Show all your calculations for credit.

Problem 1. Suppose that the Pendleton Farms grow hops that is bought by the Redhorn Breweries to produce the famous Redhorn ESB (its only output). The Pendleton Farms pay their workers $15,000 per year, use leased farm equipment at a cost of $5,000 per year, and pay $2,000 rent to the landowner. They sell their total annual hops output to Redhorn for $30,000. Redhorn pays its workforce $20,000 per year and uses its own capital equipment and its own factory\(^1\) to produce an annual output of Redhorn ESB that it sells directly to the public for $70,000 making a $5,000 profit.

Assuming that these are the only two firms in the economy, calculate the contribution to GDP of these activities using three different methods:

a. The final product approach

contribution to GDP = ____________

b. The value added approach

First define the concept of value added:

and calculate:

value added at the Pendleton Farms: ____________________________________________

value added at the Redhorn Breweries: ____________________________________________

total value added: ____________________________________________

\(^1\) They just bought the factory to avoid paying the $10,000 rent.
d. *The income approach*

Various forms of income:\[2\]

<table>
<thead>
<tr>
<th>Category</th>
<th>1990 Q</th>
<th>1990 P</th>
<th>2000 Q</th>
<th>2000 P</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pendleton Farms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Redhorn Breweries</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Problem 2. Consider an economy that only produces wine, beer, and coca cola.

Information about the production and the prices of these three products in 1990 and in 2000 follows:

<table>
<thead>
<tr>
<th></th>
<th>1990 Q</th>
<th>1990 P</th>
<th>2000 Q</th>
<th>2000 P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wine</td>
<td>20</td>
<td>10</td>
<td>25</td>
<td>10</td>
</tr>
<tr>
<td>Beer</td>
<td>50</td>
<td>5</td>
<td>70</td>
<td>6</td>
</tr>
<tr>
<td>Coca cola</td>
<td>200</td>
<td>2</td>
<td>400</td>
<td>3</td>
</tr>
</tbody>
</table>

\[2\] Name the categories using whatever information you glean from the story.
Fill the following tables to answer the questions.

a. Calculate nominal GDP in each of the 2 years and calculate nominal GDP growth over the 10-year period

<table>
<thead>
<tr>
<th></th>
<th>1990</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PQ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coke</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDP</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Nominal rate of Growth of GDP: \( \text{\%} \)

b. Calculate real GDP and real GDP growth over the 10 year period

A. using 1990 as base (Laspeyres)

<table>
<thead>
<tr>
<th></th>
<th>1990</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PQ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coke</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDP</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Rate of Growth of GDP: \( \text{\%} \)
B. then using 2000 as base (Paasche)

<table>
<thead>
<tr>
<th></th>
<th>1990</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>Q</td>
<td>PQ</td>
</tr>
<tr>
<td>P</td>
<td>Q</td>
<td>PQ</td>
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<td></td>
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<tr>
<td>GDP</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Rate of Growth of GDP: \( \% \)

C. Finally using a linked (or chained) index

<table>
<thead>
<tr>
<th></th>
<th>1990</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>Q</td>
<td>PQ</td>
</tr>
<tr>
<td>P</td>
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</tbody>
</table>

Rate of Growth of GDP: \( \% \)
In this last case only (linked index), calculate the *annual* (or yearly) rate of growth of GDP using a compound formula\(^3\).

\[ \text{\%} \]

c. Explain with a few lines why i. the two growth rates in A and in B are different and ii. why the growth rate in C must settle between that of A and that of B.

**Problem 3.** Use the above data to calculate the GDP deflator (base = 1) and the rate of inflation:

a. GDP deflator in the base year and in year 2000

<table>
<thead>
<tr>
<th>Base year (1990)</th>
<th>Year 2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ \text{%} ]</td>
<td>[ \text{%} ]</td>
</tr>
</tbody>
</table>

b. Rate of inflation over the 10-year period based on the deflator:

\[ \text{\%} \]

c. Convert it into an *annual* rate of inflation using a compound formula as above.

\[ \text{\%} \]

\[^3\text{If }$1\text{ grows at rate } r \text{ (in decimal) during } n \text{ years it will grow to } (1+r)^n\]