Appendix

Figure 13: Premature Bookmarking

a minimally prepared student should be able to complete this question for full credit even if unable to do the math they should be able to figure it out and provide correct answer
a minimally prepared student should definitely be able to calculate the perimiter of a square
basic math skills necessary for auto students
basic probability can figure out with basic fractions no understanding of prob needed
demonstrate understanding of the relationship between congruent angles and parallelism, alternate exterior angles should be able to give a partial explanation would not expect full understanding
level of geometry not directly applicable
might not be able to answer requires higher level understanding of geometric relationships
minimally prepare student should answer correctly should be able to calculate percentages perform multi-step calculations correctly order steps
minimally prepared should be able to answer chart may be confusing rather than helpful leading to quick response rather than thoughtful
minimally prepared student should be able to answer
minimally prepared student should be able to answer partially student should be able to sketch a vector would not expect a northerly component
minimally prepared student would not need to do this demonstrate understanding of sin calculate square root
minimally prepared student would not need to know this
minimally prepared will not need to know this basic question but terminology and concepts will be unfamiliar
minimally prepared would not be able to answer this dont know if they need to more difficult in that many layers of info are included lots of data to track and compare
minimally prepared would not be able to answer this no graph increases difficulty removing the ability to estimate answer
must absolutely recognize that information is missing
no clue not applicable
not applicable to automotive more dificult because there is no graphical representation
not directly applicable but should be able to answer
not directly applicable but should be able to answer
not necessary for automotive
not necessary for automotive student

not necessary for entry level auto must select necessary info for calculations
not necessary for full credit should be able to partially describe changes would not expect to see formulaic response
not necessary for minimally prepared not directly applicable
not needed
not needed
not needed
not needed
not needed basic math skills are needed spread sheet manipulation is being tested
not needed not directly applicable
not needed not directly applicable
not needed for entry level will be addressed as student progresses through program multi level progression
not needed for minimally prepared
not needed for minimally prepared would be nice to know poor question? inclusion of placebo group data increases diffiuculty
not needed basic math but terminology not used in auto
not needed will not be used in auto
not required of minimally prepared student might be able to complete at this level would probably miss a step or two
should be able to answer
should be able to answer
should be able to answer at full credit should be able to figure out that information is missing from graph
should be able to answer at this level recognize basic volume, area, flow
should be able to answer even without a geometry background
should be able to answer for full credit
should be able to answer for full credit
should be able to answer basic graphing
should be able to answer combines basic algebra and basic geometry

should be able to answer lack of graph may increase difficulty
should be able to answer logical progression of thought necessary for basic diagnostic skills appears more difficult than it is
should be able to answer might be confused by mean but should have a basic grasp of central tendencies
should be able to answer multiple layers of info add to confusion but should be able to weed out
should be able to answer multiple steps increase difficulty
should be able to answer not complex but higher level of understanding needed
should be able to answer step up in complexity from previous questions, but still basic concepts
should be able to answer very basic geometry
should be able to complete
should be able to complete multiple steps but not diffucult algebra
should be able to figure out
should be able to guess if not calculate
should be able to partially answer this question
should definitely be able to calculate basic volume
student should be able to answer basic multiplication/algebra
student should be able to answer this question shows logical progression and basic algebraic skills
students should be able to do this basic math they might not be familiar with central tendencies demontrate understanding of central tendancies perform basic calculations; multiplication and division
students should be able to do this basic math recognizing missing information is a necessary skill able to evaluate question to determine if adequate information is available to correctly answer recognize that the physical size of the town must be known to correctly answer
they should be able to do this conversion to base units is necessary for calculations in electricty
this level of geometry is not needed demonstrate understanding of dilation and recognize scale factor are not directly applicable
too advanced
will not be able to answer not a difficult question but will they have had exposure to standard deviations
will not need to know graphs make this easier than previous question again, will students have been exposed to statistical concepts such as correlation

would expect minimally prepared student to be able to partially answer this question apply to drive line angles and suspension geometry demonstrate understanding of at least one of the following relationship between congruent angles and parallelism, alternate exterior angles
would expect minimally prepared student to partially answer this question with descriptive answer rather than formulaic
would not expect complete answer
would not expect full credit minimally prepared student might not be able to recognize all steps necessary to answer this question should be able to do the math however would probably be more comfortable with this type of question
would not expect minimally prepared student to answer correctly students should be familiar with cube roots and greater than less than however this is not a problem they would face in auto program
would not expect minimally prepared student to answer correctly this level of math is not directly applicable in auto programs
would not expect minimally prepared student to answer fully minimally prepared student may not be able to develop and analyze spread sheet data should be able to recognize need to sum column develop formula to sum column data
would not expect student to answer fully advanced geometry for auto student

Figure 18: Mathematics Example 2 from Operational 1

Student needs to understand what realumbers are and the inclusive and exclusive use of or". Student must know how to graph them on a number line"
Drew the correct traingle but didn't label it
Student must understand what a Function is and how to graph it.
Only one response is correct. Knowledge of geometric formulas involving the use of pie.
correct values given but didn't draw the triangle
Only one correct response is possible Knowledge of basic algebra and ability to perfom factoring and soilving for x
student failed to answer the whole question
Student must understand what real numbers are understand inclusive and exclusive use of or""
Correct formula and answer to be given Knoledge of graphs and ability to use them to predict probabilities.
Corr3ect equation and answer to be given Ability to read a map using scales and formulate an equation to come up with the right compuitation
Correct equation and answer has to be given Ability to read a map using scales.
partially correct response
Student must be able to add, subtract, multiply and understand exponets.
Correct formula and answer Knowledge of geometric formulas
Student understands slope/intercept values.
only one correct response is possible. Knowledge and ability to perform operationws involving exponets
Correct equation and/or correct answer needs to be given Knowledge of statistics and using data to determine Mean, Mode and Range
Student obviously is a whiz at geometry and understand how to determine line segments using square root formulas. Student understand how to determine area and perimeter. Student must get all four parts to the question correct
Student needs to have a firm grasp of the Pythagorean Theorem and have the mathamatical ability to perform geometric calculations.
Correct equation and/or answer given Ability to dicsern dievistion between numbers in a set and figure averages
Student needs to understand spread sheet concept and algebraic formula development.

Student must understand geometric relationships.
Student missed one part of the equations but got the last part right
Correct equation and/or answer has to be given Knowledge of geometric shapes and ability to follow directions
Correct answer has to be given Ability to graph a line using order pairs given the function of a line
Student filled out the wrong oval. Student identifies specifically what that missing information is.
Correct answer has to be given Knoledge of fractions, subtraction, divison and multiplication using a variable
Student got the definition correct but came up with the wrong value for P, or studenbt got the right valkue for P but did not justify how it was arrived at.
Correct equation and answer Knowledge and ability using variables and subsituting values into equations
Correct equation and answer to be given Ability to read amap to scale Ability to do simple math using a varible to make comparisons
Student read graph correctly got the right answer and justified the answer correctly
Student understands how to compute standard deviation when values are given. Student answered correctly and justified the answer with the correct definition
correct equations and/or answer needs to be given knowledge and ability to solve inequalities
Correct formula and answer has to be given Knowledge of geometric formulas and how to apply them
Correct answer has to be given knowledge of the laws of exponets
Students need understsnd how to work with varibles and fractions

Figure 19: Reading Example 2 from Operational 1

Locate and recall setting.

Compare, connect ideas, perspectives, problems and solutions

State an opinion, did not need to read the story.

"Simple verbage knowledge required only.

+"

"Locate and recall textual information correctly.

Interpert, analyze/critique textual iformation correctly based on supplied information.

need many details with coupious skills of concepts in text."

"Locate and recall textual information correctly.

Interpert, analyze/critique textual iformation correctly based on supplied information.

Advanced analytical skilles"

"Locate and recall textual information correctly.

Interpert, analyze/critique textual iformation correctly based on supplied information.

Advanced technical skills."

Unnecessary complex vocublary memorization skills.

"Locate and recall textual information correctly.

Interpert, analyze/critique textual iformation correctly based on supplied information.

Learner should be able to locate and answer this question."

"Locate and recall textual information correctly.

Interpert, analyze/critique textual iformation correctly based on supplied information.

Most should be at this level."

"Locate and recall texual information correctly.

identify and interpert texual information partially.

Show beginning understanding of analayzing and critiqing information."

"Locate and recall textual information correctly.

Interpert, analyze/critique textual iformation correctly based on supplied information.

Should be able to determine facts or specs from text."

"Locate and recall textual information.

Analyze and critique texual information.

Interpret texual information."

"Locate and recall key text points.

Decide which is more important key point.

Compare and contrast textual key concepts.

Analyze, evaluate and critique textual information.

Advanced concepts"

"Locate/recall texual information.

Evalulate/ analyze and describe textual information.

Intrepert text."

"Locate and recall specific text point.

indentify/i nterpert specific text point meaning."

"Locate and recall textual information correctly.

Interpert, analyze/critique textual iformation correctly based on supplied information.

Should be able to understand meaning in context."

"locate and recall specific text point correctly.

Interpert, analyze/critique specific text point correctly.

deciper true meaning of text.

Learner should have partial skill and during classes hone skill."

"locate and recall two specific text points correctly.

Interpert, analyze two specific text points correctly.

Compare and contrast textual point mostly correctly.

Should be able to partially complete here."

"Locate and recall textual information correctly.

Interpert, analyze/critique textual iformation correctly based on supplied information.

Correctly used supplied text. inference is more advanced skill set we teach."

"Locate and recall textual information correctly.

Interpert, analyze/critique textual iformation correctly based on supplied information.

Should be able to partially complete here."

"Locate and recall textual information correctly.

Interpert, analyze/critique textual iformation correctly based on supplied information.

Sarting to understand analaytical thoght process. above here"

Simplistic question just requiring a knowledge of verbage.

"Locate and recall textual information correctly.

Interpert, analyze/critique textual iformation correctly based on supplied information.

Uses supporting information."

"Locate and recall textual information mostly correct.

Interpert, analyze/critique textual iformation mostly correct partially based on supplied information.

Fails to document correctly."

"locate and recall specific text point correctly.

Interpert, analyze/critique specific text point correctly based upon text based facts.

I think should be able to partially. PArt of diagnosing by using correct specs and procedures."

"Locate and recall textual information correctly.

Interpert, analyze/critique textual iformation correctly based on supplied information.

Should be able to partially explain concept."

"Locate and recall textual information correctly.

Interpert, analyze/critique textual iformation correctly based on supplied information.

Above this level single stage concepts."

"Locate and recall textual information correctly.

Interpert, analyze/critique textual iformation correctly based on supplied information.

Learners should be able to determine this textual fact."

"Locate and recall textual information correctly.

Interpert, analyze/critique textual iformation correctly based on supplied information.

Should be able to determine this concept."

"Identify specific meaning from text.

Interpert, analyze specific text point correctly."

"Identify specific text meaning correctly.

Interpert, analyze/critique specific text points correctly based upon the text.

Partially complete."

"locate and recall specific text points correctly.

Identify, Interpert, analyze/critique specific text points correctly.

Should be able to partially explain concept. Diagnostic thought train"

"locate and recall specific text points correctly.

Interpert, analyze/critique specific text points partially correct.

Should be about here."

"Locate and recall textual information correctly.

Interpert, analyze/critique textual iformation correctly based on supplied information.

Vocab. Should be able to"

"Locate and recall textual information correctly.

Interpert, analyze/critique textual iformation correctly based on supplied information.

Should be able to complete this level."

"Locate and recall textual information correctly.

Interpert, analyze/critique textual iformation correctly based on supplied information.

straight forward procedure. all should be able to."

"Locate and recall textual information correctly.

Interpert, analyze/critique textual iformation correctly based on supplied information.

deciper meaning in text correctly.

Student should be able to do this."

"Locate and recall textual information correctly.

Interpert, analyze/critique textual iformation correctly based on supplied information.

Advanced conpcepts."

Figure 21: Typical Mathematics Example from Operational 2

correct answer but not completely sure how they got it. formula for pythagorean the not shown The big G
cube concept, algebraic formulas and how to solve, sq roots, area, interpretation of info for problem to work took out. missing some of the major sections liked and e section-area for entire cube or one fo the lines
cube concept and formula for deternining area, angle measurement concept, algebraic formulas and how to solve, sq roots, area, interpretation of info for problem to work took out. correctly.
hypothesis understood, algebraic solving for x understood, math NOT completed in formula correctly, no conclusion reached. no justification for answer
did not convert inches to feet but right answer done
calculated only the volume of water in basement. didn't complete the problem with converting to cubic feet and remainder
conversion of feet to inches, extrapalation of info needed from word problem, percent to tenth of inch and answer given in inches so converted correctly. horizontal term, settting up equation correctly
understanding and interpreting graphs estimation and projecting/extrapolating
Measure Ratio and porportions Understanding maps and scaling solve word problems using rates addition, subtraction, mulpiplication division converting units
Understanding maps, scalling and measurement Convert units of measurement Understand ratio and porportions addition subtrraction multiplication division estimation
Use ruler and protractor Knowledge of tiangles and angles ratios and porportions multiplicationa and division addition and subtratction Knowledge of laws of sine Solving algebraic equATIONS
Understading greater than and less than Understanding and/or Real numbers/number line Substituting variables Express data using words, symbols, and graphs
Knowledge of function and domain solve algebraic equations addidtion and subtraction multiplication and division Express equations graphicallly

Describe data in algebraic and graphic form
Solving algebraic equations understanding number rproperties and order of opoerations addition subraction multiplicatioin division
Use ruler and protractor Knowledge of tiangles and angles ratios and porportions multiplicationa and division addition and subtratction Knowledge of laws of sine
Understading greater than and less than Understanding and/or Real numbers/number line Substituting variables Express data using words, symbols, and graphs
Use ruler and protractor Knowledge of tiangles and angles ratios and porportions multiplicationa and division addition and subtratction Knowledge of laws of sine
Knowledge of function and domain solve algebraic equations addidtion and subtraction multiplication and division Express equations graphicallly Describe data in algebraic and graphic form
Solving algebraic equations understanding number rproperties and order of opoerations addition subraction multiplicatioin division Using sine and cosine
understanding number rproperties and order of opoerations addition subraction multiplicatioin division
Understandig geometric figures and measurement
Knowledge and interpretation of graphs, slopes, y intercept solving algebraic formulas Incomplete answer grater than less than
Understanding and interpreting graphs and tables understanding and calculating range mean median mode rounding word problem interpretation
Knowledge and interpretation of graphs, slopes, y intercept solving algebraic formulas greatter than less than
be able to use solve an algerbraic formula given a variable addition subtraction multiplication division
Interpret information in spreadsheet and create a formula
Solving algerbraic equations

Understanding Pythagorean theorem multiplication and division Understanding Area, triangles, quaterlaterals, and angles,segments
Understanding geometric figures including verticies, edges, and segments, cubes Calculate length, area, solve algebraic formulas using exponents and square roots
Knowledge of geometric figures Knowledge of edges, verticies, and points and segments Visualization
understanding and interpreting graphs ordered pairs, plotting, function, algebraic equations, slope,
Recognizing information is missing, but not what information
uderstanding and claculating standard deviation
Understanding geometric figures including verticies, edges, and segments, cubes Calculate length, area, solve algebraic formulas using exponents and square roots
solve algebraic equations given variable addiation, subtraction, multiplication, division
Understanding and interpreting graphs Understand and calculate mean, standard deviation statistical analysis of bell curve and estimation
Understanding maps, scalling and measurement Convert units of measurement Understand ratio and porportions Algebraic equations
solving algebraic equations using variabbles addition, subtration, multiplication and division greater than less than
Understanding geometric cone figures Understanding units of measure understanding radius Circumference of the base Height Slant height Surface area Volume
understanding number rproperties and order of opoerations addition subraction multiplicatioin division fractions
Solve algerbraic formulas given variable multipication and division
understanding and interpreting graphs/tables expressing data in a algerbraic equation solving algebraic equations Use addition subtraction multiplication division USe exponents and squareroot
Understanding and interpreting graphs Understand and calculate mean, standard deviation

Understanding and interpreting graphs Understand and calculate mean, standard deviation Understanding and solving percents
Understanding and interpreting graphs Understanding geometric tranformations visualation
understanding and interpreting lines angles and segments, congruent and parallell
Solving multistep word problems solving problems using flow rates Understanding ratio and porportion Converting units of measure solving for area multipication and division Rounding
Multistep word problem Understanding percents Multiplication/Addition/Subtraction
Solving multistep word problems solving problems using flow rates Understanding ratio and porportion Converting units of measure solving for area multipication and division Rounding
Scaled drawing finding perimeter and area
understanding graphs and tables understandig percents and probobility understanding word problems
understandig geometric figures and ration and porpotion, area length
Understanding and interpreting graphs/tables calculate mean addition subtration multiplication division range rounding
Find the perimerter and area of irregular changed drawing
solve geometric formula given variables solve algerbraic formula given vairables square root, addition, subtraction, multiplication,division multistep problem
understanding and interpreting lines angles and segments, congruent and parallell
Solving multistep word problems addition, multiplication ratio and proportion decimals order of operations
understanding and interpreting graphs estimation and projecting/extrapolating

Solving multistep word problems Converting units of measure ratio and porportion, multipication, division, rounding
Understanding line segments, angles, verticies and geometric shapes, perpendicular lines.
Solving algebraic equations multistep word poblems understanding number rproperties and order of opoerations addition subraction multiplicatioin division
Understanding graphs, coordinate planes Understanding transforational geometry addition, subtration, mulpilication division
knowledge of ratios and porpotrtions express information in algbraic form as an equation muliplication and division
Solving multistep word problems Converting units of measure ratio and porportion, multipication, division,
Undderstanding graphs and andinterpreting understani=ding alfgebraic equations
solving a multistep word problem solving algebraic equations using vaialbes multiplication and division addition and subtraction
Interpreting word problem rounding interpreting less than greater than working with large numbers grouping of numbers
Interpreting and understanding graphs understainding mean, standard deviation
Interpreting graph and table
Knowledge of elemnets of survey reading and interperate data reason and probobility
Geometry
basic math order of operations absolute value
scientific method solving problems using variables
Geometry Understanding and interperating graphs
prediction mean median mod range
Geomerty formulas

Visualizations skills, line slopes, relationships., graphs
knowlege of plotting graphs
Understanding word problems basic math
Understanding geometric shapes
Missing information
MAp reading scaling and measurement
Missing info
Big G
Nterpreting map, scaling and measurement
Algebraic formula dealing with inverse function
Coordinate plane, Algebra
bigg G

Figure 22. Typical Reading Example from Operational 2

Use context clues to find word meaning
Interpret mood Integrate ideas to theme Summarize
Infer feeling, character's conflicts Locate event Determine unstated assumption
Can provide a story theme without clear support from passage. Can identify topic from story but not clear theme.
Provides and substantiates opinion regarding author's ability and success to build suspense Explains author's writing style
Locate sequence of events in literary text Infer action of specific character Locate specific information
Student can explain what the essay shows aboutthe author as a person and support the answer with relevant details from both the essay and the biographical sketch. Student offers generalizations about White's character that could be inferred from the essay, and uses details from both passages that support the generalization. Must be able to generalize and summarize. Must understand vocabulary.
Student demonstrates understanding of how the city setting contributes to the effectiveness of the essay. Can explain that the events in the essay are more significant and unusual because they are not expected in a city environment.
Can provide adequate interpretation of statement with supporting details.
Student can provide an appropriate feeling inferred from the essay. May make specific reference to White's experience at the zoo or may provide a more general statement that reflects White's experience.
Locate information Use context clues for word meaning Make inferences regarding character traits
Assess text critically Infer meaning and draw conclusions
Makes incorrect evaluation Unclear analysis Incorrect assumptions Makes incomplete argument
Analyze author's purpose Determine main idea Summarize information
Determine assumptions Use context clues to find word meaning
Students should be able to identify sections of text: beginning, middle and end. Students can create a persuasive essay using support from the textual elements. Students are able to evaluate comparative assessments presented in informational text.

Student can construct a valid argument. Can provide support data and cite correct information from article.
Students are able to compare and contrast differences in age and in gender in dreaming. Students need to locate information regarding age and gender within article. Students can use textual organizers to ascertain answers. Students can cite evidence from article to support answers and or opinions and can create a convincing argument based on information in article. Construct a persuasive essay.
Locate specific information
Locate main idea
Identify author's use of text structures to convey meaning
Locate or recall specific information Use context clues to determine word meaning
Locate information Use context clues to obtain meaning
Full credit required: Can discuss author's position on how one learns and author's purpose in describing how he was taught by his father.
Must recognize that author's father stresses that understanding bird behavior is more important than knowing their names.
Evaluates author's presentation and purpose. Evaluates author's effectiveness. Refers to details from essay to substantiate understanding.
Uses text-based criteria to explain whether the argument is convincing and refers to the article clearly in the explanation. Correctly paraphrases.
Student can explain the quote but cannot relate it to support data. Student can discuss creativity without using the explanation to define the application within behavior. Must understand vocabulary.
Provides logical opinion. Explains opinion using information from the article about both managers and creative people.
Student can describe one specific way to manage creative people from the article and explain why creative people would respond well to it. The responses use information from the article as support.
Locate specific information Use text structure to find information
Using context clues to obtain meaning Making inferences to construct meaning
Locate explicit information
Make complex inferences Describe cause and effect argument
Student identifies the main point of each author. Content analysis. Reading comprehension.
Use context clues to obtain word knowledge and meaning Locate text

Creates a convincing argument. Support arguments with data from articles. Student substantiates his rationale and argues against counter argument.
Critically evaluate informational text Summarize main ideas
Can choose two competencies from JOA and explain why each is necessary to fulfill duties and substantiates answer with information from announcement.
Locate information
Locate or identify main idea Locate specific information and supporting details
Can explain necessity for use of more than one or both documents in application procedure

Figure 23: Another Mathematics Example from Operational 2

numbers counting understand question
number properties addition most common denomatator
algebra what operation
interpred data mean, medium, mode
know the metric measurements reading scales formulate the operation
geometry pie calculate area of circle metric measurments foumulate operations
calculate area of triangel geometry formulate operations
formua for interest concept of interest interpret graph without values
understand graphs placing the points on the graph no need to show solution (equation)
functions of planes verbal descreption of figure and interpret
understand graphs placing coordinates on the graph
understanding scatter graphs interpreting data location of midpoint to form a line
algebra formulate equation
number properties what opperations
probablity read a graph
calculate area of triangle formulate operation geometry multistep pythagorean theorem
pythaagorean theorem geometry

relationships prooving equations calculate area of triangle
working linear equations with multiple ...
math operations in order use exponets
setting up formulas (comp. spreadsheet) formulating operations
relationships calculate area of triangel
missing information - area of towns population v. density
computer spreadsheets formulas in cells formulas functions for the calculations
understand graphs formulate operation order of operations function
measurement calculate perimeter
foumulating operations graphs substitute values in an equation x and y axis
what info is missing
square roots complete equations geometric figures with out proof area of cube
hypothisis counterexamples sub values in equation conclusion
volumn displacement time
hypothesis sub. values in calculations for algebraic conversions
circle, cercumfrence, redius formula for circles plot on graph
know what 'mean' is how to read a graph values in a graph dist. value
measurement for volume of water

figuring cubic feet multistep converting units of measurment (c f to gal) gal/hr
multistep problem formulate operations use calculator show solution not req. read for all information
measure cubic feet of water cubic feet to gallons
formulate operation algebra order functions insert numbers
figure the perimeter visual understanding perimeter is the same area is different multistep problem calculate area and perimeter
numbers into formula order of operation calculator
calculate perimeter and area multistep set up problem various shapes
probability formulate opperation probability in fraction form influence of each action
multistep problem how to set problem up algebraic equation use of caluculator order of operations
understand the question data analysis figuring the percentage use calculator
know the formula use of calculator - scientific order of operations rounding numbers
measurememts relationship of angles congruant paralelle

understanding data understand random and objectivity
correct formula correct arithmatic predict using known info
formulate operation understand question use calculator squaring of numbers
addition to calculate progressige factors
what a trend is calulate a probability read graph
ratios def. of triangle use of protractor and ruler
understanding numbers and calculations greater and lesser
mean mode range random sampling
substitute values into equation multiplication vs. division writing right equations using ratios

Figure 24: Another Reading Example from Operational 2

locate and recall
analyze interpret
interpret
interpret
analzye and explain from both documents supporting documentation locate and recall
interpret and expalin setting
interpret explain draw a conclusion
locate and recall interpret tone
locate and recall
locate and recall
vocabulary interpret
locate and recall
unsupportive judgement locate and recall
draw conclusions and interpet the information
locate and recall
score 4- determination,compare and contrast, locate and describe
local and recall
interpret the tone and voice draw conclusion summarize
interpret
interpret
Interpret analyze explain
interpret theme draw conclusions
interpret locate and recall suportive documentation
vocabulary
locate and recall

identify main topic
locate and recall supporting documentation from text locate main idea
recognizes one or the other
analyze compare and contrast interpret explain draw conclusions
comparing and contrasting analzye and support
locate and recall
vocabulary interpret
locate and recall interpret
locate and recall explain
interpet what he author says describe the main idea paraphase
interpet local and recall main topic
vocabulary interpret
draw a conclusion
interpret and describe locate and recall
locate and recall explain
vocabulary interpret and explain locate and recall
vocabulary
vocabulary interpret and explain locate and recall draw a conclusion
interpret locate and recall page 3
vocabulary locate and recall

Figure 25: Panelist KSA Comments Compared to Item Descriptors Example 1

Panelist6 Comment	Item Descriptor
Graphical solution of compound problem	Identify graphical solution of a compound linear inequality in one variable
Inequalities.	Identify graphical solution of a compound linear inequality in one variable
converwsion between degrees	Recognize a correct (equivalent) proportion for conversion between degrees and radians
Basic geometry	Identify the type of quadrilateral embedded in a 3D figure
Knowledge of thePythagorean theorem; problem solving in 3 dimension situations.	Compute length of hypotenuse on a 3D solid in some cases
Knowledge of geometry, recognition of triangles within a quadrilateral, and pythagorean theorem,algebraic expressin, wrong answer.	Compute length of hypotenuse on a 3D solid in some cases
Knowledge of geometry, recognition of triangles within a quadrilateral, pythagorean theorem,wrong answer.	Compute length of hypotenuse on face of a 3D solid
Using graphs to find rate of change	Read information from two graphs to make inference about rate of change
Identify missing information. Need surface area in square mile	Recognize that information is missing in a rate problem
Missing information Computation of total population based on given information.	Identify missing information in a rate problem
Knowledge of graphical functions.	Recognize the general form of an exponential function given graphically
Multiplication of decimal numbers, convrsion of indices to decimals.	Convert from scientific notation (negative exponent) to decimal representation
Knowledege of formulas and functions in excel.	Interpret information in a spreadsheet and identify correct formula
Use of functions and formulas in excel.	Interpret information in a spreadsheet and create formula
graphs and scatter charts	Estimate relative correlations from a scatterplot
Knowledge of bivariate data.	Estimate relative correlations from a scatterplot
linear function and recurrsion	Identify the recursive definition for a linear function given in tabular form
use calculator to determine probability	Find a compound probability
Knoledge of probability, dependedent and independent events.	Find a compound probability
inequalities and cube roots	Estimate cube root between consecutive whole numbers
Knowledege of probability, independent and depedent	Determine probability from a picture using definition

Panelist6 Comment	Item Descriptor
events.	
Knowledege of functions and domains.	Find the domain of a given quadratic function with restricted range based on a verbal description and a graph
Comment: Not relevant for computer support specialist	Find the domain of a given quadratic function with restricted range based on a verbal description and a graph
Knowledge of functions, domains and perimeter of a rectangle.	Construct a function for perimeter of a rectangle using symmetry and geometry interpretation of coordinates
Geometry and algebra Comment: Not relevant for computer support specialist.	Construct a function for perimeter of a rectangle using symmetry and geometry interpretation of coordinates
number properties	Expand and simplify square of binomial with radical numeric terms
Knowledge of real numbers, radical expressions and powers.	Determine probability from a two-way table (fraction)
Use the Pythagorean theorem to solve problems. Algebraic manipulation.	Use geometric information to set up an algebraic proof of the Pythagorean Theorem
Knowledge of real numbers, inequalities, wrong answer.	Find a solution to a linear inequality involving absolute value
Knowledge of range, domain, inequalities and linear algebra.	Find a counterexample for an inequality using properties of cubing real numbers
Knowledge of the angle for a circle, proportion, fration.	Find angle measure, in degrees, for a fraction of a circle in a probability context
Knoweledge of the concept of theoretical and experimental probability, wrong answer.	Recognizes that theoretical and experimental probability may differ
Generate data randomly to specified number of outcomes, knowledge of charting,computation of fractions.	Create a frequency table, graph the results, and find fraction of specific outcome, based on a verbal description of a simulation
Knowledge of probability, independent events or outcomes, generation of a tree diagram, summation of outcomes.	Calculate compound probability using a tree diagram, but may not find prob of compound event
Knowledge and recognition of different types of functions.	Recognize an exponential function given a verbal description, a table, and a graph
Verbal description Graphing Exponents	Recognize an exponential function given a verbal description, a table, and a graph
Logarithm properties,Functions, range.	Identify the domain of a transformed natural log function; evaluate at a special point
Divisibility of numbers.	Understand effect of arithmetic operations on divisibility
Transformations, cartesian coordinates.	Understand meaning of dilation; determine the scale factor of a dilation; apply to find coordinate

Panelist6 Comment	Item Descriptor
	(transformation in the plane)
Algeriac manipulations working with formulas.	Solve a literal equation for one variable in terms of the others (monomial with quadratic)
Knowledge of bar graphs; data analysis.	Create a graph to correct misrepresentation of data
Read an interprete graph or understsand bias in graph.	Explain a misleading graphical summary of data, and create a better (but not completely correct) graph to represent the data
Interprete graphs, construct graphs, understand bias.	Explain a misleading graphical summary of data, and create a correct graph to represent the data
Knowledge of substitutuion and basic computation.	Evaluate a function that requires interpretation of a verbal description to find the value of the independent variable (linear)
Knowledge of substitution, order of operations, square root of numbers	Evaluate successive functions given by formulas
Complex problem solving; operations.	Solve multi-step word problem involving incoming and outgoing rates and conversion of units
Complex problem solving; operations.	Solve multi-step word problem involving incoming and outgoing rates and conversion of units
Knowledge of composite functons.	Evaluate composite of functions given in tabular form
Knowledge of probabilty, proportions.	Use proportional reasoning to generalize from a sample to a population
Proportions, conversion from fraction to percentages.	Use proportional reasoning in the context of conditional probability statements
Probabilites	Determine conditional probability from a two-way table (percent)
Knowledge of probability.	Determine conditional probability from a two-way table (percent)
Interpretation of graphs, determination of unit price.	Recognize the relationship between the slope of a line and unit price
Geometry working with areas and adding multiple areas for a combined total.	Compute surface area of a 3D figure with trapezoidal and triangular faces
Identification of 'sub-figures' making up the entire shape of the monument.	Compute surface area of a 3D figure with trapezoidal and triangular faces
Identification of 'sub-figures' making up the entire shape of the monument. Knowldege of area of Trianlge, area of trapezium, addition of and oredr of operations.	Compute surface area of a 3D figure with trapezoidal and triangular faces
Understanding functions	Evaluate a piecewise defined function for a given value of x
Knowledeg of geometry, sum of angles within a figure.	Make an inference about a right triangle inscribed in a circle
measurement and geometry	

Panelist6 Comment	Item Descriptor
order of operations algebra and formulas	Evaluate a function (described in words and symbols) at a point
Knowledge of percentages, proportions and order of operations.	Solve a multi-step word problem; combine percent increase and percent decrease
Knowlededge of probabilty, fractions.	Determine probability from a table (decimal)
Knowledge of reflection, transformation and transposition.	Identify geometric transformations in the plane
Similar triangles, proportions, trigonometric relationships.	Apply similar triangles in a non-numerical setting (trig functions)
Solving word problem using multiple steps	Solve a multi-step word problem; recognize need for least common multiple
Formula for perimeter, formula for the area of a square, knowledge of proportion.	Find perimeter xor area of an irregular shape from a scale drawing
Formula for perimeter, formula for the area of a square.	Find perimeter and area of an irregular shape from a scale drawing
Knowledge of the formular for the distance between two poits on a line.	Find the distance between two points in the plane
Trnasformation in plane transformation and reflection	Perform sequential transformations in the plane (translation and reflection)
Transformations, reflections.	Perform sequential transformations in the plane (translation and reflection)
Knowledge of range, substitution.	Recognize a trinomial as a perfect square, and find its square root
Basic computation.	Estimate order of magnitude of product and quotients of decimals
Number properties and operations	Estimate order of magnitude of product and quotients of decimals
algebra and basic math and functions and exponents	Evaluate successive functions given by formulas
Evaluating expressions, working with powers .	Evaluate successive functions given by formulas
Statistics understanding standard deviation	Recognize and apply the fact that standard deviation is a measure of spread
Identifying points on a graph	Read a point from a graph in the xy-plane
Knowldge of functional notation.	Read a point from a graph in the xy-plane
Knowledge of functions.	Read the value of a function from a graph in xy-plane
read a point from a graph and understand functions	Identify the point where two functions have equal values, from graphs in the xy-plane
Knowledge of functional notation, Interpretation of graphs.	Identify the point where two functions have equal values, from graphs in the xy-plane
Knowledge of ratio and proportion.	Understand relationship between ratio of areas and ratio of sides in a square given values
Average and constant rate increase	Determine the effect on mean when each data point is increased by the same amount

Panelist6 Comment	Item Descriptor
Knowledge and recogniion of different types of progressions, derivation of formula dipicting progression type and basic computation.	Identify an expresson that represents an exponential function, given a verbal description
Vectors, trigonometry.	Sketch a vector given direction and speed
Knowledge of algebra, expansion order of operations.	Simplify a quadratic polynomial (involving distributing exponent and distributing negative coefficient)
Algebra Exponents	Simplify a quadratic polynomial (involving distributing exponent and distributing negative coefficient)
Knolwdege of probability.	Find number of combinations
Knowldege of symmetric and non-synnetric figures.	Recognize symmetries in a plane
PRoperties of planes and lines.	Interpret and use rate of change in linear context from table that is given in non-unit increments

Figure 26: Panelist KSA Comments Compared to Item Descriptors Example 2

Panelist4 Comment	Item Descriptor
had to solve the compound inequality for x id the solution from the given graphs	Identify graphical solution of a compound linear inequality in one variable
Differentiate geometric shapes.	Identify the type of quadrilateral embedded in a 3D figure
find links of sides of cube and area of trapezoid. 2 correct	Compute length of hypotenuse on a 3D solid in some cases
Understand area calculation. Partial credit if certain parts are correct and others are not.	Compute length of hypotenuse on a 3D solid in some cases
Understand area calculation. Partial credit if certain parts are correct and others are not.	Compute length of hypotenuse on face of a 3D solid
Interprete the question, and know the difference between density and area. /and that Area is needed to know which town has the greater population.	Recognize that information is missing in a rate problem
Partial credit if explanation describes missing information	Identify missing information in a rate problem
Understand counter examples related to algebraic equations. Partial credit if conclusion or hypothesis is correct.	Use hypothesis, conclusion, and definition to identify counterexamples in an algebraic setting in some cases
use hypothesis conclusion and definition to identify counter examples in an algebraic setting in two cases	Use hypothesis, conclusion, and definition to identify counterexamples in an algebraic setting
determine the inverse of a function	Find the inverse of a linear function defined symbolically
Interpret information on a spreadsheet and determine correct formula	Interpret information in a spreadsheet and identify correct formula
need to create formulas based on a spreadsheet information	Interpret information in a spreadsheet and create formula
Must be able to compare and interpret slopes in linear equastions. Proper use of calculator. Partial credit if answers are correct but no explanation, one of two correct answers.	Interpret/compare slope xor intercept of two linear functions, given as equations in literal slope-intercept form and graphically
Ability to compare slope properties of linear equations. Correct use of calculator. Partial credit if explanation is correct but answer is incorrect.One of two answers correct. Correct anwer but no explanation.	Interpret/compare slope and intercept of two linear functions, given as equations in literal slope-intercept form and graphically
use slope and xy plane coordinates	Interpret/compare slope and intercept of two linear functions, given as equations in literal slope-intercept form and graphically
identify charicteristics of a minor word problem	Identify characteristics of a well-designed survey
Proper use of calculator. Understand coordinate location. Partial credit if one pair correct.	Compose dilation and reflection in the plane (transformation in the plane)
math terms, reflection and composite transformation, only 2 coord pairs correct	Compose dilation and reflection in the plane (transformation in the plane)

Panelist4 Comment	Item Descriptor
estimation and exponant rules	Compute using rules of exponents; multiple steps, order of operations, using given estimate
Understand expression with fractional exponant.	Calculate with multiple exponents, including fractional exponent
Interpret proper algebraic equation that could model data.	Identify an equation that represents data in a table (exponential)
Recognize the mean a bell shaped curve.	Identify the mean from a normal graph
Interpret function of a graph. Interpret meaning of point on a normal distribution. Partial credit if answer is correct but incorrect explanation.	Find midpoint on number line in a statistical context
use definition of logarythim	Simplify difference of rational expressions
Must be able to apply recursive formula in correct sequence. Operations with fractions.	Evaluate term of recursively defined sequence (subscript notation)
Understand range, mean, mode and statistics. Word problem interpretation. Determine relavant information.	Understands the effect of outliers on summary statistics
Interpreting quadratic equastions	Solve a quadratic equation with complex roots (radicals)
mathematical terminology, mathematical operations,	Use geometric information to set up an algebraic proof of the Pythagorean Theorem
Understand estimation. Understand division and multiplication of decimals.	Determine range of quotient of an integer divided by a bounded variable
correct order of mathmatical operations, substitute for X	Evaluate ratio of quadratic polynomials for a given value of x
Interpret angle measurement. Understand 3-D figures. Understand triangle principles. follow instructions	Determine angle in a 3D context; recognize isosceles right triangle
manipulative knowledge of triangles, isosceles find angle	Determine angle in a 3D context; recognize isosceles right triangle
Proper use of calculator. Understand mean.	Calculate a weighted average from a table of data
mean from a table	Calculate a weighted average from a table of data
Evaluate a function that requires interpretation of a verbal description to find a value of the independant.	Evaluate a function that requires interpretation of a verbal description to find the value of the independent variable (linear)
use mid point formula or graph and find the mid point	Find midpoint of segment with endpoints that have negative coordinates, with arithmetic error for one coordinate
Determine order of mathmatical operations. Correct use of a calculator	Evaluate successive functions given by formulas
Must be able to solve multi step problem. Be familiar with linear measurement. Calculate areas. Proper use of calculator. Partial credit if calculates water remaining instead of hours or incorrect conversions.	Solve multi-step word problem involving incoming and outgoing rates and conversion of units

Panelist4 Comment	Item Descriptor
Proper use of calculator. Interpreting multi-step story problem. Finding probabilities. Interpret percentages.	Determine conditional probability from a two-way table (percent)
find probability interpret percentages	Determine conditional probability from a two-way table (percent)
Understand proper use of calculator. Interpret scatterplot concepts. Interpret the question	Read data from a scatterplot
Complete a table, write the function PartiAL credit for correct taBLE ONLY OR ERROPRS IN TAble with correct formula, incorrect table but formulqa mathed the taBLE	Complete table based on verbal description (multiplicative growth)
find the sum of an arithmatic sequence	Find sum of the terms of an arithmetic sequence, in context, from verbal description
Proper use of calculator. Understand conversion charts.PaRTIAL credit forne partr correct	Solve multi-step word problem involving rates; one conversion between system
Must be able to solve mulri-step word problem using rates and conversion formulas. Proper use of calculator. Partial credit if one of two answers is correct.	Solve multi-step word problem involving rates; two conversions between system
Must be able to solve a multi step problem working with percentqges/decimals.	Solve a multi-step word problem; combine percent increase and percent decrease
Must understand conjunction and disjunction of inequalities(and/or) Partial credit if explanations are correct but no answer is chosen.	Distinguish between conjunction and disjunction of a pair of inequalities in one variable
Proper use of calculator. Understand geometric properties to solve reflection questions.	Identify geometric transformations in the plane
transformation	Identify geometric transformations in the plane
use multiplication counting principle to calculate number of options	Apply elementary counting principle
Student needs to be able solve geometric problem in 2 and 3 dimensions. Correct use of calculator.	Find perimeter xor area of an irregular shape from a scale drawing
Must be able to solve geometric problems in 2 and 3 dimnensions using fractions where applicable. Correct use of calculator.	Find perimeter and area of an irregular shape from a scale drawing
Understand scatterplot concepts. Interpret graph information.	Extrapolate from a graph with a linear trend
Use correct legend scale. Proper use of protractor and ruler.	
legend, use protactor and rules	
Proper use of ruler and protractor. Linnear measurements, conversion of units, distance and rates.	Find distance from scale drawing and estimate time from the rate
Solve a word problem using the least common multiple	Solve a word problem; recognize need for least common multiple
knowledge of triangles and measurements concerning triangles. interpretation of problem, how to label ngles	Recognize that a Pythagorean triple gives a right triangle

Panelist4 Comment	Item Descriptor
Understand geometric principals to find areas, determine algebraic proof of Pythagorean Theorem. Partial credit if correct relationship is shown, but incorrect answer.	Recognize the difference between the ratios of angles and the ratios of sides in a triangle Compute angles of a triangle given the ratio
Proper use of ruler and protractor. Underestand triangle properties	Recognize and apply the fact that standard deviation is a measure of spread
Proper interpretaion of graphs. Determine proper algebraic formulas.	Identify the point where two functions have equal values, from graphs in the xy-plane
Proper use of calculator. Understaning ratios, area calculations, interpreting diagrams, properties of squares.	Understand relationship between ratio of areas and ratio of sides in a square given values
Proper use of calculator. Understand quadratic functions. Determine correct algebraic formula. Graph interpretation.	Identify solution set of an inequality given the intercepts of a function defined only by its graph
Must be able to write correct algebraic equation and solve ratios. Correct use of calculator. Partial credit if student used alternative formula and came up with incorrect answer.	Translate from verbal to symbolic form involving proportional reasoning
rewrite expression in terms of x	Translate from verbal to symbolic form involving proportional reasoning
Interpreting algebraic formulas, Proper use of calculator. Understanding percentages. Interpreting word problems.	Recognize equivalent algebraic expressions for given verbal descriptions about percent increase
Proper use of calculator. Understand perpendicular lines in a plane. scetch of information	Draw and label a figure from a verbal description
Interpret measurement types/units. know the difference of linnear area and volume measurements	Recognize attribute of a solid that is measured in square units (3D)
interpret units of measurements	Recognize attribute of a solid that is measured in square units (3D)
Understand drawing to scale. Understand ratios.	Recognize a correct (equivalent) proportion for change of scale