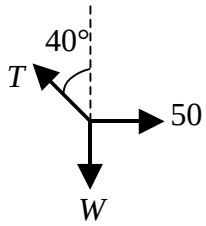
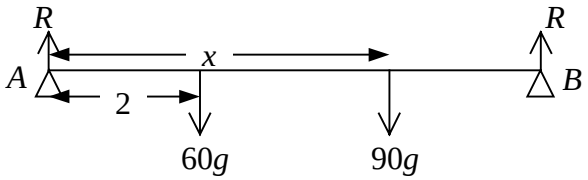
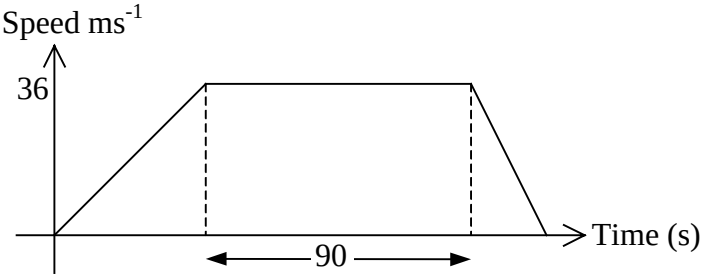
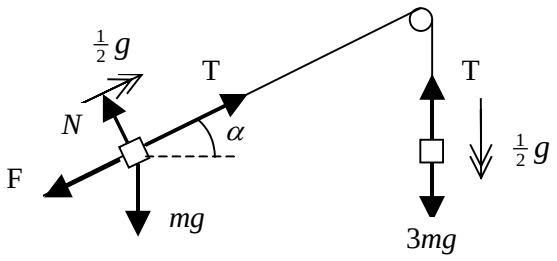
Question number		Scheme	Marks
1.	(*a*)	 $T \sin 40° = 50 \Rightarrow, T \approx 77.8$ N	M1 A1, A1 (3)
	(*b*)	$(\uparrow)$ $W = T \cos 40°$	M1 A1
		$W = 77.8 \cos 40° \approx 59.6$ N	M1 A1 (4)
			(7 marks)
2.	(*a*)	"$v = u + at$" $v_B = 10 + 3 \times 6 = 28$ m s^{-1}	M1A1 (2)
	(*b*)	*OA*: "$v^2 = u^2 + 2as$" $10^2 = 0 + 2 \times 4 \times OA \Rightarrow OA = 12.5$ m	M1A1
		AB: "$s = ut + \frac{1}{2} at^2$" OB $= 10 \times 6 + \frac{1}{2} \times 3 \times 36 = 114$ m	M1A1
		$OB = 12.5 + 114 = 126.5$ m	A1 ft (5)
			(7 marks)
3.			
	(*a*)	$R(\uparrow)$ $R + R = 60g + 90g$	
		$R = 75g = 735$ N	M1 A1 (2)
	(*b*)	$M(A)$ $60g.2 + 90g.x = 75g.6$	M1 A1 A1 ft
		$90x = 450 - 120 = 330$	
		$x = 3\frac{2}{3}$ m accept AWRT 3.67	M1 A1 (5)
	(*c*)(i)	Plank remains a straight line/rigid.	B1
	(ii)	Weight of woman acts at *C*.	B1 (2)
			(9 marks)

Question number		Scheme	Marks
4.	(*a*)		
		Shape	M1A1
		36,90	B1 (3)
	(*b*)	Time to accelerate : time to decelerate	M1 A1
		18 s 12 s	
		Distance = area under graph	
		$= \frac{1}{2} \times 36 \times (90 + 120)$ m	M1 A1
		= 3780 m	A1 (5)
	(*c*)	There is no period of constant maximum velocity	
		(OR "it speeds up and then immediately slows down again" OR "it attains a greater maximum speed")	B1 (1)
	(*d*)	Let greatest speed be V m s^{-1} then	
		$\frac{1}{2} \times 150 \times V_{max} = 3780$	M1 A1
		$V = 50.4$	A1
			(9 marks)

Question number		Scheme	Marks
5.	(*a*)	Conservation of linear momentum applied	
		$3000 \times 3 - 4 \times 1000 = 4000 \times V$	M1 A1
		$V = 1.25$	A1
		Direction *AB*	A1 (4)
	(*b*)	Impulse $= 3000\,[3 - 1.25]$ Ns	M1 A1 ft
		$= 5250$ Ns	A1 (3)
	(*c*)	Trucks are assumed to be particles	B1 (1)
	(*d*)	$F = ma \Rightarrow 250 = 4000\,a$	M1
		$a = \frac{1}{16}$	A1
		$v^2 = u^2 + 2as \Rightarrow 0 = (1.25)^2 - 2\left(\frac{1}{16}\right) d$	M1
		$d = 12.5$	A1 (4)
			(12 marks)
6.			
	(*a*)	B: $3mg - T = 3m.\frac{1}{2}g$	M1 A1
		$T = \underline{\frac{3}{2}mg}$	M1 A1 (4)
	(*b*)	A: $T - F - mg.\frac{3}{5} = m.\frac{1}{2}g$	M1 A1 A1
		$\Rightarrow F = \frac{2}{5}mg$	M1 A1 ft
		$N = mg.\frac{4}{5}$	M1 A1
		$\mu = \frac{F}{N} = \frac{1}{2}$	M1 A1 (9)
			(13 marks)

Question number		Scheme	Marks
7.	(*a*)	$\mathbf{r} = 20\,t\mathbf{i}$	B1
		$\mathbf{s} = (300 + 10t)\mathbf{i} + (10t)\mathbf{j}$	M1 A1 (3)
	(*b*)	$\overrightarrow{AB} = \mathbf{s} - \mathbf{r} = (300 - 10t)\mathbf{i} + (10t)\mathbf{j}$	B1 ft (1)
	(*c*)	Bearing of B from A $045^\circ \Rightarrow \overrightarrow{AB}$ // $\mathbf{i} + \mathbf{j}$	M1
		$\Rightarrow \dfrac{10t}{300 - 10t} = 1$	M1 A1
		$\Rightarrow 10t = 300 - 10t \Rightarrow t = 15$	M1 A1 (5)
	(*d*)	Distance $= 300 \Rightarrow \lvert s - r \rvert^2 = 300^2$	M1
		$\Rightarrow (300 - 10t)^2 + (10t)^2 = 300^2$	M1 A1 ft
		$\Rightarrow 300^2 - 6000t + 100t^2 + 100t^2 = 300^2$	A1 ft
		$\Rightarrow 200t^2 = 6000t$	
		$t = 0$ or $30 \Rightarrow t = 30$	M1A1 (6)
			(15 marks)