Unit 4 Exam A

7a)

The most straightforward solution is to find the force of tension F_T by first finding the vertical component F_{Ty}:

$$F_{Ty} = mg = 0.15 \cdot 9.8 = 1.47\ N$$
$$F_T = \frac{F_{Ty}}{sin\theta} = 1.47\frac{0.5}{0.3} = 2.45\ N$$

A more roundabout solution can be found by first finding the horizontal component F_{Tx} using the centripetal force equation, and substituting the formula $v^2 = rg\ tan(\theta)$ (which was provided at the top of the page):

$$F_{Tx} = F_c = \frac{mv^2}{r}$$
$$v^2 = rg\ tan(\theta) = 0.4(9.8)\frac{0.4}{0.3} = 5.23$$
$$F_{Tx} = \frac{mv^2}{r} = \frac{0.15 \cdot 5.23}{0.4} = 1.96$$
$$F_T = \frac{F_{Tx}}{cos\theta} = 1.96\frac{0.5}{0.4} = 2.45\ N$$

Eli went this route, and his solution was correct except that he didn't do the last step of multiplying his answer by $\frac{5}{4}$ to get the full magnitude of F_T.

7b)

Eli's solution here is correct, though he reused some of the work he did in part (b) where he calculated v^2 to be 5.23, so this may have made it less clear to the grader where his answer came from.

$$v^2 = rg\ tan(\theta) = 0.4(9.8)\frac{0.4}{0.3} = 5.23$$
$$v = \sqrt{5.23} = 2.29\ m/s$$