Authoring Your Own Question Types

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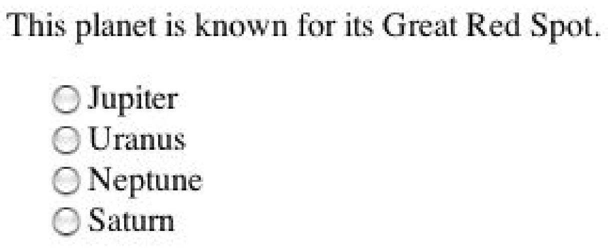
WebAssign Question Types

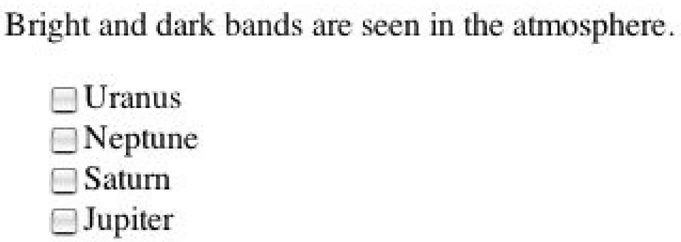
- multiple choice



This planet is known for its Great Red Spot.

○ Jupiter
○ Uranus
○ Neptune
○ Saturn

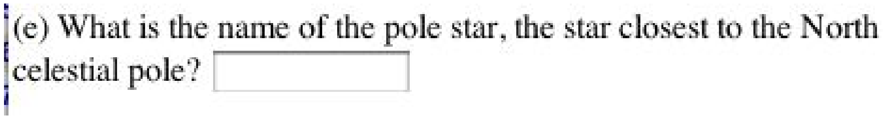
- multiple select



Bright and dark bands are seen in the atmosphere.

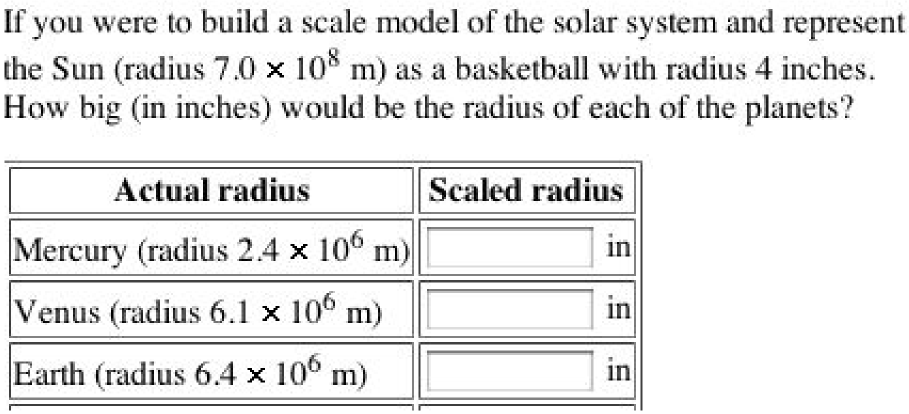
□ Uranus
□ Neptune
□ Saturn
□ Jupiter

- fill in the blank



(e) What is the name of the pole star, the star closest to the North celestial pole?

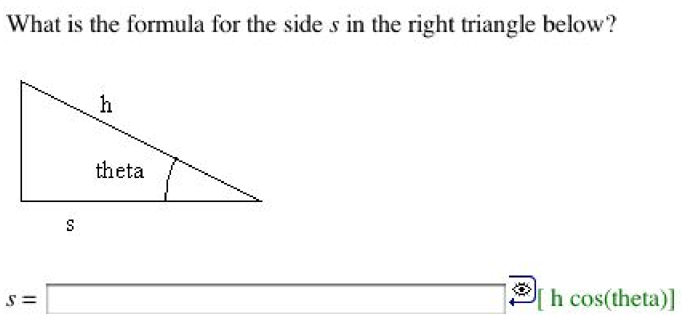
- numerical



If you were to build a scale model of the solar system and represent the Sun (radius 7.0 × 10^8 m) as a basketball with radius 4 inches. How big (in inches) would be the radius of each of the planets?

Actual radius	Scaled radius
Mercury (radius 2.4 × 10^6 m)	in
Venus (radius 6.1 × 10^6 m)	in
Earth (radius 6.4 × 10^6 m)	in

- symbolic



What is the formula for the side *s* in the right triangle below?

s = [h cos(theta)]

- java

The sky’s the limit (if you can program like Brian)

Java Question Type

The Java question type extends WebAssign by taking over WebAssign's role to display a response, grade the response, and display the answer key. The question must contain JavaScript functions or Java methods (that can be called via JavaScript) that are called.

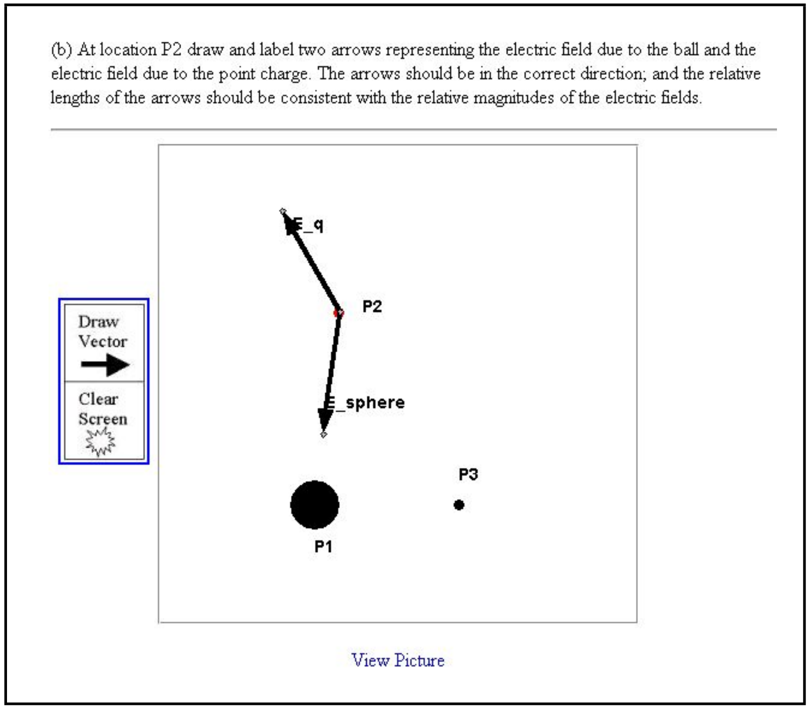
- `isCorrect()` calls a function to grade the response and returns a 0 (incorrect) or 1 (correct).
- `setResponse()` calls a function to parse and display the response.
- `getResponse()` calls a function to get the response (string) so that WebAssign can store the response in its database.

- `computeAnswer()` calls a function to get the correct answer (string) so that WebAssign can store the correct answer in its database.

- `computeFeedback()` calls a function to generate feedback for an incorrect response.

Physlet Vector Grader

- Using the Animator Physlet by Wolfgang Christian, you can evaluate vector diagrams.
- JavaScript functions are used to create vectors and clear the applet window, get vectors and create a `response` string, display the answer key, etc.
- See WebAssign questions 325457 and 327547 .



(b) At location P2 draw and label two arrows representing the electric field due to the ball and the electric field due to the point charge. The arrows should be in the correct direction; and the relative lengths of the arrows should be consistent with the relative magnitudes of the electric fields.

Writing your own vector grader

As the question author, you must

- define the correct vectors

```
//components of correct vectors in the form of variables, x1 and y1, x2 and y2 etc.
//and positions from which vectors should be drawn
        x1=-3;
        y1=10;
        xPos1=0;
        yPos1=0;
        label1="F_1";

        x2=0;
        y2=-10;
        xPos2=0;
        yPos2=0;
        label2="F_2";
//
```

- adjust grading criteria and display options

```
//grading criteria
        gradeMagnitudes=false;
        gradeAngles=true;
        gradeComponents=false;
        gradePositions=true; //evaluate the location of vector tails
        gradeSum=false; //evaluate the sum of the vectors drawn
        gradeSumAngle=true; //evaluate just the angle of the net vector

        posTol=0.4; //absolute
        compTol=0.1; //absolute
        magTol=0; //absolute
        angTol=10*Math.PI/180; //absolute tolerance in radians
        sumTol=1; //absolute
        sumAngTol=20*Math.PI/180; //absolute tolerance in radians
//

//display options
        showMagnitude=false;
        showAngle=false;
        showLabel=true;
        setDragable=true;
        setResizable=true;
//
```

- display background objects and/or animation in Animator

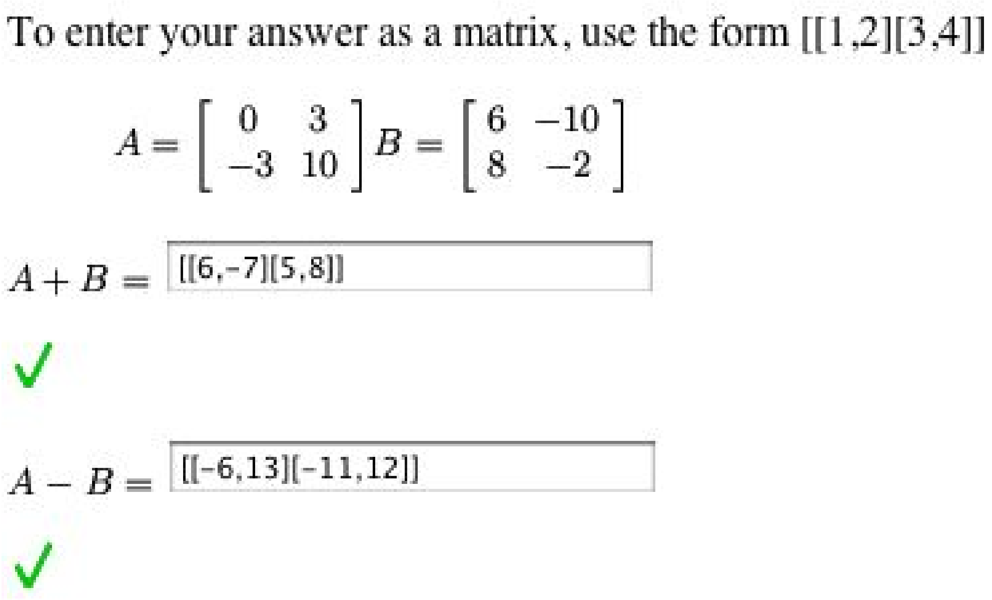
```
//init Animator
function startProb() {
        document.Animator.setAutoRefresh(false);
        document.Animator.setDefault();
        document.Animator.shiftPixOrigin(-50,-100);
        document.Animator.setPixPerUnit(20);
        document.Animator.setGridUnit(0);
        document.Animator.setTimeVisibility(false);

        p1=document.Animator.addObject("circle","r=10,x="x=0,y=0");
        document.Animator.setRGB(p1,0,0,0);
        document.Animator.updateDataConnections();
        document.Animator.setAutoRefresh(true);
}
//
```

Matrix Grader

- Students enter a matrix in the form [[1,2][3,4]] with brackets enclosing rows and commas delineating columns.

- See question 342033 as an example.



To enter your answer as a matrix, use the form [[1,2][3,4]]

$$A = \begin{bmatrix} 0 & 3 \\ -3 & 10 \end{bmatrix} B = \begin{bmatrix} 6 & -10 \\ 8 & -2 \end{bmatrix}$$

$A + B =$ [[6,-7][5,8]]

✓

$A - B =$ [[-6,13][-11,12]]

✓

Matrix Grader

- Random matrices are generated by a Perl function.

```
$matrixA=randMatrix(2,2,-10,10,1);
$matrixB=randMatrix(2,2,-10,10,1);
```

- Matrix algebra is accomplished by a Perl module.

```
$key1=$matrixA+$matrixB;
$key2=$matrixA-$matrixB;
```

Matrix Grader

- JavaScript functions write the matrix in WebAssign format for TI calculator format.

```
$wamatrixA=toWaMatrix($matrixA);
$wamatrixB=toWaMatrix($matrixB);

$tiKey1=toTiMatrix($key1);

$tiKey2=toTiMatrix($key2);
```

- JavaScript functions are used by WebAssign to get and set the response, get and set the key, grade the response, and get feedback.

Summary

If you use WebAssign, then you may duplicate my questions and modify the javascript to write new questions.

If you do not use WebAssign, then this is one reason that you should consider using WebAssign instead of another web-based assessment system.

Other examples of using Java to grade “non-standard” questions are PADs by Scott Bonham and JME by Peter Ertl.

I’m working on Java applets to grade circuits (circuit design and analysis) and optics (WebTOP).