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Question Number		Scheme	M
1.		$45 = 2u + \frac{1}{2}a2^2 \Rightarrow 45 = 2u + 2a$ $165 = 6u + \frac{1}{2}a6^2 \Rightarrow 165 = 6u + 18a$ eliminating either u or a $u = 20$ and $a = 2.5$	M1 A1 M1 A1 M1 A1 A1 **(7 marks)**
2.	(a)	$\tan\theta = \frac{p}{2p} \Rightarrow \theta = 26.6°$	M1 A1 (2)
	(b)	$\mathbf{R} = (\mathbf{i} - 3\mathbf{j}) + (p\mathbf{i} + 2p\mathbf{j}) = (1 + p)\mathbf{i} + (-3 + 2p)\mathbf{j}$ $\mathbf{R}$ is parallel to $\mathbf{i} \Rightarrow (-3 + 2p) = 0$ $\Rightarrow p = \frac{3}{2}$	M1 A1 DM1 A1 (4) **(6 marks)**
3.	(a)	For A: $-\frac{7mu}{2} = 2m(v_A - 2u)$ $v_A = \frac{u}{4}$	M1 A1 A1 (3)
	(b)	For B: $\frac{7mu}{2} = m(v_B - -3u)$ $v_B = \frac{u}{2}$	M1 A1 A1 (3) **(6 marks)**
4.		$0.5g\sin\theta - F = 0.5a$ $F = \frac{1}{3}R$ seen $R = 0.5g\cos\theta$ Use of $\sin\theta = \frac{4}{5}$ or $\cos\theta = \frac{3}{5}$ or decimal equiv or decimal angle e.g 53.1° or 53° $a = \frac{3g}{5}$ or 5.88 m s^{-2} or 5.9 m s^{-2}	M1 A1 A1 B1 M1 A1 B1 DM1 A1 **[9]**
			(9 marks)

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Question Number		Scheme	M
5.		$F = P\cos 50^o$	M1 A1
		$F = 0.2R$ seen or implied.	B1
		$P\sin 50^o + R = 15g$	M1 A1 A1
		Eliminating R; Solving for P ; $P =$ 37 (2 SF)	M1; M1;A1 **(9 marks)**
6.	(a)	For whole system: $1200 - 400 - 200 = 1000a$	M1 A1
		$a = 0.6$ m s^{-2}	A1 (3)
	(b)	For trailer: $T - 200 = 200$ x 0.6	M1 A1 **ft**
		$T = 320$ N	A1
		OR:	**OR**:
		For car: $1200 - 400 - T = 800$ x 0.6	M1 A1 **ft**
		$T = 320$ N	A1 (3)
	(c)	For trailer: $200 + 100 = 200f$ or $-200f$	M1 A1
		$f = 1.5$ 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 marks)**

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Question Number		Scheme	Ma
7.	(a)	$M(Q),\ \ 50g(1.4-x)+20g \text{ x } 0.7 = T_P \text{ x } 1.4$	M1 A1
		$T_P = 588 - 350x$ Printed answer	A1 (3)
	(b)	$M(P),\ \ 50gx+20g \text{ x } 0.7 = T_Q \text{ x } 1.4$ or $R(\uparrow),\ T_P + T_Q = 70g$	M1 A1
		$T_Q = 98 + 350x$	A1 (3)
	(c)	Since $0 < x < 1.4$,	M1
		$98 < T_P < 588$ and $98 < T_Q < 588$	A1 A1 (3)
	(d)	$98 + 350x = 3(588 - 350x)$	M1
		$x = 1.19$	M1 A1 (3)
			(12 marks)
8.	(a)	$\lvert\mathbf{v}\rvert = \sqrt{1.2^2 + (-0.9)^2} = 1.5 \text{ m s}^{-1}$	M1 A1 (2)
	(b)	$(\mathbf{r}_H =) 100\mathbf{j} + t(1.2\mathbf{i} - 0.9\mathbf{j})$ m	M1 A1 (2)
	(c)	$(\mathbf{r}_K =) 9\mathbf{i} + 46\mathbf{j} + t(0.75\mathbf{i} + 1.8\mathbf{j})$ m	M1 A1
		$\overrightarrow{HK} = \mathbf{r}_K - \mathbf{r}_H = (9 - 0.45t)\mathbf{i} + (2.7t - 54)\mathbf{j}$ m **Printed Answer**	M1 A1 (4)
	(d)	Meet when $\overrightarrow{HK} = \mathbf{0}$	
		$(9 - 0.45t) = 0$ and $(2.7t - 54) = 0$	M1 A1
		$t = 20$ from both equations	A1
		$\mathbf{r}_K = \mathbf{r}_H = (24\mathbf{i} + 82\mathbf{j})$ m	M1 A1 **cso** (5)
			(13 marks)