Unit 2 SG answer key:

① speed & direction (velocity) are constant and ∴ acceleration is zero.

② a must also be zero b/c $F_{net} = m \cdot a$ and m cannot be zero. The object could still be moving w/ a constant velocity.

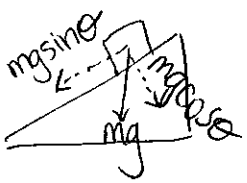
③ F_N is ⊥ to the surface

④ F_f opposes the direction of motion

⑤ weight = $F_g = m \cdot g$ & mass (m) is the amount of matter that composes something.

⑥ $F_{fs} = \mu_s \cdot F_N$ $F_{fk} = \mu_k \cdot F_N$

⑦ It would also be 250N

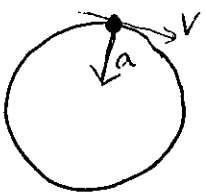
⑧ 

$F_{g\parallel} = mg\sin\theta$ $F_{g\perp} = mg\cos\theta$

⑨ 2 objects.

⑩ The speed is uniform. NOT the velocity b/c the direction is always Δing.

⑪ NO ↑

⑫ ⊥ to v & toward the center ⇒ 

(13) $F_c = m \cdot a_c = m \cdot \frac{v^2}{r}$ (D) if radius is doubled, F_c will decrease

(14) $F_c = 4N = m \cdot a_c$ *if $\frac{m}{2}$ then F_c will = 2N

(15) $r = 120m$ $v = 70\frac{m}{s}$ $F_c = 3.5 \times 10^4 N$ $m = ?$

$F_c = m \cdot a_c = m \cdot \frac{v^2}{r} \Rightarrow 3.5 \times 10^4 N = \frac{m \cdot (70\frac{m}{s})^2}{120m}$ · 120m

$\frac{4.2 \times 10^6 N \cdot m}{4,900\frac{m}{s}} = \frac{m \cdot 4,900\frac{m}{s}}{4,900\frac{m}{s}}$

$m = 857 kg$

(16) Did in class (17) $m = ?$ $F_g = 500N = m \cdot 9.8\frac{m}{s^2}$ $\frac{500N}{9.8} = \frac{m \cdot 9.8}{9.8}$ $m = 51 kg$

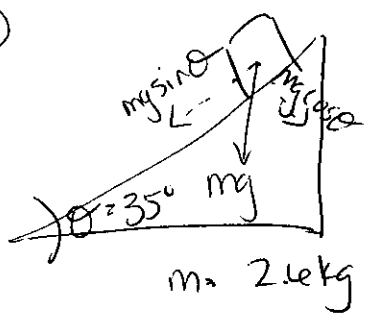
(18) $m = 9,000 kg$
$F_g = 390,000N$ $g = ?$

$\frac{390,000N}{9,000kg} = \frac{9,000kg \cdot g}{9,000kg}$

$g = 43 m/s^2$

(19) B

(20)



m = 2.6kg

$F_f = ?$

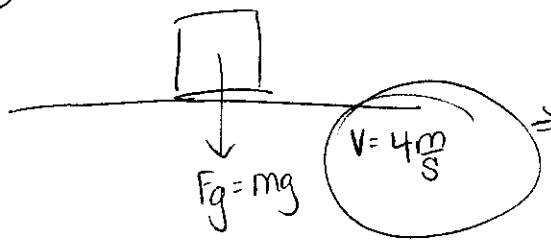
*The block is RESTING. ∴ $F_f = F_{fs}$

& ∴ $F_{net} = 0$

so $mg\sin\theta = F_f$

$2.6kg \cdot 9.8\frac{m}{s^2} \sin(35°) = 14.6N$

(21) $m = 2kg$

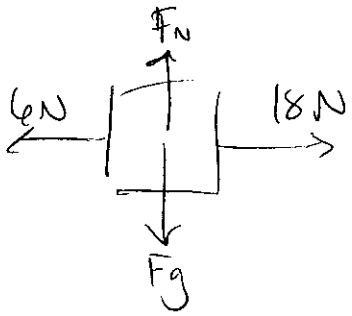


$\Rightarrow$ CONSTANT V = Zero a

$F_{net} = ma$

$F_{net} = m \cdot 0\frac{m}{s^2} = \boxed{0N}$

(22)



*Here, F_g & F_N cancle out

$F_{net} = 18N - 6N = 12N$

$F_{net} = m \cdot a$

$12N = m \cdot 6m/s^2$

$\boxed{m = 2kg}$

(23) A

(24) $m = 3 \times 10^3 kg$ $V_i = 20m/s$ $V_f = 0$ $t = 0.1s$

$F_{on\ truck} = ?$

$F = m \cdot a$ $a = \frac{V_f - V_i}{t} = \frac{0 - 20\frac{m}{s}}{0.1s} = -200\frac{m}{s^2}$

$F = 3 \times 10^3 kg \cdot (-200\frac{m}{s^2}) = -6 \times 10^5 N$

$\Downarrow$

F of truck on wall.

∴ wall on truck = $\boxed{6 \times 10^5 N}$

(25) $m = 35kg$ $V_i = 0\frac{m}{s}$ $V_f = ?$

$x = 20.1m$

find a $F = m \cdot a$

$18N = 35kg \cdot a$

$a = 0.5\frac{m}{s^2}$

*use $V_f^2 = V_i^2 + 2a\Delta x$

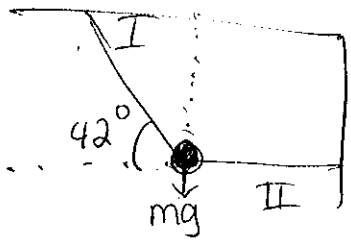
$V_f^2 = 2 \cdot 0.5\frac{m}{s^2}(20.1)$

$V_f^2 = 20.1$

$\boxed{V_f = 4.5m/s}$

(26) $6.7 \frac{m}{s}$ (27) 120N (Newton's 3rd Law)

(28)



$m = 1.9\,kg$

$F_g = 1.9\,kg \cdot 9.8 \frac{m}{s^2} = 18.62\,N$ and since the object is static, F_g must be balanced out by a vertical force which is $F_T \sin\theta$ ∴ $F_T \sin\theta = 18.62N$ and the force in string II must be equal to $F_T \cos\theta$

*Find F_T.

$$\frac{F_T \sin 42}{\sin 42} = \frac{18.6N}{\sin 42}$$

$F_T = 28\,N$

$F_T \cos 42 = 28N \cos 42 = 20.8N \approx \boxed{21N}$

(29) 20N
* Did this one in class

(30) B * $F_C = m \cdot a_c = m \cdot \frac{v^2}{r}$

(31) C