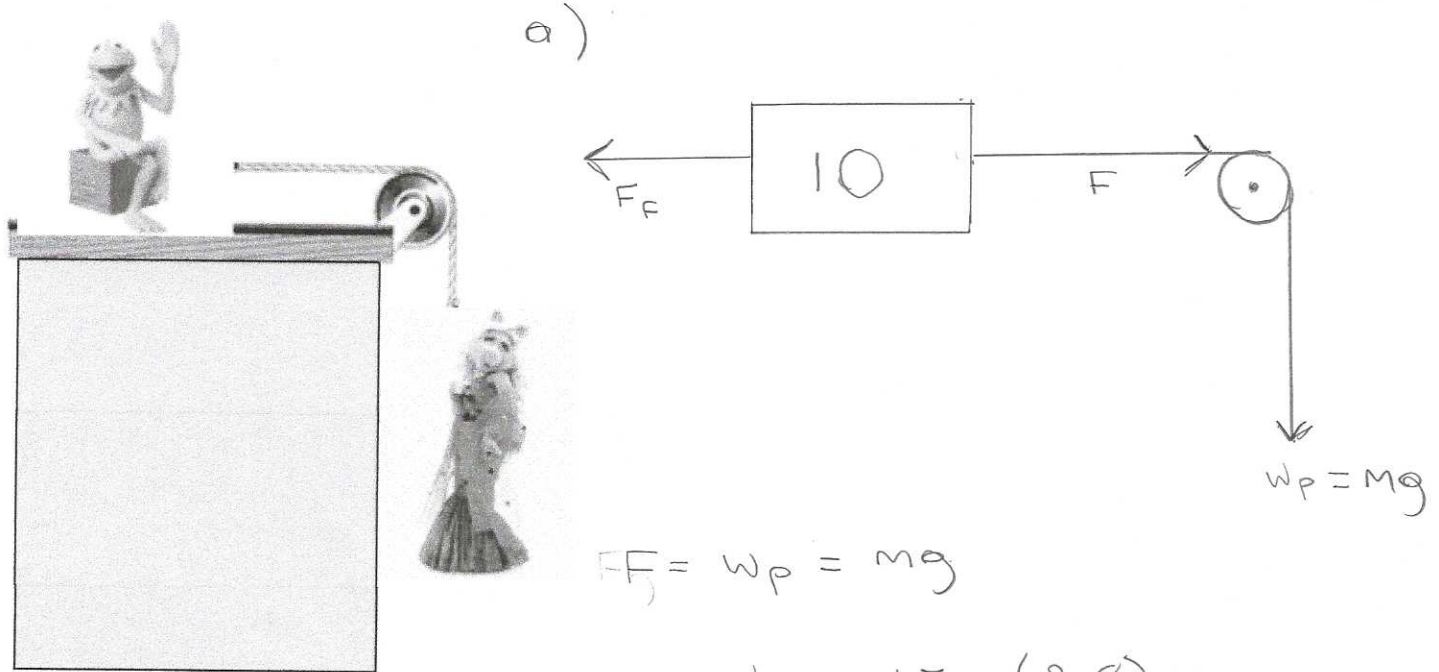Question 1:

1. Kermit (10 kg), is Miss Piggy's (150 kg) love interest. He comes to her rescue when she accidently goes over the side of the building while clutching a rope. Kermit tries desperately to hold on but slips along the surface with a frictional force of 15N.

   a. Draw the FBD for the the whole system, Kermit, and Miss Piggy. (3 marks)
   b. How fast does Kermit accelerate? (1 mark)

a)

$F_F \leftarrow$ | 10 | $\rightarrow F$

$W_p = Mg$

$F_F = W_p = mg$

$W_p = 150 (9.8)$

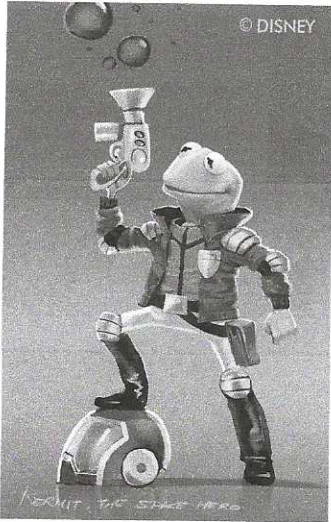$W_p = 1470 \, N \, [Down]$

b)

$F_F = 15 \, N$

$\Sigma F_x = ma$

$1470 - 15 = 10a$

$\dfrac{1455}{10} = \dfrac{10a}{10}$

$a = 145.5 \, m/s^2$

Question #2

1) Kermit (m = 10kg) has landed on another planet, where the force of Gravity he feels is 190N. If the mass of the planet is 4.3×10^{32}kg, what is the radius of the planet? (3 marks)

$$W_k = Ma$$

$$\frac{190}{10} = \frac{10a}{10}$$

$$a_p = 19 \ m/s^2$$

$$G = \text{gravitational constant}$$
$$= 6.7 \times 10^{-11}$$

$$\boxed{g = G\left(\frac{M_p}{r_p^2}\right)}$$

$$r_p^2 = \frac{GM_p}{g_p}$$

$$r_p = \sqrt{\frac{GM_p}{g_p}}$$

$$r_p = \sqrt{\frac{(6.7 \times 10^{-11})(4.3 \times 10^{32})}{19}}$$

$$r_p = 3.9 \times 10^{10} \ m$$