GCE Examinations

Advanced Subsidiary / Advanced Level

Mechanics
Module M1

Paper C

MARKING GUIDE

This guide is intended to be as helpful as possible to teachers by providing concise solutions and indicating how marks should be awarded. There are obviously alternative methods that would also gain full marks.

Method marks (M) are awarded for knowing and using a method.

Accuracy marks (A) can only be awarded when a correct method has been used.

(B) marks are independent of method marks.



Written by Shaun Armstrong & Chris Huffer

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M1 Paper C – Marking Guide

1. *(a)* ratio is $\frac{\frac{3}{4}d}{3} : \frac{\frac{1}{4}d}{2}$ — M1 A1

$= \frac{1}{4} : \frac{1}{8} = 2 : 1$ — M1 A1

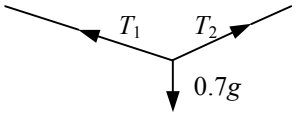
(b) 80 km h^{-1} for 5 hrs = 400 km — M1

$\frac{3}{4}$ of 400 = 300 km — M1

av. speed on first part of journey = $\frac{300}{3}$ = 100 km h^{-1} — M1 A1 **(8)**

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2. *(a)*



resolve ↑ : $T_1\sin35° + T_2\sin40° - 0.7g = 0$ (1) — M1 A1

resolve →: $T_2\cos40° - T_1\cos35° = 0$ (2) — M1

from (2), $T_2 = 1.069\ T_1$ — M1

sub. into (1) to get $T_1 = 5.44$ N (3sf) — M1 A1

and so $T_2 = 5.82$ N — A1

(b) e.g. jacket likely to slide to a position near centre of line — B1 **(8)**

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3. *(a)* $t = 0 \Rightarrow \mathbf{v} = 8\mathbf{i} + 6\mathbf{j}$ — M1

speed = $\sqrt{8^2 + 6^2} = 10\ \text{m s}^{-1}$ — M1 A1

(b) parallel to $(\mathbf{i} + \mathbf{j})$ when $3t^2 - 2t + 8 = 5t + 6$ — M1

i.e. $3t^2 - 7t + 2 = 0$ — A1

$(3t - 1)(t - 2) = 0$ — M1 A1

$t = \frac{1}{3}$ or 2 — A1

(c) e.g. improbably large values for the speed of the car — B1 **(9)**

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4. *(a)* moments about O (anticlockwise +ve) = 5(2) + 2(3) — M2

= 16 Nm anticlockwise — A2

(b) resultant about O is zero $\Rightarrow 4p + q = 16$ — M1 A1

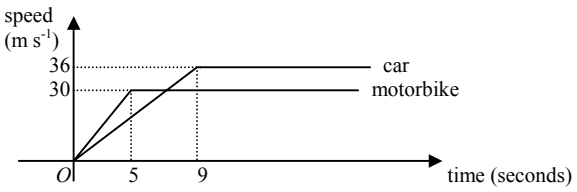
resultant about A is 34 Ns $\Rightarrow 6p + 4q = 34$ — M1 A1

solving simult. $p = 3$, $q = 4$ — M1 A1 **(10)**

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5. *(a)* acc$^{\text{n}}$ = $\frac{36-0}{9} = 4\ \text{m s}^{-2}$ — M1 A1

(b)



B4

(c) after t seconds $s_M = \frac{1}{2}(5)(30) + 30(t - 5)$ (for $t > 5$) — M1 A1

after t seconds $s_C = \frac{1}{2}(9)(36) + 36(t - 9)$ (for $t > 9$) — M1 A1

car level with bike when $s_M = s_C$ i.e. $75 + 30t - 150 = 162 + 36t - 324$ — M2

$t = 14.5$ seconds — A1 **(13)**

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6. *(a)* eqn. of motion for Dermot: $54g - T = 54(1)$ — M1 A1
eqn. of motion for Corinne (mass M) : $T - Mg = M(1)$ — M1 A1
$54g - Mg = 54 + M$ — M1
$M(1 + g) = 54(g - 1)$ — M1
mass of Corinne = 44 kg — A1

(b) $T = 44(1 + 9.8)$ (from eqn. of motion of Corinne) — M2
$T = 475.2$ N — A1

(c) force on pulley = $2T = 950.4$ N — M1 A1

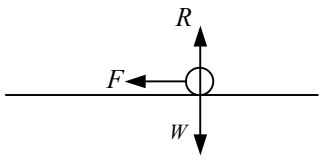
(d) e.g. rough branch will mean lower (possibly zero) acc$^{n.}$ — B1 **(13)**

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7. *(a)* $3M(3) - 2M(5) = {}^{-}3Mv + 2Mv$ — M1 A1
${}^{-}M = {}^{-}Mv$ i.e. $v = 1$ ms^{-1} — M1 A1

(b) $|\, 3M(1 - {}^{-}3) \,| = 24$ — M1 A1
$M = 2$ — A1

(c)



$R = 6g \quad {}^{-}F = ma$ — M2
but $F = \mu R$ so $a = \frac{-\mu R}{m} = \frac{-0.1 \times 6g}{6} = {}^{-}0.98$ ms^{-2} — M1 A1
$u = 1$, $v = 0$, $a = {}^{-}0.98$; use $v = u + at$ — M1
$0 = 1 - 0.98t$ i.e. $t = 1.02$ seconds — M1 A1 **(14)**

Total **(75)**

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Performance Record – M1 Paper C

Question no.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	Total
Topic(s)	dist-time graph	statics	**i**, **j**, vectors	**i**, **j**, moments	speed - time graph, uniform accel.	connected bodies	cons. of mom., impulse, friction	
Marks	8	8	9	10	13	13	14	75
Student								

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