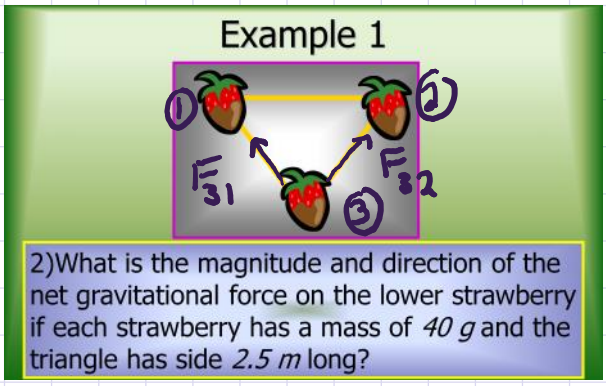
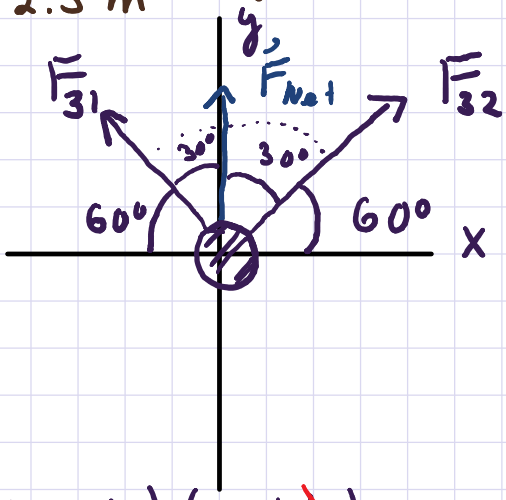
Example 1

Monday, January 12, 2015 7:45 AM



$m = 40\,g = .04\,kg$

$r = 2.5\,m$



$$F_{32} = F_{31} = F = G\frac{m_1 m_3}{r^2}$$

$$F = \left(6.67 \times 10^{-11}\,N\,\frac{m^2}{kg^2}\right)\frac{(.04\,kg)(.04\,kg)}{(2.5\,m)^2} = 1.71 \times 10^{-14}\,N$$

$$\vec{F}_{Net} = \Sigma \vec{F}$$

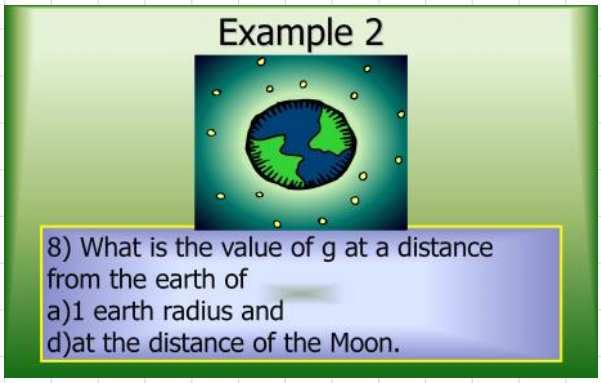
$$F_{Net_x} = \Sigma F_x = F_{32}\cos(60°) - F_{31}\cos(60°) = 0$$

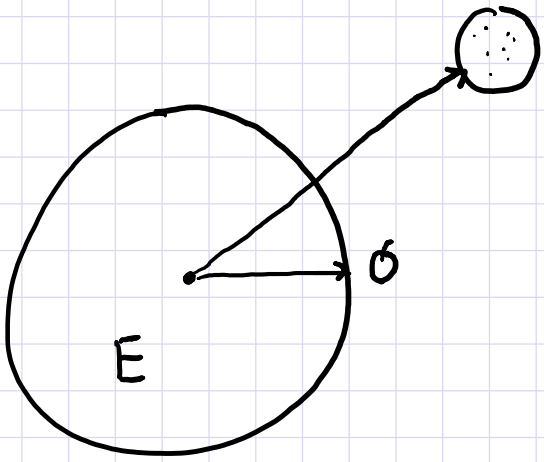
$$F_{Net_y} = \Sigma F_y = F_{32}\sin(60°) + F_{31}\sin(60°) = 2F\sin(60°)$$

$$F_{Net_y} = 2(1.71 \times 10^{-14}\,N)\sin(60°) = 2.9 \times 10^{-14}\,N$$

Example 2

Tuesday, January 13, 2015 3:14 PM





$W = mg$

$W = G\frac{m M_E}{r_E^2}$

$mg = G\frac{m M_E}{r_E^2}$

$g = G\frac{M_E}{r_E^2}$

$M_E = 5.98 \times 10^{24}\ kg$

$r_E = 6.38 \times 10^6\ m$

$r_m = 384 \times 10^6\ m$

$g = (6.67 \times 10^{-11}\ N\frac{m^2}{kg^2})\frac{(5.98 \times 10^{24}\ kg)}{(6.38 \times 10^6\ m)^2}$

$g = 9.79\ m/s^2 \approx 9.8\ m/s^2$

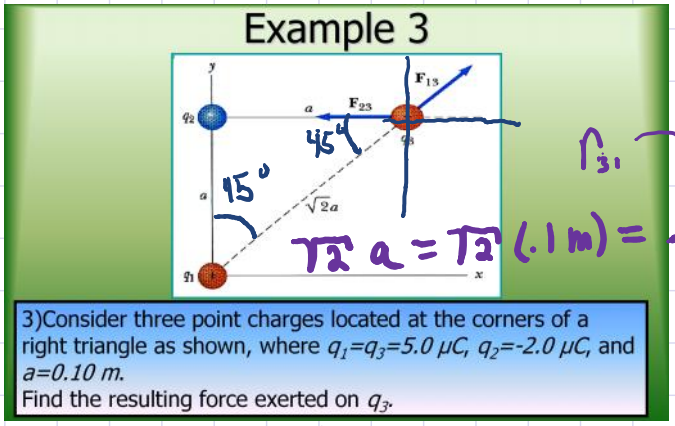
at Moon: $g = G\frac{M_E}{(r_E + r_m)^2}$

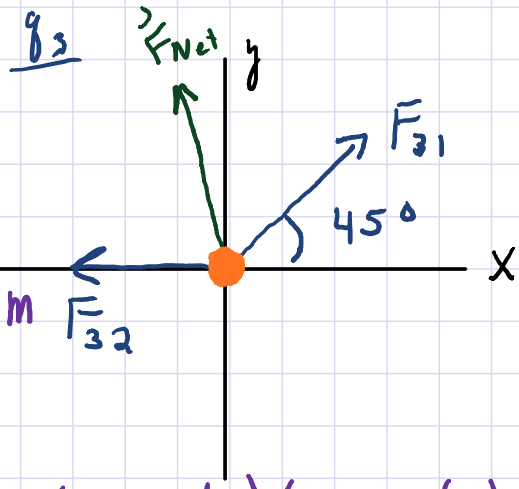
$g = (6.67 \times 10^{-11}\ N\frac{m^2}{kg^2})\frac{(5.98 \times 10^{24}\ kg)}{(6.38 \times 10^6\ m + 384 \times 10^6\ m)^2}$

$g = .0026\ m/s^2$

Example 3

Tuesday, January 13, 2015 3:15 PM





r_{31}

$\sqrt{2}a = \sqrt{2}(.1\,m) = .14\,m$

$$F_{31} = k\frac{q_3 q_1}{r_{31}^2} = \left(9\times10^9\,N\frac{m^2}{C^2}\right)\frac{(5\times10^{-6}C)(5\times10^{-6}C)}{(.14\,m)^2} = 11.48N$$

$$F_{32} = k\frac{q_3 q_2}{r_{32}^2} = \left(9\times10^9\,N\frac{m^2}{C^2}\right)\frac{(5\times10^{-6}C)(2\times10^{-6}C)}{(.1\,m)^2} = 9N$$

$$\Sigma F_x = F_{31}\cos(45°) - F_{32} = (11.48N)\cos(45°) - 9N = -.88N$$

$$\Sigma F_y = F_{31}\sin(45°) = 8.11N$$

$$|F_{Net}| = \sqrt{(\Sigma F_x)^2 + (\Sigma F_y)^2} = \sqrt{(-.88N)^2 + (8.11N)^2} = 8.16N$$

$$\theta = \tan^{-1}\left(\frac{\Sigma F_y}{\Sigma F_x}\right) = \tan^{-1}\left(\frac{8.11N}{-.88N}\right) = -83.8°$$