43. (a) At the top (the highest point in the circular motion) the seat pushes up on the student with a force of magnitude $N = 556\,\mathrm{N}$. Earth pulls down with a force of magnitude $W = 667\,\mathrm{N}$. The seat is pushing up with a force that is smaller than the student's weight, and we say the student experiences a decrease in his "apparent weight" at the highest point.

(b) When the student is at the highest point, the net force toward the center of the circular orbit is $W - F_t$ (note that we are choosing downward as the positive direction). According to Newton's second law, this must equal mv^2/R, where v is the speed of the student and R is the radius of the orbit. Thus

$$mv^2/R = W - N = 667\,\mathrm{N} - 556\,\mathrm{N} = 111\ \mathrm{N}\ .$$

(c) Now N is the magnitude of the upward force exerted by the seat when the student is at the lowest point. The net force toward the center of the circle is $F_b - W = mv^2/R$ (note that we are now choosing upward as the positive direction). The Ferris wheel is "steadily rotating" so the value mv^2/R is the same as in part (a). Thus,

$$N = \frac{mv^2}{R} + W = 111\,\mathrm{N} + 667\,\mathrm{N} = 778\ \mathrm{N}\ .$$

(d) If the speed is doubled, mv^2/R increases by a factor of 4, to $444\,\mathrm{N}$. Therefore, at the highest point we have $W - N = mv^2/R$, which leads to

$$N = 667\,\mathrm{N} - 444\,\mathrm{N} = 223\ \mathrm{N}\ .$$

Similarly, the normal force at the lowest point is now found to be $N = 667 + 444 \approx 1.1$ kN.