69. (a) We denote the apparent weight of the crew member of mass m on the spaceship as $W_a = 300\,\mathrm{N}$, his weight on Earth as $W_e = mg = 600\,\mathrm{N}$, and the radius of the spaceship as $R = 500\,\mathrm{m}$. Since $mv_s^2/R = W_a$, we get

$$v_s = \sqrt{\frac{W_a R}{m}} = \sqrt{\left(\frac{W_a}{W_e}\right) gR}$$

where we substituted $m = W_e/g$. Thus,

$$v_s = \sqrt{\left(\frac{300\,\mathrm{N}}{600\,\mathrm{N}}\right)(9.8\,\mathrm{m/s^2})(500\,\mathrm{m})} = 49.5\ \mathrm{m/s}\ .$$

(b) For any object of mass m on the spaceship $W_a = mv^2/R \propto v^2$, where v is the speed of the circular motion of the object relative to the center of the circle. In the previous case $v = v_s = 49.5\,\mathrm{m/s}$, and in the present case $v = 10\,\mathrm{m/s} + 49.5\,\mathrm{m/s} = 59.5\,\mathrm{m/s} \equiv v'$. Thus the apparent weight of the running crew member is

$$W_a' = W_a\left(\frac{v'}{v}\right)^2 = (300\,\mathrm{N})\left(\frac{59.5\,\mathrm{m/s}}{49.5\,\mathrm{m/s}}\right)^2 = 4.3 \times 10^2\,\mathrm{N}\ .$$