15. We note that the free-body diagram is shown in Fig. 5-18 of the text.

(a) Since the acceleration of the block is zero, the components of the Newton's second law equation yield $T - mg\sin\theta = 0$ and $N - mg\cos\theta = 0$. Solving the first equation for the tension in the string, we find

$$T = mg\sin\theta = (8.5\,\text{kg})(9.8\,\text{m/s}^2)\sin 30^\circ = 42\ \text{N}\ .$$

(b) We solve the second equation in part (a) for the normal force N:

$$N = mg\cos\theta = (8.5\,\text{kg})(9.8\,\text{m/s}^2)\cos 30^\circ = 72\ \text{N}\ .$$

(c) When the string is cut, it no longer exerts a force on the block and the block accelerates. The x component of the second law becomes $-mg\sin\theta = ma$, so the acceleration becomes

$$a = -g\sin\theta = -9.8\sin 30^\circ = -4.9$$

in SI units. The negative sign indicates the acceleration is down the plane. The magnitude of the acceleration is 4.9 m/s^2.