



REQUEST FOR INFORMATION

FOR

Artificial Intelligence Scoring

Solicitation No.: RFI 2012-21

Florida Department of Education
325 West Gaines Street
Tallahassee, Florida 32399-0400

Please deliver submissions to:

Florida Department of Education
Attn: Fran Shewan
325 W. Gaines Street, Suite 332
Tallahassee, FL 32399-0400
Fax number: 850-245-0737
Telephone number: 850-245-9884
Email: Fran.Shewan@fldoe.org



**Florida Department of Education
Artificial Intelligence Scoring Engines
Request for Information
Purpose and Scope**

I. OVERVIEW

To help address gaps in student assessment, through its 2010 Race to the Top Competition, the U.S. Department of Education awarded The Partnership for Assessment of Readiness for College and Careers (PARCC) a four year grant to create a comprehensive multi-state “Next Generation Assessment System.” PARCC is a consortium of 25 states working together to develop a common set of K-12 assessments in English language arts (ELA) and mathematics aligned with the Common Core State Standards (CCSS) and, thereby, anchored in what it takes to be ready for college and careers. Together, PARCC states educate approximately 25 million students. The new K-12 assessments will build a pathway to college and career readiness by the end of high school and mark the progress of students toward this goal from 3rd grade up. The PARCC design calls for all grade 6 and above assessments to be administered online. The PARCC assessments will be ready for states to administer during the 2014 -15 school year.

One of the goals for PARCC is that all end-of-year assessment items be entirely machine scorable in order to return results as rapidly as possible. It will be advantageous to PARCC states for at least some components of the performance assessments administered earlier in the school year to be machine scorable as well. Currently, machine scorable assessments generally rely primarily on items with multiple-choice responses. However, multiple-choice items are not the best option for assessing several of the standards that are important indicators for a student’s college and career readiness. These are often best assessed using constructed response items and innovative item types that are more recently emerging in computer based testing (CBT); e.g., essays, short answer, fill in a blank, show work done to solve a math problem, etc. Examples of such item types are included as Attachments A-C.

PARCC anticipates using artificial intelligence to score a subset of test items. The challenge is that the current capabilities of artificial intelligence (A.I.) scoring fall far short of how PARCC hopes to use this resource. The A.I. scoring engines used by major testing companies that are most widely known tend to rely on rules rather than content, and require a significant amount of information to produce a reliable score (e.g., extensive amounts of student writing in response to a stimulus).

In comparison, dramatic advances in A.I. are occurring in other fields and several appear to be using a more probabilistic approach; some are producing quite impressive results. PARCC is, therefore, interested in broadening its consideration of A.I. scoring to not only include traditional testing companies, but other leading edge researchers and developers of A.I. applications. This Request for Information (RFI) is an invitation to all organizations with A.I. experience and related products that may be interested in pursuing their application to scoring our nation's next generation K-12 assessments to share what they may have to offer this important endeavor.

The items to be scored this way would:

- Be administered online for grade 6 or above (although options for using A.I. in lower grades are also of interest).
- Possibly contain some paper and pencil components which would then be digitized.
- Assess only Common Core State Standards in Mathematics and ELA /Literacy.

Some examples of 'hard to assess items' are included as Attachments A - C. These files contain released samples of ELA and mathematics constructed/open response questions that have been administered as part of the Massachusetts (MCAS) testing program for public school students.

No award or contract will result from this Request for Information (RFI), however information provided in this process may be used in the development of a subsequent solicitation that may be awarded. Vendors responding to this RFI are not prohibited from responding to subsequent related solicitations and subsequent solicitations are not limited to information received or to those responding to this RFI.

II. PURPOSE OF THE REQUEST FOR INFORMATION

This RFI is issued solely for the purpose of obtaining information about the technologies, products and processes that vendors are currently using or that could be used to score open / constructed response assessment items and other student work products using artificial intelligence.

Responses should provide information that supports the below Requirements section based on the above paragraphs.

III. INFORMATION REQUESTED

1. Do you have any products/solutions available currently to score the types of assessments described above and in the examples in Attachments A-C? If yes, please describe the process and provide examples of results. If no, do you have any research or products that could provide the foundation for A.I.

scoring of such items and do you have an interest in creating such a product/solution for the education sector?

2. Provide a description of the A.I. engine referenced in your response to #1 (e.g., rules based, probabilistic, etc.)
3. If your A.I. engine(s) currently do not address the following content areas, could they be adapted to score assessments in these content areas? If yes, please explain the process, and changes needed for each subject area.
 - a. ELA (English Language Arts)
 - b. Mathematics (including mathematical and formulaic symbols)
 - c. Science (not included in PARCC's scope, but of interest to member states)
 - d. History / Social Science (not included in PARCC's scope, but of interest to member states)
4. Please explain your company's level of interest in either creating such a solution and/or partnering with another organization (e.g., a testing company) to create such a solution?
5. How long might it take to create such a solution?
6. What would be the proposed system budget? Examples of costs associated with current A.I. efforts would be helpful.
7. What additional information would you need to better estimate the effort required to create such a solution?
8. What would be the proposed technology requirements? (i.e., operating system, hosting, licensing, etc.)
9. Are there any emerging or innovative technologies that would support the artificial intelligence efforts described above? If so, please describe the functions, requirements and potential time frames.
10. If you do not offer such a solution, nor have any intention of building one, do you know of any other solution providers who may be able to help us meet this need?

IV. OTHER CONSIDERATIONS

This RFI will not result in a contract with the Department. Therefore, it is not subject to a challenge pursuant to Section 120.57, F.S.

SCHEDULE OF EVENTS

The following timetable shows the approximate dates for this RFI. All times indicated are Eastern Time (ET).

Request for Information Issued	September 30, 2011
Questions Due no later than	October 17, 2011
Answers to Vendors on or before	October 20, 2011
Receipt of RFI responses 332 Turlington Building	November 16, 2011

RESPONSE REQUIREMENTS

The response should be indexed in the order and manner of the "Information Requested" Section III.

Vendors should submit twelve (12) hard copies and two (2) CD's in Adobe and Microsoft Word 5.0 or higher of the response.

QUESTIONS

The Department of Education may be contacted via email or fax regarding the submission of questions concerning this RFI. Any respondent's questions must be submitted in writing and received by the Department on or before the specified due date at the following email address or fax:

**Please deliver questions to:
Florida Department of Education
Attn: Fran Shewan
325 W. Gaines Street, Suite 332
Tallahassee, FL 32399-0400
Fax number: 850-245-0737
Email: Fran.Shewan@fldoe.org**

The Department will provide written answers to all questions that respondents submit by the specified due date. Questions and Answers and notice of changes (addenda), will be posted on the Florida Vendor Bid System (VBS) at www.myflorida.com (click on Business & Industry, under Doing Business with the State of Florida, click on State Purchasing, click on Everything for Vendors and Customers, then Vendor Bid System and Search Advertisement, select the Department of Education in the Agency window and initiate search), under this RFI number. It is the responsibility of all respondents to monitor this site for any changing information prior to submitting a response.

ATTACHMENT A

Grade 4 MCAS Open Responses

2011 ELA Standard: *Grade 4: Reading Standards for Literature/ Key Ideas and Details # 3:* Describe in depth a character, setting, or event in a story or drama, drawing on specific details in the text (e.g., a character's thoughts, words, or actions).

Reading Selection: Toys Go Out by Emily Jenkins;

Based on the selection, describe how StingRay and Plastic are different from one another. Support your answer with important details from the selection.

2011 ELA Standard: *Grade 4: Reading Standards for Informational Text/ Key Ideas and Details # 8:* Explain how an author uses reasons and evidence to support particular points in a text.

Reading Selection: Ultimate Field Trip 5: Blasting Off to Space Academy by Susan E. Goodman

Based on the selection, explain how the experiences at U.S. Space Academy help kids understand what it is like to be in space. Support your answer with important information from the selection.

ATTACHMENT A con't

Grade 6 MCAS Open Responses

2011 ELA Standard: *Grade 6 Reading Standards for Literature/ Integration of Knowledge and Ideas # 9*: Compare and contrast texts in different forms or genres (e.g., stories and poems; historical novels and fantasy stories) in terms of their approaches to similar themes and topics.

Reading Selection: Boy and Charlie and the Chocolate Factory by Roald Dahl;

Based on the two selections, explain how Roald Dahl used his experience as a chocolate taster to turn a real event into an imaginative story. Support your answer with important details from the selections.

2011 ELA Standard: *Grade 6 Reading Standards for Informational Text/ Craft and Structure # 5*: Analyze how a particular sentence, paragraph, chapter, or section fits into the overall structure of a text and contributes to the development of the ideas.

Reading Selection: Invisible Inks by Paul B. Janeczko;

The instructions in "Invisible Inks" might be easier to follow if the selection used headings for different sections. (a) Break the selection into three sections. Using the paragraph numbers, identify where each section will begin. (b) Write an appropriate heading for each of the three sections you identified in part (a). Explain why each heading is appropriate. Support your answer with important details from the selection.

ATTACHMENT A con't

Grade 10 MCAS Open Responses

2011 ELA Reading Standards for Information Text #5: Analyze how a particular sentence, paragraph, chapter, or section fits into the overall structure of a text and contributes to the development of the ideas.

Reading selection: Making Humus from Composting;

Explain how the structure and format of the article help the reader understand the process of composting. Support your answer with relevant and specific examples from the article.

2011 ELA Reading Standards for Literature #3: Analyze how complex characters (e.g., those with multiple or conflicting motivations) develop over the course of a text, interact with other characters, and advance the plot or develop the theme.

Reading selection: The Fountainhead;

Based on the excerpt, explain how Roark controls the meeting with the Dean. Support your answer with relevant and specific information from the excerpt.

ATTACHMENT B

Sample Math MCAS Open Response Items

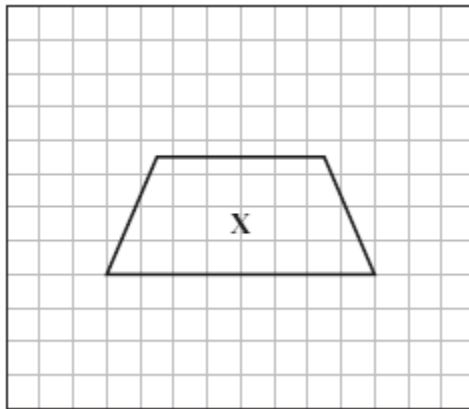
Grade 4

2011 Math Standard: 4.G.2 – Classify two dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.

Jason drew a closed shape with the properties listed below.

- It has exactly four angles.
 - All angles are right angles.
 - Opposite sides are congruent.
 - Opposite sides are parallel.
- a. On the grid in your Student Answer Booklet, draw a shape that has the same properties as Jason's shape.
 - b. On the grid in your Student Answer Booklet, draw a **different** shape that also has the same properties as Jason's shape.

Jason also drew trapezoid X shown on the grid below.



- c. List 3 properties of trapezoid X.

ATTACHMENT B con't

Grade 6

2011 Math Standard: 6.EE.6 – Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.

Lucinda earns \$20 each week. She spends \$5 each week and saves the rest. The table below shows the total amount that she saved at the end of each week for 4 weeks.

Lucinda's Savings at the End of Each Week

Week	1	2	3	4
Total Amount Saved	\$15	\$30	\$45	\$60

Lucinda continues to save at the same rate.

- What will be Lucinda's total amount saved at the end of 7 weeks? Show or explain how you got your answer.
- Use numbers, words, or symbols to write an expression that represents Lucinda's total amount saved at the end of n weeks.
- How many weeks will it take for Lucinda to save \$300? Show or explain how you got your answer.

Attachment B con't

Grade 10

2011 Math Standard: A.CED.1 – Create equations and inequalities in one variable and use them to solve problems.

An arcade charges the same admission price for each person who enters the arcade. Inside the arcade, people buy sets of tokens, which they use to play the arcade games. The sign below shows the price of admission and the price of a set of tokens at the arcade.

Arcade Prices	
Admission.....	\$3
Set of Tokens.....	\$2

- What is the total price, in dollars, of 1 admission and 6 sets of tokens? Show or explain how you got your answer.
- Joey has \$25 to spend at the arcade on admission and sets of tokens. What is the greatest number of sets of tokens he can buy? Show or explain how you got your answer.
- Write a linear equation that can be used to determine p , the total price, in dollars, of 1 admission and t sets of tokens.
- Will an increase in the price of a set of tokens increase the slope of the line represented by the equation you wrote in part (c)? Explain your reasoning.
- Will an increase in the price of a set of tokens increase the y -intercept of the line represented by the equation you wrote in part (c)? Explain your reasoning.

ATTACHMENT C



Massachusetts Comprehensive Assessment System Grade 10 Mathematics Reference Sheet

AREA FORMULAS

- square $A = s^2$
- rectangle $A = bh$
- parallelogram $A = bh$
- triangle $A = \frac{1}{2}bh$
- trapezoid $A = \frac{1}{2}h(b_1 + b_2)$
- circle $A = \pi r^2$

LATERAL SURFACE AREA FORMULAS

- right rectangular prism $LA = 2(hw) + 2(lh)$
- right circular cylinder $LA = 2\pi rh$
- right circular cone $LA = \pi r\ell$
(ℓ = slant height)
- right square pyramid $LA = 2s\ell$
(ℓ = slant height)

TOTAL SURFACE AREA FORMULAS

- cube $SA = 6s^2$
- right rectangular prism $SA = 2(lw) + 2(hw) + 2(lh)$
- sphere $SA = 4\pi r^2$
- right circular cylinder $SA = 2\pi r^2 + 2\pi rh$
- right circular cone $SA = \pi r^2 + \pi r\ell$
(ℓ = slant height)
- right square pyramid $SA = s^2 + 2s\ell$
(ℓ = slant height)

VOLUME FORMULAS

- cube $V = s^3$
(s = length of an edge)
- right rectangular prism $V = lwh$
- OR
- $V = Bh$
(B = area of a base)
- sphere $V = \frac{4}{3}\pi r^3$
- right circular cylinder $V = \pi r^2h$
- right circular cone $V = \frac{1}{3}\pi r^2h$
- right square pyramid $V = \frac{1}{3}s^2h$

CIRCLE FORMULAS

- $C = 2\pi r$
- $A = \pi r^2$

SPECIAL RIGHT TRIANGLES

