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A Programmer's Guide to MyOpenMath

MyOpenMath is a free learning management system providing online interactive homework. One of the limitations of using MyOpenMath is that the question libraries are smaller than those of its commercial competitors. In this session, we will learn to use the Internet Mathematics Assessment System (IMathAS) to write our own questions and thus contribute to the growing open educational resources (OER) ecosystem.

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Introduction

MyOpenMath was started in 2011 by David Lippman and runs on the open source IMathAS platform. IMathAS is an Internet Mathematics Assessment System which provides for the delivery and automatic grading of math homework and tests. In addition, MyOpenMath includes many features of course management systems including announcements, discussion forums and a gradebook. To learn more and request an account, visit <https://www.myopenmath.com/>.

MyOpenMath



Welcome

Free and Open

Students

Are you a student looking to study mathematics on your own, and want to do exercises with immediate feedback as you work through a free and open textbook? Then read more about our [self study courses](#).

Instructors

Are you an instructor who wants to adopt an open textbook, who feels online interactive homework is valuable, but doesn't want their students to have to pay an additional fee? Then read more about [using MyOpenMath in the classroom](#).

Getting Started

If you already have an account, you can log on using the box to the right.

If you are a new student to the system, [register as a new student](#)

If you are an instructor, you can [request an instructor account](#)

MyOpenMath is powered by [IMathAS](#) © 2006-2017 David Lippman
[Privacy Policy](#) | [Accessibility](#)

Programming environment

The question editor can be accessed using Questions/Manage or from within an assignment. Either way, the editor can be opened by pressing the Add New Question button.

Add New Question

When the editor opens you will see several sections including the Description, My library assignments, Question type, Common Control, Question Text and a place to add a detailed solution and/or provide a link to internet resources.

Add QuestionSet Question

Description:

Enter description here

Author:

Use Rights:

License:

[Add additional attribution](#)

My library assignments: Unassigned

Question type:

[Writing Questions Help](#) | [Macro Library Help](#) | [Tutorial Style editor](#)

Common Control:

1

Question Text:

[Add a detailed solution](#)

Image file: No file selected. assign to variable: Description:

Help button: Type: URL:

The **Question type** drop-down menu is where you select the type of the question you wish to create. There are many options. The **Common Control** is where the programming happens. The programming is based on a derivative/subset of PHP, however, it has its own custom syntax and function set. PHP is a recursive acronym for Hypertext Preprocessor and is server-side scripting language designed for web development which is also used as a general-purpose programming language. Above the Common Control, you will find several resources to assist with the programming including the **Writing Questions Help** which provides detailed documentation but with a minimum number of examples.

- Question Types**
- [Number](#)
 - [Calculated](#)
 - [Multiple-Choice](#)
 - [Multiple-Answer](#)
 - [Matching](#)
 - [Function](#)
 - [String](#)
 - [Essay](#)
 - [Drawing](#)
 - [N-Tuple](#)
 - [Calculated N-Tuple](#)
 - [Complex](#)
 - [Calculated Complex](#)
 - [Numerical Matrix](#)
 - [Calculated Matrix](#)
 - [Interval](#)
 - [Calculated Interval](#)
 - [File Upload](#)
 - [Multipart](#)
 - [Conditional](#)

- MyOpenMath Help**
- [Writing Questions](#)
 - [Question Parts](#)
 - [Basic Control Syntax](#)
 - [Randomizers](#)
 - [Graph/Table Macros](#)
 - [Format Macros](#)
 - [String Macros](#)
 - [Array Macros](#)
 - [General Macros](#)
 - [Math Macros](#)
 - [Conditional Test Macros](#)
 - [Feedback Macros](#)
 - [Using Other Macros](#)
 - [Math Entry](#)
 - [Solver](#)
 - [Options Common to All Types](#)
 - [Question Types](#)

The **Macro Library Help** provides documentation on additional macro libraries which extend the functionality of the core macros. These libraries vary in size from those addressing a very specific need such as ineq which provides functions to plot solutions to inequalities to those addressing an area of mathematics such as stat which provides a fair number of common statistical graphs and functions for working with the PDFs and CDFs of several discrete and continuous probability distributions.

Installed Macro Libraries

Load a macro library by entering the line

```
loadlibrary("list of library names")
```

at the beginning of the Common Control section.

Examples:

```
loadlibrary("stats")
```

or

```
loadlibrary("stats,misc")
```

You do not need to load the Core libraries.

- Core Randomizers
- Core Graph/Table Macros
- Core Format Macros
- Core String Macros
- Core Array Macros
- Core General Macros
- Core Math Macros
- JSXG
- acct
- calculus
- chemistry
- chgbase
- construct2
- crypto
- finance
- fractions
- functioneval
- geogebra
- graphtheory
- ineq
- interval
- interval_ext
- lineutil
- matrix
- normalcurve
- plot3d
- polys
- polys2
- primes
- radicals
- sagecell
- simplex
- socchoice
- solvers
- stats
- vector
- virtmanip

Click on the Solver tab to open a solver based on the Sage computer algebra system. This solver can be used to check your answers or perform some of the calculations needed to program questions.

Solver

Solver

Select and drag or copy an expression from your question code. ?

Solve

```
1 var("a,b,c,d,x,y")
2 solve(y==(a*x+b)/(c*x-d),x)
```

Go

[x == (d*y + b)/(c*y - a)]

Help | Powered by SageMath

Drag this to the Common Control box or use the buttons below. ?

$(d*y + b)/(c*y - a)$

Insert in Common Control Insert as \$answer

Data types

For all practical purposes, there are five data types used in the IMathAS system. Just as in PHP, variables are prefixed with a dollar sign (\$).

- **Number.** Numbers can be integers, floating point numbers, calculations which result in numbers or they can be returned from functions.

```
$a = 5
$b = 1/3^2
$c = rand(1,6)
```

- **Strings and Lists.** A string is a sequence of characters enclosed in quotes and a list is a special type of string made up of a collection of items separated by commas. Variables can be incorporated into strings. Strings are typically used to display information in the question text and define answers.

```
$greeting = "Hello everyone."
$color = "Red, Green, Blue"
$a = 3
$b = 5
$c = $a + $b
$text = "The sum of $a and $b is $c."
$eqn = makepretty("f(x)= x^2 + $b x + $c")
$answer = "3cos(x)"
```

Note that backticks (grave accent) are used to instruct MyOpenMath to render an expression as ASCIIMath. For example, consider the difference between how the equation shown below is displayed without and then with backticks.

```
$eq = makexxpretty("y=(a x + b)/(c x + d)")
```

without backticks	with backticks
Question Text: [+][-]	Question Text: [+][-]
<code>\$eq</code>	<code>`\$eq`</code>
$y = (a x+b)/(c x+d)$	$y = \frac{ax + b}{cx + d}$

- **Array.** An array is a collection of variables normally of the same data type (although this does not need to be the case in MyOpenMath, probably due to the weak typecasting in PHP). We can perform calculations on arrays and display them in tables. Some functions work equally well with lists and arrays.

```
$x = consecutive(1,5)
$y = calconarray($x,"x^2+1")
$table = showarrays("x",$x,"y",$y)
```

x	y
1	2
2	5
3	10
4	17
5	26

```
$c1 = randfrom("Red, Green, Blue")
$c2 = randfrom(array("Red", "Green", "Blue"))
```

- **Boolean.** Boolean values are used in if statements. This can be used to create conditional assignment statements or the more traditional if-else statements.

```
$zc = 1.64485 if ($c == 90)
$zc = 1.95996 if ($c == 95)
```

```
if ($c == 90) {
    $zc = 1.64485
} elseif ($c = 95) {
    $zc = 1.95996
}
```

- **Null.** The null data type is frequently used when processing student responses to provide feedback. This particular application is both beyond the scope of this presentation and the MyOpenMath coding experience of the presenter.

Example 1: Area of a painting (Number)

The Girl with a Pearl Earring is an oil painting by the 17th century Dutch painter Johannes Vermeer. The painting has been in the Mauritshuis Museum in the Hague since 1902. The painting has dimensions 17.5 inches by 15 inches. What is the area of the painting? (Round your answer to 1 decimal place)



Area = in²

Show Answer

Question type:

[Writing Questions Help](#) | [Macro Library Help](#) | [Tutorial Style editor](#)

Common Control:

```
1 // Choose a random width and height
2
3 $width = rrand(14,16,0.1)
4 $height = rrand(16.5,18.5,0.1)
5
6 // Determine the answer
7
8 $answer = $width*$height
9 $abstolerance = 0.1
```

Question Text:

```
<p>The Girl with a Pearl Earring is an oil painting by the 17th century Dutch painter Johannes Vermeer. The painting has been in the Mauritshuis Museum in the Hague since 1902. The painting has dimensions 17.5 inches by 15 inches. What is the area of the painting? (Round your answer to 1 decimal place)</p>
<p>
  <br /><br />
Area = $answerbox in<sup>2</sup></p>
```

Example 2: Unit circle practice (Calculated Number)

Provide an exact answer for $\cos\left(\frac{\pi}{2}\right)$.

Preview

Show Answer

Question type:

[Writing Questions Help](#) | [Macro Library Help](#)

Common Control:

```
1 // Use arrays to store the angles and the corresponding
2 // values of the sine and cosine functions
3
4 $angles = array("0", "pi/6", "pi/4", "pi/3", "pi/2")
5 $cosines = array("1", "sqrt(3)/2", "sqrt(2)/2", "1/2", "0")
6 $sines = array("0", "1/2", "sqrt(2)/2", "sqrt(3)/2", "1")
7
8 // Randomly select a trigonometric function and an angle
9
10 $strig = randfrom(array("cos", "sin"))
11 $i = rand(0,4)
12 $theta = $angles[$i]
13
14 // Define the answer and an acceptable answer format
15 // nodecimal - requires an answer w/o decimals
16 // noval - answer preview does not show a decimal equivalent
17
18 $answer = $cosines[$i] if ($strig == "cos")
19 $answer = $sines[$i] if ($strig == "sin")
20 $answerformat = "nodecimal,noval"
```

Question Text:

Provide an exact answer for ``$strig($theta)``.

Example 3: Carbon dioxide (Function)

The carbon dioxide levels in the atmosphere as measured at the Mauna Loa Observatory in Hawaii in 1970 was 326 ppm and the concentration in 1990 was 355 ppm. Find a linear equation for the concentration of carbon dioxide in the atmosphere of the form $c = mt + b$ where t is the number of years since 1970 and c is the concentration of carbon dioxide. (Round numbers to 3 decimal places as needed)



$c =$

Preview

Show Answer

Common Control: [+][-]

```
1 $variables = "t,c"
2
3 // Carbon dioxide concentrations
4
5 $years = array(1960, 1970, 1980, 1990, 2000, 2010)
6 $co2 = array(317, 326, 338, 355, 370, 390)
7
8 // Randomly select two ordered pairs
9
10 $i, $j = diffrands(0,5,2) where ($i < $j)
11 $t1 = $years[$i]
12 $c1 = $co2[$i]
13 $t2 = $years[$j]
14 $c2 = $co2[$j]
15
16 // Determine the equation of the line
17
18 $m = ($c2 - $c1)/($t2 - $t1)
19 $b = $c1
20
21 // Define the answer
22
23 $ansprompt = "`c = `"
24 $answer = "$m*t + $b"
25
26 // Provide a hint if a student mistakenly treats t as the year
27 // rather than the number of years since $t1.
28
29 $hints[1] = "Remember that `t` is the number of years since $t1.
<br> Hence, your ordered pairs should be `(0,$c1)` and `($td,$c2)`."
```

Question Text: [+][-]

The carbon dioxide levels in the atmosphere aas measured at the Mauna Loa Observatory in Hawaii in \$t1 was \$c1 ppm and the concentration in \$t2 was \$c2 ppm. Find a linear equation for the concentration of carbon dioxide in the atmosphere of the form `c = m t + b` where `t` is the number of years since \$t1 and `c` is the concentration of carbon dioxide.

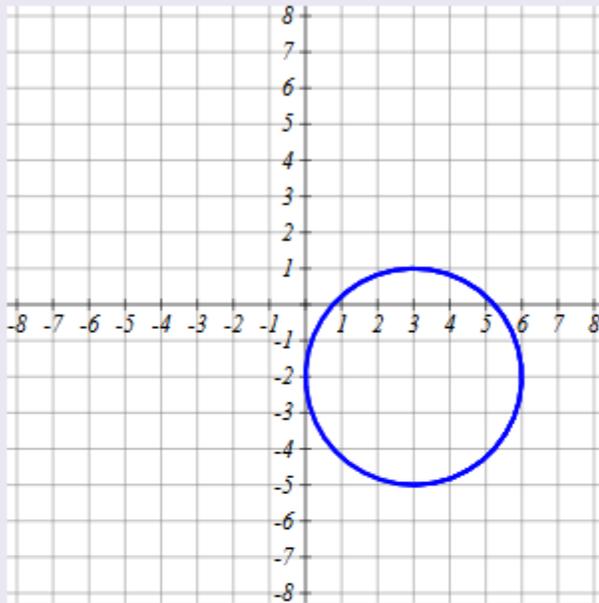
```

```

```
$answerbox
$hintloc
```

Example 4: Equation of a circle (Multiple choice)

Which of the following is the equation of the circle?



- $(x - 3)^2 + (y + 2)^2 = 9$
- $(x + 3)^2 + (y + 2)^2 = 9$
- $(x + 3)^2 + (y - 2)^2 = 9$
- $(x - 3)^2 + (y - 2)^2 = 9$

Show Answer

Common Control: [+][-]

Solver

Save

Quick Save and Preview

```
1 $variables = "x,y"
2
3 // Define a circle
4
5 $r = rand(2,4)
6 $h, $k = nonzerorands(-4,4,2)
7
8 // Plot the circle
9
10 $plot = showplot("[$h + $r*cos(t), $k + $r*sin(t)],blue,,,,,2",-
11 8,8,-8,8,1,1,300,300)
12
13 // Choices for the equation
14
15 $rsq = $r^2
16 $eq1 = makepretty("` (x - $h)^2 + (y - $k)^2 = $rsq`")
17 $eq2 = makepretty("` (x + $h)^2 + (y + $k)^2 = $rsq`")
18 $eq3 = makepretty("` (x - $h)^2 + (y + $k)^2 = $rsq`")
19 $eq4 = makepretty("` (x + $h)^2 + (y - $k)^2 = $rsq`")
20
21 $choices = array($eq1,$eq2,$eq3,$eq4)
22
23 // Define the answer
24
25 $answer = 0
```

Question Text: [+][-]

Toggle Editor

Save

Quick Save and Preview

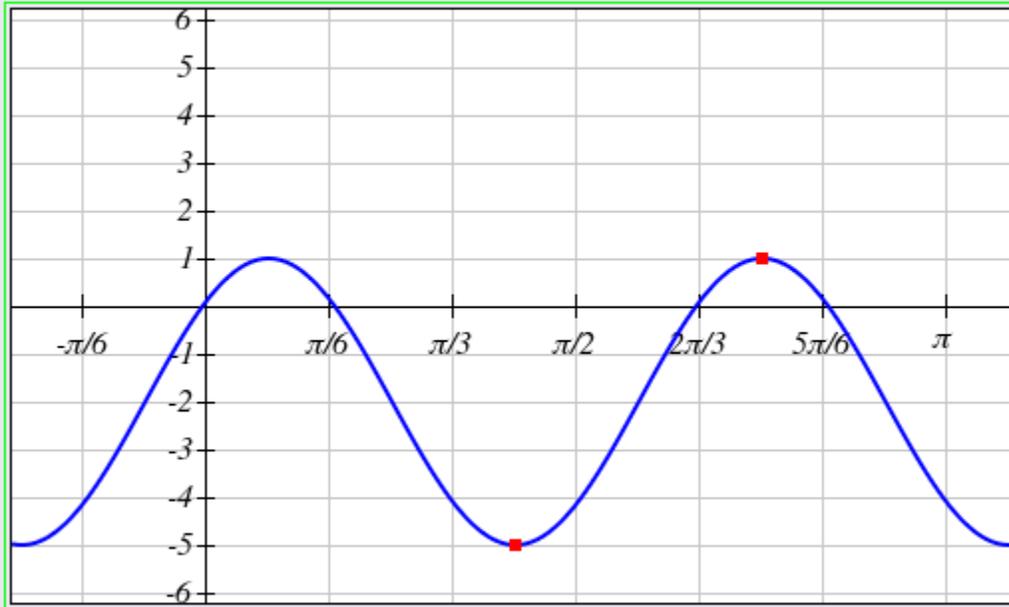
Which of the following is the equation of the circle?

\$plot

Example 5: Sketch transformations of sine and cosine (Drawing)

Sketch a graph of

$$y = 3 \cos\left(3x - \frac{\pi}{4}\right) - 2$$



Clear All Draw:



Show Answer

Common Control: [+] [-] Solver Save Quick Save and Preview

```
1 // -----
2 // Graph  $y = a \sin(bx + c) + d$  or  $y = a \cos(bx + c) + d$ .
3 // To determine the x-coordinates of the viewing window, set
4 //  $0 < bx + c < 2\pi$  and solve to obtain  $-c/b < x < (2\pi - c)/b$ .
5 // Then extend this window by one-half of the period on each
6 // end by subtracting  $\pi/b$  from the left endpoint and adding  $\pi/b$ 
7 // to the right endpoint yielding  $-(c+\pi)/b < x < (3\pi - c)/b$ .
8 // The parameter  $c$  is chosen to be a multiple of  $\pi/4$ . To ensure
9 // the y-axis is visible, restrict the values of the parameter  $c$ 
10 // to the interval  $-3\pi/4 < c < 3\pi/4$ . A display version of  $c$  is
11 // created to properly display the fraction involving  $\pi$ .
12 // -----
13
14 // Choose a function and the parameters.
15
16 $f = randfrom("cos,sin")
17 $a,$b = rands(2,4,2)
18 $d = nonzerorand(-2,2)
19 $s = randfrom("+,-")
20 $c = rand(1,3)
21 $c_display = makereducedfraction($c,4,null,"pi")
22 $c = $c*pi/4 if ($s == "+")
23 $c = -$c*pi/4 if ($s == "-")
24
25 // Set the viewing window.
26 // Use with x-axis spacing =  $\pi/\text{den}$  and y-axis spacing = 1.
27 // Use snaptogrid in the x-direction = dx and in the y-direction =1.
28
29 $xmin = -($c+pi)/$b
30 $xmax = (3*pi-$c)/$b
31 $ymin = -6
32 $ymax = 6
33 if ($b == 2) {
34     $den = 4
35     $dx = pi/8
36 } elseif ($b == 3) {
37     $den = 6
38     $dx = pi/12
39 } elseif ($b == 4) {
40     $den = 8
41     $dx = pi/16
42 }
43 $grid = "$xmin,$xmax,$ymin,$ymax,pi/$den,1,500,300"
44 $snaptogrid = "$dx:1"
45
46 // Create an equation for display and define the answer.
47
48 $eqn = makexxpretty("$a $f($b x $s $c_display) + $d")
49 $answers = "$a $f($b x + $c) + $d"
50 $answerformat = "twopoint,trig"
```

Question Text: [+] [-] Toggle Editor Save Quick Save and Preview

Sketch a graph of

`y = \$eqn`

Example 6: Confidence interval for means (Multipart)

The table below contains the barley yields in bushels per acre grown at six locations in 1932. Compute a 95% confidence interval for the barley yields. **Source:** Immer, F.R., Hayes, H.D. and LeRoy Powers (1934) Statistical determination of barley varietal adaptation. Journal of the American Society for Agronomy. Fisher, R.A. (1947) The Design of Experiments.



Directions: Click on the Data button shown below to display the data in a single column. Copy the data into a statistical software package and click the Data button a second time to hide it.

Data

- Find the point estimate for the barley yield. (Round your answer to 4 decimal places)
- Determine the value of t_c . (Round your answer to 5 decimal places)
- Compute the margin of error. (Round your answer to 3 decimal places)
- Construct the 95% confidence interval for barley yields. (Enter your answer as an open interval of the form (a,b) and round to 2 decimal places)
- Can you conclude that the barley yields were greater than 80 bushel per acre?
 - Yes, the entire confidence is above 80.
 - No, the entire confidence interval is below 80.
 - No conclusions can be drawn since the confidence interval contains 80.

Show Answer

Show Answer

Show Answer

Show Answer

Show Answer

Common Control: [+][-] Solver Save Quick Save and Preview

```
1 loadlibrary("stats")
2 $anstypes = array("number", "number", "number", "interval",
3 "choices")
4 // Actual sample data
5 $d = array(80.7, 82.3, 80.4, 87.2, 84.2, 100.4, 115.5, 112.2,
6 147.7, 108.1, 103.1, 105.1, 116.5, 139.9, 129.6, 98.9, 61.9,
7 96.2, 125.5, 75.7, 66.4, 49.9, 96.7, 61.9, 80.3, 67.7, 66.7,
8 67.4, 91.8, 94.1)
9 $n = count($d)
10
11 // Add some normally distributed noise to the data
12 $mu = 0
13 $sigma = 2
14 $noise = calconarray(rrands(0.2,0.8,0.001,30),"round($mu +
15 $sigma*invnormalcdf(x),1)")
16 for ($i = 1..$n) {
17   $d[$i-1] = $d[$i-1] + $noise[$i-1]
18 }
19
20 // Data table using HTML and CSS attached to a button
21 $table = forminlinebutton("Data","<style>table { border: 1px
22 solid black; border-collapse: collapse; border-spacing: 10px; }
23 td,th { padding-left: 10px; padding-right: 10px; text-align:
24 center; border: 1px solid black; } th { background-color:
25 #e6ffe6; border-bottom: 2px solid black; } </style><table>
26 <tr><th>Yield</th></tr><tr><td>$d[0]</td></tr><tr><td>$d[1]
27 </td></tr><tr><td>$d[2]</td></tr><tr><td>$d[3]</td></tr>
28 <tr><td>$d[4]</td></tr><tr><td>$d[5]</td></tr><tr><td>$d[6]
29 </td></tr><tr><td>$d[7]</td></tr><tr><td>$d[8]</td></tr>
30 <tr><td>$d[9]</td></tr><tr><td>$d[10]</td></tr><tr><td>$d[11]
31 </td></tr><tr><td>$d[12]</td></tr><tr><td>$d[13]</td></tr>
32 <tr><td>$d[14]</td></tr><tr><td>$d[15]</td></tr><tr><td>$d[16]
33 </td></tr><tr><td>$d[17]</td></tr><tr><td>$d[18]</td></tr>
34 <tr><td>$d[19]</td></tr><tr><td>$d[20]</td></tr><tr><td>$d[21]
35 </td></tr><tr><td>$d[22]</td></tr><tr><td>$d[23]</td></tr>
36 <tr><td>$d[24]</td></tr><tr><td>$d[25]</td></tr><tr><td>$d[26]
37 </td></tr><tr><td>$d[27]</td></tr><tr><td>$d[28]</td></tr>
38 <tr><td>$d[29]</td></tr></table>","button","block")
39
40 // Confidence level
41 $c = 95
42
43 // Sample statistics
44 $xbar = mean($d)
45 $s = stdev($d)
46
47 // Confidence interval
48 $q = (100 + $c)/200
49 $tc = invtcdf($q,$n-1,10)
50 $E = $tc*$s/sqrt($n)
51 $L = $xbar - $E
52 $U = $xbar + $E
```

```
33 // Part a)
34 $answer[0] = $xbar
35 $abstolerance[0] = 0.0001
36 $answerboxsize[0] = 10
37 $showanswer[0] = round($xbar,4)
38
39 // Part b)
40 $answer[1] = $tc
41 $abstolerance[1] = 0.00001
42 $answerboxsize[1] = 10
43 $showanswer[1] = round($tc,5)
44
45 // Part c)
46 $answer[2] = $E
47 $abstolerance[2] = 0.001
48 $answerboxsize[2] = 10
49 $showanswer[2] = round($E,3)
50
51 // Part d)
52 $answer[3] = "($L,$U)"
53 $abstolerance[3] = 0.01
54 $answerboxsize[3] = 20
55 $LR = round($L,2)
56 $UR = round($U,2)
57 $showanswer[3] = "($LR,$UR)"
58
59 // Part e)
60 $cutoff = 80 // bushels per acre
61 $questions = array("No, the entire confidence interval is below
62 $cutoff.", "Yes, the entire confidence is above $cutoff.", "No
63 conclusions can be drawn since the confidence interval contains
64 $cutoff.")
65 if ($U < $cutoff/100) {
66     $answer[4] = 0
67 } elseif ($L > $cutoff) {
68     $answer[4] = 1
69 } else {
70     $answer[4] = 2
71 }
72 }
```


Additional Resources

1. **Question writing guide.** The best resource I have found to date is the MathAS Question Writing Guide and Resource by Marianna McClymonds. This resource includes much of the documentation for the IMathAS system and several examples of each question type. You can access these materials by enrolling or copying the MyOpenMath course as shown below.

iMathAS Question Writing Course (in How do I ...)

Posted by: William Meacham, March 12, 2018, 5:23 pm

In the Fall of 17, Phoenix College and Scottsdale Community College offered a five week MathAS Question Writing Seminar. We had 28 people enrolled and about 22 made it all the way through!!! I have to give a huge shout out to Frank Marfai and Marianna McClymonds at Phoenix College who made it all happen as part of a Title V Grant.

I've made the course available in MOM if anyone would like additional resources on how to write questions. Enroll as a student or copy the course if you wish.

Course ID: 33010

Enrollment Key: MOMRocks

In the course, you will find the following

MathAS and OER Conference - Feb 9-10 2018 Block

This block provides resources for getting started creating a course and writing your first question.

Question Writing Guides Block

This block is full of amazing resources created by Marianne McClymonds at Phoenix College. It has detailed guides for creating each and every type of question. She did an incredible job. At the minimum, grab these pdf's as a reference!

Homework Block

We gave the students some homework questions to write. The first homework includes video's that take you all the way through the design and development process. The students really liked the exercise.

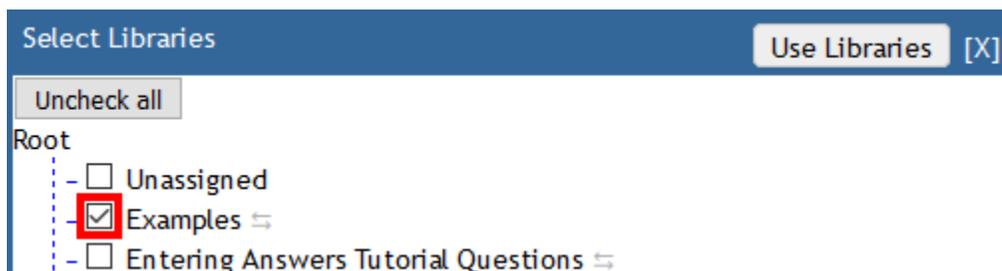
PowerPoints

We have powerpoints for the first four sessions. For the fifth session, we allowed them to work on their homework problems. The PowerPoints were used as a preface to the Question Writing Guides

Remember, "Write Code, Be Happy"

Bill Meacham

2. **IMathAs documentation.** The website <http://www.imathas.com/imathas/help.html> provides the official documentation for IMathAS including course administration, course management and a manual for writing questions. The manual provides an explanation on how to write different types of questions but has only minimal examples.
3. **Template existing questions.** The Question library provided within MyOpenMath contains an example of each question type. To access this library, log into MyOpenMath, enter a course and create an assignment. When adding questions to the assignment, select the Examples library.



You will then be able to access the example questions. You will have the option to view the code or template the question and use it as a starting point for your own question. This advice extends to the questions in any library. Find a question which is close to the one you would like to create and then template it. You will be able to see and modify the code to suit your needs. This is one of the fastest ways to improve your question writing skills.

4. **Support course.** The Support Course in MyOpenMath contains a Tips and Tricks section which provides some useful documentation on how to use some of the technologies utilized in MyOpenMath including an ASCIIsvg reference (programmatic drawing language), ASCIIMath reference (math typesetting language), HTML reference and more.



▼ **Tips and Tricks** Isolate

 **Exceptions and LatePasses**

 **ASCIISvg Reference**

A reference for the programatic drawing language you can use in questions using showasciisvg

 **ASCIIMath Reference**

A reference to the math typesetting language used in WAMAP (from the documentation page)

 **HTML Reference**

When question writing, it is handy to know a little HTML. Here's a reference to some basic tags.

 **Question Language Quick Reference**

A short printable Word doc documenting most of the question writing macros and question requirements.

 **Account Approval Process**

This document is a reference for people on the account approval volunteer group.

 **Testing using a Screen Reader**

The support course also contains a forum where instructors can ask and obtain answers from other instructors on how to use specific features of the MyOpenMath system.

[Messages](#)
[Forums New \(1861\)](#)
[Calendar](#)
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5. **ASCIIMath.** ASCIIMath is a client-side mathematical markup language for displaying mathematical expressions in web browsers. This simplified markup language supports a subset of LaTeX but replaces some syntax with a shorter version. For example, \times is replaced with xx . The following websites provide examples of working with ASCIIMath.

- <http://www.imathas.com/imathas/docs/asciimathref.html>
- <http://www.wjagray.co.uk/maths/ASCIIMathTutorial.html>

```
`sum_(k=1)^n k = 1+2+ cdots
+n=(n(n+1))/2`

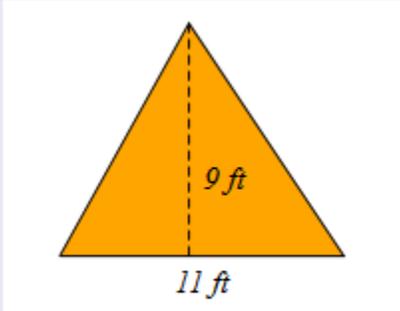
`int_0^1 x^2 dx`
```

$$\sum_{k=1}^n k = 1 + 2 + \dots + n = \frac{n(n+1)}{2}$$

$$\int_0^1 x^2 dx$$

6. **ASCIISvg.** ASCIISvg is a programatic drawing language, allowing you to create randomized basic drawings and illustrations. To learn more, go to the website <http://www1.chapman.edu/~jipsen/svg/asciisvg.html>.

Compute the area of the triangle shown below.
Round your answer to 2 decimal places.



Show Answer

```
// base of triangle $b1 + $b2
```

```
$b1 = rand(3,6)
$b2 = rand(4,7)
$b = $b1 + $b2
```

```
// height of triangle
```

```
$h = rand(7,10)
```

```

// area of the triangle

$A = 1/2*$b*$h

// window size

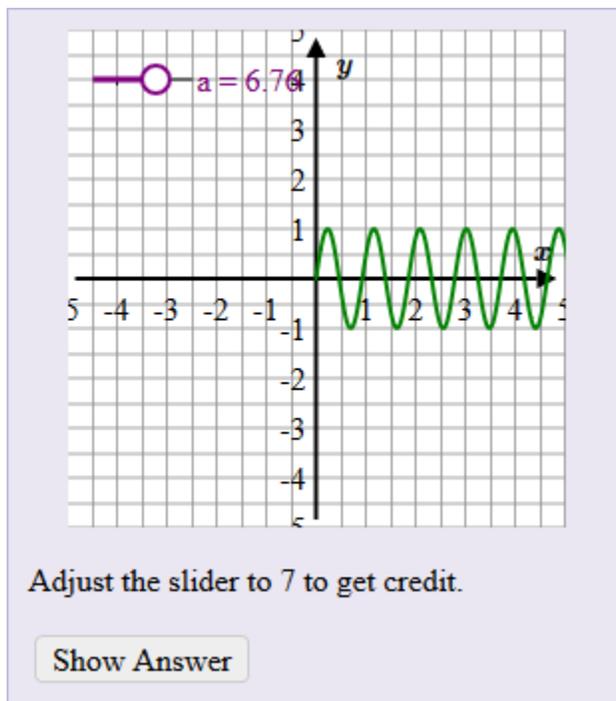
$size = max($b1+$b2,$h)

// triangle

$triangle = showasciisvg(
"initPicture(-0.2*$size,1.2*$size,-0.2*$size,1.2*$size);
fill='orange'; path([[0,0],[b1+b2,0],[b1,h],[0,0]]);
strokedasharray='5 3'; line([b1,0],[b1,h]);
text([(b1+b2)/2,0],'b ft','below');
text([b1,h/3],'h ft','right')")

```

7. **JSXGraph.** JSXGraph is a JavaScript library for interactive geometry, function plotting and data visualization in a browser. For more information, visit the website <https://jsxgraph.uni-bayreuth.de/wp/index.html>.



Common Control: [+] [-]

Solver

Save

Quick Save and Preview

```
1 loadlibrary("JSXG");
2 $ops=array(); $ops['size']=[250, 250]; $ops['bounds']=[-5,5,-5,5];
  $ops['axisLabel']=["`x`", "`y`"];
3 $board = JSXG_createAxes("plot{$thisq}", $ops);
4
5 $ops=array(); $ops['position']=[0.05,0.1,0.25,0.1]; $ops['range']=[
  1,10,3]; $ops['name']="a"; $ops['answerbox'] = [$thisq];
6 $board = JSXG_addSlider($board, "a", $ops);
7
8 $ops=array(); $ops['slider-names']=["a"]; $ops['rule']="sin(%a*x)";
  $ops['bounds']=[0, "%a"]; $ops['strokeColor']="green";
9 $board = JSXG_addFunction($board, $ops);
10
11 $answer = 7;
12 $abstolerance = 0.3;
```

Question Text: [+] [-]

Toggle Editor

Save

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\$board

<p>Adjust the slider to 7 to get credit.</p>

<p style='display:none'>\$answerbox</p>

