Pearson

Mark Scheme (Results)

Summer 2026

Pearson Edexcel International Advanced Level
In Mechanics M1 (WME01)
Paper 01

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

EDEXCEL IAL MATHEMATICS
General Instructions for Marking

1. The total number of marks for the paper is 75.

2. The Edexcel Mathematics mark schemes use the following types of marks:
   - **M** marks: Method marks are awarded for 'knowing a method and attempting to apply it', unless otherwise indicated.
   - **A** marks: Accuracy marks can only be awarded if the relevant method (M) marks have been earned.
   - **B** marks are unconditional accuracy marks (independent of M marks)

   Marks should not be subdivided.

3. Abbreviations

   These are some of the traditional marking abbreviations that will appear in the mark schemes and can be used if you are using the annotation facility on ePEN:

   - bod – benefit of doubt
   - ft – follow through
     - the symbol $\surd$ will be used for correct ft
   - cao – correct answer only
   - cso – correct solution only. There must be no errors in this part of the question to obtain this mark
   - isw – ignore subsequent working
   - awrt – answers which round to
   - SC – special case
   - oe – or equivalent (and appropriate)
   - d… or dep – dependent
   - indep – independent
   - dp – decimal places
   - sf – significant figures
   - * – The answer is printed on the paper or ag- answer given

- ⌐ or d… – The second mark is dependent on gaining the first mark

4. All A marks are 'correct answer only' (cao), unless shown, for example, as A1 ft to indicate that previous wrong working is to be followed through. After a misread however, the subsequent A marks affected are treated as A ft, but manifestly absurd answers should never be awarded A marks.

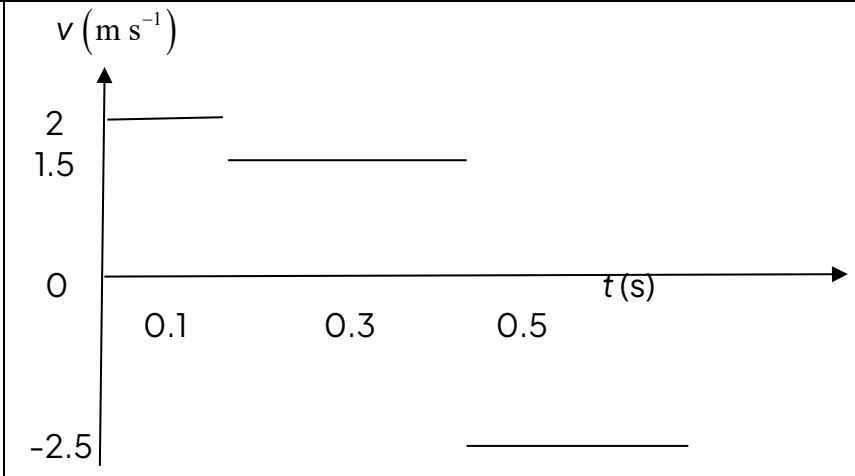
5. For misreading which does not alter the character of a question or materially simplify it, deduct two from any A or B marks gained, in that part of the question affected. If you are using the annotation facility on ePEN, indicate this action by 'MR' in the body of the script.

6. If a candidate makes more than one attempt at any question:
   a) If all but one attempt is crossed out, mark the attempt which is NOT crossed out.
   b) If either all attempts are crossed out or none are crossed out, mark all the attempts and score the highest single attempt.

7. Ignore wrong working or incorrect statements following a correct answer.

Question Number	Answer	Mark
1(a)	$5mu - 3m \times 1.5u = (5m + 3m)v$ or $5mu - 3m \times 1.5u = -(5m + 3m)v$	M1 A1
	$\frac{u}{16}$, 0.0625u oe isw	A1 (3)
1(b)	$\pm 5m\left(\frac{u}{16} - u\right)$ **OR** $\pm 3m\left(\frac{u}{16} - -\frac{3u}{2}\right)$	M1 A1**ft**
	$\frac{75mu}{16}$, 4.6875mu oe isw	A1 (3)
		(6)
	Notes	
1(a)	M1: CLM with correct terms, condone sign errors, cancelled m's or consistent extra g's. Must have $(5m + 3m)v$ or $-(5m + 3m)v$ M0 if a 'u' is missing	
	A1: Correct equation	
	A1: Accept 0.063u or better. Must be positive and of the form ku, where k is a single decimal or fraction $\frac{p}{q}$, where p and q are positive whole numbers.	
1(b)	M1: Impulse-momentum, dimensionally correct with correct terms, condone sign errors, masses and velocities must be paired correctly Allow with their v from (a) provided their v is a multiple of u M0 if m is missing or g included or if m is used for the mass.	
	A1**ft**: Correct expression, ft on their answer to (a), allow to 2sf or better.	
	A1: Accept 4.7mu or better (must be positive) isw	

Question Number	Answer	Mark
	N.B. Only penalise overaccuracy after use of g = 9.8 ONCE for the question Omission of g is an A error not an M error.	
2(a)	M(P): $4T_Q = 20g \times 3.5$	M1A1
	Other possible equations: $T_P + T_Q = 20g$ M(A): $0.5T_P + 4.5T_Q = 20g \times 4$ M(G): $3.5T_P = 0.5T_Q$ M(Q): $4T_P = 20g \times 0.5$ M(B): $5.5T_P + 1.5T_Q = 20g \times 2$ from which T_P would need to be eliminated to give an equation in T_Q only	
	$(T_Q =)$ 170 or 172 (N) isw	A1 (3)
2(b)	M(B): $1.5X = 20g \times 2$	M1A1
	$(X =)$ 260 or 261 isw	A1 (3)
	Other possible equations: $(\uparrow)$: $X = 20g + mg$ M(A): $4.5X = 6mg + (20g \times 4)$ M(G): $0.5X = 2mg$ M(P): $4X = 20g \times 3.5 + mg \times 5.5$ M(Q): $1.5mg = 20g \times 0.5$ from which m would need to be eliminated to give an equation in X or T_Q only	
		(6)
	Notes	
2(a)	M1: Complete method to obtain an equation in T_Q only	
	A1: Correct equation	
	A1: Accept 17.5g oe. A0 for 171.5	
2(b)	M1: Complete method to obtain an equation in X or T_Q only	
	A1: Correct equation	
	A1: Accept $\frac{80g}{3}$ oe	

Question Number	Answer	Mark
3(a)	0 (m)	B1 (1)
3(b)	1 (m)	B1 (1)
3(c)		B1 1st line B1 2nd line B1 3rd line B1 figures (4)
3(d)	$\pm 0.04(-2.5-1.5)$	M1A1
	0.16 Ns or kg m s^{-1}	A1 B1 (4)
		(10)
	Notes	
3(a)	B1: cao	
3(b)	B1: cao (must be positive)	
3(c)	B1: Horizontal line between 0 and 0.1	
	B1: Horizontal line between 0.1 and 0.3, with a smaller *v* value than the first line.	
	B1: Horizontal line between *t* = 0.3 and *t* = 0.5, with a negative *v* value.	
	B1: All figures clearly marked and correct, **dependent** on all three lines being **horizontal**.	
	N.B. Allow dotted vertical lines. Subtract max 1 if any solid vertical lines are included from FIRST B1 earned.	
3(d)	M1: Impulse-momentum expression using their velocities either side of *t* = 0.3, which must be non-zero and different and come from use of $v = \pm\frac{s}{t}$, condone sign errors. M0 if 0.04 omitted or *g* included.	
	A1: Correct expression	
	A1: cao (must be positive)	
	B1: correct units seen	

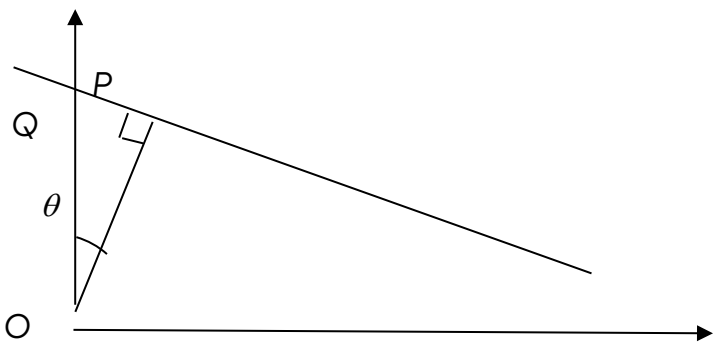
Question Number	Answer	Mark
4(a)	$24^2 = (-U)^2 + 2g \times 28.4$	M1A1
	(U =) 4.4	A1 (3)
	ALT 1: $28.4 = 24t - \frac{1}{2}gt^2 \Rightarrow t = \frac{142}{49}$ or 2	
	$24 = -U + g \times \frac{142}{49}$	M1A1
	(U =) 4.4	A1 (3)
	ALT 2: Using energy: $\frac{1}{2}m(24^2 - U^2) = mg \times 28.4$	M1A1
	(U =) 4.4	A1 (3)
4(b)	**ALT 1**: $4 = 12t - \frac{1}{2}gt^2$	M1
	t = 0.398022…. or 2.050957…	A1
	Difference of roots **OR** time to top = $\frac{12}{9.8} = 1.224$ **and** $2 \times (1.224 - 0.3980..)$	**dM**1
	Answer: 1.7 or 1.65 (s) Do **not** apply isw.	A1
	$4 = 6t - \frac{1}{2}gt^2$	M1
	No roots.	A1 (6)
	ALT 2: $v = \sqrt{12^2 - 2 \times 9.8 \times 4} = 8.099..$ so half time = $\frac{8.099..}{9.8}$ Or time from ground to 4 m given by $\frac{12 - 8.099..}{9.8}$	M1
	half time = 0.826.. or time from ground to 4 m = $0.3980..$	A1
	Total time = 2 × 0.826..	**dM**1
	Answer: 1.7 or 1.65 (s)	A1
	$v = \sqrt{6^2 - 2 \times 9.8 \times 4}$ **OR** $0 = 6^2 - 2 \times 9.8 \times h \Rightarrow h = 1.8..$	M1
	No real value **OR** 1.8.. < 4	A1 (6)
	ALT 3: $0 = 12^2 - 2 \times 9.8h$ so $h =$ 7.3469.. $(7.3469.. - 4) = \frac{1}{2} \times 9.8t^2$ **OR** $0^2 = v^2 - 2 \times 9.8 \times 3.3469 \Rightarrow v = 8.099..$ so half time = $\frac{8.099..}{9.8}$	M1
	half time, t = 0.826..	A1

	Total time = 2 × 0.826..	**dM**1
	Answer: 1.7 or 1.65 (s)	A1
	$v = \sqrt{6^2 - 2\times 9.8\times 4}$ **OR** $0 = 6^2 - 2\times 9.8\times h \Rightarrow h = 1.8..$	M1
	No real value **OR** 1.8.. < 4	A1 (6)
		(9)
	Notes	
4(a)	M1: Complete method to find an equation in *U* (or *u*) only. Condone sign errors. **ALT** M0: if they use the smaller of their two times.	
	A1: Correct equation in *U* only.	
	A1: cao. A0 for a fraction.	
4(b)	M1: Complete method to find a relevant time. Condone sign errors. M0 if use of 12 is not seen	
	A1: **One** correct relevant time (0.398022…. or 2.050957…) Allow rounded to 2sf or better	
	dM1: Complete method to find required time, dependent on M1	
	A1: cao	
	M1: Complete method to show it never reaches a height of 4 m again **N.B.** This is an independent M mark M0 if use of 6 is not seen.	
	A1: Correct relevant statement	

Question Number	Answer	Mark
	N.B. An extra g on 50 is an A error not an M error. Use of an incorrect angle consistently, should be marked as a Misread, but if used inconsistently M0.	
5.	$F + X\cos 40^\circ = 50\cos 70^\circ$	M1A1
	$R + X\sin 40^\circ = 50\sin 70^\circ$	M1A1
	Other possible equations: $(\rightarrow): X\cos 60^\circ + F\cos 20^\circ = R\sin 20^\circ$ $(\uparrow): X\sin 60^\circ + F\sin 20^\circ + R\cos 20^\circ = 50$	
	$F = 0.3R$	B1
	(X =) 5.2 or better (5.2435…)	A1 (6)
		(6)
	Notes	
5.	M1: Correct no. of terms, condone sign errors and sin/cos confusion Correct pairings of forces and angles.	
	A1: Correct 1st equation	
	M1: Correct no. of terms, condone sign errors and sin/cos confusion Correct pairings of forces and angles	
	A1: Correct 2nd equation	
	B1: Seen or implied – R does not need to be substituted	
	A1: 5.2 or better	
	N.B. Enter marks on ePEN, for the two equations, in the order in which they appear in the script. If they only write down a **SINGLE** equation which is a combination of their two equations: e.g. $0.3(\text{their } R) + X\cos 40^\circ = 50\cos 70^\circ$ Enter the marks for the bracketed 'equation' as the second M1A1	

Question Number	Answer	Mark
6(a)	$\sqrt{(-5)^2+6^2}$	M1
	$\sqrt{61}$ (N)	A1 (2)
6(b)	e.g. $\tan\alpha=\frac{1}{2}$ or $\frac{2}{1}$ **OR** $\sin\alpha=\frac{1}{\sqrt{5}}$ or $\frac{2}{\sqrt{5}}$ **OR** $\cos\alpha=\frac{1}{\sqrt{5}}$ or $\frac{2}{\sqrt{5}}$ **OR** $\tan\beta=\pm\frac{5}{6}$ or $\pm\frac{6}{5}$ **OR** $\sin\beta=\pm\frac{5}{\sqrt{61}}$ or $\pm\frac{6}{\sqrt{61}}$ **OR** $\cos\beta=\pm\frac{5}{\sqrt{61}}$ or $\pm\frac{6}{\sqrt{61}}$	M1
	$76.75948....^\circ$ or $283.245019....^\circ$	A1
	e.g. Required angle = 103°	A1 (3)
	SC: $\cos^{-1}\left(\frac{(2\mathbf{i}+\mathbf{j}).(-5\mathbf{i}+6\mathbf{j})}{\sqrt{2^2+1^2}\times\sqrt{(-5)^2+6^2}}\right)$ $=\cos^{-1}\left(\frac{-4}{\sqrt{305}}\right)$ **OR** $\cos^{-1}\left(\frac{(5^2+6^2)+(1^2+2^2)-(5^2+7^2)}{2\sqrt{(5^2+6^2)}\sqrt{(1^2+2^2)}}\right)$	M1 A1 M1A1
	= 103°	A1
6(c)	$a(-\mathbf{i}+2\mathbf{j})+b(2\mathbf{i}-3\mathbf{j})=(-5\mathbf{i}+6\mathbf{j})$ with $a\neq b$	M1
	$-a+2b=-5$ and $2a-3b=6$	M1
	$a=-3, b=-4$ seen or implied	A1
	$\mathbf{F}_1=(3\mathbf{i}-6\mathbf{j})$ and $\mathbf{F}_2=(-8\mathbf{i}+12\mathbf{j})$	A1 (4)
	ALT 1	
	$(a\mathbf{i}+b\mathbf{j})+(c\mathbf{i}+d\mathbf{j})=(-5\mathbf{i}+6\mathbf{j})$ **and** $\frac{a}{b}=-\frac{1}{2}$ oe **and** $\frac{c}{d}=-\frac{2}{3}$ oe seen	M1
	Two equations in two unknowns	M1
	$a=3, b=-6, c=-8, d=12$ seen or implied	A1
	$\mathbf{F}_1=(3\mathbf{i}-6\mathbf{j})$ and $\mathbf{F}_2=(-8\mathbf{i}+12\mathbf{j})$	A1 (4)
		(9)
	Notes	
	Allow use of column vectors throughout including for answers	
6(a)	M1: Pythagoras with root	
	A1: Accept 7.8 or better (7.810249676..) (N)	
6(b)	M1: Complete method to find one relevant angle, seen or implied	

	e.g. allow reciprocals or negatives or use of sin or cos	
	A1: Seen or implied by correct answer i.e . $\alpha+\beta$ or $360^o-(\alpha+\beta)$ **N.B.** Accept to the nearest whole number or better.	
	A1: Accept 103° or better (103.2405..) **OR** 257° or better (256.759..)	
6(c)	M1: Correct vector equation in 2 unknowns, seen or implied	
	M1: Complete method to obtain two **scalar** equations in two unknowns **N.B.** This is an independent M mark.	
	A1: Correct values for ALL unknowns **N.B.** Could be implied by two correct forces if neither or only one correct value is seen.	
	A1: Two correct vectors.	

Question Number	Answer	Mark
7(a)	$(\mathbf{r} =)\ (a\mathbf{i}+b\mathbf{j}) + t(-2\mathbf{i}+\mathbf{j})$	M1
	$(11\,\mathbf{i}+3.5\mathbf{j}) = (a\mathbf{i}+b\mathbf{j}) + 1.5(-2\mathbf{i}+\mathbf{j})$ oe	M1
	ALT for first two marks: $(11\,\mathbf{i}+3.5\mathbf{j})+(t-1.5)(-2\mathbf{i}+\mathbf{j})$	(M1 M1)
	$(\mathbf{r} =)\ (14\mathbf{i}+2\mathbf{j}) + t(-2\mathbf{i}+\mathbf{j}) = (14-2t)\mathbf{i}+(2+t)\mathbf{j}$ (km) *	A1* (3)
7(b)	$(14-2t)^2+(2+t)^2=9^2$ oe	M1
	$t = 7$ or 3.4	A1
	Subtract roots (which must both be positive)	M1
	3.6 (hours) oe	A1 (4)
7(c)	$14-2t=-(2+t)$	M1
	$t = 16$	A1 (2)
7(d)	$\dfrac{14-2t}{2+t}=\dfrac{1}{2}$ **ALT 1** $[(14-2t)\mathbf{i}+(2+t)\mathbf{j}].(-2\mathbf{i}+\mathbf{j})=0$ $-2(14-2t)+(2+t)=0$ **ALT 2** $2(14-2t)\times(-2)+2(2+t)=0$ (derivative) i.e. $10t-52=0$ **ALT 3** Equn of path is $y-2=-\dfrac{1}{2}(x-14)$ and OP is $y=2x$ so at P $2x-2=-\dfrac{1}{2}(x-14)$	M1 A1
	$t = 5.2$ or $x = 3.6$	A1
	$(\overrightarrow{OP}) = (3.6\mathbf{i}+7.2\mathbf{j})$ (km) or (3.6,7.2)	**dM**1
	$OP=\sqrt{3.6^2+7.2^2}$	M1
	$=\dfrac{18\sqrt{5}}{5}$ km*	A1* (6)
	SC:  	
	At Q, $14-2t=0\Rightarrow t=7$	M1A1
	so, OQ = 2 + 7 = 9	A1

	$\tan\theta = \frac{1}{2}$ oe	**dM**1
	$OP = OQ\cos\theta = 9\times\frac{2}{\sqrt{5}} = \frac{18\sqrt{5}}{5}$ km *	M1A1* (6)
		(15)
	Notes	
	N.B. Column vectors can be used throughout apart from in the answer to (a)	
7(a)	M1: Correct structure seen or implied	
	M1: Use of given information to give correct vector equation M0 for $(11\,\mathbf{i}+3.5\mathbf{j}) + 1.5(-2\mathbf{i}+\mathbf{j}) = (a\mathbf{i}+b\mathbf{j})$	
	A1*: Given answer correctly obtained with clear working including $(\mathbf{r} =)\ (14\mathbf{i}+2\mathbf{j}) + t(-2\mathbf{i}+\mathbf{j})$ or equivalent in column vector form. **N.B.** Allow **i** and/or **j** in front of a bracket in the final answer. **N.B.** Simple verification using the given answer is M0M0 unless $(\mathbf{r} =)\ (a\mathbf{i}+b\mathbf{j}) + t(-2\mathbf{i}+\mathbf{j})$ is seen first. If they start with:: $(\mathbf{r} =)\ (14\mathbf{i}+2\mathbf{j}) + t(-2\mathbf{i}+\mathbf{j})$, M0M0A0	
7(b)	M1: Correct equation or inequality, allow with square root. **N.B.** Condone inequality the wrong way round.	
	A1: Two correct roots	
	M1: Correct method	
	A1: oe	
7(c)	M1: Complete method to obtain an equation in *t* only including negative sign	
	A1: cao	
7(d)	M1: Complete method to obtain **an equation in t** or *x* **only**, allow a sign error but not reciprocal. May use a derivative.	
	A1: Correct equation in *t* or *x* only	
	A1: cao	
	dM1: Use their calculated *t* or *x* to find **OP,** dependent on previous M mark	
	M1: Use of Pythag, with square root, must have found a single value of *t* and used it to find *OP*	
	A1*: Correct answer from correct working A0* if they use decimals	

Question Number	Answer	Mark
8.	**N.B.** In parts (a) and (c), $g = 9.8$ could appear in the working but final answers must be using g. For any equation of motion, if they use an incorrect mass in the '*ma*' term, award M0 for the equation.	
8(a)	$R = 3mg\cos\alpha$	M1A1
	$F = \frac{1}{4}\times 3mg\times\frac{4}{5} = \frac{3mg}{5}$	A1 (3)
8(b)	$T = 2ma$	B1 (1)
8(c)	$3mg\sin\alpha - T - F = 3ma$ $\left(\frac{6mg}{5} - T = 3ma\right)$ **OR:** $3mg\sin\alpha - F = 5ma$	M1A1
	Solve their equations, both of which must have an 'mass x accln' term, for T in terms of mg	M1
	$(T =)\ \frac{12mg}{25}$ *	A1* (4)
8(d)	Same acceleration for both particles	B1 (1)
8(e)	Downwards at $\left(90^\circ - \frac{1}{2}\alpha\right)$ oe to the horizontal plane oe	B1 (1)
8(f)	$2T\sin\frac{1}{2}\alpha$ **OR** $\sqrt{2T^2 - 2T^2\cos\alpha}$ **OR** $\sqrt{(T - T\cos\alpha)^2 + (T\sin\alpha)^2}$	M1A1
	Put $T = \frac{12mg}{25}$ and substitute for trig. to give an answer in the form kmg	**dM**1
	$\frac{12mg\sqrt{10}}{125}$, Accept $0.3mg$, $0.30mg$ or better $(0.3035786\ldots.mg)$	A1 (4)
		(14)
	Notes	
8(a)	M1: Resolve perp to the plane, correct terms, condone cos/sin confusion and sign errors. Allow if they use $\cos(\frac{4}{5})$ or similar.	
	A1: Correct equation	
	A1: oe e.g. $0.6mg$	
8(b)	B1: cao.	
8(c)	M1: Equation of motion for A or whole system, correct terms, condone cos/sin confusion and sign errors. Allow if they use $\sin(\frac{3}{5})$ or similar.	
	A1: Correct equation	
	M1: Sub for trig and solve for T in terms of mg i.e. must be of the form kmg	
	A1*: Correct given answer correctly obtained	

8(d)	B1: cao B0 for acceleration throughout the string is constant B0 for the acceleration (each side) is the same B0 if any extra incorrect answers are included, e.g. mention of tension	
8(e)	B1: Accept a clear diagram with an arrow showing $\left(90^{\circ}-\frac{1}{2}\alpha\right)$ oe. B0 for any reference to a bearing or direction	
8(f)	M1A1: **Correct** expression in terms of T and α only. **N.B.** M1A0 is not possible.	
	dM1: Substitute for T and trig to give kmg, dependent on first M1	
	A1: Must be positive and in terms of mg.	