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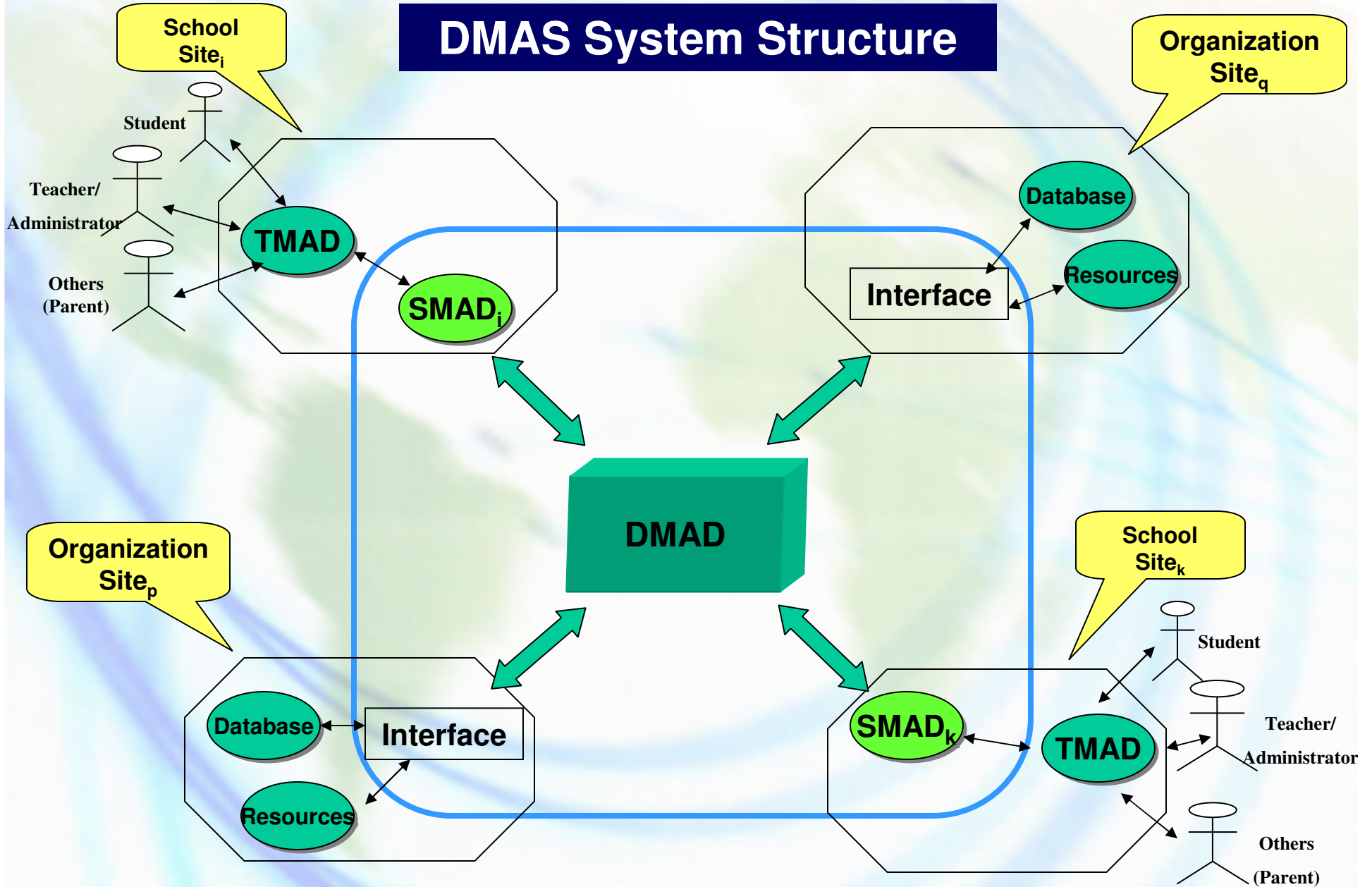
# Distributed Mathematics Assessment System (DMAS) & WME

Progress and Demo

# Outline

- **DMAS System Structure**
- **DMAS System Interface to Web Applications**
- **DMAS System Interface to WME**
- **Integrating DMAS with WME**
- **DMAS Search Engine (DMASEngine)**
- **Assessment Markup Language: MAML**
- **Conclusions and Future Work**

# DMAS System Structure



06/13/2007

## DMAD -- The Core Component

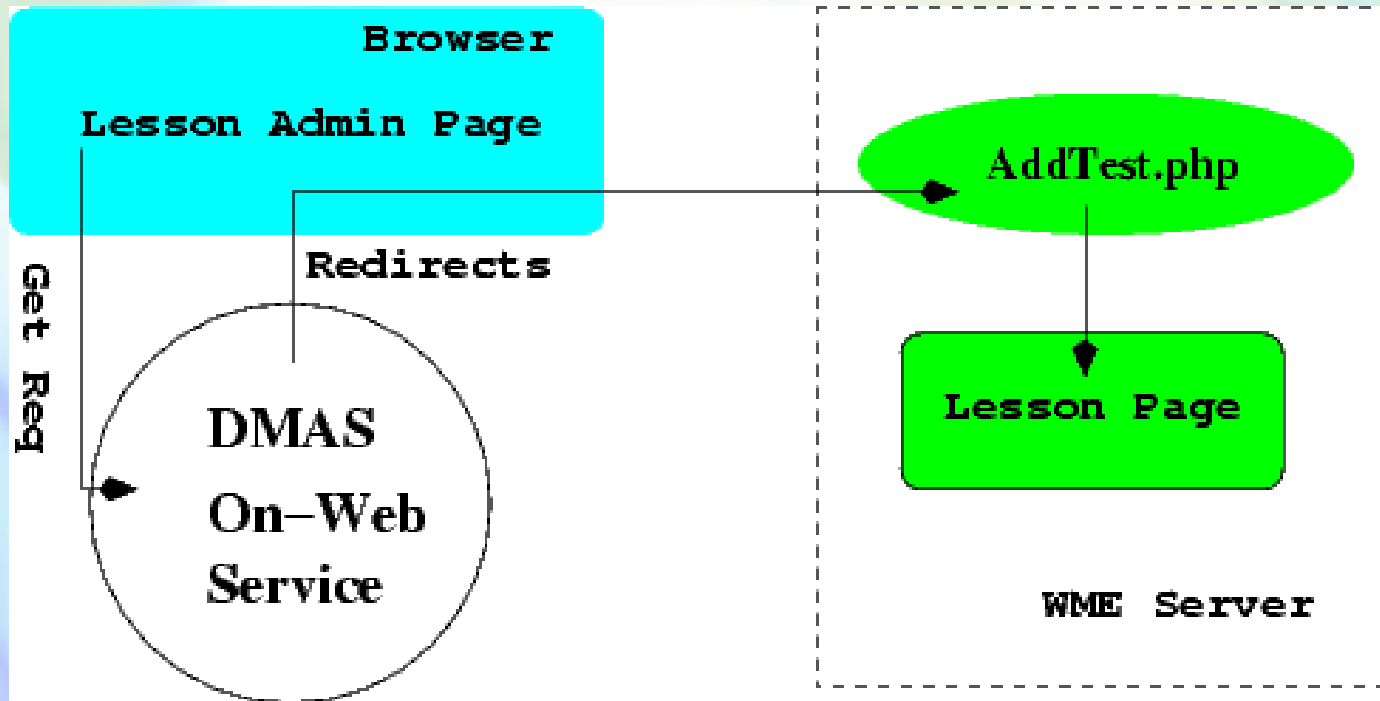
- **DMAD** (Distributed Mathematics Assessment Databases): *is a distributed database with local databases at different school sites. Within DMAD we have:*
- **TMAD** (Teachers Mathematics Assessment Database): *is a database assigned to mathematics teachers of same school.*
  - It stores and manages assessment tests, homework assignments, questions, student answers, grades, statistics and other info for each individual teacher.
- **SMAD** (School Mathematics Assessment Database): *is created for individual school as part of its school site.*
  - A SMAD connects TMADs within the school and SMADs at different schools through the DMAS system.
  - The SMAD performs a critical role in enabling the sharing of assessment materials within and without a school.

## DMAS System Interface to Web Applications

- DMAS system will provide APIs interface to other applications on the Web.
- These APIs can serve different requests either from:
  - server-to-server (i.e. from other servers such as WME server to DMAS server) or
  - client-to-server (from an Internet browser to DMAS server).
- In either case, DMAS system interface will handle all different calls in proper way.

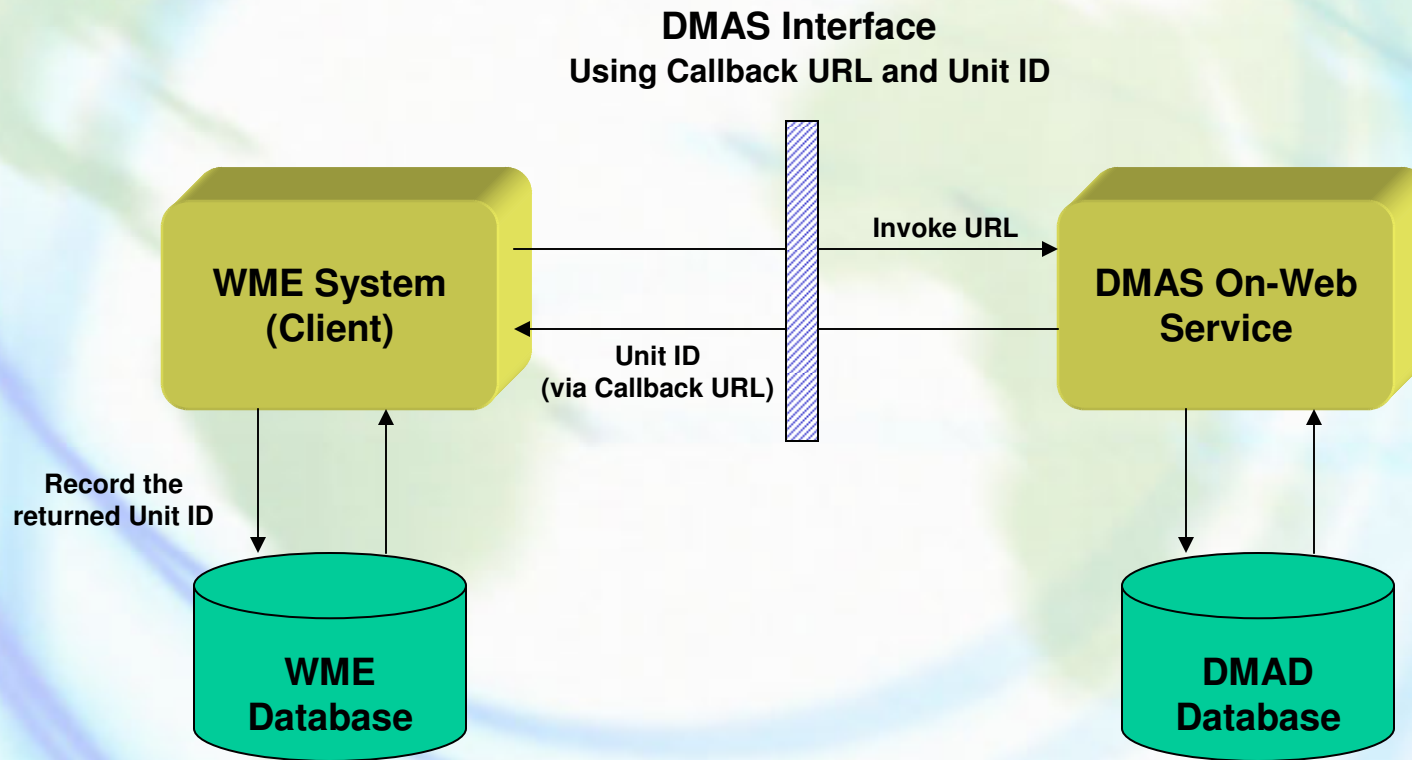


## DMAS System Interface to WME



# Integrating DMAS with WME

(DMAS as On-Web Service in WME )



## Integrating DMAS with WME (cont.)

### ➤ Procedures:

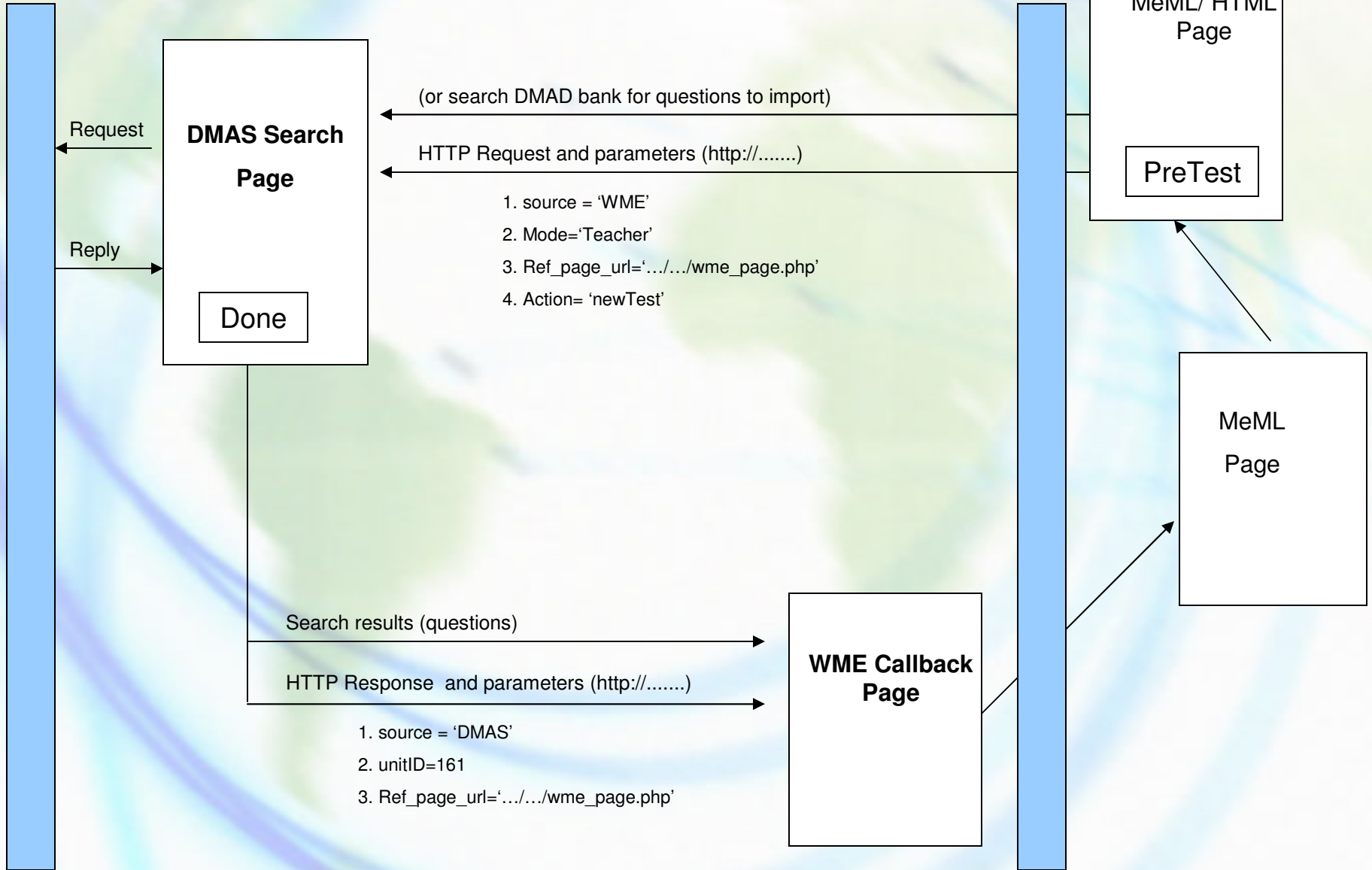
- ✓ DMAS system (DMAS Engine) is invoked via a URL to search/import questions from DMAD bank. This URL will receive POST or GET data including a "callback URL".
- ✓ The user can search for (or import) questions in from the DMAD bank databases.
- ✓ When ends, the user will be redirected to the callback URL using something like ( ...?UnitID=...) appended at the end of it.
- ✓ This call back URL is a program that knows how to take the data returned and display it or records it in the database for the WME page involved.



# DMAS-WME Interface Implementation

**DMAS System  
(DMAS Engine)**

**WME System**



# Integrating DMAS with WME (cont.)

WME - Feedback Administration Section - Windows Internet Explorer

http://wme.cs.kent.edu/testing/kimpton/admin/feedbackadmin.php

Windows Live

File Edit View Favorites Tools Help

WME - ...

Home Feeds (1) Print Page Tools Help

### Actions for This Page

- [Add a New Question Set](#)
- [Pose New Question \(s\)/Get New Question from DMAS](#)
- Set configuration parameters
- [Do nothing and go back](#)

### Assessment Part

- [Add a New Assessment Test](#)
- [Go to DMAS and Manage My Existing Assessment Tests](#)
- [Choose and Manage an Assessment Test](#)
- [Add Assessment Test link on the page](#)

### Question Sets for Length and Area

1	My Question Set <a href="#">(Edit/Remove)</a>
---	---

No questions posted for this set

Internet 100%

# Integrating DMAS with WME (cont.)

The screenshot displays three overlapping browser windows from the WME (Web Math Environment) system, demonstrating its integration with DMAS (Dynamic Math Assessment System).

**Top-Left Window: Feedback Administration Section**  
 This window shows the interface for creating and managing questions. It contains three question forms, each with a title, a text area for the question, and options to assign it to a question set and to hide it on the web page.

**Top-Right Window: DMAD Search Form**  
 This window shows the search interface for the DMAS system. It includes a search box, a 'Search DMAD' button, and a 'Reset Form' button. Below the search box, there are radio buttons to select the search scope: 'Whole DMAD Bank' (selected) and 'My School only'. An 'Advanced' link is also visible.

**Bottom-Left Window: Feedback Administration Section (Detailed)**  
 This window shows a specific question being created: 'Question 1: Which sign would complete the statement  $-3 [ ] 2$  indicating that 2 is greater than -3.' The interface includes options to assign the question to a set and to hide it on the web page.

**Bottom-Right Window: Search Results**  
 This window shows the results of a search for 'magicmath - Search DMAD results'. The results are displayed in a table with columns for question text, type, and source.

Question Text	Type	Source
Is $(3 + 4) + 5$ the same as $3 + (4 + 5)$ ?	TF	David - School3
Describe what is different about getting \$5 every hour for 20 hours of work versus getting \$1 for the first hour, \$3 for the second hour, \$9 for the third hour, etc.	ES	Anonymous
Amy buys tickets for a movie at \$8 per ticket. a) Create a table which shows the cost of 0 through 5 tickets. b) Create a graph which represents the information in the table. c) Describe in words how the total cost is related to the number of tickets bought. d) Use symbols to represent what you wrote in part c.	ES	Anonymous
Translate the English to mathematical notation: one thousand thirty three is greater than one thousand thirty and 3 tenths. (remember to only use symbols, numbers and decimals)	ES	Anonymous
If Frank is driving at 55 miles per hour, how long would it take him to go 230 miles? Also, how would you calculate how many feet per hour Frank is driving?	ES	Anonymous
If Drew wanted to find $\frac{2}{3}$ of the number 63, how could he do it without a calculator?	ES	Anonymous



# Integrating DMAS with WME (cont.)

The image displays two side-by-side screenshots of a web browser window, illustrating the integration of DMAS with WME.

**Left Screenshot (Student Interface):**

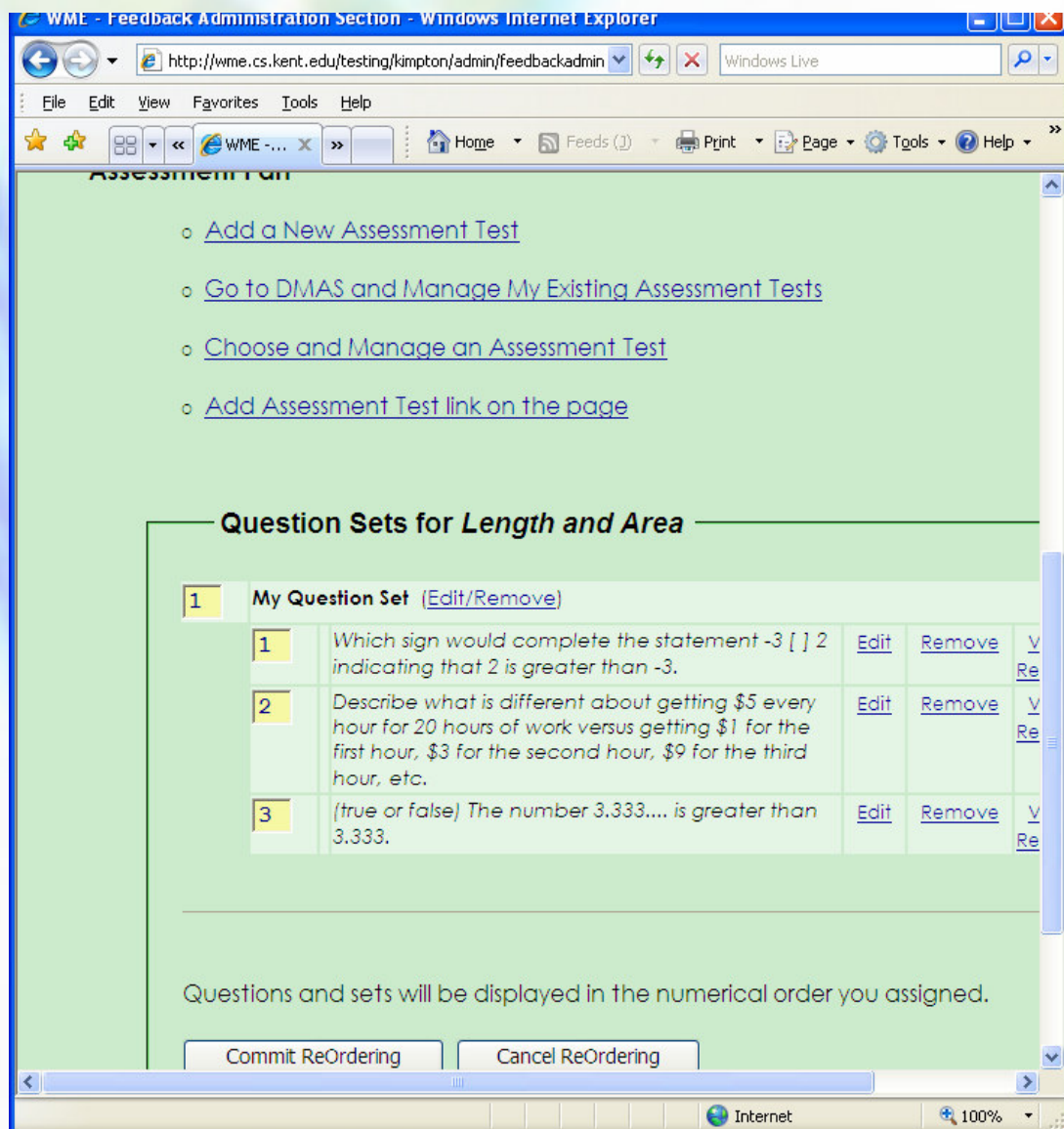
- Browser title: WME - Length and Area - Windows Internet Explorer
- Address bar: [http://wme.cs.kent.edu/testing/kimpton/measure\\_index.html?inde](http://wme.cs.kent.edu/testing/kimpton/measure_index.html?inde)
- Page content:
  - [Area and Circumference of a Circle](#)
  - My Question Set**
  - Teacher/Class:  Student Name:
  - 1. Which sign would complete the statement  $-3 [ ] 2$  indicating that 2 is greater than  $-3$ .
  - 2. Describe what is different about getting \$5 every hour for 20 hours of work versus getting \$1 for the first hour, \$3 for the second hour, \$9 for the third hour, etc.
  - 3. (true or false) The number 3.333.... is greater than 3.333.

**Right Screenshot (Administrator Interface):**

- Browser title: WME - Feedback Administration Section - Windows Internet Explorer
- Address bar: <http://wme.cs.kent.edu/testing/kimpton/admin/feedbackadmin.php>
- Page content:
  - Assessment Fun
    - [Add a New Assessment Test](#)
    - [Go to DMAS and Manage My Existing Assessment Tests](#)
    - [Choose and Manage an Assessment Test](#)
    - [Add Assessment Test link on the page](#)
  - Question Sets for Length and Area**
  - 1 **My Question Set** ([Edit/Remove](#))

1	Which sign would complete the statement $-3 [ ] 2$ indicating that 2 is greater than $-3$ .	<a href="#">Edit</a>	<a href="#">Remove</a>	<a href="#">View Replies</a>
2	Describe what is different about getting \$5 every hour for 20 hours of work versus getting \$1 for the first hour, \$3 for the second hour, \$9 for the third hour, etc.	<a href="#">Edit</a>	<a href="#">Remove</a>	<a href="#">View Replies</a>
3	(true or false) The number 3.333.... is greater than 3.333.	<a href="#">Edit</a>	<a href="#">Remove</a>	<a href="#">View Replies</a>
  - Questions and sets will be displayed in the numerical order you assigned.
  -

## Integrating DMAS with WME (cont.)



WME - Feedback Administration Section - Windows Internet Explorer

http://wme.cs.kent.edu/testing/kimpton/admin/feedbackadmin

File Edit View Favorites Tools Help

WME - ... x

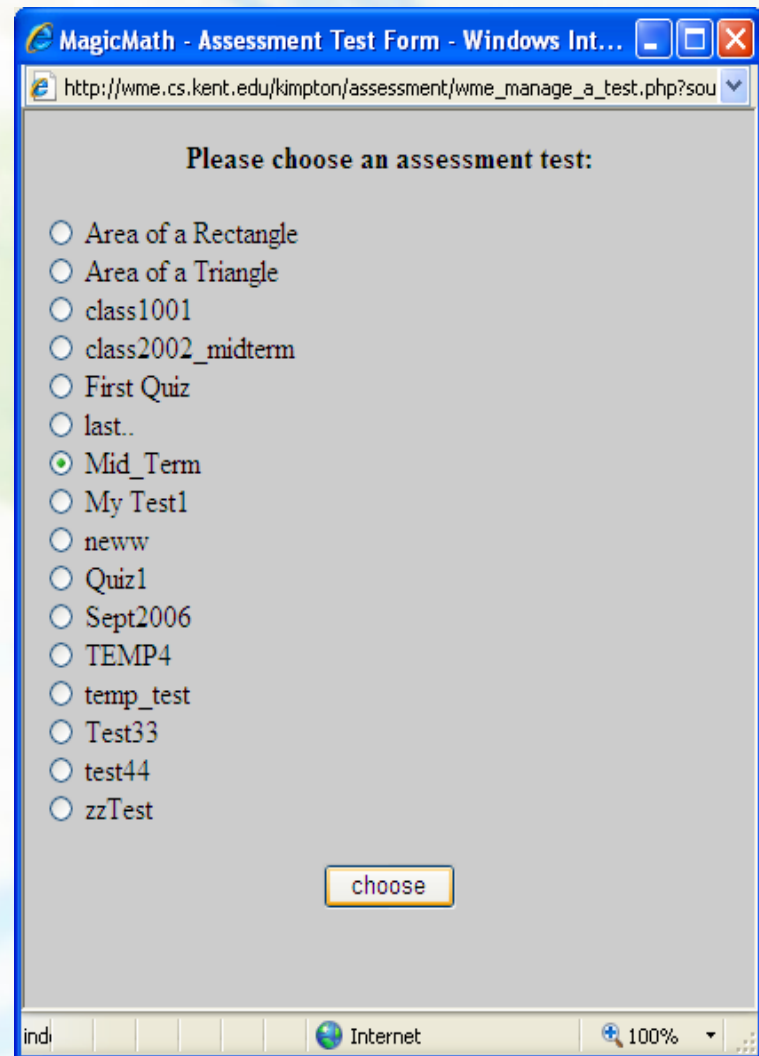
- o [Add a New Assessment Test](#)
- o [Go to DMAS and Manage My Existing Assessment Tests](#)
- o [Choose and Manage an Assessment Test](#)
- o [Add Assessment Test link on the page](#)

### Question Sets for Length and Area

1	My Question Set (Edit/Remove)			
1	Which sign would complete the statement $-3 [ ] 2$ indicating that 2 is greater than -3.	<a href="#">Edit</a>	<a href="#">Remove</a>	<a href="#">V</a> <a href="#">Re</a>
2	Describe what is different about getting \$5 every hour for 20 hours of work versus getting \$1 for the first hour, \$3 for the second hour, \$9 for the third hour, etc.	<a href="#">Edit</a>	<a href="#">Remove</a>	<a href="#">V</a> <a href="#">Re</a>
3	(true or false) The number 3.333.... is greater than 3.333.	<a href="#">Edit</a>	<a href="#">Remove</a>	<a href="#">V</a> <a href="#">Re</a>

Questions and sets will be displayed in the numerical order you assigned.

[Commit ReOrdering](#) [Cancel ReOrdering](#)



MagicMath - Assessment Test Form - Windows Int...

http://wme.cs.kent.edu/kimpton/assessment/wme\_manage\_a\_test.php?sou

Please choose an assessment test:

- Area of a Rectangle
- Area of a Triangle
- class1001
- class2002\_midterm
- First Quiz
- last..
- Mid\_Term
- My Test1
- neww
- Quiz1
- Sept2006
- TEMP4
- temp\_test
- Test33
- test44
- zzTest

[choose](#)

Internet 100%



# Integrating DMAS with WME (cont.)

The image displays three overlapping screenshots of a web browser (Windows Internet Explorer) showing the WME (Web Management Environment) interface. The browser address bar shows <http://wme.cs.kent.edu/te/>.

**Top Left Screenshot:** Titled "Adding Assessment Test link on the page". It shows instructions for adding a link to a page named "Length and Area". A text input field contains "MidTerm Exam". Below it, there are radio buttons for "Show/Enable Assessment Test link on the page?" with "Yes" selected. A "submit" button is visible at the bottom.

**Top Right Screenshot:** Titled "Assessment Part". It lists four options for managing assessment tests:

- [Add a New Assessment Test](#)
- [Go to DMAS and Manage My Existing Assessment Tests](#)
- [Choose and Manage an Assessment Test](#)
- [Add Assessment Test link on the page](#)

Below this list, there is a section for "Assessment Test Link(s) for Length and Area" containing a link "MidTerm Exam (Edit/Remove)".

**Bottom Screenshot:** Titled "Length and Area". It shows a list of links:

- [Area and Perimeter of a Trapezoid](#)
- [Area and Circumference of a Circle](#)

Below this is the "Assessment Test Link" section with a link "MidTerm Exam". The "My Question Set" section includes a form for "Teacher/Class:" and "Student Name:", and a list of questions. The first question is: "1. Which sign would complete the statement  $-3 [ ] 2$  indicating that  $-3$  is greater than  $-2$ ." Below the question is a dropdown menu and a "Submit Answer" button.

## DMAS Search Engine (DMASEngine) - old

- First version of the DMASEngine has been produced.
- The search covers the local SMAD and all participating DMASs of other sites the rest of DMAD – All that is transparent to the user.
- A teacher (user) can easily *search for assessment questions* on particular subjects and at specific grade levels.
- The search can be narrowed by subjects, topics (for example, fractions, algebra, geometry, and measurement), keywords, grade levels, question type and author.
- The search engine will also look for geometrical graphs, questions with formulas, and those containing images (gif, jpeg, etc.).

# DMAD Search Engine (cont.) - old

**DMAD Search Form**

Please type your search:

Where to search?

Whole DMAD Bank  My School only

[Advanced Search<<](#)

Select Category:

Algebra

Grade:

7

Question Type:

Short Answer

Exported by?

Other people  My exported questions only

Question Content Search:

Contains SVG graph

Contains formula(s)

Contains image (uploaded)

(The following info is based on people's usage and Experience):

## DMAS Search Engine (DMASEngine)- new

- DMASEngine will use AJAX technology to get better, quicker, and more efficient search results and more interactive web applications.

-AJAX stands for **A**synchronous **J**avaScript **A**nd **X**ML. AJAX uses asynchronous data transfer (HTTP requests) between the browser and the web server, allowing web pages to request small part of information from the server instead of loading whole pages.

- AJAX is a type of programming made popular in 2005 by Google. It is not a new programming language, but a way of using existing standards and a technique for creating better, faster, and more user-friendly web applications. AJAX is based on JavaScript and HTTP requests.

Using AJAX, JavaScript can communicate directly with the server, using the JavaScript **XMLHttpRequest** object. With this object, the JavaScript can trade data with a web server, without refreshing the page.



## DMAS Search Engine (DMASEngine)- new (cont.)

- The DMASEngine uses **ResponseXML** property that returns an XML document object, which can be examined and parsed using W3C DOM node tree methods and properties.
- The DMASEngine dynamically can fetch information from DMAS bank databases using AJAX technology.
- The returned data from the server (databases) will be dynamically created and converted into an XML document format.
- Then DMASEngine will use the DOM to parse the returned XML document and extract the values to be displayed.



# DMAD Search Engine (cont.)

The screenshot shows a web browser window titled "MagicMath - Search DMAD Bank - Windows Internet Explorer". The address bar shows the URL: [http://wme.cs.kent.edu/kimpton/assessment/search\\_dmad\\_form\\_wme.php?source=WME&mode=tea](http://wme.cs.kent.edu/kimpton/assessment/search_dmad_form_wme.php?source=WME&mode=tea). The browser's menu bar includes File, Edit, View, Favorites, Tools, and Help. The toolbar contains icons for Home, Feeds, Print, Page, Tools, Help, Real.com, and Messenger.

The main content area is titled "DMAD Search Form". It features a search input field containing the letter "n". Below the input field is a dropdown menu with the following suggestions: numbers, PI, repeating numbers, scale, measure, fraction number, fraction, numbers, equality, prime number, numbers, equations, Measurement, reasonable estimate, and Geometric graph. To the right of the input field is a "Search DMAD" button. Further right is a "Reset Form" button.

Below the search input field, there is a yellow box that says "Questions Found 60".

Underneath the search field, there is a section titled "Where to search?" with two radio buttons: "Whole DMAD Bank" (which is selected) and "My School only".

At the bottom right of the search area, there is a link for "Advanced Search<<".

Below the search area, there is a section titled "Select Category:" with five checkboxes: Algebra (checked), Geometry, Measurement, Number and Operations, and Data Analysis and Probability.

Below the category section, there is a section titled "Grade:" with checkboxes for grades 1 through 12. Grades 1, 2, and 7 are checked.

Below the grade section, there is a section titled "Question Type:" with four checkboxes: Multiple Choices (checked), True or False, Extended Question, and Short Answer.

The browser's status bar at the bottom shows "Internet" and "100%".

# DMAD Search Engine (cont.)

http://wme.cs.kent.edu/kimpton/assessment/search\_dmad.php?txtSearch=&btn\_search=Se

DMAD - Search DMAD Res...

**Total number of questions found ( 12 )**

### DMAD Search Results

choose?	Question	Type	Action	Author
<input type="checkbox"/>	On the ruler below, what value lies at each labeled point A-D? (Dr. M - can a ruler have the points shown but no intervals identified except one half? the ruler should be broken into 16ths and point A would be at 1 and 1/4, point B at 5/8, point C at 2 and 7/16 and point D at 2 and 3/4) at point A _____ at point B. _____ at point C. _____ at point D. _____	SH	[view] [edit] [del] [import]	Anonymous
<input type="checkbox"/>	On the ruler below, what value lies at each labeled point A-D? (Dr. M - can a ruler have the points shown but no intervals identified except one half? the ruler should be broken into 16ths and point A would be at 1 and 1/4, point B at 5/8, point C at 2 and 7/16 and point D at 2 and 3/4) at point A _____ at point B. _____ at point C. _____ at point D. _____	SH	[view] [edit] [del] [import]	Anonymous
<input type="checkbox"/>	Wal-mart is having a contest. They filled a large jar with peanuts and whoever guesses closest to the number of peanuts in the jar wins a \$50 gift certificate at Wal-mart. Carolyn made a guess of 655 peanuts, which was 135 off. Carl guessed 480 peanuts, which was only 40 off. How many peanuts are in the jar? Explain in detail how you found your answer using words, number, and/or pictures.	SH	[view] [edit] [del] [import]	WASL
<input type="checkbox"/>	Today Connie is three times as old as Grace. Six years from now, Connie will be twice as old as Grace. How old is Connie today? Explain in detail how you found your answer using words, number, and/or pictures.	SH	[view] [edit] [del] [import]	WASL
<input type="checkbox"/>	The new movie, Return to Monkey Island, opened on Monday, March 1st. On the first day, 50 people attended the show. On the second day, there were 78 people in attendance. On the third day, 106 people were there. If the pattern continues, what is the first day on which there will be at least 200 people in the audience? Explain in detail how you found your answer using words, number, and/or pictures.	SH	[view] [edit] [del] [import]	WASL
<input type="checkbox"/>	On the quiz show "What Do You Know?" each question is worth four		[view]	

## Assessment Markup Language: MAML

- ✓ MAML (Mathematics Assessment Markup Language) is an XML markup language for DMAS.
- ✓ To transmit assessment questions to and from DMAS system and to interact with outside systems.
- ✓ MAML will be used for representation/encoding of assessment questions and exams..
- ✓ MAML defines markup elements and attributes such as question head, type, classification, body, rubric, and so on.
- ✓ The XSLT style sheet for MAML (maml.xsl) will be responsible to translate MAML markup into XHTML + SVG + MathML.



## Assessment Markup Language: MAML (cont.)

```
<?xml version="1.0" encoding="iso-8859-1" ?>
<dmad>
  <question type="Multiple Choices">
    <q_head>
      <author>Dan Alan</author>
      <keywords>fraction number, fraction</keywords>
      <classification>Algebra</classification>
      <comments>fraction number, fraction comparison</comments>
      <answer>9/12</answer>
    </q_head>
    <q_body>
      <q_text>Which fraction below is equivalent to 3/4.</q_text>
      <q_diagram />
      <q_choices>
        <choice id="1">27/36</choice>
        <choice id="2">8/16</choice>
        <choice id="3">4/8</choice>
        <choice id="4">9/12</choice>
      </q_choices>
    </q_body>
  </question>
</dmad>
```

# DMAS and Geometrical Graphing

MagicMath - Teacher New Question - Windows Internet Explorer

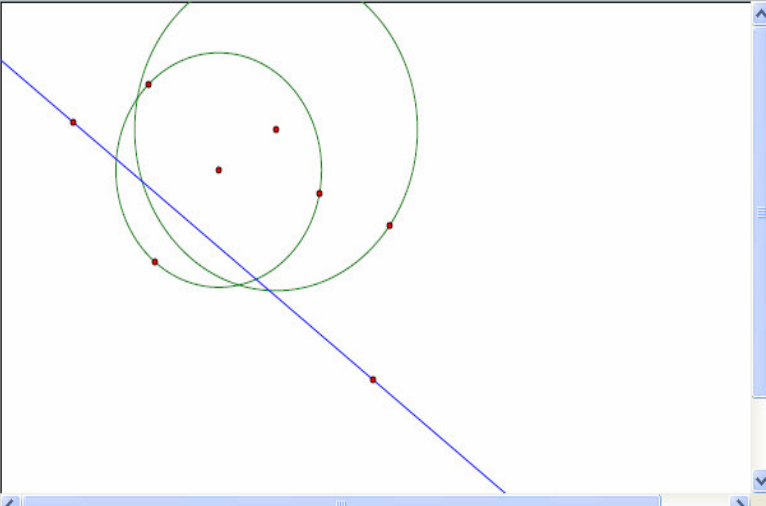
http://wme.cs.kent.edu/kimpton/assessment/insert\_upload.php

B I Link Ext. Link IMG UL OL LI B-QUOTE Close Tags Dict

« H1 H2 H3 H4 P CODE PRE DL DT DD TABLE TR TD U S NOBR Footnote

add (infix) formula Use MathEdit add image (upload) add flash file edit geometric graph

Measure



Enter short Answer/Rubric:

formula

Done Internet 100%



# Assessment Test Giving

http://wme.cs.kent.edu - MagicMath - Test Codes Form - Windo...

seq.	Student Name	Student Code	Re-take Test?	Student Code(2)
1	Adam Ben	1550	Enabled	7347
2	David	2199	Enabled	9078
3	Jack	2466	Disabled	
4	Alina K.	3143	Disabled	
5	Jim II	3986	Disabled	
6	Alan	4161	Disabled	
7		5572	Disabled	
8		7787	Disabled	
9		8793	Disabled	
10		9443	Disabled	

Save Changes

http://wme.cs.kent.edu - MagicMath - Test Codes Form - Windows Internet ...

For Test: Mid\_Term

Please choose code type:

- Numeric (numbers only)
- Alphabetic (Capital letters only)
- Alphabetic (Small letters only)
- Alphabetic (Mix capital and small letters)
- Alphanumeric (Capital letters only)
- Alphanumeric (Small letters only)
- Alphanumeric (Mix capital and small letters)

Please enter code length (number of digits): Integer (4 - 20):

Please enter number of students (no of codes needed), Integer (1 - 99):

continue

http://wme.cs.kent.edu - MagicMath - Login form - W...

### Student Login

Student Name:

Student Code:

Login

Re-take test?

Second Code:

# Grading Results Administration

http://wme.cs.kent.edu - MagicMath - Assessment Results - Windows Internet Explorer

back to: Results form

Student Name: Adam Ben Total student Score: (30.00/40.00) = 75.00%

Adam Ben [Select]

(Wrong Answer) Score: 0.00

**Q: (true or false) The number 3.333.... is greater than 3.333.**

A:  
 True  
 False

(Correct Answer) Score: 10.00

**Q: Which sign would complete the statement  $-3 [ ] 2$  indicating that 2 is greater than  $-3$ .**

A:  
 <  
 >  
 =  
 ≠

(Correct Answer) Score: 10.00

http://wme.cs.kent.edu - MagicMath - Assessment Result ...

## Your assessment Test:

Please choose a test:  
 Mid\_Term [Select]

Display Student results by:  
 A Student Name.  
 A Question.

[Select]

http://wme.cs.kent.edu - MagicMath - Assessment Results - Windows Internet Explorer

back to: Results form

Please choose a question:  
 (true or false) The number 3...  
 Which sign would complete the ...  
 four to the third power is: ...  
 Is X times 4 equal to 4 times ...  
 Explain what a prime number is ...  
 Is (3 + 4) +5 the same as 3 + ...

[Pick]

Total no. of students= 5	Correct answer(s)= 3, This means: (60.00%) of students got it correct	Wrong answer(s)= 2, This means: (40.00%) of students got it wrong!
--------------------------	--	---

**Q: (true or false) The number 3.333.... is greater than 3.333.**

A:  
 True  
 False

3 student(s)  
 2 student(s)

**. True**

Student names:

seq.	Student Name
1	Alina K.
2	David
3	Jim II

start | Inbox - Microsoft... | Saleh\_Desertali... | Dissertation | 3 Internet Expl... | Microsoft Power... | EN | 1:55 PM

06/13/2007

## Conclusions and Future Work

- The DMAS system aims to be an effective and easy to use assessment tool for mathematics education. A systematic way of authoring, importing, customizing, and exporting assessment materials can help create an environment in which usage and experience can accumulate and mutually reinforce.
- In fact, I have much work to do and to add features and more improvements to DMAS system to make assessment materials ready to deploy on the Web, to conduct tests online, to provide grading help, to generate performance statistics, to provide diagnostics and to suggest remedial materials, while making tests and scores private and secure, controlling access to tests and results.
- Creating the new assessment language MAML, Assessment Web service, and DMAS interface to other Web applications definitely need more investigations and much work ahead.
- My goal is to put DMAS system under extensive trial in schools and collecting feedback and suggestions from teachers, students, school administrators and education experts to help me evolve DMAS. As more schools adopt WME and DMAS, the distributed nature of DMAS will be demonstrated in realistic situations.

## Demo and Q&A

- **Take a look..**

<http://wme.cs.kent.edu/testing/kimpton/>

<http://wme.cs.kent.edu/kimpton/assessment/>

[http://wme.cs.kent.edu/wme\\_sample\\_page.php](http://wme.cs.kent.edu/wme_sample_page.php)