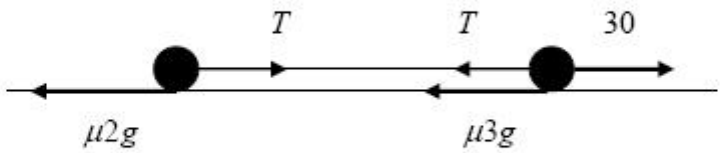
Connected Objects Horizontal Plane - Edexcel Past Exam Questions MARK SCHEME

Question 1: June 06 Q6

	(a) Car + trailer: $2100a = 2380 - 280 - 630$	M1 A1
	$= 1470 \Rightarrow a = \underline{0.7 \text{ m s}^{-2}}$	A1 (3)
	(b) e.g. trailer: $700 \times 0.7 = T - 280$	M1 A1√
	$\Rightarrow T = \underline{770 \text{ N}}$	A1 (3)
	(c) Car: $1400a' = 2380 - 630$	M1 A1
	$\Rightarrow a' = 1.25 \text{ m s}^{-2}$	A1
	distance = $12 \times 4 + \frac{1}{2} \times 1.25 \times 4^2$	M1 A1√
	$= \underline{58 \text{ m}}$	A1 (6)
	(d) Same acceleration for car and trailer	B1 (1)
	(a) M1 for a complete (potential) valid method to get a (b) If consider car: then get $1400a = 2380 - 630 - T$. Allow M1 A1 for equn of motion for car or trailer wherever seen (e.g. in (a)). So if consider two separately in (a), can get M1 A1 from (b) for one equation; then M1 A1 from (a) for second equation, and then A1 [(a)] for a and A1 [(b)] for T. In equations of motion, M1 requires no missing or extra terms and dimensionally correct (e.g. extra force, or missing mass, is M0). If unclear which body is being considered, assume that the body is determined by the mass used. Hence if '$1400a$' used, assume it is the car and mark forces etc accordingly. But allow e.g. 630/280 confused as an A error. (c) Must be finding a *new* acceleration here. (If they get 1.25 erroneously in (a), and then simply assume it is the same acceln here, it is M0). (d) Allow o.e. but you must be convinced they are saying that it is same acceleration for both bodies. E.g. 'acceleration constant' on its own is B0 Ignore extras, but 'acceleration and tension same at A and B' is B0	

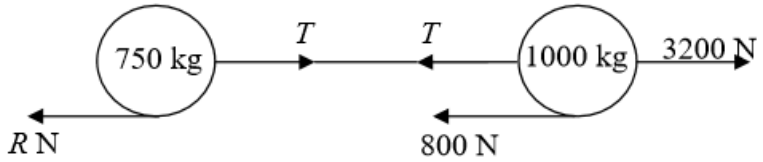
Question 2: June 08 Q8

Question Number	Scheme	Marks
(a)	 $s = ut + \frac{1}{2}at^2 \Rightarrow 6 = \frac{1}{2}a \times 9$	M1
	$a = 1\frac{1}{3}\ \left(\text{ms}^{-2}\right)$	A1 (2)
(b)	N2L for P $\quad T - \mu 2g = 2a$ ft their μ, their a, accept symbols $T - \frac{14}{3g} \times 2g = 2 \times \frac{4}{3}$	M1 A1 ft
	Leading to $T = 12\ (\text{N})$ awrt 12	M1 A1 (4)
(c)	The acceleration of P and Q (or the whole of the system) is the same.	B1 (1)
(d)	$v = u + at \Rightarrow v = \frac{4}{3} \times 3 = 4$	B1 ft on a
	N2L (for system or either particle) $-5\mu g = 5a$ or equivalent	M1
	$a = -\mu g$ $v = u + at \Rightarrow 0 = 4 - \mu gt$	M1
	Leading to $t = \frac{6}{7}\ (\text{s})$ accept 0.86, 0.857	A1 (4)
		(15 marks)

Question 3: June 09 Q6

Question Number	Scheme	Marks
(a)	For whole system: $1200 - 400 - 200 = 1000a$	M1 A1
	$a = 0.6 \text{ m s}^{-2}$	A1 (3)
(b)	For trailer: $T - 200 = 200 \times 0.6$	M1 A1 ft
	$T = 320$ N	A1
		OR:
	OR: For car: $1200 - 400 - T = 800 \times 0.6$	M1 A1 ft
	$T = 320$ N	A1 (3)
(c)	For trailer: $200 + 100 = 200f$ or $-200f$	M1 A1
	$f = 1.5 \text{ m s}^{-2}$ (-1.5)	A1
	For car: $400 + F - 100 = 800f$ or $-800f$	M1 A2
	$F = 900$	A1 (7)
	(N.B. For both: $400 + 200 + F = 1000f$)	[13]

Question 4: Jan 12 Q2

Question Number	Scheme	Marks
(a)	 For the whole system R(→) $3200-800-R=1750\times0.88$ Leading to $R=860$ ✱	M1 A1 A1 (3)
(b)	For the caravan R(→) $T-860=750\times0.88$ Leading to $T=1520$ (N)	M1 A1 A1 (3) **6**
	Alternative for (b) For the car R(→) $3200-800-T=1000\times0.88$ Leading to $T=1520$ (N)	M1 A1 A1 (3)