Newton's 3^{rd} Law

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Question: 2

a

$$
\begin{aligned}
F &= ma \\
60 &= (20 + m) * 2 \\
20 + m &= 30 \\
m &= 10kg
\end{aligned}
$$

b

$$
\begin{aligned}
F &= ma \\
60 - T &= 10 * 2 \\
60 - T &= 20 \\
T &= -40 = 40N
\end{aligned}
$$

Question: 3

a

$$
\begin{aligned}
F &= ma \\
60 &= (7 + 8)a \\
a &= \frac{60}{15} \\
a &= 4ms^{-2}
\end{aligned}
$$

b

$$
\begin{aligned}
F &= ma \\
30 - T &= 7 * 4 \\
30 - T &= 28 \\
T &= 2N
\end{aligned}
$$

Question: 4

a

$$
\begin{aligned}
F &= ma \\
T - (110 + 190 + 1700) * 9.8 &= (110 + 190 + 1700) * -1.8 \\
T &= (110 + 190 + 1700) * (-9.8 - 1.8) \\
T &= 23200N
\end{aligned}
$$

b

i

$$ma = F$$
$$110 * -1.8 = F - 190 * 9.8$$
$$F = -190 * 9.8 + 110 * 1.8$$
$$F = -1664 = 1660N$$

ii

$$ma = F$$
$$1700 * -1.8 = F - 110 * 9.8 - 190 * 9.8$$
$$F = -110 * 9.8 - 190 * 9.8 + 1700 * 1.8$$
$$F = 120N$$

Question: 5

a

$$F = ma$$
$$50000 - 4000 - 10000 = (3m + m) * 5$$
$$36000 = 20m$$
$$m = 1800kg$$

- Trailer: $= 3m = 1800 * 3 = 5400kg$
- Lorry: $= m = 1800kg$

b

$$F = ma$$
$$50000 - 4000 - T = 1800 * 5$$
$$46000 - T = 9000$$
$$T = -37000 = 37000N$$

c

- I don't have to account for the mass of the tow-bar in $F = ma$ calculations.
- The Tension always remains the same on both sides.

Question: 6

a

$$F = ma$$
$$180 - (10 + 5) * 9.8 = (10 + 5)a$$
$$33 = 15a$$
$$a = 2.2ms^{-2}$$

b

$$F = ma$$
$$180 - 10 * 9.8 - T = 10 * 2.2$$
$$-T = 22 - 180 + 98$$
$$T = 60N$$