EDEXCEL - LONDON EXAMINATIONS

Stewart House 32 Russell Square London WC1B 5DN

June 2001

Advanced Supplementary/Advanced Level

General Certificate of Education

Subject **MECHANICS 6677**   Paper No. **M1**

Question number	Scheme	Marks
1.	$3 \longrightarrow \quad \longleftarrow 2$ Before $\quad$ $0.5 \circledast \quad \circledast 0.2$ $\quad \overset{\longrightarrow}{1.5} \quad \longrightarrow v$ After $\qquad \left(\begin{matrix} \text{Mom}^m \text{ eqn.} \\ \text{with 4 terms} \end{matrix} \right)$ (a) $\quad 0.5 \times 3 - 0.2 \times 2 = 0.5 \times 1.5 + 0.2 \times v$ $\Longrightarrow v = \underline{1.75 \ m s^{-1}}$ (b) $\qquad I = 0.2(2 + 1.75)$ $= \underline{0.75 \ Ns}$	M1 A1 A1 (3) M1 A1 ✓ A1 (3) (6)

EDEXCEL - LONDON EXAMINATIONS

Stewart House 32 Russell Square London WC1B 5DN

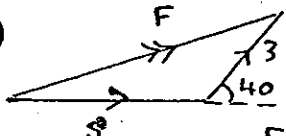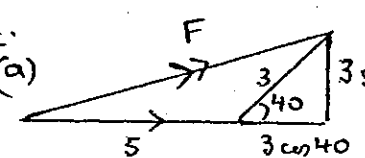## June 2001

Advanced Supplementary/Advanced Level

General Certificate of Education

ubject MECHANICS 6677   Paper No. M1

Question number	Scheme	Marks
2.	EITHER	
	(a) Vector $\triangle$ attempt Correct	M1 A1
	$F^2 = 5^2 + 3^2 - 2.5.3\cos 140$ (cos rule)	m1 A1
	$\rightarrow \quad F \simeq \underline{7.55\ N}$	A1 (5)
	(b) $\dfrac{F}{\sin 140} = \dfrac{3}{\sin\theta} \quad \Rightarrow \quad \theta \simeq \underline{14.8°}$	M1 A1, A1 (3) ⑧

	OR.
	 (a) $3\sin 40$
	     5 $3\cos 40$ $F^2 = (5+3\cos 40)^2 + (3\sin 40)^2$ Vector $\triangle$ attempt correct
	         $F \simeq \underline{7.55\ N}$
		M1
		 A1
		 m1 A1 ✓
		 A1 (5)

	(b) $\tan\theta = \dfrac{3\sin 40}{5+3\cos 40}$, $\quad \theta \simeq \underline{14.8°}$	M1 A1, ✓ A1 (3) ⑧
	OR (a) $\underline{P} = \begin{pmatrix} 5 \\ 0 \end{pmatrix}$ or $5\underline{i}$ $\underline{Q} = \begin{pmatrix} 3\cos 40 \\ 3\sin 40 \end{pmatrix}$ or $3\cos 40\,\underline{i} + 3\sin 40\,\underline{j}$	M1
	$\Rightarrow \underline{F} = \begin{pmatrix} 5+3\cos 40 \\ 3\sin 40 \end{pmatrix}$	A1
	$|\underline{F}| = (5+3\cos 40)^2 + (3\sin 40)^2$	m1 A1 ✓
	$\simeq \underline{7.55\ N}$	A1 (5)
	(b) $\tan\theta = \dfrac{3\sin 40}{5+3\cos 40}$	M1 A1 ✓
	$\simeq \underline{14.8°}$	A1 (3) ⑧

EDEXCEL - LONDON EXAMINATIONS

Stewart House 32 Russell Square London WC1B 5DN

June 2001
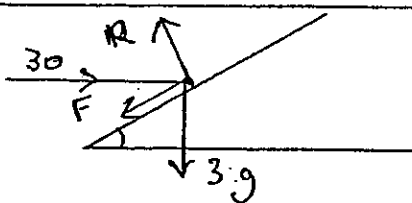
Advanced Supplementary/Advanced Level

General Certificate of Education

Subject **MECHANICS 6677**   Paper No. **M1**

Question number	Scheme	Marks
3.	**(a)** Distance $= \frac{1}{2} \times (30+17) \times 3, + 4 \times 17$	M1 A1, M1
	$= 138.5$ m.	A1 (4)
	$\left[\underline{\underline{OR}} \quad \frac{1}{2} \times 3 \times (30-17)_* + 3 \times 17 + 4 \times 17 \right.$	M1 A1, M1
	$\left. = 138.5 \text{ m} \right]$	A1
	(b) Str. line graph $\Rightarrow$ const. decel^n	M1
	"$F = ma$" $\Rightarrow$ $\underline{F \text{ const}}$	A1 cso (2)
	(c) Decel$^n = \dfrac{30-17}{3}$	M1
	Force $= 1200 \times \left(\dfrac{30-17}{3}\right) = \underline{5200 \text{ N}}$	M1 A1 (3) ⑨
4.	**(a)** Diag. with 4 forces marked (Allow F & R combined if clear)	B2 −1 e.e. (2)
	(b) R(↑) $R = 3g \cos 30° + 30 \sin 30°$ (3 terms)	M1 A2 −1 e.e.
	$= 40.46\ldots \simeq 40.5$ or 40 N.	A1 (4)
	(c) R(↙) $F = 30 \cos 30° - 3g \sin 30°$ (3 terms)	M1 A1
	$F = \mu R, \Rightarrow \mu = \dfrac{F}{R} = \dfrac{11.28}{40.46}$	M1, M1
	$\simeq 0.28$ (or 0.279)	A1 (5) ⑪

EDEXCEL - LONDON EXAMINATIONS

Stewart House 32 Russell Square London WC1B 5DN

June 2001

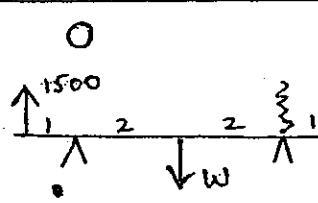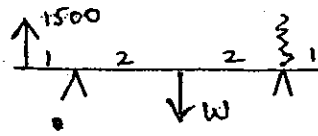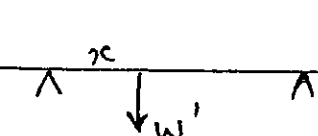### Advanced Supplementary/Advanced Level

General Certificate of Education

Subject **MECHANICS 6677**   Paper No. **M1**

Question number	Scheme	Marks
5.	**(a)** O	B1 (1)
	(b) $M(D):$ $2W = 1500.5$	m1 A1
	$\Rightarrow W = 3750 \text{ N}$	A1 (3)
	[If moments about another pt: m1 for a complete method to get W, A1 for a moments equ^2 correct.]	
	(c) $M(D)$ $1500.5 = W'(4-x)$	m1 A1
	$M(c)$ $1000.5 = W'x$	m1 A1
	Solve $\rightarrow W' = 3125 \text{ N}$	m1 A1 (6)
	(d) $x = 1.6 \text{ m}$	m1 A1 (2)
	(e) · AB remains straight line (o.e.)	B1 (1)
		(13)

EDEXCEL - LONDON EXAMINATIONS

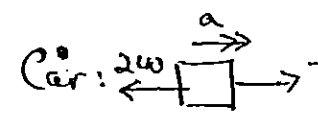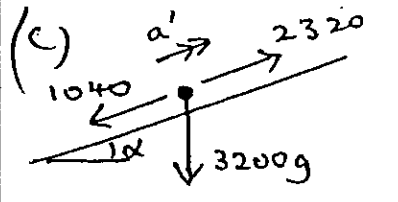Stewart House 32 Russell Square London WC1B 5DN

June 2001

Advanced Supplementary/Advanced Level

General Certificate of Education

Subject **MECHANICS 6677**   Paper No. **M1**

Question number	Scheme	Marks
6.	**(a)** Car + Van: $3200a = 2320 - 800 - 240$ $a = \underline{0.4 \text{ m s}^{-2}}$	M1 A1 A1 (3)
	(b) Car: $\xleftarrow{240} \square \xrightarrow{a} \xrightarrow{T}$ $1200a = T - 240$ $\rightarrow T = 720 \text{ N}$	M1 A2√ −1 e.e. A1 (4)
	$\left[\underline{\text{OR}} \text{ Van } \xleftarrow{T}_{800} \square \xrightarrow{2320} \quad 2000a = 2320 - 800 - T \right.$ $\left. \rightarrow T = 720 \right]$	
	<u>NB</u> If use eqⁿˢ for car + van alone, allow M1 A2 for one equⁿ involving T, then M1 A1 for a second equⁿ <u>provided</u> it is part of a complete method to find a/T. Then A1 A1 for a & T.	

	(c) $\xrightarrow{a'} \xrightarrow{2320}$ $\xleftarrow{1040}$ $\xrightarrow{\alpha}$ $\downarrow 3200g$ (4 terms)
	
	    $3200a' = 2320 - 1040 - 3200g \cdot \frac{1}{20}$
	
	      $a' = -0.09 \text{ m s}^{-2}$
	
	    $\Rightarrow$ magn. 0.09 m s^{-2}
	      speed decreasing
		M1 A2
		 −1 e.e.
		 M1
		
		 A1
		 A1 (6)
		
		 (13)

EDEXCEL - LONDON EXAMINATIONS

Stewart House 32 Russell Square London WC1B 5DN
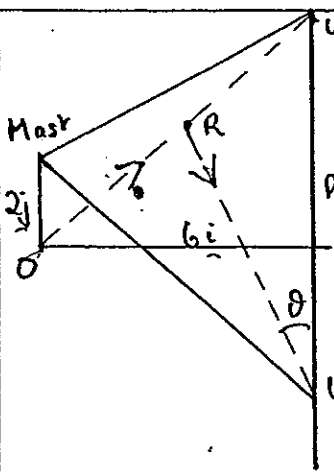
June 2001

Advanced Supplementary/Advanced Level

General Certificate of Education

Subject **MECHANICS 6677**   Paper No. **M1**

Question number	Scheme	Marks
7.	(a) $\omega_1 = 2j + 6i + 6j$ $= 6i + 8j$ (b) $O\omega_1 = \sqrt{(6^2 + 8^2)} = 10 \text{ km}$ Est^d time $= \dfrac{10}{5} = 2 \text{ hrs}$ (c) $\omega_2 = 2j + 6i - 6j$ $= 6i - 4j$ (d) P.v. of rescue party after 1 hour = $R = 3i + 4j$ $R\omega_2 = 3i - 8j$ $\tan\theta = \dfrac{3}{8} = 20.6°$ $\Rightarrow$ Required bearing $= 180° - 20.6°$ $= 159.4°$	B1 B1 (2) M1 M1/A1 (3) B1, M1 A1 (3) M1 A1 M1 A1 M1 M1 A1 (7) (15)