Which of the following programming languages will you use to answer the questions?

Matlab   Java   C   C++

1. Write a statement to compute \( P \) from the equation at right assuming the values for \( \theta \) and \( \phi \) are known.
\[
P = \ln 2.7632 - \frac{\sqrt{(\sin^2 \theta + 1) - 0.5}}{\frac{\pi}{2} - 3 \tan^{-1} \phi}
\]

2. Write a program snippet that computes the volume of a cone based on the equation shown at right and then displays the result. The program should also display the message: “Input data defines a cylinder” if the two radii are equal within 1%. You may assume that the radii and height values have been defined as variable \( R_1, R_2, \) and \( H \).
\[
\text{volume}_{\text{cone}} = \pi \left( \frac{r_1 + r_2}{2} \right)^2 h
\]

3. Write the portion of a program to calculate the standard deviation \( s_y \) for a set of \( n \) values of \( y \) array based on the equation at right. Assume an array named \( Y \) of \( N \) real numbers has been defined.
\[
s_y = \sqrt{\frac{\sum_{i=1}^{n} (y_i - \overline{y})^2}{n-1}}
\]

4. Write a program to ask the user to repeatedly enter a number followed by [Enter] until the user just hits the [Enter] key without entering a number. At this point the program calculates the largest number based on the data entered and displays a message similar to “You have entered 5 numbers of which 26.2 was the largest.”.

5. Given that: aster = 2, crocus = 3, daisy = 4, flox = 5
Would the logical relationship shown below evaluate to True or False?

\[
\text{aster} > \text{flox} \text{ Or } \frac{\text{aster}}{\text{crocus}} * \text{daisy} < \text{daisy} \text{ And } \text{daisy} > \text{aster} ^ 2
\]

6. You are given the simultaneous equations shown below. a) write down an expression for the problem using matrix/vector notation. b) write a code snippet for solving for \( F_a, F_b, \) and \( F_c \). Your code should allow new values of all the constants to be substituted in.
\[
\begin{align*}
(0.3904)F_a + (-0.5367)F_b &= 0.0 \\
(-0.7807)F_a + (-0.7155)F_b + (0.8480)F_c &= 0.67 \\
(0.4880)F_a + (0.4472)F_b + (0.5300)F_c - 735.8 &= 0.0
\end{align*}
\]

7. You have given a recording of a car’s speed recorded every second, from rest (\( t=0 \)) to one minute. Those are stored in a vector \( \mathbf{v} = [v(0), v(1), v(2), \ldots, v(60)] \). Assume the mass of the car is 1000 kg. Write a code snippet to compute the force (\( F=ma \)) at each second.
8. A farmer has 1000 feet of fencing, and wants to use it to build the largest possible rectangular field. She is building the field next to a (straight) river, so only three sides need to be fenced. Say the side parallel to the river has length $x$, and the other two (equal) sides have length $y$. Write a code snippet to find the optimal value of $x$.

9. You measure the output current of a circuit as a function of the input voltage, getting the data pairs below. You are also given two possible models that fit the data, model A and model B. Write a code snippet that will quantify which is the better fit. Write your code so you can easily process a different dataset. Describe in words what standard ways are for quantifying fit.

<table>
<thead>
<tr>
<th>Voltage in, V</th>
<th>Current out, mA (measured)</th>
<th>Model A</th>
<th>Model B</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.52</td>
<td>2.3</td>
<td>2.08</td>
<td>0.6</td>
</tr>
<tr>
<td>1.7</td>
<td>4.2</td>
<td>6.8</td>
<td>6.5</td>
</tr>
<tr>
<td>2.5</td>
<td>9.66</td>
<td>10</td>
<td>10.5</td>
</tr>
<tr>
<td>9</td>
<td>32</td>
<td>36</td>
<td>43</td>
</tr>
</tbody>
</table>