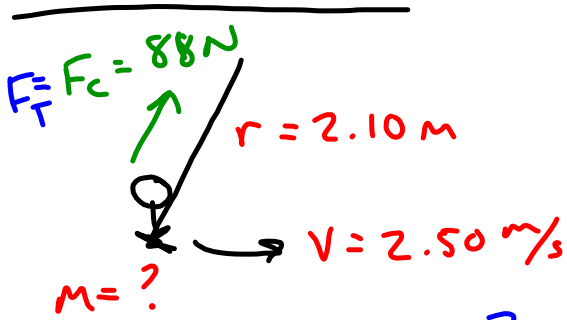
Practice - Circular Motion

- p. 238: 1-4

p. 238 #1



$$a_c = \frac{v^2}{r}$$

$$= \frac{(2.5\,m/s)^2}{2.10\,m}$$

$$= 2.98\,m/s^2$$

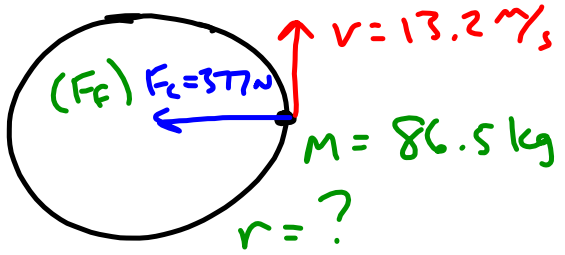
$$F_c = ma_c$$

$$m = \frac{F_c}{a_c}$$

$$= \frac{88\,N}{2.98\,m/s^2}$$

$$= 29.5\,kg$$

p. 238 #2



$$F_c = ma_c$$

$$a_c = \frac{F_c}{m}$$

$$= \frac{377\ N}{86.5\ kg}$$

$$= 4.36\ m/s^2$$

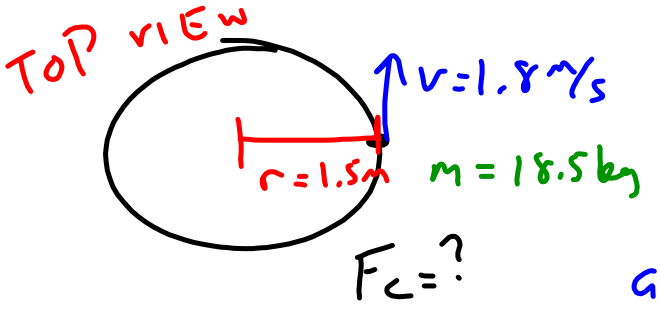
$$r(a_c) = \left(\frac{v^2}{r}\right)r \rightarrow \frac{r\,a_c}{a_c} = \frac{v^2}{a_c}$$

$$r = \frac{v^2}{a_c}$$

$$= \frac{(13.2\ m/s)^2}{4.36\ m/s^2}$$

$$= 39\ m$$

p. 238 #3



$$a_c = \frac{v^2}{r}$$

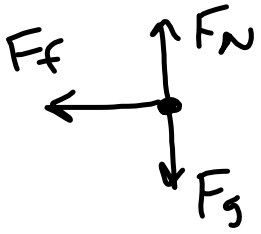
$$F_c = ma_c$$

$$= \frac{mv^2}{r}$$

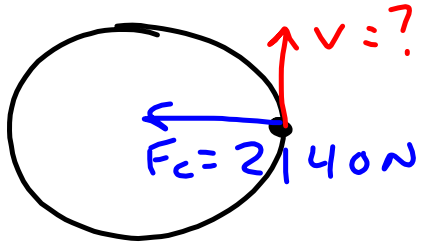
$$= \frac{(18.5\,kg)(1.8\,m/s)^2}{1.5\,m}$$

$$= 40\,N$$

FBD



p. 238 #4



$C = 2\pi r$

$r = \frac{C}{2\pi} = \frac{3250\ m}{2\pi} = 517\ m$

$a_c = \frac{v^2}{r}$

$v^2 = a_c r$

$v = \sqrt{a_c r}$

$= \sqrt{(2.36\ m/s^2)(517\ m)}$

$= 34.9\ m/s$

$F_c = ma_c$

$a_c = \frac{F_c}{m}$

$= \frac{2140\ N}{905\ kg}$

$= 2.36\ m/s^2$

PRACTICE – GRAVITATION

m_1	m_2	r	F_g	g
m_1	m_2	$6r$	$\frac{Gm_1m_2}{(36)r^2} = \frac{1}{36}F$	$\frac{Gm_2}{(36)r^2} = \frac{1}{36}g$
$2m_1$	$3m_2$	r	$\frac{G(2m_1)(3m_2)}{r^2} = 6F$	$\frac{G(3m_2)}{r^2} = 3g$
m_1	$5m_2$	$2r$ $\hookrightarrow 2^2$	$\frac{G(m_1)(5m_2)}{(4)r^2} = \frac{5}{4}F$	$\frac{G(5m_2)}{4r^2} = \frac{5}{4}g$

$$\frac{Gm_1m_2}{r^2} = \frac{\quad}{(2r)^2} = \frac{\quad}{4r^2}$$

m_1	m_2	$\frac{1}{4}r$	$\frac{Gm_1m_2}{(\frac{1}{16})r^2} = 16F$	$\frac{Gm_2}{(\frac{1}{16})r^2} = 16g$
m_1	$\frac{1}{10}m_2$	$\frac{1}{4}r$	$\frac{G(m_1)(\frac{1}{10}m_2)}{(\frac{1}{16})r^2} = \frac{16}{10}F = \frac{8}{5}F$	$\frac{G(\frac{1}{10}m_2)}{(\frac{1}{16})r^2} = \frac{8}{5}g$
m_1	$20m_2$	$10r$	$\frac{G(m_1)(20m_2)}{(100)r^2} = \frac{1}{5}F$	$\frac{G(20m_2)}{(100)r^2} = \frac{1}{5}g$