ASSIGNMENT 1: Productivity
Submit Answers via Entropy (https://csbapp.uncw.edu/entropy/)
Due by 11:59pm on Thursday, January 22nd, 2015

Submission Instructions (Please read carefully)

- This assignment is to be completed via an Entropy quiz (listed as Productivity Assignment Quiz). PLEASE answer the questions below on paper FIRST. After you have completed the assignment on paper, then go in to Entropy to record your answers! Entropy will time out and you not be able to complete the quiz if you attempt to do the work while logged in to the quiz.

Acme Chemicals makes a variety of industrial materials. Acme maintains two facilities that make Gliquidone: one in Japan and one in the United States. A variety of resources are required at each plant in order to produce Gliquidone. Inputs are given for each 100 kilograms of product produced (see table below).

<table>
<thead>
<tr>
<th>Output (kilograms)</th>
<th>Japan 2013</th>
<th>USA 2013</th>
<th>Japan 2014</th>
<th>Japan 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wage (Labor)</td>
<td>13.00</td>
<td>11.25</td>
<td>13.25</td>
<td>11.55</td>
</tr>
<tr>
<td>Raw Materials</td>
<td>44.52</td>
<td>42.17</td>
<td>41.24</td>
<td>43.14</td>
</tr>
<tr>
<td>Utilities</td>
<td>10.87</td>
<td>1.55</td>
<td>11.05</td>
<td>5.37</td>
</tr>
<tr>
<td>Waste Treatment</td>
<td>12.00</td>
<td>1.02</td>
<td>12.50</td>
<td>1.05</td>
</tr>
<tr>
<td>Research &amp; Development</td>
<td>0.00</td>
<td>4.48</td>
<td>0.00</td>
<td>4.50</td>
</tr>
</tbody>
</table>

1. What are the units of productivity for this problem?
   A. kilograms/$
   B. $/kilogram
   C. Productivity does not have units in this problem

   Productivity is defined as Output/Input. In this problem output is given in kilograms and the inputs are given in $. Therefore, the units are kilograms/$.

2. Which plant had the highest labor productivity?
   A. Japan in 2013
   B. Japan in 2014
   C. USA in 2013
   D. USA in 2014
Labor productivity is calculated as Output/(Input costs due to labor, typically wages as given in this problem).

Japan 2013: \( \frac{100}{13} = 7.69 \)
Japan 2014: \( \frac{100}{13.25} = 7.55 \)
USA 2013: \( \frac{100}{11.25} = 8.89 \)
USA 2014: \( \frac{100}{11.55} = 8.66 \)

The best of these us USA 2013 (Answer C).

3. Which plant had the highest total productivity (include all inputs)?
   
   A. Japan in 2013  
   B. Japan in 2014  
   C. **USA in 2013**  
   D. USA in 2014  

   Total productivity is Output/All Inputs.

Japan 2013: \( \frac{100}{80.39} = 1.24 \)
Japan 2014: \( \frac{100}{78.04} = 1.28 \)
USA 2013: \( \frac{100}{60.47} = 1.65 \)
USA 2014: \( \frac{100}{65.61} = 1.52 \)

The best of these us USA 2013 (Answer C).

4. Which of the following is closest to the value for percent change in labor productivity for Japan from 2013 to 2014?
   
   A. 3%  
   B. **-2%**  
   C. 5%  
   D. 1%  

   Labor productivity for Japan 2013 is 7.69. For Japan 2014 is 7.55 (see Problem 2). Our equation for % change in labor productivity is then:

   \[
   \left( \frac{7.55 - 7.69}{7.69} \right)(100) = -1.89\%
   \]

   The closest answer to -1.89% is -2% (Answer B).
5. Which plant experienced the best change in total productivity from 2013 to 2014?

A. Japan
B. USA

Similar to Problem 4, but using total productivity instead. First, for Japan.

\[
\left( \frac{1.28 - 1.24}{1.24} \right) (100) = 3.01\%
\]

Next for USA.

\[
\left( \frac{1.52 - 1.65}{1.65} \right) (100) = -7.83\%
\]