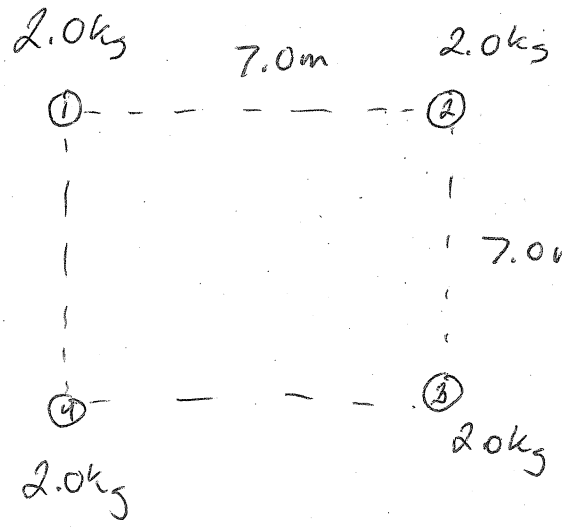
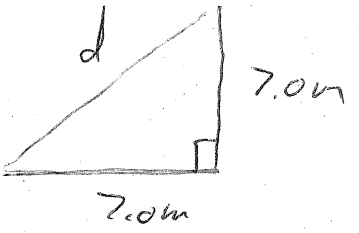
Determine the velocity of each mass as they collide.



Let each radius be 0.10 m



$d = 9.90\,m$

Potential Energy of System Initially

$$E_{g_{total}} = E_{g_{1-2}} + E_{g_{1-3}} + E_{g_{1-4}} + E_{g_{2-3}} + E_{g_{2-4}} + E_{g_{4-3}}$$

Notice $E_{g_{1-2}} = E_{g_{2-3}} = E_{g_{4-3}} = E_{g_{1-4}}$

$$E_{g_{1-3}} = E_{g_{2-4}}$$

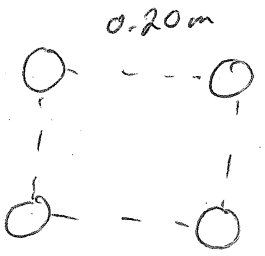
* Let $E_g = 0$ @ ∞ so all E_g values are negative

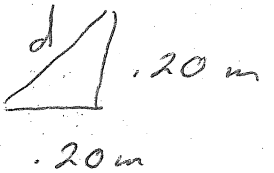
$$E_{g_{total}} = 4\left(E_{g_{1-2}}\right) + 2\left(E_{g_{1-3}}\right)$$

$$E_{g_{\text{Total Initial}}} = \frac{4\left(6.67E\text{-}11 \frac{Nm^2}{kg^2}\right) 2.0kg^2}{7.0m} + \frac{2\left(6.67E\text{-}11 \frac{Nm^2}{kg^2}\right) 2.0kg^2}{9.90m}$$

$$= -2.06\ E^{-10}\ J$$

At collision the masses look like this:





$d = 0.283m$

$$E_{g_{\text{Total final}}} = 4\left(E_{g_{1\text{-}2}}\right) + 2\left(E_{g_{1\text{-}3}}\right)$$

$$E_{g\,Total\ final} = \frac{4\left(6.67E\text{-}11\ \frac{Nm^2}{kg^2}\right)2.0kg^2}{0.20m} + \frac{2\left(6.67E\text{-}11\ \frac{Nm^2}{kg^2}\right)2.0kg^2}{0.289m}$$

$$= -7.22E\text{-}9\ J$$

$\Delta E = 0$ Energy conservation

$$0 = E_f - E_i$$

$$E_f = E_{g_f} + E_{K_f}$$

$$E_i = E_{g_i} + \cancel{E_{K_i}}^{\,0}$$

$$0 = E_{g_f} + E_{K_f} + -E_{g_i}$$

$$E_{K_f} = -E_{g_f} + E_{g_i}$$

$$= \left(7.22E\text{-}9J\right) + \left(-2.06E\text{-}10J\right)$$

$$E_{K_f} = 7.01E-9\,J$$

$$E_{K_f} = 4\left(\tfrac{1}{2}mv^2\right) = 2mv^2$$

$$\sqrt{\frac{E_{K_f}}{2m}} = v$$

$$\sqrt{\frac{7.01E-9\,J}{2(2.0k_g)}} = v$$

$$\boxed{4.19E-5\,\tfrac{m}{s} = v}$$