7.44. **Model:** The painter and the chair are treated as a single object and represented as a particle. We assume that the rope is massless and that the pulley is massless and frictionless.

**Visualize:**

**Solve:** If the painter pulls down on the rope with force $F$, Newton’s third law requires the rope to pull up on the painter with force $F$. This is just the tension in the rope. With our model of the rope and pulley, the same tension force $F$ also pulls up on the painter’s chair. Newton’s second law for (painter + chair) is

$$
2F - F_G = (m_p + m_c) a
$$

$$
\Rightarrow F = \frac{1}{2} \left[ (m_p + m_c) a + (m_p + m_c) g \right] = \frac{1}{2} (m_p + m_c) (a + g)
$$

$$
= \frac{1}{2} (70 \text{ kg} + 10 \text{ kg}) \left( 0.20 \text{ m/s}^2 + 9.8 \text{ m/s}^2 \right) = 4.0 \times 10^2 \text{ N}
$$

**Assess:** A force of 400 N, which is approximately one-half the total gravitational force, is reasonable since the upward acceleration is small.