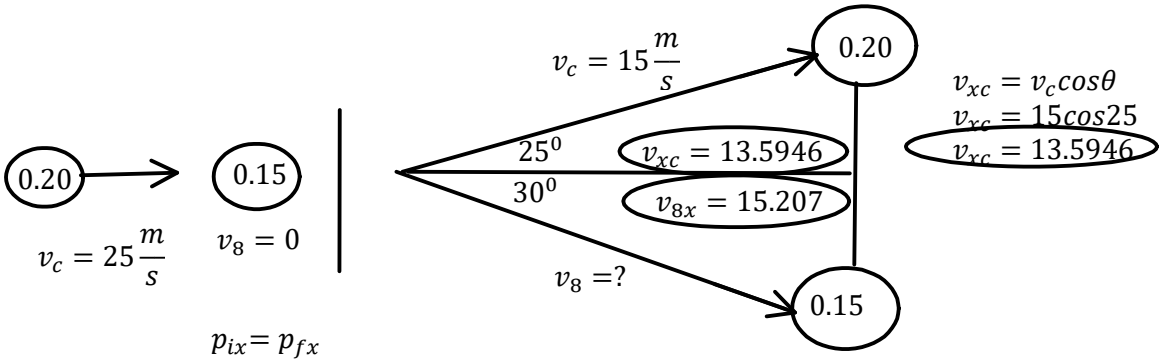
P12 - 5.3 - Momentum Trig Notes

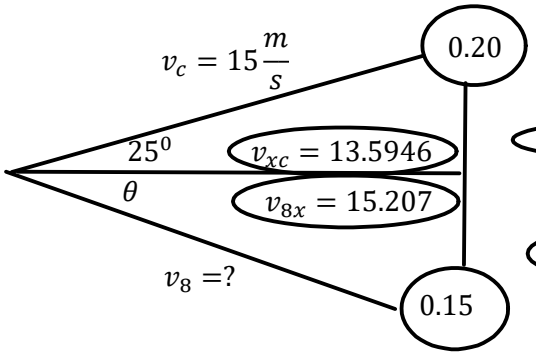
A pool player shoots the cue ball with a $m = 0.2\ kg$ *with a* $v = 25\frac{m}{s}$ *at the eight ball with a* $m = 0.15\ kg$ *at Rest. The cue ball deflects at a* $v = 15\frac{m}{s}$ *in the diagram (see* $\theta's$*). Find* v_8.



$$p_{ix} = p_{fx}$$
$$mv_{cx} + mv_{8x} = mv_{cx} + mv_{8x}$$
$$0.2(25) + 0.15(0) = 0.20(13.5946) + 0.15v_{8x}$$
$$v_{8x} = 15.207\frac{m}{s}$$

$$v_{x8} = v_8 cos\theta$$
$$15.207 = v_8 cos30$$
$$v_8 = 17.56\frac{m}{s}$$

If θ_8 *is unknown, find* v_8.



$$v_{yc} = v_c sin\theta$$
$$v_{yc} = 15sin25$$
$$v_{yc} = 6.339$$

$$O = Atan\theta$$
$$v_{y8} = 15.207tan\theta$$

$$v_{y8} = 15.207tan\theta$$
$$v_{y8} = 15.207tan28.08$$
$$v_{y8} = 8.11\frac{m}{s}$$

Up=Down

$$p_{cy} = p_{8y}$$
$$mv = mv$$
$$0.2(6.339) = 0.15(15.207tan\theta)$$
$$tan\theta = 0.5561$$
$$\theta = \tan^{-1}(0.5561)$$
$$\theta = 28.08^0$$

$$c = \sqrt{a^2 + b^2}$$
$$c = \sqrt{15.207^2 + 8.11^2}$$
$$c = 17.23$$

$v_8 = 17.24^0\frac{m}{s}$ 28.08^0 *below horizontal.*