

Appendix J. Decision Rules

*Decision rules presented at the following levels:
project, content area, occupational area, and objective and standard*

Note: In several instances below, decision rules appear as captured during the meeting by note-takers.

Project Decision Rules

- Knowledge and skills that are ***prerequisites but are also reviewed*** in this course should be coded as (1) - KSA is PREREQUISITE for this course. Partial evidence—that is, if only part of the framework element applies—should be coded as (1) - KSA is PREREQUISITE for this course. No evidence of the KSA in materials should be coded as (0) - KSA is NOT APPLICABLE to this course.
 - Note: You will then identify the framework elements that DO NOT APPLY in the KSA exclusions column.
 - Note: If only part of a framework element applies to new content, please use your best judgment as to whether the included elements are sufficient to warrant identification as new content.
- Once you rate a framework statement as prerequisite, you will be prompted to complete additional ratings, including documenting any KSA exclusions. If you do not identify any KSA exclusions, enter “n/a” into the text box.
- Only for NAEP Framework statements identified as prerequisite will you be prompted to complete an importance rating:
 - **0 - Minimally important.** Although a prerequisite, possessing this KSA will make *minimal difference to student performance in this course.*
 - **1 - A little important.** This KSA is a prerequisite, and if possessed, the student is *likely to learn more and have higher performance in the course.*
 - **2 - Important.** Without this KSA, students *will struggle with the course material.*
 - **3 - Very important.** Without this KSA students are not prepared for, and *will be unlikely to complete this course.*
- The BPD, or “borderline performance description”, is a short—usually two-to-three paragraph—narrative description describing the knowledge, skills, and abilities (KSA) a student would need to be *minimally* prepared for an occupational program in a postsecondary setting. After you rate all the NAEP Framework statements for a course packet, you will have a very good idea of what the KSAs a student will need to know to be prepared for that *specific course*. You will then compare the KSAs required in the course packet to the BPD, and tell us whether the course requires fewer or less complex/difficult KSA as compared to the BPD, if the KSAs are similar, or if the KSAs in the course packet are more complex/difficult than the BPD.
- Remember, you are rating rigor level of each course packet *relative to the other courses reviewed for this occupation in this study*. It is possible that your definition of rigor will change as you progress through rating course packets. Due to limitations of our online survey tool, it is imperative that you record your rigor ratings in the word document for each packet rating. Then, after you finish rating all packets, go back and review your rigor ratings and adjust as appropriate.
- When you encounter an “and” in a framework statement:
 - Rate “1-prerequisite” if part—but not all—of the statement is applicable

- Use the KSA Exclusion text box to note which parts(s) of the statement is not applicable
- *Table of Contents is only used as stand-alone if syllabus indicates which part or all is used in the class.
- *Including = "and"
- *"And" in a list of items means all items in list must be evident.
- *"Or" in a list of items means that not all items must be evident.
- *Lists containing "such as" are not a closed universe; treat as examples.

*Note. Decision rules marked with an * indicate project level decision rules implemented during the onsite workshops. The remaining decision rules were implemented during the independent study and reiterated during the onsite workshops.*

Content Area Decision Rules

Mathematics	Reading
None.	Refer to decision rules to: <ul style="list-style-type: none"> • Interpret terms • "Simple inferences," "Author's purpose," "Organizing structures," etc. Refer to definitions to: <ul style="list-style-type: none"> • Define literary and informational text categories • Define literary and information genres/type of texts

Decision Rules and Definitions for NAEP Reading Framework

Standard/ Objective	Term of Interest	Decision Rule
1.1, 1.1.a 2.1, 2.1.a-2.1.f 2.4, 2.4.a 3.1, 3.1.a-3.1.c	"both literary and informational texts"	If partial agreement (evidence of KSA for literary <i>or</i> informational text, but not both), select 1-prerequisite. Make sure to identify which part is not applicable in the KSA exclusion textbox.
1	"Simple inferences"	"Simple inferences" and their associated objectives will be interpreted as including the understanding of close paraphrase of "explicit information" within or across texts.
1.3.b	"Author's purpose"	"Author's purpose" will be interpreted as referring to explicit statements of the author's purpose within or across texts.
1.3.d	"Organizing	"Organizing structures" will be interpreted as:

	structures”	<ul style="list-style-type: none"> Referring to organizing structures that are explicitly identified in texts, through such indicators as the author’s use of enumeration (“first, second, third,” etc.) or explicit references to a problem and its solution (i.e., “The problem is . . .”), etc. Referring to the organizational structures such as comparison, chronology, cause/effect, description, problem/solution, etc. May also be interpreted as referring to an author’s organization of a larger unit of text (i.e., a paragraph or whole passage), not to the relationship between two sentences.
2.1.d	“Literary devices or text features”	The terms “literary devices or text features” will be interpreted broadly as including all aspects of author’s craft and “text features.” ⁱ
2.1.e	“Organizing structures”	<p>“Organizing structures” will be interpreted as:</p> <ul style="list-style-type: none"> Referring to the organizational structures such as comparison, chronology, cause/effect, description, problem/solution, etc. May also be interpreted as referring to an author’s organization of a larger unit of text (i.e., a paragraph or whole passage), not to the relationship between two sentences.
2.1.f	“Author’s purpose”	“Author’s purpose” will be interpreted as referring to the implicit purpose of a text.
2.3.a	“Major ideas”	“Major ideas” will be interpreted as including important ideas within a paragraph or portion of a text as well as ideas central to a passage as a whole.

Definitionsⁱⁱ

Literary

<i>Text Categories</i>	<i>Genre/Type of Text</i>
Fiction	<ul style="list-style-type: none"> Adventure stories Historical fiction Contemporary realistic fiction Folktales Legends Fables Tall tales Myths Fantasy

	<ul style="list-style-type: none"> • Science fiction • Satire • Parody • Allegory • Monologue
Literary Nonfiction	<ul style="list-style-type: none"> • Personal essay • Autobiographical and biographical sketches • Character sketch (memoir, speech) • Classical essay
Poetry	<ul style="list-style-type: none"> • Narrative poem • Lyrical poem • Humorous poem • Free verse • Ode • Song (including ballad) • Epic • Sonnet • Elegy

Information

<i>Text Categories</i>	<i>Genre/Type of Text</i>
Exposition	<ul style="list-style-type: none"> • Informational trade book • Textbook • News article • Feature article • Encyclopedia entry • Book review • Historical document • Essay (e.g., informational, persuasive, analytical) • Research report • Essay (e.g., political, social, historical, scientific, natural history) • Literary analysis
Argumentation and Persuasive Text	<ul style="list-style-type: none"> • Informational trade book • Journal • Speech • Simple persuasive essay • Letter to the editor • Argumentative essay • More complex persuasive essay • Editorial • Essay (e.g., political, social) • Historical account

	<ul style="list-style-type: none"> • Position paper (e.g., persuasive brochure, campaign literature, advertisements)
Procedural Text and Documents	<ul style="list-style-type: none"> • Embedded in text <ul style="list-style-type: none"> ▪ Directions ▪ Map ▪ Timeline ▪ Graph ▪ Table ▪ Chart • Embedded in text <ul style="list-style-type: none"> ▪ Recipe ▪ Schedule • Stand-alone material <ul style="list-style-type: none"> ▪ Application ▪ Manual ▪ Product support material ▪ Contract

Occupational Area Decision Rules (Occupational area or packet specific)

Occupational Area	Decision Rule
CSS Math	<p>Packet 8 : For an introductory algebra course, designate a pre-algebra entry as prerequisite. Assume a pre-algebra level of entry? Decision: Skip packet.</p> <p>Packet 10 : Interpreting ledger is rated as prerequisite and very important.</p>
HVAC Math	<p>In order to indicate evidence, a concept needs to be manipulated. If a concept is evidenced within a line item, such as Table of Contents, we can't look at a noun and assume what types of activities take place.</p> <p>The indication of grade calculation is not to be considered as evidence.</p>
LPN Math	<p>Packet 8 : Very well put together packet, we could use this as an example for how to put together a packet.</p>
PT Intro Math	<p>"Or" is not being treated as "and" in terms of triggering the KSA exclusion rule, if a statement includes "or" and at least one of the options is present in the course, can be New Content.</p> <p>Including is being treated as "and"—if not present in the course, can bracket out that part of the statement.</p> <p>Adopting decision rule of other team: will review packet to ensure that the table of content is useful, if syllabus refers to sections of text can safely assume that the information referred to in table of contents is included in course. If syllabus does not include</p>

	<p>information about which parts of the text are being taught, will need to look for other evidence of content than the table of contents. If pre-req due to KSA exclusion, only rate importance for the part of the KSA that was included. For pre-req due to "prior knowledge", must look for evidence in packet around pre-requisite courses or reviewed materials, cannot assume is prior knowledge without evidence. Where KSA says "such as..." will treat them as examples, not closed universe of options. "Data" is interpreted strictly as real statistical data. Where KSA says "either...or" will treat them as closed universe of options (unlike "such as"). Where there are references to "written descriptions" looking for word problems.</p> <p>Packet 4: Not reviewed for final rating. Very similar in content to packet #3. Packet 5, 18, and 21: Not reviewed for final rating. Incomplete packet. Consultants noted that packets 5, 18, and 21 were very similar. Packet 9: Not reviewed for final rating. Incomplete packet. Packet 14, 15, 19, 20, and 22: No consensus process because lack of time. Packet 16 and 17: No consensus process because lack of time. Consultants noted that there was no evidence of math in this packet. Consultants noted that packets 16 & 17 were very similar.</p>
PT Concl Math	N/A
CSS Reading	<p>Simple step inference as noted in decision rules is a paraphrase and extends up to a single step text based inference. Complex inference equals evidence of multi-step or knowledge based/higher level comprehension.</p> <p>Packet 4 : The course documents note that this is not a required course in the program of study. Packet 6 : This course is the third course in the sequence for Assoc and a bachelor. This is usually taken by students in second year of both programs. It requires independent research, evaluation of scholarly research articles and producing a report citing sources with APA style guidelines. Packet 7 : This course is about filing. This is very targeted and specific and typically an elective. This course is listed as an elective. Not a standard component of a standard CSS curriculum. Records management is a course often in medical asst or logistics.</p>
HVAC Reading	Packet 11 : This syllabus is for a building technologies certificate,

	<p>which is a new trend but not necessarily a traditional HVAC. It is a hybrid certificate.</p> <p>Packet 14 : This course is a customer service/communications type course for future HVAC professionals. There is alignment with many of the NAEP framework KSAs statements.</p>
LPN Reading	<p>"Prereq"= they have to enter the course with x skills; minimal preparedness</p> <p>"New"= seeing evidence that they are being taught this material in the course</p> <p>- When content is present, but also taught as new, rate the lowest</p> <p>Importance Rating: Stage 1 : if it's taught, then assessed later, it's lower on the importance scale Stage 2: how much is it evident in the course? Stage 3: weight both 1 & 2</p> <p>Packet 2: Packet not to be rated because of course prerequisites; p.3 of doc "completion of year one of Nursing and successful passing NCLX-PN.</p> <p>Packet 6: Remove packet, OA states that this course type is never taught as introductory; students would need to test prior course requisites to be able to administer and measure medicine.</p> <p>Packet 7: Do not rate, dual degrees.</p> <p>Packet 13: OA states Intro nursing courses would likely contain (the pillars) the majority of KSAs. Passing course is 77-80%. Recalling information and being able to take tests are significant to the success in the program.</p> <p>Packet 13 is evidence-based nursing, which includes drawing conclusions.</p> <p>All courses with clinical component have a summary feature (pre- and post- summaries).</p> <p>Packet 14: Packet not to be rated because it is a second year course.</p>
PT Introductory Reading	<p>If students have had some version of, but it is refined in the course, then we rate as prerequisite.</p> <p>Importance Rating: Stage 1 : if it's taught, then assessed later, it's lower on the importance scale. Stage 2: how much is it evident in the course? Stage 3: weight both 1 & 2.</p> <p>Packet 2 : skipped, OA packet.</p> <p>Packet 18 : Includes an extra credit assignment which is to be considered as evidence in review.</p>
PT Concluding Reading	N/A

Standard and Objective Decision Rules – Mathematics, Reading

Note: In addition to providing decision rules for all occupational areas, notes are also listed to add context behind content review team decisions. For example, 1.1.0 in CSS does not have a decision rule, but a note was captured, stating "Note: CE states that adding 'simple inferences' adds dimension to basic skill of locate and recall. OA defines 'important' as how a student deals with/responds to the material"

NAEP Framework		CSS (NA)	HVAC	LPN	PT Introductory	PT Concluding (NA)
1	Locate/Recall: Locate or recall textually explicit information within					
1-1.0	Locate or recall textually explicit information and make simple inferences within and across both literary and informational texts.		Note: CE states that adding "simple inferences" adds dimension to basic skill of locate and recall. OA defines "important" as how a student deals with/responds to the material.	Note: "Inference," as defined by CE, means drawing a conclusion; not having explicitly stated information, deducing information provided to make a statement.		
	1-1-a) Locate or recall specific information such as definitions, facts, and supporting details in text or graphics.					
	1-2) Locate or recall textually explicit information and make simple inferences within and across literary texts.		If we see evidence of a skill being taught/reviewed in the course, and evident as prereq, then rate as "little important." Prereq because students need the basic ability to infer.			
	1-2-a) Locate or recall character traits.					
	1-2-b) Locate or recall sequence of events or actions.					
	1-2-c) Locate or recall setting.					
	1-2-d) Locate or recall figurative language.					
	1-2-e) Locate or recall organizing structures of literary texts, such as verse or stanza in poetry or description, chronology, comparison, etc. in literary non-fiction.					
	1-3) Locate or recall textually explicit information and make simple inferences within and across informational texts.		An exam is evidence of this KSA.	Agree to disagree Note: (from LPN Rdg) CE states that within and across, across piece met with more than one source of information (e.g., text).	Evidence of KSA must include more than one text.	
	1-3-a) Locate or recall the topic sentence or main idea.		Note: An example is a student pulling out pieces of information, not explicitly topic sentence or main idea. Note: KSA is so basic and necessary to function (being able to identify main idea) that they have to have basic skill in order to progress, but the KSA doesn't translate well into the field.	Note: CE states that "Locate a main idea" - terms used are list/describe/discuss/explain, doesn't mean a student can sift through information, nothing that directs us to that skill. Perhaps skills required are listing, in terms of describing types of procedures. E.g., a research based assignment, then summarize and report the main thesis of the assignment, that requires summarization. E.g.2, a case study- what is the most important issue here? Key is prioritization. Note: OA states that more often, in pharmacology you will likely see causal relations as students study medicine and their effects on the patient. If there was a general education objective in the syllabi, not considering that as evidence.	Note: KSA not explicitly stated in packets, but students must have this skill in order to succeed in courses.	
	1-3-b) Locate or recall the author's purpose.					
	1-3-c) Locate or recall causal relations.		Note: CEs state that case studies may be interpreted as "causal relation."	Note: "Causal relation" means that if two events happen simultaneously, one doesn't bring about the other. Causal, the taking of this drug brings about these effects. There has to be a relationship, what happens in A is a direct result of B.	An example of KSA is side effect from drug.	
	1-3-d) Locate or recall organizing structures of texts, such as comparison/contrast, problem/solution, enumeration, etc.		Procedural content and listing in the correct order is evidence of KSA. Nursing care plan is considered to be problem/solution and is evidence of the KSA.			
2	Integrate/Interpret: Make complex inferences within and across					
2-1.0	Make complex inferences within and across both literary and informational texts.		Note: CE defines complex as a student looking in/considering more than one variable, short story, case studies.			
	2-1-a) Describe problem and solution, or cause and effect.					
	2-1-b) Compare or connect ideas, perspectives, problems, or situations.					
	2-1-c) Determine unstated assumptions in an argument.					
	2-1-d) Describe or analyze how an author uses literary devices or text features to convey meaning.					
	2-1-e) Describe or analyze how an author uses organizing structures to convey meaning.					
	2-1-f) Describe or analyze author's purpose.					
	2-2) Make complex inferences within and across literary texts.					
	2-2-a) Interpret mood, tone, or voice.					
	2-2-b) Integrate ideas to determine theme.					
	2-2-c) Interpret a character's conflicts, motivations, and decisions.					
	2-2-d) Examine relations between or among theme, setting, plot, or characters.					
	2-2-e) Explain how rhythm, rhyme, sound, or form in poetry contribute to meaning.					
2-3.0	Make complex inferences within and across informational texts.			Note: "Complex inferences" means multiple variables to come to an answer.	Evidence of KSA must include more than one text.	
	2-3-a) Summarize major ideas.		Note: CE defines "summarize" as not a listing, but a distillation of information rather than recounting of information; not restating. OA defines "summarize" as restating/recalling information; describe or explain in their own words.	Note: CE define "Summarize" as dealing with a large piece of text and pull out the major points, only using those meaningful details to support the main idea. Assignments requiring research and synthesizing.	Evidence of KSA must include discussion questions.	
	2-3-b) Draw conclusions and provide supporting information.		Evidence based nursing includes fact-based information and should be rated as prereq and important.	No discussion questions, then no evidence.		
	2-3-c) Find evidence in support of an argument.		Rate KSA as not applicable, unless there is evidence of research assignment. Note: KSA is more than locating and recalling, it's providing reasoning in support of reasoning; more than one argument is not an option.			
	2-3-d) Distinguish facts from opinions.		Note: Means that students are able to recognize evidence based information. Note: Nursing process requires distinguishing subjective from objective.			
	2-3-e) Determine the importance of information within and across texts.		Evidence of KSA must include more than one text (e.g., study guides)	Anytime we have an exam and multiple texts, evidence of this KSA. In order for a student to complete an exam, he/she would have to determine the importance of information.		
2-4.0	Apply understanding of vocabulary to comprehension of both					
2-4-a.0	Determine word meaning as used in context.					
3	Consider text(s) critically					
3-1.0	and informational texts critically.					
	3-1-a) Judge the author's craft and technique.					
	3-1-b) Analyze, critique, or evaluate the author's perspective or point of view.					
	3-1-c) Take different perspectives in relation to a text.					
	3-2) Consider literary text critically.					
	3-2-a) Evaluate the role of literary devices in conveying meaning.					
	3-2-b) Determine the degree to which literary devices enhance a literary work.					
	3-2-c) Evaluate a character's conflict, motivations, and decisions.					
	3-3) Consider informational text critically.		Note: CE considers research as evidence of KSA.	Research component meets evidence of KSA. CE states that critical evaluation of text implies an evaluation of the text within a text; e.g., a research component.	Note: Research must come from an outside source, which may present a different perspective.	
	3-3-a) Evaluate the way the author selects language to influence readers.					
	3-3-b) Evaluate the strength and quality of evidence used by the author to support his or her position.		Note: OA states not a standard component, looking at research with an evaluative research	Note: OA places emphasis on author, not student. CE states that reading a text for information, choosing a text to support point of view. Giving student info, and asking students to select correct info.		
	3-3-c) Determine the quality of counterarguments within and across texts.					
	3-3-d) Judge the coherence or logic of an argument.		Note: For example, a student can choose ten diagnosis answers, but there is only one that is actually correct	Case studies are evidence of KSA.		

Note: In addition to providing decision rules for all occupational areas, notes are also listed to add context behind content review team decisions. For example, 1.1.d in CSS does not have a decision rule, but a note was captured, stating "Note: OA states that without understanding of concepts such as credit and debit, students would not be successful in course".

NAEP Framework		CSS	HVAC	LPN	PT Introductory	PT Concluding
1	Number properties and operations					
1.1	Number sense					
1.1.d	Represent, interpret, or compare expressions for real numbers, including expressions using exponents and logarithms.	Note: OA states that without understanding of concepts such as credit and debit, students would not be successful in course.	Note: CE states that "expressions" expands beyond numbers and operations, comparing algebraic expressions; implies more complexity than just numbers. Most math here consists of pre-set formulas requiring students to plug in a number; for example, Ohm's law - a set formula.			
1.1.f	Represent or interpret expressions involving very large or very small numbers in scientific notation.			If there is no evidence of scientific value, then rate as not applicable.		
1.1.g	Represent, interpret, or compare expressions or problem situations involving absolute values.	Note: For example, a number line.		If there is no evidence of absolute value, then rate as not applicable.	If there is no evidence of absolute value, then rate as not applicable.	
1.1.i	Order or compare real numbers, including very large and very small real numbers.	Skill if evidenced, is prerequisite and little important.	Rated consistently as N/A because students are not explicitly asked to do KSA in course packets.			
1.2	Estimation					
1.2.b	Identify situations where estimation is appropriate, determine the needed degree of accuracy, and analyze the effect of the estimation method on the accuracy of results.			If evidence of both estimation and analysis, then rate as new.	Agree to Disagree	
1.2.c	Verify solutions or determine the reasonableness of results in a variety of situations.	Note: OA states that a student must verify their solutions before progressing to next step; they to be able to look at data in a variety of ways to determine the correct solution.			Agree to Disagree	
1.2.d	Estimate square or cube roots of numbers less than 1,000 between two whole numbers.					
1.3	Number operations					
1.3.a	Find integral or simple fractional powers of real numbers.		Note: CE states that KSA should exclude fractional powers because students are not actually calculating, rather they are matching with prefixes.	Note: Exponents are examples of KSA.	KSA will always be n/a.	
1.3.b	Perform arithmetic operations with real numbers, including common irrational numbers.		If evidenced in course materials, should be rated App/Little Imp.	Note: Without irrational numbers rate as prereq.	KSA will always be n/a.	
1.3.c	Perform arithmetic operations with expressions involving absolute value.				Evidence must include absolute value, otherwise n/a.	
1.3.d	Describe the effect of multiplying and dividing by numbers including the effect of multiplying or dividing a real number by Zero, or A number less than zero, or A number between zero and one, or One, or A number greater than one.					
1.3.f	Solve application problems involving numbers, including rational and common irrationals.	Note: For example, writing programs.			KSA will always be prerequisite.	
1.4	Ratios and proportional reasoning					
1.4.c	Use proportions to solve problems (including rates of change).		Note: For example, RPM calculation.	If there is evidence of IV drip rate as new.	If there is evidence of flow rates on other rates, then rate as new. If only evidence of proportions, then rate as prereq.	IV Flow rates are evidence of KSA.
1.4.d	Solve multistep problems involving percentages, including compound percentages.		Note: For example, a percentage of a percentage; such as, 50% discount plus an additional 10% off.	Without evidence of multistep rate as N/A.	Agree to Disagree	
2	Properties of number and operations					
1.5.c	Solve problems using factors, multiples, or prime factorization.			Multiply/divide functions - New, UNLESS review	If there is evidence of multiplying/dividing fractions, then rate as new content.	
1.5.d	Use divisibility or remainders in problem settings.			"Divisibility" = "guessing" rule (if calculators NA) "problem settings" = word problems, contextual situations. Note: Word problems are evidence of problem settings.	If there is evidence of reducing fractions with word problems, then rate as new.	
1.5.e	Apply basic properties of operations, including conventions about the order of operations.	Note: For example, converting a decimal to a binary.	If evidenced in course materials, should be rated App/Little Imp.			
1.5.f	Recognize properties of the number system (whole numbers, integers, rational numbers, real numbers, and complex numbers) and how they are related to each other, and identify examples of each type of number.	Note: For example, commutative property.	Note: Rated consistently as N/A because students are not explicitly asked to do KSA in course packets.	Evidence of "recognize" or NA.	Rate KSA n/a unless "recognize" is evident.	
2	Mathematical reasoning using number					
1.6.a	Give a mathematical argument to establish the validity of a simple numerical property or relationship.					
1.6.b	Analyze or interpret a proof by mathematical induction of a simple numerical relationship.			Note: Induction is a very complex math application.	KSA will always be n/a.	
2	Measurement					
2.1	Measuring physical attributes					
2.1.b	Determine the effect of proportions and scaling on length, area, and volume.					
2.1.c	Estimate or compare perimeters or areas of two-dimensional geometric figures.					
2.1.d	Solve problems of angle measure, including those involving triangles or other polygons or parallel lines cut by a transversal.		Note: Measurement is present, but the "effect" is missing.			
2.1.f	Solve problems involving perimeter or area of plane figures such as polygons, circles, or composite figures.					
2.1.h	Solve problems by determining, estimating, or comparing volumes or surface areas of three-dimensional figures.					
2.1.i	Solve problems involving rates such as speed, density, population density or flow rates.		Note: For example, determine the pulley size to determine the RPM.		If there is evidence of looking for rates, then rate as new; if none, n/a.	
2.2	Systems of measurement					
2.2.a	Recognize that geometric measurements (length, area, perimeter, and volume) depend on the choice of a unit, and apply such units in expressions, equations, and problem solutions.			Note: Length, area, perimeter and volume are considered as the examples of "geometric measurements"	Note: Parenthesis may mean "such as." Proportions are evidence of KSA.	
2.2.b	Solve problems involving conversions within or between measurement systems, given the relationship between the units.				If there is evidence of conversions, then rate as new.	
2.2.d	Understand that numerical values associated with measurements of physical quantities are approximate, are subject to variation, and must be assigned units of measurement.		Note: For example, checking pressure with varied temperature.	Rating based on the exclusion of "physical quantities are approximate, are subject to variation."		
2.2.e	Determine appropriate accuracy of measurement in problem situations (e.g., the accuracy of measurement of the dimensions to obtain a specified accuracy of area) and find the measure to that degree of accuracy.				If there is evidence of taking measurements or using significant figures, then rate as prerequisite; if not, rate as n/a.	
2.2.f	Construct or solve problems involving scale drawings.		Note: Scaling is most important aspect of KSA.			
2	Measurement in triangles					
2.3.a	Solve problems involving indirect measurement.					
2.3.b	Solve problems using the fact that trigonometric ratios (sine, cosine, and tangent) stay constant in similar triangles.					
2.3.c	Use the definitions of sine, cosine, and tangent as ratios of sides in a right triangle to solve problems about length of sides and measure of angles.					
2.3.d	Interpret and use the identity sin ² + cos ² = 1 for angles between 0 and 90; recognize this identity as a special representation of the Pythagorean theorem.					
2.3.e	Determine the radian measure of an angle and explain how radian measurement is related to a circle of radius 1.					
2.3.f	Use trigonometric formulas such as addition and double angle formulas.					
2.3.g	Use the law of cosines and the law of sines to find unknown sides and angles of a triangle.					
3	Geometry					
3.1	Dimension and shape					
3.1.c	Give precise mathematical descriptions or definitions of geometric shapes in the plane and in three-dimensional space.					
3.1.d	Draw or sketch from a written description plane figures and planar images of three-dimensional figures.		Note: For example, taking a 3D figure and representing it in 2D with a drawing.			
3.1.e	Use two-dimensional representations of three-dimensional objects to visualize and solve problems.					
3.1.f	Analyze properties of three-dimensional figures including spheres and hemispheres.					
3.2	Transformation of shapes and preservation of properties					
3.2.a	Recognize or identify types of symmetry (e.g., point, line, rotational, self-congruence) of two- and three-dimensional figures.					
3.2.b	Give or recognize the precise mathematical relationship (e.g., congruence, similarity, orientation) between a figure and its image under a transformation.					
3.2.c	Perform or describe the effect of a single transformation on two- and three-dimensional geometric shapes (reflections across lines of symmetry, rotations, translations, and dilations).					
3.2.d	Identify transformations, combinations, or subdivisions of shapes that preserve the area of two-dimensional figures or the volume of three-dimensional figures.					
3.2.g	Justify relationships of congruence and similarity and apply these relationships using scaling and proportional reasoning.					
3.2.h	Perform or describe the effects of successive transformations.					
3.3	Relationships between geometric figures					
3.3.b	Apply geometric properties and relationships to solve problems in two and three dimensions.					
3.3.c	Represent problem situations with geometric models to solve mathematical or real-world problems.					
3.3.d	Use the Pythagorean theorem to solve problems in two- or three-dimensional situations.					
3.3.e	Recall and interpret definitions and basic properties of congruent and similar triangles, circles, quadrilaterals, polygons, parallel, perpendicular and intersecting lines, and associated angle relationships.					
3.3.f	Analyze properties or relationships of triangles, quadrilaterals, and other polygonal plane figures.					

NAEP Framework		CSS	HVAC	LPN	PT Introductory	PT Concluding
1	Number properties and operations					
1.1	Number sense					
1.1.g	Analyze properties and relationships of parallel, perpendicular, or intersecting lines including the angle relationships that arise in these cases.					
1.1.h	Analyze properties of circles and the intersections of lines and circles (inscribed angles, central angles, tangents, secants, and chords).					
3	Position, direction, and coordinate geometry					
3.4.a	Solve problems involving the coordinate plane such as the distance between two points, the midpoint of a segment, or slopes of perpendicular or parallel lines.					
3.4.b	Describe the intersections of lines in the plane and in space, intersections of a line and a plane, or of two planes in space.					
3.4.c	Describe or identify conic sections and other cross sections of solids.					
3.4.d	Represent two-dimensional figures algebraically using coordinates and/or equations.					
3.4.e	* Use vectors to represent velocity and direction; multiply a vector by a scalar and add vectors both algebraically and graphically.					
3.4.f	Find an equation of a circle given its center and radius and, given an equation of a circle, find its center and radius.					
3.4.g	* Graph ellipses and hyperbolas whose axes are parallel to the coordinate axes and demonstrate understanding of the relationship between their standard algebraic form and their graphical characteristics.					
3.4.h	* Represent situations and solve problems involving polar coordinates.					
4	Mathematical reasoning in geometry					
3.5.a	Make, test, and validate geometric conjectures using a variety of methods including deductive reasoning and counterexamples.					
3.5.b	Determine the role of hypotheses, logical implications, and conclusion in proofs of geometric theorems.					
3.5.c	Analyze or explain a geometric argument by contradiction.					
3.5.d	Analyze or explain a geometric proof of the Pythagorean theorem.					
3.5.e	Prove basic theorems about congruent and similar triangles and circles.					
4	Data analysis, statistics, and probability					
4.1	Data representation					
4.1.a	Read or interpret graphical or tabular representations of data.				KSA rated as n/a without evidence of statistics.	If there is evidence of using tables/graphs, then rate as new (assuming not prior knowledge).
4.1.b	For a given set of data, complete a graph and solve a problem using the data in the graph (histograms, scatterplots, and line graphs).				Note: Graphing, in this instance, means a scatterplot.	
4.1.c	Solve problems involving univariate or bivariate data.				Note: For example, enthalpy diagram or pressure temperature charts. Temperature and pressure would be an example of a bivariate set.	KSA rated as n/a without evidence of statistics. Rate KSA as n/a.
4.1.d	Given a graphical or tabular representation of a set of data, determine whether information is represented effectively and appropriately.					
4.1.e	Compare and contrast different graphical representations of univariate and bivariate data.					
4.1.f	Organize and display data in a spreadsheet in order to recognize patterns and solve problems.				Note: For example, Ohm's law matrices.	Evidence of KSA must include a spreadsheet, other tables won't satisfy this requirement.
4	Characteristics of data sets					
4.2.a	Calculate, interpret, or use summary statistics for distributions of data including measures of typical value (mean, median), position (quartiles, percentiles), and spread (range, interquartile range, variance, and standard deviation).					
4.2.b	Recognize how linear transformations of one-variable data affect mean, median, mode, range, interquartile range, and standard deviation.					
4.2.c	Determine the effect of outliers on mean, median, mode, range, interquartile range, or standard deviation.					
4.2.d	Compare data sets using summary statistics (mean, median, mode, range, interquartile range, or standard deviation) describing the same characteristic for two different populations or subsets of the same population.					
4.2.e	Approximate a trend line if a linear pattern is apparent in a scatterplot or use a graphing calculator to determine a least-squares regression line and use the line or equation to make predictions.					
4.2.f	Recognize that the correlation coefficient is a number from -1 to +1 that measures the strength of the linear relationship between two variables; visually estimate the correlation coefficient (e.g., positive or negative, closer to 0, .5, or 1.0) of a scatterplot.					
4.2.g	Know and interpret the key characteristics of a normal distribution such as shape, center (mean), and spread (standard deviation).					
4	Experiments and samples					
4.3.a	Identify possible sources of bias in sample surveys and describe how such bias can be controlled and reduced.					
4.3.b	Recognize and describe a method to select a simple random sample.					
4.3.c	* Draw inferences from samples, such as estimates of proportions in a population, estimates of population means, or decisions about differences in means for two "treatments."					
4.3.d	Identify or evaluate the characteristics of a good survey or of a well-designed experiment.					
4.3.e	* Recognize the differences in design and in conclusions between randomized experiments and observational studies.					
4	Probability					
4.4.a	Recognize whether two events are independent or dependent.					
4.4.b	Determine the theoretical probability of simple and compound events in familiar or unfamiliar contexts.					
4.4.c	Given the results of an experiment or simulation, estimate the probability of simple or compound events in familiar or unfamiliar contexts.					
4.4.d	Use theoretical probability to evaluate or predict experimental outcomes.					
4.4.e	Determine the number of ways an event can occur using tree diagrams, formulas for combinations and permutations, or other counting techniques.				Note: For example, using trees to count how many ways something happens.	
4.4.f	Determine the probability of independent and dependent events.					
4.4.g	Determine conditional probability using two-way tables.					
4.4.h	Interpret and apply probability concepts to practical situations.					
4.4.i	Use the binomial theorem to solve problems.					
5	Mathematical reasoning with data					
5.1	Identify misleading uses of data in real-world settings and critique different ways of presenting and using information.					
5.1.b	Distinguish relevant from irrelevant information, identify missing information, and either find what is needed or make appropriate approximations.				Note: For example, in a networking course, students are given a variety of situations, then irrelevant information is thrown in for them to distinguish against the relevant information.	Rated consistently as N/A because students are not explicitly asked to do KSA in course packets; for example, no evidence of mathematical reasoning.
5.1.c	* Recognize, use, and distinguish between the processes of mathematical (deterministic) and statistical modeling.					
5.1.d	Recognize when arguments based on data confuse correlation with causation.				Note: For example, when working with two sets of data, one that is daily temperature (by the hour), the second is how many people drink a soda at that hour. Data sets are not related, but data plotted would indicate relation, e.g., temperature on a hot day in correlation to number of ice cream cone sales. The outcome gives students a chance to see correlation, but not necessarily a causation.	
5.1.e	* Recognize and explain the potential errors caused by extrapolating from data.					
5	Algebra					
5.1	Patterns, relations, and functions					
5.1.a	Recognize, describe, or extend numerical patterns, including arithmetic and geometric progressions.					
5.1.b	Express linear and exponential functions in recursive and explicit form given a table, verbal description, or some terms of a sequence.					
5.1.c	Identify or analyze distinguishing properties of linear, quadratic, rational, exponential, or *trigonometric functions from tables, graphs, or equations.					
5.1.d	Determine whether a relation, given in verbal, symbolic, tabular, or graphical form, is a function.				KSA rated as n/a without evidence of functions	
5.1.e	Recognize and analyze the general forms of linear, quadratic, rational, exponential, or *trigonometric functions.					
5.1.f	Determine the domain and range of functions given in various forms and contexts.					
5.1.g	* Given a function, determine its inverse if it exists and explain the contextual meaning of the inverse for a given situation.					
5	Algebraic representations					
5.2.a	Create and translate between different representations of algebraic expressions, equations, and inequalities (e.g., linear, quadratic, exponential, or *trigonometric) using symbols, graphs, tables, diagrams, or written descriptions.				Note: Evidence of word problems is a trigger for prereq rating.	Agree to Disagree
5.2.b	Analyze or interpret relationships expressed in symbols, graphs, tables, diagrams (including Venn diagrams), or written descriptions and evaluate the relative advantages or disadvantages of different representations to answer specific questions.				If word problems are evident, then rate as prerequisite. If analysis is evident, then rate as new content.	Agree to Disagree
5.2.c	Perform or interpret transformations on the graphs of linear, quadratic, exponential, and *trigonometric functions.					
5.2.d	Make inferences or predictions using an algebraic model of a situation.					

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3	Number properties and operations					
	5.2.f	Given a real-world situation, determine if a linear, quadratic, rational, exponential, logarithmic, or trigonometric function fits the situation.				
	5.2.g	Solve problems involving exponential growth and decay.	Note: Examples include: population growth or radioactive decay, which are solved with logarithms (specific problems).			
	5.2.h	* Analyze properties of exponential, logarithmic, and rational functions.				
5	Variables, expressions, and operations					
	5.3.b	Write algebraic expressions, equations, or inequalities to represent a situation.	Note: The actions behind the concept are not present.	Note: Word problems are a trigger to evidence of this KSA.		An example of KSA is word problems: students making equations based on what the problem says.
	5.3.c	Perform basic operations, using appropriate tools, on algebraic expressions including polynomial and rational expressions.		<i>If evidence of dimensional analysis rate as "new".</i>		
	5.3.d	Write equivalent forms of algebraic expressions, equations, or inequalities to represent and explain mathematical relationships.	Note: CE states that there is an element of translation involved with this KSA.		Rate KSA as n/a.	
	5.3.e	Evaluate algebraic expressions including polynomials and rational expressions.	Note: in CSS, the computer is doing the evaluation, not the student		<i>If there is evidence of Clark's rule or pediatric dosing, then rate as new.</i>	KSA is evident with Clark's Rule.
	5.3.f	Use function notation to evaluate a function at a specified point in its domain and combine functions by addition, subtraction, multiplication, division, and composition.				
	5.3.g	* Determine the sum of finite and infinite arithmetic and geometric series.				
	5.3.h	Use basic properties of exponents and logarithms to solve problems.				
5	Equations and inequalities					
	5.4.a	Solve linear, rational, or quadratic equations or inequalities including those involving absolute value.	Note: For example, Ohm's law.	Solve linear equations is to be rated prereq, when excluding quadratic equations or inequalities.	Without evidence of absolute value, the highest rating can be prereq.	
	5.4.c	Analyze situations, develop mathematical models, or solve problems using linear, quadratic, exponential, or logarithmic equations or inequalities symbolically or graphically.	Note: For example, Ohm's law.			Ratios and proportions are evidence of linear equations.
	5.4.d	Solve (symbolically or graphically) a system of equations or inequalities and recognize the relationship between the analytical solution and graphical solution.				
	5.4.e	Solve problems involving special formulas such as: $A = P(1 + r)^t$, $A = Pekt$.		Evidence of looking for IV rate, etc. it to be rated as "new."	<i>If there is evidence of Clark's rule or pediatric dosing, then rate as new.</i>	KSA is evident with Clark's Rule.
	5.4.f	Solve an equation or formula involving several variables for one variable in terms of the others.	Note: For example, Ohm's law.			
	5.4.g	Solve quadratic equations with complex roots.				
6	Mathematical reasoning in algebra					
	5.5.a	Use algebraic properties to develop a valid mathematical argument.		Note: Look for proofs as evidence of KSA.		
	5.5.b	Determine the role of hypotheses, logical implications, and conclusions in algebraic argument.				
	5.5.c	Explain the use of relational conjunctions (and, or) in algebraic arguments.				

ⁱ Examples:

- *Literary Devices/Aspects of Author's Craft*: Exaggeration, Figurative Language (Simile, Metaphor, Symbolism), Imagery, Connotation, Personification, Irony, Foreshadowing, Flashback, Comic Relief, and Dialogue.
- *Rhetorical Structures/Author's Craft*: Parallel Structure, Repetition, Quotations, Analogy, Emotional Appeal, Paradox, Contradictions, Sarcasm, and Irony.
- *Text Features*: Titles, Headings, Charts and Graphs, Italics, Bold text, and Illustrations.

ⁱⁱ Source: American Institutes for Research. (2010). *Reading Framework for the 2011 National Assessment of Educational Progress*.