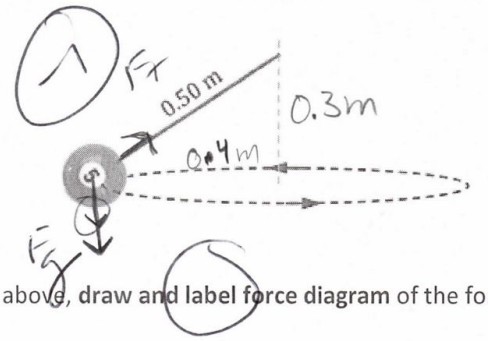
7) A billiard ball (mass m = 0.150 kg) is attached to a light string that is 0.50 meters long and swung so that it travels in a horizontal, circular path of radius 0.40 m, as shown.



a) On the diagram above, **draw and label force diagram** of the forces acting on the billiard ball.

b) Calculate the force of tension in the string as the ball swings in a horizontal circle. Show all work including equations used, substitution and final answer.

$r = 0.4$ m

$F_C = \frac{mv^2}{r}$ $F_C = 0.15$ $F_T = \frac{mv^2}{r}$

2 $F_{TY} = mg$

$v^2 = rg\tan\theta$ ← not correct formula

$v^2 = 0.4(9.8)\frac{0.4}{0.3}$

$v^2 = 5.23$

$F_T = \frac{.15 \cdot 5.23}{0.4}$

$F_T = 1.96$N 2.45N

c) Calculate the speed of the ball motion. Show all work including equations used, substitution and final answer.

$v^2 = 5.23$

13 correct answer by accident $v = \sqrt{5.23}$

$v = 2.29$ m/s