Examples of Action Words*
Knowledge	Student remembers, or recalls, appropriate previously learned information.	identify, recall, observe, recognize, use, calculate, measure, order
Comprehension	Student translates, comprehends, or interprets information based on prior learning.	explain, interpret, describe, classify, identify, recognize, predict
Application	Student selects, transfers, and uses data and principles to complete a task or problem with minimum direction.	apply, classify, experiment, interpret, use, order, calculate
Analysis	Student distinguishes, classifies, and relates assumptions, hypotheses, evidence, or structure of a statement or question.	analyze, order, explain, classify, arrange, compare, contrast, infer, calculate, categorize, examine, experiment, question, test
Synthesis	Student originates, integrates, and combines ideas into a product, plan, or proposal that is new to him or her.	combine, arrange, rearrange, modify, invent, design, construct, organize, predict, infer, conclude, create experiment and record data
Evaluation	Student appraises, assesses, or critiques on a basis of specific standards and criteria.	evaluate, measure, explain, compare, summarize, predict, test, decide, rate, conclude

Webb's Depth of Knowledge—Biology

Categories	Definition	Examples of Action Words*
Recall	Student recalls facts, information, procedures, or definitions.	identify, recall, observe, recognize, use, calculate, measure, order
Basic Application of Skill/Concept	Student uses information, conceptual knowledge, and procedures.	explain, interpret, describe, classify, identify, order, recognize, predict, apply, use, calculate, organize, estimate, observe, collect, display data
Strategic Thinking	Student uses reasoning and develops a plan or sequence of steps; process has some complexity.	analyze, order, explain, classify, arrange, compare, contrast, infer, interpret, calculate, categorize, examine, experiment, question, predict, evaluate, test
Extended Thinking	Student conducts an investigation; needs time to think and process multiple conditions of the problem or task. (The item/task generally requires several days or weeks to complete.)	combine, arrange, rearrange, propose, evaluate, modify, invent, design, construct, organize, predict, infer, conclude, evaluate, create, experiment and record data

*Some action words (verbs) can be classified at different depth-of-knowledge levels, depending on the context of the item and the complexity of the action.



Depth of Knowledge Guidelines for Review of Literature

Committees of Pennsylvania educators review each Keystone Exam item, not only to determine whether the item measures what it is intended to measure, but also to determine whether the item aligns with the cognitive level or depth of knowledge of the Assessment Anchor as defined by the Eligible Content. The information below provides a definition of the four depth-of-knowledge levels. The charts at the end of the section also provide a comparison between Bloom's Taxonomy and Webb's Depth of Knowledge for literature. Examples of verbs (i.e., action words) are included. Using this information as well as the charts, Pennsylvania educators are asked to determine the depth of knowledge of each item and to verify that the depth of knowledge of each item is in alignment with the depth of knowledge of the Assessment Anchor as defined by the Eligible Content.

Definitions of Webb's Depth of Knowledge

Literature—DOK Level 1

Level 1 requires students to receive or recite facts or to use simple skills or abilities. Oral reading that does not include analysis of the text, as well as basic comprehension of a text, is included. Items require only a shallow understanding of the text presented and often consist of verbatim recall from text, slight paraphrasing of specific details from the text, or simple understanding of a single word or phrase. Some examples that represent, but do not constitute all, Level 1 performance are as follows:

- Support ideas by reference to verbatim or only slightly paraphrased details from the text.
- Use a dictionary to find the meanings of words.
- Recognize figurative language in a reading passage.

A sample Literature DOK Level 1 test item is shown below. This item is a Level 1 item because students are asked to recall the meaning of this age-appropriate word and identify the synonym for it. No understanding of the text is required as students are expected to know the word. Identifying synonyms for grade-appropriate words is considered a routine skill for students.

DOK Level 1 Sample: L.F.1.2.1

Which word is a synonym for dilapidation?

- A. discomfort
- * B. disrepair
- C. disfavor
- D. disbelief



Literature—DOK Level 2

Level 2 requires the engagement of some mental processing beyond recalling or reproducing a response; it requires both comprehension and subsequent processing of text or portions of text. Inter-sentence analysis of inference is required. Some important concepts are covered but not in a complex way. Content curriculum standards and items at this level may include words such as summarize, interpret, infer, classify, organize, collect, display, compare, and determine whether fact or opinion. Literal main ideas are stressed. A Level 2 item may require students to apply skills and concepts that are covered in Level 1. However, items require closer understanding of text, possibly through the item's paraphrasing of both the question and the answer. Some examples that represent, but do not constitute all, Level 2 performance are as follows:

- Use context cues to identify the meaning of unfamiliar words, phrases, and expressions that could otherwise have multiple meanings.
- Predict a logical outcome based on information in a selection.
- Identify and summarize the major events in a narrative.

A sample Literature DOK Level 2 test item is shown below. This item is Level 2 because students are asked to comprehend why the propaganda technique used is effective in the sentence, which requires students to use their knowledge of propaganda techniques to make an inference.

DOK Level 2 Sample: L.N.2.5.5

Read the sentence from the speech.

“Those who came before us made certain that this country rode the first waves of the industrial revolution, the first waves of modern invention, and the first wave of nuclear power, and this generation does not intend to founder in the backwash of the coming age of space.”

Why is the propaganda technique used in the sentence effective?

- A. It persuades the reader to ask for more help from other countries in future space exploration programs.
- * B. It convinces the reader to support this country's continued efforts in being a forerunner in all scientific endeavors.
- C. It persuades the reader to want to save money on future scientific projects in this country.
- D. It convinces the reader to support other countries' efforts toward space exploration.



Literature—DOK Level 3

Level 3 requires deeper knowledge. Students are encouraged to go beyond the text; however, they are still required to show understanding of the ideas in the text. Students may be encouraged to explain, generalize, or connect ideas. Content curriculum standards and items (Assessment Anchors as defined by the Eligible Content) at Level 3 involve reasoning and planning. Students must be able to support their thinking. Items may involve abstract theme identification, inference across an entire passage, or students' application of prior knowledge. Items may also involve more superficial connections between texts. Some examples that represent but do not constitute all Level 3 performance are as follows:

- Explain or recognize how the author's purpose affects the interpretation of a selection.
- Summarize information from multiple sources to address a specific topic.
- Analyze and describe the characteristics of various types of literature.

A sample Literature DOK Level 3 item is shown below. This item is Level 3 because students are asked to use deeper knowledge and understanding of the text in analyzing what Howard's thoughts reveal about his personality, which requires students to reason and plan in constructing their analyses. They must also be able to support their thinking (analyses) with information from the passage.

DOK Level 3 Sample: L.F.2.3.1

Analyze what Howard's thoughts throughout the passage reveal about his personality. Use information from the passage to support your analysis.



Literature—DOK Level 4

Level 4 requires higher-order thinking and deep knowledge. The content curriculum standard or item at this level will probably require an extended activity, with extended time provided for completing it. The extended time period is not a distinguishing factor if the required work is only repetitive and does not require the application of significant conceptual understanding and higher-order thinking. Students take information from at least one passage of a text and are asked to apply this information to a new task. They may also be asked to develop hypotheses and perform complex analyses of the connections among texts. Some examples that represent, but do not constitute all, Level 4 performance are as follows:

- Analyze and synthesize information from more than one source.
- Examine and explain alternative perspectives across a variety of sources.
- Describe and illustrate how common themes are found across texts from different cultures.

Note: Multiple-choice and constructed-response items can be written at a depth-of-knowledge Level 4; however, to design an item in this format is difficult, as it would require research, investigation, and application, often over an extended period of time (e.g., performance-based tasks, portfolios, research studies/projects).

Note: The levels are based on Valencia and Wixson (2000, pp. 909–935).



Bloom's Taxonomy—Literature

Categories (1956)	Definition	Examples of Action Words*
Knowledge	Student remembers, or recalls, appropriate previously learned information.	define, identify, name, recall, recognize, select, tell
Comprehension	Student translates, comprehends, or interprets information based on prior learning.	describe, distinguish, explain, identify, indicate, interpret, locate, recognize, restate, summarize
Application	Student selects, transfers, and uses data and principles to complete a task or problem with minimum direction.	apply, choose, demonstrate, determine, interpret, inform, select, show, use
Analysis	Student distinguishes, classifies, and relates assumptions, hypotheses, evidence, or structure of a statement or question.	analyze, characterize, compare, contrast, discriminate, distinguish, explain, infer
Synthesis	Student originates, integrates, and combines ideas into a product, plan, or proposal that is new to him or her.	compose, create, develop, formulate, generalize, organize
Evaluation	Student appraises, assesses, or critiques on a basis of specific standards and criteria.	assess, conclude, convince, defend, evaluate, explain, justify, predict, prove, support

Webb's Depth of Knowledge—Literature

Categories	Definition	Examples of Action Words*
Recall	Student recalls facts, information, procedures, or definitions.	define, identify, locate, name, recall, recognize, sequence, tell
Basic Application of Skill/Concept	Student uses information, conceptual knowledge, and procedures.	apply, compare, comprehend, identify, describe, determine, infer, interpret, predict, summarize, use
Strategic Thinking	Student uses reasoning and develops a plan or sequence of steps; process has some complexity.	analyze, cite evidence, compare, contrast, draw conclusions, explain, generalize, infer, interpret, evaluate, recognize, summarize, support
Extended Thinking	Student conducts an investigation; needs time to think and process multiple conditions of the problem or task. (The item/task generally requires several days or weeks to complete.)	describe and illustrate, evaluate, examine and explain, analyze, synthesize

*Some action words (verbs) can be classified at different depth-of-knowledge levels, depending on the context of the item and the complexity of the action.



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