

**WESTEST 2
Mathematics**

**March 2008 School Leadership Team Conference
Charleston Civic Center**

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21st Century Item Writing for WESTEST2 Checklist

Area	Use on Test	RLA	MA	SS	SC
Overall, the focusing lens, when writing test items for 21 st century summative assessment, should be based upon the interpretation of the content and the skill sets of the CSOs.			√		
Test Format for Graphic Organizers	Set the stage with high interest engaging topics; use graphic organizers, Venn diagrams, graphs, etc. that can be completed in the test booklet.		√		
Rigor	Items skill sets MUST match the rigor of the CSO skill sets.		√		
Language of 21 st Century Skills	Use the types of skill sets found in the CSOs that students are expected to be able to use and apply. (Use PISA items as a guide for items to address extrapolation and application.)		√		
21 st Century Tools	<p>Use Information, Media and ICT (Information, Communication & Technology) Literacy Skills to develop item stems, answers, and scenarios. For example, you can build your items using</p> <ul style="list-style-type: none"> ▪ appropriate technology tools/scenarios ▪ information and communication technologies ▪ examples of ways to access, manage, integrate and evaluate information ▪ scenarios that might include audio, video, and other media and multimedia and digital tools ▪ item stems, answers, and scenarios that might include electronic probes, iPods, electronic white boards, etc. ▪ snap shots, graphics, and resources with access to online learning communities and resources 		√		
Real World Application (also called authentic assessment)	Frame language in item to real life experiences and applications in the 21 st Century. Use examples, applications and settings from students' lives, modern workplaces and school communities to frame items.		√		
Critical Thinking	The clear, precise and purposeful use of higher order thinking skills and strategies to include extrapolation and application.		√		
Problem Solving	Identify a problem, evaluate options, propose solutions and evaluate results. Problem solving items built upon the context of the grade level CSOs that align to thinking skills in the objectives.		√		

Area	Use on Test	RLA	MA	SS	SC
When writing items the areas below are to be used to provide scenarios, formats and items, when appropriate, to the specific content of the CSOs.			√		
Information and Media Literacy	How modern media combines sound, image and text to communicate meaning.		√		
Visual Literacy	Use images to communicate a message .		√		
Communication Skills	Convey messages across cultures and media.		√		
Systems Thinking	Recognize patterns. Understand how parts interact and how they form a whole system.		√		
Adaptability	Ability to adapt to changing situations and environments while keeping in mind time constraints, budgets etc.		√		
Ethical Behavior	Act with integrity.		√		
Social/Personal Accountability	Accepting responsibility for one's own behavior. Understanding common good.		√		
Project planning and development	Organize work (projects) and achieve goals.		√		
Global Awareness	Learning from and working with people from diverse cultures, religions and lifestyles. To include "green" environmental issues.		√		
Financial, Economic and Business Literacy	Understanding business, economics and finance (personal too).		√		
Civic Literacy	Understanding one's role in government and how government affects our lives.		√		
Health and Wellness Literacy	Understanding healthy lifestyles and their benefits.		√		

21st Century Item Writing for WESTEST - Mathematics

Check Here	Area	Use on Test
		<p>The focusing lens of the items should be based upon the interpretation of the skill sets of the CSOs. (It is easy to miss the intended skill set of the CSO. An example: The CSO skill set is to interpret relationships, but the item provided was actually measuring the student's ability to compare graphs.</p>
	Test Format	<p>Set the stage with high interest engaging topics; use graphic organizers, Venn diagrams, graphs, etc. that can be completed in the test booklet.</p> <p>High interest engaging topics may include "Boxapede" type problems.</p> <p>Graphic organizers in math will be suggested so students may use them to solve the problem. For example: complete the Venn diagram to solve probability problems, graph transformational geometry to determine the coordinates of a figure, "matrix" to do vocabulary type problems, like the geometry attributes for various shapes.</p>
	Rigor	<p>Items skill sets MUST match the rigor of the CSO skill sets.</p> <p>Compare and contrast location of figures when transformational geometry is used in the problem. Determine the "best" graph that represents a change over time. Quantifier type problems may be used in all grades.</p>
	Language of 21st Century Skills	<p>Use the types of skill sets found in the CSOs that students are expected to be able to use and apply (Use PISA items as a guide for items to address extrapolation and application).</p> <p>Student is given a graph that represents speed on a race track and must determine the shape of the track that would have produced the graph. Select the appropriate tools to find lengths, weights, capacity, etc. to have appropriate units.</p>
	21st Century Tools	<p>Use Information, Media and ICT (Information, Communication & Technology) Literacy Skills to develop item stems, answers, and scenarios. For example, you can build your items using:</p> <ul style="list-style-type: none"> ▪ appropriate technology tools/scenarios (Calculators) ▪ Information and communication technologies (Spreadsheets embedded in the problems) ▪ Examples of ways to access, manage, integrate and evaluate information. (Data from websites to make graphs, analyze data, newspaper ads, income tax forms) ▪ Scenarios that might include audio, video, and other media and multimedia and digital tools. (Camera shots to use in scale drawing problems, shadows for proportionality problems) ▪ Item stems, answers, and scenarios that might include electronic probes, iPods, electronic white boards, etc. (Scenario of a student doing a particular presentation using white boards for example, a scale drawing to show

Check Here	Area	Use on Test
		<p>understanding of proportion.)</p> <ul style="list-style-type: none"> ▪ Snap shots, graphics, and resources with access to online learning communities and resources. Use examples from various websites incorporated into the problems, example New York Times
	Real World Application	<p>Frame language in item to real life experiences and applications in the 21st Century.</p> <p>Use examples, applications and settings from students' lives, communities and modern workplaces to frame items. (Make the problems relevant to the students by including things important to them, such as, sports, music, puzzles, racing, vacations, clothes, volunteer work and community service that involve the students.)</p>
	Critical Thinking	<p>The clear, precise and purposeful use of higher order thinking skills and strategies to include extrapolation and application. (Include problems which involve the students to demonstrate more than just selecting an answer, such as, completing a graphic organizer, diagram, construction, transformation.)</p>
	Problem Solving	<p>Identify a problem, evaluate options, propose solutions and evaluate results. Problem solving items built upon the context of the grade level CSOs that align to thinking skills in the objectives. (Student is presented a scenario that requires them to choose the correct operation to solve the problem, solve the problem and then use estimation to determine the reasonableness of the answer.</p>
<p>When writing items the areas below are to be used to provide context, formats and scenarios, when appropriate, to the specific content of the CSOs. Please note, Policy 2520.14 will not be part of an alignment study, but certainly these are rich tools and skills to utilize in the manner defined above.</p>		
	Information and Media Literacy	<p>How modern media combines sound, image and text to communicate meaning. (Graphics and text are both essential parts of the problem.)</p>
	Visual Literacy	<p>Use images to communicate a message. (Use newspaper and magazine ads to solve problems, such as, discounts.)</p>
	Communication Skills	<p>Convey messages across cultures and media. (Use different currencies in business problems, planning budgets, architectural designs in scale drawings and puzzles from different cultures.)</p>
	Systems Thinking	<p>Recognize patterns. Understand how parts interact and how they form a whole system. (Input-output tables, different designs when tessellating, linear and quadratic equations result from patterns.)</p>
	Adaptability	<p>Ability to adapt to changing situations and environments while keeping in mind time constraints, budgets etc. (Using different scenarios budget type problems, spending, tax</p>

Check Here	Area	Use on Test
		problems with different incomes and situations.)
	Ethical Behavior	Act with integrity. (Tax returns with scenario that does not claim acceptable deductions.)
	Social/Personal Accountability	Accepting responsibility for one's own behavior. Understanding common good. (Budgets: personal, community, state, national and businesses.)
	Project planning and development	Organize work (projects) and achieve goals. (Using CSOs that have project-based expectations embed the problem with development issues from the projects and expected goals for these projects.)
	Global Awareness	Learning from and working with people from diverse cultures, religions and lifestyles. To include "green" environmental issues. (Embed diverse cultures and lifestyles into problems, such as, architectural design to complete scale drawings, budget plans for students in other countries, landscape designs using area requirements: urban vs. rural.)
	Financial, Economic and Business Literacy	Understanding business, economics and finance (personal too). (Choose items to purchase when given a set amount of money to spend. Use graphs from business data to analyze and solve problem situations or make the graph from the data and then answer a set of questions.)
	Civic Literacy	Understanding one's role in government and how government affects our lives. (Economic issues, budgets, taxes.)
	Health and Wellness Literacy	Understanding healthy lifestyles and their benefits. (Use data from medical reports to answer questions. May analyze data from physical activities, such as, sports, exercise, etc. to solve problems. When doing problems that have food mentioned, use healthy type foods or compare and contrast healthy and non-healthy foods.)

Depth of Knowledge

Level 1 Recall

Recall of a fact, information, or procedure.

Level 2 Skill/Concept

Use information or conceptual knowledge, two or more steps, etc.

Level 3 Strategic Thinking

Requires reasoning, developing plan or a sequence of steps, some complexity, more than one possible answer.

Level 4 Extended Thinking

Requires an investigation, time to think and process multiple conditions of the problem.

Westest 2

Mathematics

The mathematics portion of WESTEST 2 will include multiple choice items and gridded response items. All items in the test booklets will include embedded opportunities to make charts, graphs, Venn diagrams and other graphic organizers, as well as, space to show written work to arrive at the correct solution choice. The gridded response items are another testing format that does not require a constructed response, but does not offer a selected response. A couple of examples are included for teachers to know what will be expected on the gridded response items, so they may begin practicing this type of questions in their classrooms. This new format will be included in all mathematics tests grades 3-11.

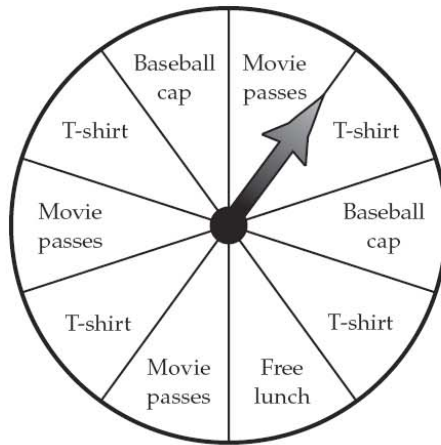
Some sample gridded-response problems follow. Read each one carefully, and then find the answer to the problem. Fill in the answer on the response grid to the right of the problem. After you complete the sample problems, we will compare your response grids to the answer key.

- 1** Evaluate the following when $x = 6$:

$$\frac{(x^2 + 5)}{8 - 3}$$

	0	0	0	
•	•	•	•	•
0	0	0	0	0
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6
7	7	7	7	7
8	8	8	8	8
9	9	9	9	9

- 2** Look at the spinner below.



	0	0	0	
•	•	•	•	•
0	0	0	0	0
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6
7	7	7	7	7
8	8	8	8	8
9	9	9	9	9

Each section of the spinner is equal in size. What is the probability that the spinner will stop on a free lunch or movie passes?

The following answer key shows some of the ways that the answers to the sample problems could be correctly filled in on the response grids. Compare your response grids on pages 6 and 7 with the answer key.

1 Evaluate the following when $x = 6$:

$$\frac{(x^2 + 5)}{8 - 3}$$

The correct answer to this problem is $8\frac{1}{5}$; however to receive credit, this answer **MUST BE** placed in the grid as an improper fraction or as a decimal. Therefore the correct answer would be 8.2 or $\frac{41}{5}$. The response grids below show some of the ways these answers could be correctly filled in.

8	.	2	
/	/	/	
•	•	•	•
0	0	0	0
1	1	1	1
2	•	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
•	8	8	8
9	9	9	9

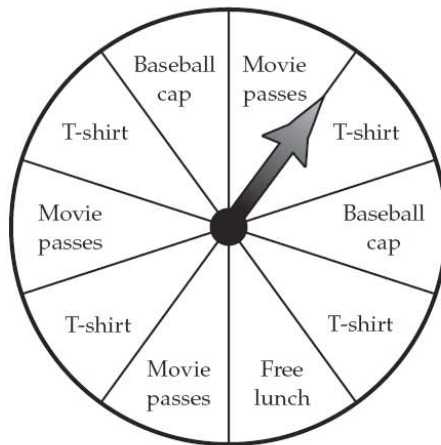
OR

8	.	2	
/	/	/	
•	•	•	•
0	0	0	0
1	1	1	1
2	2	•	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
•	8	8	8
9	9	9	9

OR

4	1	/	5
/	/	•	
•	•	•	•
0	0	0	0
1	1	•	1
2	2	2	2
3	3	3	3
4	•	4	4
5	5	5	•
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

2 Look at the spinner below.



Each section of the spinner is equal in size. What is the probability that the spinner will stop on a free lunch or movie passes?

The correct answer to this problem is $\frac{4}{10}$ or $\frac{2}{5}$. The decimal 0.4 may also be used as a correct answer. The response grids below show how this answer could be correctly filled in.

4	/	1	0
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

OR

		2	/	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0	0	0	0	0
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6
7	7	7	7	7
8	8	8	8	8
9	9	9	9	9

OR

0	.	4	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

Grade 3 – Number and Operations

M.O.3.1.9 Demonstrate and model multiplication (repeated addition, arrays) and division (repeated subtraction, portioning)

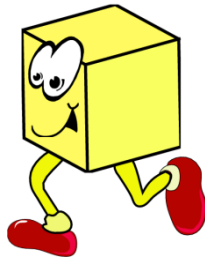
DOK 2

Many unusual animals live on the planet Html.

Some of them have bodies that are made of cube shapes.

These animals grow by getting new cube shapes on each birthday.

When Baby Boxapede is born it looks like this.



It is 1 cube long and has 2 legs.

On its first birthday it has grown.

It is 4 cubes long and has eight legs.

The Boxapede continues to grow in this way. On each birthday it gets 3 more cube shapes and 6 more legs.

1. How long is a Boxapede when it is 10 years old?
 - a. 10
 - b. 18
 - c. 31
 - d. 80
2. Scientists are studying how Boxapedes grow. They have collected some in their laboratory. One Boxapede is 16 cubes long. How old is this Boxapede?
 - a. 4
 - b. 5
 - c. 8
 - d. 16
3. Another Boxapede has 20 legs. How old is this Boxapede?
 - a. 2
 - b. 3
 - c. 4
 - d. 5

PARTIAL GRAPHIC ORGANIZER (TABLE) THAT MAY BE CONSTRUCTED BY THE STUDENT:

AGE	CUBES
Birth (0)	1
1	4
2	7
3	10
4	13
5	16
6	19
7	22
8	25
9	28
10	31

The student may use a table (array).

The student may draw the Boxapede and count the cubes.

The student may add 3 cubes each year (repeated addition).

The student may add 6 legs each year (repeated addition).

9th Grade – Algebra 1

M.O.A1.2.2 Create and solve multi-step linear equations, absolute value equations, and inequalities in one variable, (with or without technology): apply skills toward solving practical problems such as distance, mixtures, or motion and judge the reasonableness of solutions

DOK 2

One of the elements of my Junior Achievement project was to display my data in a spreadsheet. I have included a portion of my spreadsheet below.

This example contains 20 cells. A cell in a spreadsheet can be identified first by the column letter and then by the row number. For example, the number 10 is found in Cell C4.

	A	B	C	D	E
1	6	-3	7	1	5
2	12	-4	8	2	
3	18	-5	9	3	-35
4	24	-6	10	4	

If the number in Cell A3 = $B4 - 3(E2 + D4)$, which of the following must be the number in Cell E2?

- a. -21
- b. -15
- c. -4
- d. -12

FOR USE BY TRAINED SCHOOL SYSTEM LEADERSHIP CONFERENCE ATTENDEES

DIRECTIONS: Choose a CSO to use as you practice writing a mathematics item for WESTEST 2:

MATHEMATICS CSOs

Elementary – choose one CSO to use to write your item

M.O.3.2.2 create an input/output model using addition, subtraction, multiplication or division. **DOK 2**

M.O.4.2.1 determine the rule and explain how change in one variable relates to the change in the second variable, given an input/output model using two operations. **DOK 2**

M.O.5.2.2 given an input/output model using two operations, determine the rule, output or input. **DOK 2**

Middle School - choose one CSO to use to write your item

M.O.6.2.4 determine the rule, output or input; given an input/output model using one operation, write an algebraic expression for the rule and use to identify other input/output values. **DOK 2**

M.O.7.2.3 solve problems by creating an input/output function table (including, but not limited to, spreadsheets) to predict future values, given a real-world situation involving rational numbers. **DOK 2**

M.O.8.2.5 apply inductive and deductive reasoning to write a rule from data in an input/output table, analyze the table and the rule to determine if a functional relationship exists. **DOK 3**

High School - choose one CSO to use to write your item

M.O.A1.2.2 create and solve multi-step linear equations, absolute value equations and linear inequalities in one variable (with and without technology); apply skills toward solving practical problems such as distance, mixture or motion and judge the reasonableness of solutions. **DOK 2**

M.O.G.3.16 derive and justify formulas for area, perimeter, surface area and volume using nets and apply them to solve real-world problems. **DOK 2**

M.O.A2.2.8 analyze families of functions and their transformations; recognize linear, quadratic, radical, absolute value, step, piece-wise and exponential functions; analyze connections among words, graphs, tables and equations when solving practical problems with and without technology. **DOK 2**

Content Area: Mathematics

CSO: _____

DOK: _____

Using the checklist and DOK charts – Write an item on the lines below.

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

FURTHER REFLECTION TO ITEM WRITING

a. Did you use authentic assessment language when writing your item? If not, please re-work your item to frame the question or scenario. For example:

- Your third grade class is going on a field trip.....**
- You have borrowed your friend's laptop computer.....**
- Your school community service program.....**
- Your grade level elections indicate.....**

Rework item in the space below.

b. Did you use a graphic organizer when writing your item? If not, please re-work your item to include some type of graphic organizers. For example: Venn diagram, matrix, rankings, webbing, tables, other.

Rework item in the space below.