49. (a) From problem #43, we have $\mathcal{N}_{\text{total}} = 2^{100} = 1.27 \times 10^{30}$ microstates.

(b) Using Eq. 21-18, we find

$$\frac{W}{\mathcal{N}_{\text{total}}} = \frac{\left(\frac{100!}{(50!)(50!)}\right)}{1.27 \times 10^{30}} = \frac{126114180681955241668515621 57}{158456325028528675187087900672}$$
$$= 0.079589 \approx 8.0\% .$$

(c) Similarly, for $n_1 = 48$ and $n_2 = 52$ we obtain

$$\frac{W}{\mathcal{N}_{\text{total}}} = \frac{\left(\frac{100!}{(48!)(52!)}\right)}{1.27 \times 10^{30}} = \frac{233016397187624692373954202 75}{316912650057057350374175801344}$$
$$= 0.073527 \approx 7.4\% .$$

(d) With $n_1 = 52$ and $n_2 = 48$, we obtain the same result as in part (c).

(e) For $n_1 = 40$ and $n_2 = 60$ we obtain

$$\frac{W}{\mathcal{N}_{\text{total}}} = \frac{\left(\frac{100!}{(40!)(60!)}\right)}{1.27 \times 10^{30}} = \frac{171827926822535143765842 1215}{158456325028528675187087900672}$$
$$= 0.010844 \approx 1.1\% .$$

(f) Finally, for $n_1 = 30$ and $n_2 = 70$ we find

$$\frac{W}{\mathcal{N}_{\text{total}}} = \frac{\left(\frac{100!}{(30!)(70!)}\right)}{1.27 \times 10^{30}} = \frac{183577123885068405149773 5}{792281625142643375935439503 36}$$
$$= 0.00002317 \approx 0.0023\% .$$