Ch 3 Extra Practice

1. Mass: kg or g

2a) $F_g = mg$
$= 150\,kg\left(9.81\frac{N}{kg}\right) = 1471.5\,N \rightarrow 1.47\times10^3\,N$

b) $F_{g\,moon} = \frac{1}{6}(1471.5\,N) = 245.25\,N \rightarrow 2.45\times10^2\,N$

3. The moon has no atmosphere so both would hit the ground at the same time.

4. $\frac{1}{r^2} \propto 1440N$

$\frac{1}{(4r)^2} \propto \frac{1440N}{4^2} = 90N$

5a) $g = \frac{GM}{r^2} = \frac{(6.67\times10^{-11}\,N\cdot m^2/kg^2)(7.3\times10^{22}\,kg)}{(1785000\,m)^2}$

$= 1.528\frac{N}{kg} \rightarrow 1.5\frac{N}{kg}$

b) $F = mg = 80\,kg\left(1.5\frac{N}{kg}\right) = 122.24\,N \rightarrow 1.2\times10^2\,N$ weight

c) mass = 80 kg (same on Earth as the Moon)

6. $F = \frac{GMm}{r^2} = \frac{(6.67\times10^{-11}\,N\cdot m^2/kg^2)(5.8\,kg)(5.8\,kg)}{(0.355\,m)^2}$

$= 1.8\times10^{-8}\,N$

7. $5.5 \times 10^{-71}\ N = \dfrac{(6.67 \times 10^{-11})(m)(m)}{(1)^2}$

$$\sqrt{m^2} = \sqrt{\frac{5.5 \times 10^{-71}}{6.67 \times 10^{-11}}}$$

$$m = \underline{9.1 \times 10^{-31}\ kg}$$

8. $F = \dfrac{(6.67 \times 10^{-11})(2 \times 10^{30}\ kg)(6 \times 10^{23}\ kg)}{(6 \times 10^{12})^2}$

$$= \underline{2 \times 10^{18}\ N}$$

9. $F_f = 2.5N$, $F_g = F_N = 40N$ $\Rightarrow \mu = \dfrac{F_f}{F_N} = \dfrac{2.5N}{40N} = 0.0625$

$F_g = F_N = 120N$ $\qquad F_f = \mu F_N = (0.0625)(120N)$

$$= \underline{7.5N}$$

10. $\mu = \dfrac{F_f}{F_N} = \dfrac{2.5N}{40N} = 0.0625 \rightarrow \underline{0.063}$

11. $157N - 123N = F_{accel} = 34N$

$F = ma$ $\qquad a = \dfrac{F}{m} = \dfrac{34N}{5kg} = \underline{6.8\ m/s^2}$

12. constant speed so no acceleration

$300N + 425N$

$= \underline{725N}$

13a) $F_f = 16.0N$, $F_N = 45.0N$

$$\mu = \frac{F_f}{F_N} = \frac{16.0}{45.0} = \underline{0.3\overline{5}}$$

b) $F_f = \mu F_N$

$= 0.3\overline{5}(45 + 1.8 \times 9.81)$

$= 22.2784\,N$

$\rightarrow \underline{22.3\,N}$

14. The coefficient of friction, μ, remains the same

15. least effect is how much area contacts (if the normal force remains the same)

16. $F = k\Delta x$

$$k = \frac{F}{\Delta x} = \frac{(2kg)(9.81\,N/kg)}{20cm} = 0.981\,\frac{N}{cm}$$

$$F_g = mg = k\Delta x = 0.981\,\frac{N}{cm}(35cm)$$

$$m = \frac{(0.981)(35)}{9.81} = \underline{3.5\,kg} \rightarrow \underline{4\,kg}$$

17. skip the calculating k step:

$$\frac{F}{\Delta x} = \frac{F}{\Delta x}$$

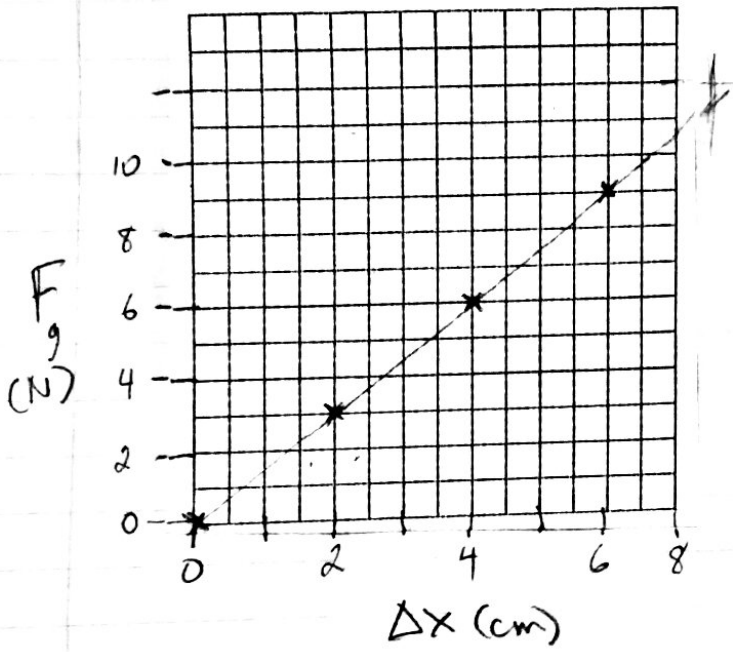
$$\frac{12N}{3cm} = \frac{27N}{x}$$

$$x = \frac{27 \times 3cm}{12} = 6.75cm$$

$\rightarrow \underline{6.8cm}$

8a) $K = 1.5 = \text{slope} = \frac{1.5\,N}{1\,cm}$

(cm) X					
(kg) M	0.1 kg	0.2 kg	0.4 kg	0.5 kg	1 kg
(N) F_g	0.981	1.962	3.924	4.905	9.81



b) $300\,g \rightarrow (0.3\,kg)\left(\frac{9.81\,N}{kg}\right)$

$= 2.943\,N$

graph → ~ $\frac{2\,cm}{stretch}$

c) $1200\,g \rightarrow (1.2\,kg)\left(\frac{9.81\,N}{kg}\right) = 11.772\,N$

graph → ~ $\frac{9^{+}\,cm}{stretch}$