We find $x_1 = 0.3$, $y_1 = 0.8$. The fractions of the liquid and vapor are calculated from the lever rule:

$$L = \frac{0.8 - 0.5}{0.8 - 0.3} = 0.6,$$
$$V = 1 - L = 0.4.$$

Therefore, 60% is in the liquid and the rest is vapor. Since point C is near the middle of the line VL but closer to the liquid side, we should have guessed that the liquid fraction is somewhat larger than 50%.

Example 8.2: Working with Phase Diagrams
What is the maximum concentration of heptane in the vapor that we can obtain by heating the solution of the previous example at 1 atm?

Solution The maximum concentration in the vapor is when the system is at the bubble point, point B in Figure 8-2. Then the vapor has the concentration of point V. From the graph we read $y_1 \approx 0.9$. The composition of the liquid at this point is $x_1 = 0.5$, the same as the initial solution. The lever rule then gives $L = 1$ and $V = 0$. Although the purity of the vapor is highest at that ~~is~~ point, the *amount* collected is zero.

Example 8.3: Working with Phase Diagrams–2
A vapor mixture of heptane(1)-decane(2) with $y_1 = 0.5$ is condensed by cooling under constant pressure of 1 atm. What is the composition of the first drop to appear? What is the composition of the last bubble to condense?

Solution When the first drop condenses the system is at the dew point, D. If we draw the tie line at D, the composition of the first drop is read at the intersection of the tie line with the bubble line. We find $x_1 \approx 0.13$. When the last bubble condenses the system is at the bubble point, B. The corresponding composition is $y_1 \approx 0.9$.

8.2 The *Pxy* Graph

In the *Txy* graph, we plot the phase behavior of a binary system as a function of temperature at constant pressure. We may also make a plot as a function of pressure at constant temperature. The resulting phase diagram is a *Pxy* graph.