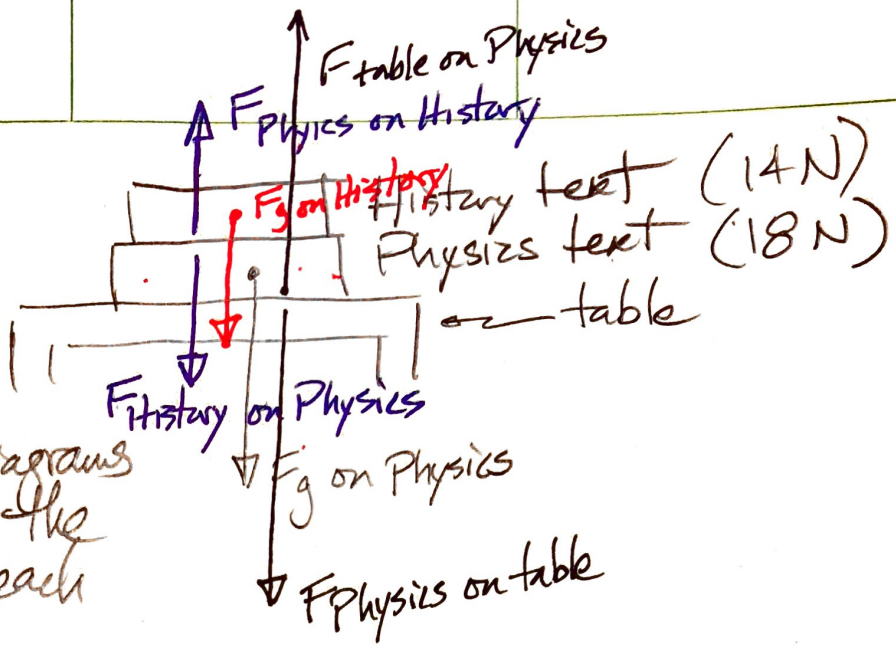
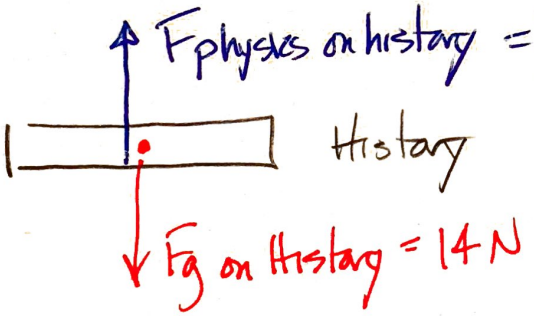
5.53



Free-body diagrams emphasizing the forces on each book.

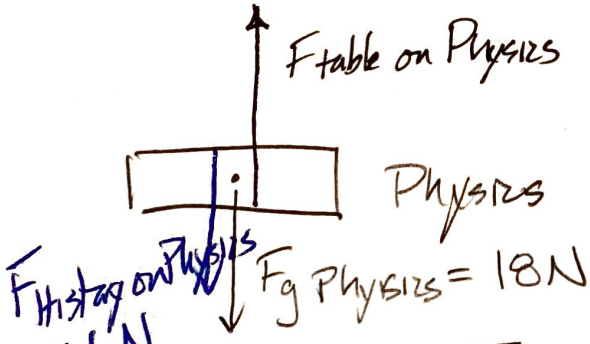
One solution appears to have been given in the text, at least as far as the free-body diagram is concerned.

In this diagram, I've drawn force-pairs w/ the same color. It's easier to see what's happening if we split the books apart,



└ We know this because the history book isn't accelerating.

$$\Sigma F_y = m_{history}\, a$$
$$+F_{physics} - F_{g\,history} = 0$$
$$F_{physics} = F_{g\,history} = \boxed{14N}$$



$$\Sigma F = ma = 0$$
$$F_{table} = F_{History} + F_{Physics}$$
$$= 14N + 18N = \boxed{32N}$$

5.57

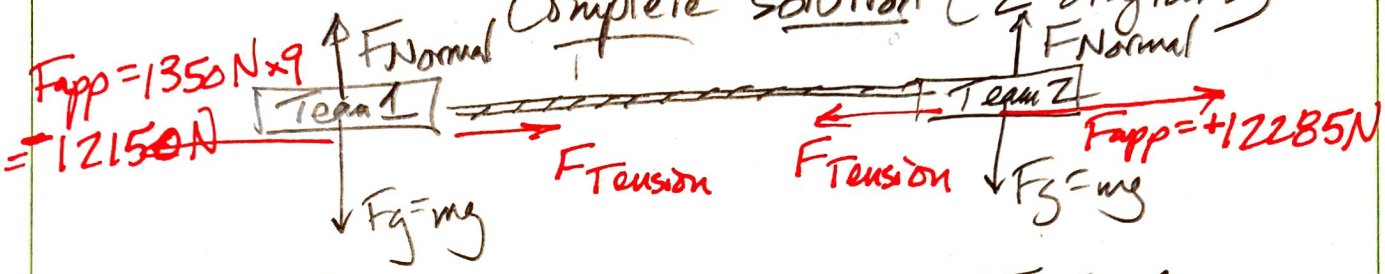
$m = 9 \times 68\,kg = 612\,kg$

$F_{app} = 9 \times 1350N = 12150N$ total force horizontal

$m = 9 \times 73 = 657\,kg$

$F_{app} = 9 \times 1365N = 12285N$

Complete solution (2 diagrams)



$\Sigma F = ma$

$+F_{app} + F_T = ma$

$-12150 + F_T = (612)a$

$\Sigma F = ma$

$+F_{app} - F_T = ma$

$12285 - F_T = (657)a$

Sub & solve

$F_T = 12150 + 612a$

$12285 - (12150 + 612a) = 657a$

$12285 - 12150 - 612a = 657a$

$135 = 1269a$

$a = \frac{135}{1269} = \boxed{0.106\,m/s^2}$ to the right b/c positive

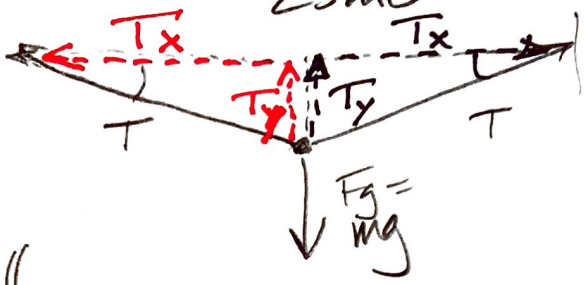
Now sub back in to get $F_{Tension}$:

$F_T = 12150 + 612(0.106)$

$= \boxed{12215\,N}$

5.63

a) Show that $T = \frac{mg}{2\sin\theta}$



Vertically

$\Sigma F_y = ma_y = 0$

$T_y + T_y - mg = 0$ ← Not accelerating, so Forces are balanced.

$2T_y = mg$

$T_y = T\sin\theta$,

so

$2(T\sin\theta) = mg$

$T = \boxed{\frac{mg}{2\sin\theta}}$

b) $T = \frac{mg}{2\sin\theta}$

$= \frac{(0.026\,kg)(9.8\,m/s^2)}{2\sin 5°}$

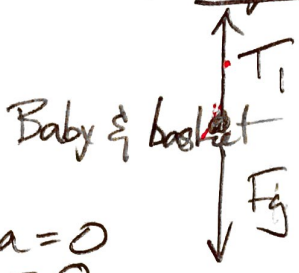
$= \boxed{1.46\,N}$

c) $T = \frac{(0.026)(9.8)}{2\sin(0.5)} = \boxed{14.6\,N}$

5.65

a) $m_{baby\ \&\ basket} = ?$

Focus on baby & basket



$\Sigma F = ma = 0$

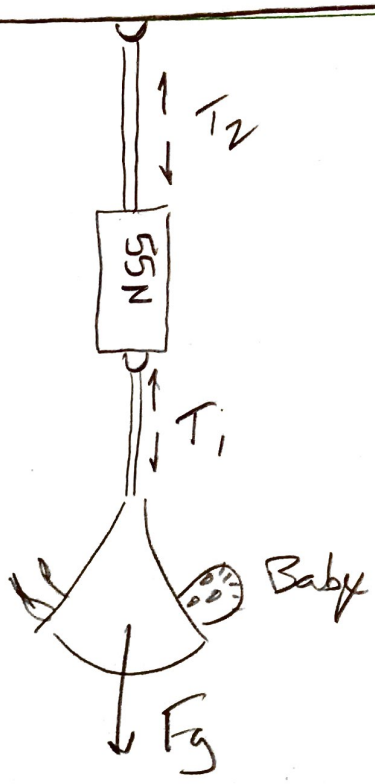
$T_1 - F_g = 0$

$+55N = F_g$, so

$w = mg$

$55 = (m)(9.8)$

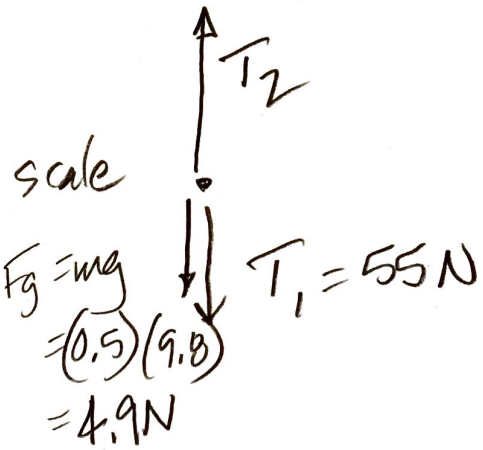
$m = \frac{55}{9.8} = \boxed{5.61 kg}$



b) $T_1 = 55N$, as indicated by the scale.

c) Find T_2 if scale has a mass of 0.500kg.

Focusing on scale now



$\Sigma F_y = ma = 0$

T_2 up $- T_1 - F_g = 0$

$T_2 = T_1 + F_g$

$= (55N) + (0.5)(9.8) = \boxed{59.9N}$