An automobile can be considered to be mounted on four identical springs as far as vertical oscillations are concerned. The springs of a certain car are adjusted so that the oscillations have a frequency of 2.00 Hz.

a) What is the spring constant of each spring if the mass of the car is 1200 kg and the mass is evenly distributed over the springs?

The angular frequency of the vertical oscillation of the car is
\[ \omega = 2\pi f = 4\pi \text{ rad/s} \]
The spring constant of the car is
\[ \omega = \sqrt{\frac{k_{\text{tot}}}{M}} \Rightarrow k_{\text{tot}} = M\omega^2 = 1.89 \times 10^5 \text{ N/m} \]
Four identical springs support the car. Therefore, each spring has a spring constant of
\[ k = \frac{k_{\text{tot}}}{4} = 4.74 \times 10^5 \text{ N/m} \]

b) What will be the oscillation frequency (in Hz) if four passengers, averaging 65.0 kg each, ride in the car with an even distribution of mass?

The spring constant of the car does not change. However, the mass of the oscillator changes due to the four passengers. The oscillation frequency will be
\[ f = \frac{\omega}{2\pi} = \frac{1}{(2\pi)} \sqrt{\frac{k_{\text{tot}}}{M + 4m}} = 1.81 \text{ Hz} \]