Newtons Third Law Questions – Answers

1. $m_A = m_B = 2000\,kg$
$F_T = 5000\,N$

① $a = ?$

$F_T = ma$

$a = \frac{F_T}{m_T}$

$= \frac{5000\,N}{4000\,kg}$

$= 1.250\,m/s^2$

② $F_{AB} = ?$

$F_{AB} = m_A a$

$= (2000\,kg)(1.250\,m/s^2)$

$= 2.500 \times 10^3\,N$

∴ the wagons have an acceleration of $1.250\,m/s^2$ and the force between the two wagons is $2.500 \times 10^3\,N$

2. $m_T = 4000\,kg + 5000\,kg + 6000\,kg$
$= 15000\,kg$

$a = 1.5\,m/s^2$

a) $F_T = ?$

$F_T = m_T a$

$= (15000\,kg)(1.5\,m/s^2)$

$= 22500\,N$

$= 2.3 \times 10^4\,N$

b) 

$F_{NETC} = F_{CB} = ma$

$= (4000\,kg)(1.5\,m/s^2)$

$= 6.0 \times 10^3\,N$

$F_{CB} = ?$

$m_C = 4000\,kg$

NEWTONS THIRD LAW QUESTIONS - ANSWERS

2b cont

$F_{BA} = ?$
$M_B = 5000\,kg$

$F_{NETB} = ma$
$= (5000\,kg)(1.5\,m/s^2)$
$= 7.5 \times 10^3\,N$

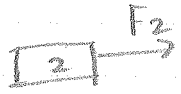
$F_{NETB} = F_{BA} - F_{CB}$
$F_{BA} = F_{NETB} + F_{CB}$
$= 7.5 \times 10^3\,N + 6.0 \times 10^3\,N$
$= 1.35 \times 10^4\,N$

∴ the total force on the system is $2.3 \times 10^4\,N$.
∴ the total force on the last barge is $6.0 \times 10^3\,N$; the force between the front two barges is $1.35 \times 10^4\,N$.

3. $F_{app} = 700N$
$F_{f1} = 100N = F_{f2}$
a) $m_1 = m_2 = 300kg$

$F_{NET} = F_{app} - F_{f1} - F_{f2} = ma$
$a = \dfrac{F_{app} - (F_{f2})}{m}$
$= \dfrac{700N - 2(100N)}{2(300kg)}$
$= 8.33 \times 10^{-1}\,m/s^2$

b)



$F_2 = ?$

$F_{NET} = F_2 = m_2 a$
$= (300kg)(8.33 \times 10^{-1}\,m/s^2)$
$= 2.50 \times 10^2\,N$

∴ the acceleration is $8.33 \times 10^{-1}\,m/s^2$.
∴ the force between the two sleds is $2.50 \times 10^2\,N$.