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Mark Scheme (Results)

Summer 2024

Pearson Edexcel International GCSE
In Mathematics B (4MB1) Paper 02

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Summer 2024
Question Paper Log Number P76504A
Publications Code 4MB1_02_2406_MS
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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.

- **Types of mark**
  - M marks: method marks
  - A marks: accuracy marks
  - B marks: unconditional accuracy marks (independent of M marks)

Abbreviations

- cao – correct answer only
- cso – correct solution only
- ft – follow through
- isw – ignore subsequent working
- SC – special case
- oe – or equivalent (and appropriate)
- dep – dependent
- indep – independent

- awrt – answer which rounds to
- eeoo – each error or omission
- cas – Correct answer scores full marks (unless from obvious incorrect working)
- wr – working required

No working

If no working is shown then correct answers normally score full marks
If no working is shown then incorrect (even though nearly correct) answers score no marks.

With working

If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks.

If a candidate misreads a number from the question: eg. uses 252 instead of 255; follow through their working and deduct 2A marks from any gained provided the work has not been simplified. (Do not deduct any M marks gained.)

If there is a choice of methods shown, then award the lowest mark, unless the subsequent working makes clear the method that has been used

Examiners should send any instance of a suspected misread to review (but see above for simple misreads).

Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: eg. Incorrect cancelling of a fraction that would otherwise be correct.
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect eg algebra.
Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded to another.

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Question		Working	Answer	Mark	Notes
1	(a)		1.596×10^{-5}	1	B1 ISW
	(b)	$\frac{81460000000000}{3142.7}\left[=2.5920...\times10^{10}\right]$		4	M1 for use of Speed = distance / time. Condone missing zeros or incorrect standard form for numerator/denominator. Allow if clear trying to use 81 460 000 000 000 (eg 460 000 000 000) and 3142.7
		$\frac{"2.5920...\times10^{10}"}{60\times60\times24}\left[=\frac{"2.5920...\times10^{10}"}{86400}\right]$			M1 for using a correct method to change their Speed from km/day to km/second.
		300 004			A1 awrt 300000 Dependent on both M marks being awarded.
			3×10^{5}		A1 from correct working. Dependent on both M marks being awarded. Allow awrt 3.0×10^{5}
	ALT	$3142.7\times60\times60\times24\left[=2.715...\times10^{8}\right]$			M1 for using a correct method to change 3142.7 days to seconds or allow for 271529280 given to minimum of 3sf
		$\frac{81460000000000}{"2.715...\times10^{8}"}$			M1 for use of Time = distance / speed. Condone missing zeros or incorrect standard form for numerator/denominator. Allow if clear trying to use 81 460 000 000 000(eg 460 000 000 000) and their changed 3142.7
		300004			A1 awrt 300000 Dependent on both M marks being awarded.
			3×10^{5}		A1 from correct working. Dependent on both M marks being awarded Allow awrt 3.0×10^{5}
		wr			***Total 5 marks***

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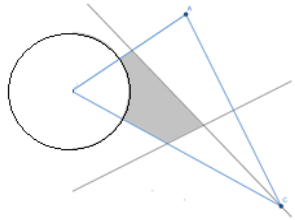
Question		Working	Answer	Mark	Notes
2	(a)		a circle centre *B* with radius 3 cm	1	B1 full circle drawn. Use overlay
	(b)		a correct *perpendicular* bisector of AC with arcs shown	2	B2 for a correct bisector with [2 pairs of arcs] **or** [2 arcs centre *C* and the cross drawn] (use overlay) must cross/touch *AC* **NB** bisector does not need to cross/touch *BC* (B1 for a bisector without arcs or only one pair drawn or correct arcs without bisector drawn. Arcs must cross within the lines on the overlay or would if they were extended
	(c)		a correct bisector with arcs shown	2	B2 for a correct bisector with arcs (use overlay) (B1 for a bisector without arcs or correct arcs without bisector drawn) NB bisector does not need to cross/touch *AB*
	(d)		correct region shaded	1	B1ft only follow through if they have a circle centre *B* of any radius (allow partial circle of any radius that crosses *BA* and *BC*) and at least B1 for bisector drawn in part (b) and part (c) with the 3 loci being a boundary of the area. The angle bisector must cross AB and the perpendicular bisector must cross BC. Only allow if the correct area is shaded.
					Total 6 marks

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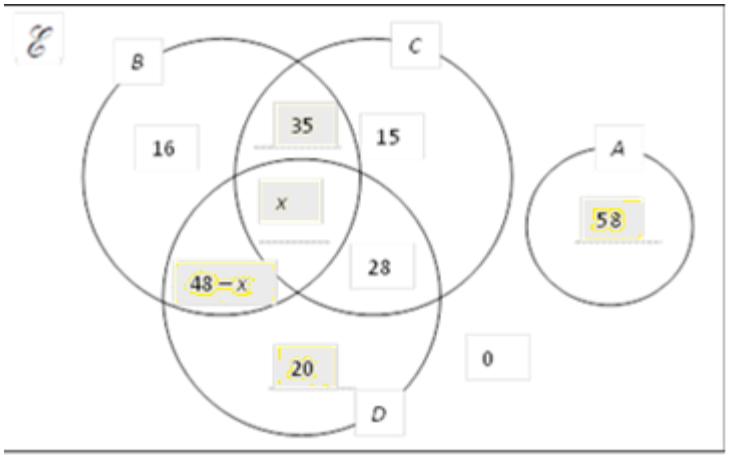
Question		Working	Answer	Mark	Notes
3	(a)			3	B3 All 5 shaded regions correct B2 3 or 4 shaded regions correct B1 2 shaded regions correct
	(b)	$16+"48-x"+"20"+"58"[+0]=105$ oe **or** $"35"+"x"+15+28=115$ oe		2	M1 ft their values providing they are not blank or 0 and at least one region contains an expression in terms of x. Allow their ft equation if simplified eg $"142"-"x"=105$ **or** $"78"+"x"=115$ For adding their values and equating to 105 or 115 to form an equation in terms of x Do not award if the x terms would cancel each other out when simplified
			37		A1 cao
	(c)		$\frac{16}{220}$	1	B1 oe eg $\frac{4}{55}$ Allow 0.0727 or better. We will condone 7.27% or better (actual 0.0727272...)
	(d)		$\frac{43}{220}$	1	B1 oe do not allow $\frac{15+28}{220}$ Allow 0.195 or better. We will condone 19.5[%] or better (actual 0.1954545…)
		cas			***Total 7 marks***

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Question		Working	Answer	Mark	Notes
In this question ignore any labelling on the triangles					
4	(a)		correct triangle *B* drawn	2	B2 correct triangle drawn (–2, –3) (–7, –5)(–5,–1) Award 2 marks for a correct triangle drawn irrespective of working in the working space. (B1 for 2 correct vertices plotted correctly or a triangle of the correct size and orientation, or 3 correct vertices listed)) SC B1 for a correct reflection applied to triangle *A* in the *y*-axis. [vertices (2, 3) (5, 1) (7, 5)] or for a correct reflection in the *x* – axis applied to triangle *D* [vertices (1, 0) (7, –4) (11, 4)]
	(b)		correct triangle *C* drawn	2	B2 correct triangle drawn (3, 2) (5, 7)(1, 5) (B1 for 2 points correct or for 90° clockwise rotation but incorrect position or for correct rotation of 90° around (0, 0) anticlockwise (–3, –2) (–1, –5)(–5, –7))
	(c)		Enlargement	3	B1 allow enlarge. Do not allow bigger B0 if multiple transformations stated. Multiple transformations are when more than one of reflection (mirrored), rotation (turn), translation (move), is stated eg a vector or SF or equation of a line do not imply multiple transformations
			Centre (–1, 2)		B1 for (–1, 2) Do not accept if written as a column vector. These two marks can still be awarded if multiple transformations are stated
			SF –2		B1 for –2
	(d)	$\begin{pmatrix} -1 & -1 \\ 0 & -2 \end{pmatrix}\begin{pmatrix} -2 & -5 & -7 \\ 3 & 1 & 5 \end{pmatrix}$		3	M1 for the intention to multiply the right way. Points can be in any order. May be implied by writing the matrices in the correct order or correctly stating or plotting one point.
		$=\begin{pmatrix} -1 & 4 & 2 \\ -6 & -2 & -10 \end{pmatrix}$			M1 for at least two correct columns or correctly stating or plotting two points.
			correct triangle *E* drawn		A1 correct triangle drawn NB Award 3 marks for a correct triangle drawn irrespective of working in the working space.

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	(e)	$\mathbf{M}^{-1} = \begin{pmatrix} -1 & 0.5 \\ 0 & -0.5 \end{pmatrix}$ or matrix for reflection in x-axis is $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$ or $\begin{pmatrix} a & b \\ c & d \end{pmatrix}\begin{pmatrix} -1 & 4 & 2 \\ -6 & -2 & -10 \end{pmatrix} = \begin{pmatrix} -2 & -5 & -7 \\ -3 & -1 & -5 \end{pmatrix}$		3	M1 for a correct inverse matrix for **M** or correct matrix for reflection in the x-axis or for setting up a correct matrix equation. Points in any order but the order must be the same in both matrices
		$\mathbf{N} = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}\begin{pmatrix} -1 & 0.5 \\ 0 & -0.5 \end{pmatrix}$ or 2 of $\begin{bmatrix} -a-6b=-2 \\ 4a-2b=-5 \\ 2a-10b=-7 \end{bmatrix}$ and 2 of $\begin{bmatrix} -c-6d=-3 \\ 4c-2d=-1 \\ 2c-10d=-5 \end{bmatrix}$			M1 dep on M1 fully correct product or 2 correct equations from each set (any letters) May be implied by a correct answer
			$\begin{pmatrix} -1 & 0.5 \\ 0 & 0.5 \end{pmatrix}$		A1 cao
		cas			***Total 13 marks***

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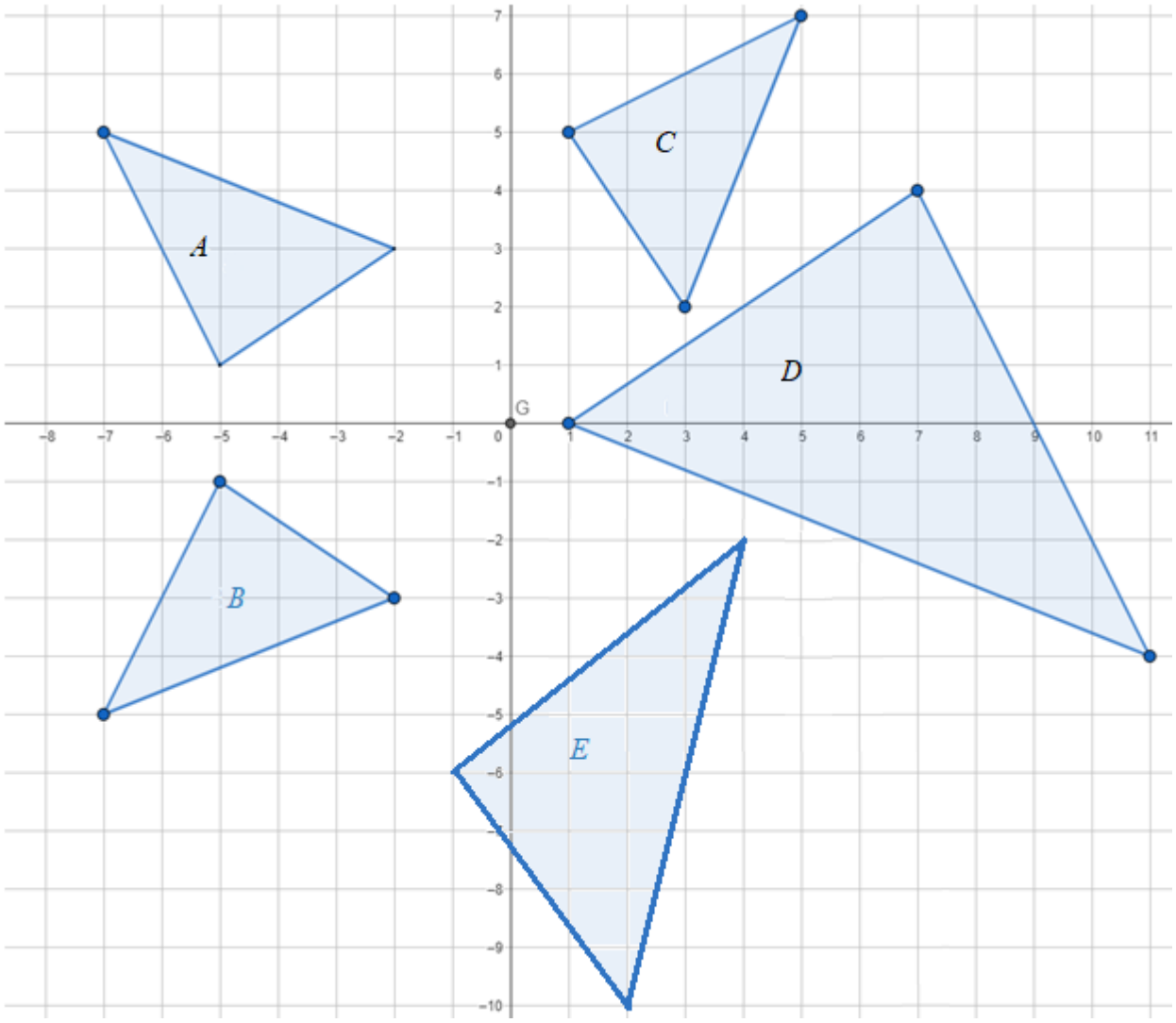

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Question		Working	Answer	Mark	Notes
5		$\frac{\mathrm{d}x}{\mathrm{d}t} = 2kt - 3t^2$		5	M1 Attempt to differentiate ie $t^n \to t^{n-1}$ for at least one term
		$4k - 3\times 4 = 24 \left[\Rightarrow k = 9\right]$ oe			M1 dep on the first M1 being awarded. subst t = 2 into their differential and equating to 24 leading to a value for $k \neq 0$
		$2\times "9"t - 3t^2 = 0 \left[\Rightarrow t = 0 \text{ or } t = 6\right]$			M1 dep on the first M1 being awarded. subst their value of k into their differential and equating to 0 leading to a value for $t > 0$
		$\left[x =\right] "9"\times "6"^2 - 6^3$			M1 dep on 2 of the previous 3 method marks being awarded. subst their positive value of $t \neq 2$ and $k \neq 0$ into the equation for x. If t or k is incorrect working must be shown.
			108		A1 Do Not ISW
		cas			***Total 5 marks***

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Question		Working	Answer	Mark	Notes
6	(a)		0.4	1	B1 allow $\frac{2}{5}$ oe
	(b)	"0.4"×"0.4"		2	M1 ft their answer to part (a) If no working shown you may need to check their answer follows form (a) for this mark eg if (a) is 0.6 award M1A0 for 0.36
			0.16		A1 allow $\frac{4}{25}$ oe
	(c)		84	1	B1
	(d)	$\frac{\frac{1}{2}n}{n}\times\frac{\frac{1}{2}n-1}{n-1}\times\frac{\frac{1}{4}n}{n-2}$ oe		6	M2 A fully correct expression. (M1 for setting up an expression with at least one of the numerators correct and all the denominators correct eg $\frac{\frac{1}{2}n}{n}\times\frac{\frac{1}{2}n-1}{n-1}\times\frac{\frac{1}{4}n}{n-2}\times m$ where m is an integer for M1)
		$\frac{1}{2}\times\frac{1}{2(n-1)}\times\frac{n}{4}=\frac{5}{78}$ oe or $39\times(\frac{1}{2}n-1)\times\frac{1}{4}n=5\times(n-1)(n-2)$ oe			M1dep on M2 for forming a correct equation and realising that $(n-2)$ can be cancelled eg $\frac{n}{16(n-1)}=\frac{5}{78}$ or for forming a correct quadratic equation by removing all terms in n correctly from the denominator eg $\frac{39}{4}n^2-\frac{39}{2}n=10n^2-30n+20$ May be implied by $n = 40$
		$78n=80n-80$ or $n^2-42n+80=0$			M1 dep on M3 for removing the fractions to get a **correct** linear equation, or a **correct** 3 term quadratic equation or $n = 40$
		$\frac{\frac{1}{4}\times"40"}{"40"}\times\frac{\frac{1}{4}\times"40"-1}{"40"-1}\times\frac{\frac{1}{4}\times"40"-2}{"40"-2}$			M1 A correct method to the required probability. Only ft their value of n if a positive integer and working shown. May be implied by $\frac{3}{247}$ or 0.05th m1 which 12[145…]
		cas	$\frac{3}{247}$		A1 or equivalent fraction. Do **Not** allow written as a decimal
		PTO for ALT for (d)			

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ALT	(d)	$\frac{2x}{4x}\times\frac{2x-1}{4x-1}\times\frac{x}{4x-2}$ oe or $\frac{y}{2y}\times\frac{y-1}{2y-1}\times\frac{\frac{1}{2}y}{2y-2}$ oe			M2 A fully correct expression. x is the number of blue/green counters, y is the number of red counters (M1 for setting up an expression with at least one of the numerators correct and all the denominators correct eg $\frac{2x}{4x}\times\frac{2x-1}{4x-1}\times\frac{x}{4x-2}\times m$ where m is an integer for M1)
		$\frac{1}{2}\times\frac{1}{4x-1}\times\frac{x}{2}=\frac{5}{78}$ or $\frac{1}{2}\times\frac{1}{2y-1}\times\frac{y}{4}=\frac{5}{78}$ or $39\times(2x-1)\times x=5\times(4x-1)(4x-2)$ or $39\times y=20\times(2y-2)$			M1dep on M2 for forming an equation and realising that $(2x-1)$ or $(4x-2)$ or $(y-1)$ can be cancelled or for forming a quadratic equation by removing all terms in x or y correctly from the denominator May be implied by $x=10$ or $y=20$
		$78x=80x-20$ or $78y=80y-40$ or $2y^2-42y+40=0$ or $2x^2-21x+10=0$			M1 dep on M3 for removing the fractions to get a correct linear equation, or a correct 3 term quadratic equation or $x=10$ or $y=20$
		$\frac{"10"}{4\times"10"}\times\frac{"10"-1}{4\times"10"-1}\times\frac{"10"-2}{4\times"10"-2}$ or $\frac{\frac{1}{2}\times"20"}{2\times"20"}\times\frac{\frac{1}{2}\times"20"-1}{2\times"20"-1}\times\frac{\frac{1}{2}\times"20"-2}{2\times"20"-2}$			M1 a correct method to the required probability. Only ft their value of x or y if a positive integer and working shown. May be implied by $\frac{3}{247}$ or 0.012[145…]
			$\frac{3}{247}$		A1 or equivalent fraction. Do **Not** allow written as a decimal
		cas			***Total 10 marks***

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Question		Working	Answer	Mark	Notes
7	(a)	$[BF =]\dfrac{40}{\sin 30}$ or $\dfrac{40}{\cos 60}$ or $\sqrt{\left(\dfrac{40}{\tan 30}\right)^2 + 40^2}$ $[=80]$ **or** $\sin 30 = \dfrac{40}{BF}$ **or** $\cos 60 = \dfrac{40}{BF}$		3	M1 for a fully correct method or expression to find *BF* eg $\dfrac{BC}{\sin 60} = \dfrac{40}{\sin 30}$ **and** $BF^2 = 40^2 + "4800"$ **(NB** $BC^2 = 4800$ and $BC = 40\sqrt{3}$ or 69.2[82...]**)** Allow any letters for *BF*
		eg $\left[EH^2 =\right] 100^2 + ("80" - 57.5)^2$ **or** $\left\{\begin{array}{l}\tan \angle FEH = \dfrac{"80" - 57.5}{100}\ [\Rightarrow \angle FEH = 12.68...]\ \textbf{and}\\ EH = \dfrac{100}{\cos("12.68...")}\end{array}\right\}$			M1 dependent on M1being awarded. for a fully correct method to find EH^2 or *EH* eg $\left[EH^2 =\right] 100^2 + (22.5)^2$ or $[EH =]\sqrt{100^2 + (22.5)^2}$ condone $100^2 + (57.5 - "80")^2$
		wr $\quad [EH =]\sqrt{10506.25} \Rightarrow EH = 102.5$			A1oe dep on both previous M marks being awarded. for a fully correct expression for EH^2 or *EH* seen leading to 102.5 eg $\left[EH^2 =\right] 100^2 + (22.5)^2$ or 10506.25 or $[EH =]\sqrt{100^2 + (22.5)^2}$ or $\sqrt{10506.25}$ or $\dfrac{100}{\cos(12.68...)}$
	(b)	***X* is a point on the line *FC* such that *HX* is horizontal and *Y* is a point on the line *BC* such that *HY* is vertical**			
		$[HX$ or $YC =]("80" - 57.5)\cos 30$ $\sqrt{80^2 - 40^2} - 57.5\cos 30$ or $19.4[85...]$		5	M1 for a fully correct method to find *HX* (the distance from *H* to *FC*) eg $("80" - 57.5)\sin 60$ Allow 19.4 or 19.5 Allow awrt 19 from correct working
		$[CX$ or $YH =]57.5\sin 30$ **or** $\dfrac{57.5}{"80"} \times 40$ **or** $40 - ("80" - 57.5)\sin 30$ **or** 28.75 **or** 28.8			M1 for a fully correct method to find *CX* (the height of *H* above *BC*) Allow 29 from correct working
		$\left[DH^2 =\right] 100^2 + ("19.485...")^2 + ("28.75")^2 [=11206.25]$ **or** 11206 **or** 11200 or [D*H* =] 105.8…			M1 dep on both previous M marks being awarded. For a fully correct method to find DH^2 or D*H* ft their *HX* and *CX* if clearly labelled or comes from correct working. Allow 11000 from correct working or awrt 105 or 106
		$\cos \angle EHD = \dfrac{102.5^2 + 11206.25 - 40^2}{2 \times 102.5 \times \sqrt{11206.25}}\ [= 0.92679...]$ oe			M1 dependent on all 3 method previous M marks being awarded. For a fully correct method to find $\cos \angle EHD$. For 11206.25 allow (awrt 105 or awrt 106)^2
		cas	22.1		A1 awrt 22.1 Allow 22.2 or 22 or 22.0 from correct working
					Total 8 marks

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Question		Working	Ans	Mark	Notes
8	(a)	$\frac{54}{6}\times 4$ oe		2	M1 for a correct method to find number of watches May be seen within a ratio ie 36 : 54 : 45 or 36 : 54 or 36 : 45 Condone $\frac{54}{15}\times 4$ May be implied 14.4 for M1
			36		A1
	(b)	$120\times 32+0.06\times 13000\left[=3840+780\right]$		2	M1 for a complete method to find Mel's earnings.
			4620		A1
					SC M1A0 for 5580 (misread 150)
	(c)	$8040-150\times 32\left[=3240\right]$ or $0.6w+150\times 32=8040$		3	M1 a correct expression to find the amount earnt on watches or a correct equation
		$\frac{"3240"}{0.06}$ or $0.06w$ = "3240"			M1 dep on M1 being awarded Allow 6% = "3240" or 0.06% = "3240"
			54000		A1
	(d)	$0.64\times 250\times 140$ $\left[=160\times 140=22400\right]$		5	M1 for calculating the total selling price for watches sold in Swiss francs
		$\left[\$216=\right]$ $\frac{216}{1.08}$ $\left[=200\right]$			M1 for a correct method to change $ to Swiss francs. May be seen in any calculation (need not be correct calculation) eg $\left(250-0.64\times 250\right)\times\frac{216}{1.08}$ or $\left(250-160\right)\times\frac{216}{1.08}$ Implied by 18000
		$\left(250-0.64\times 250\right)\times"200"$ $\left[=90\times"200"=18000\right]$			M1 for calculating the total selling price for watches sold in America in Swiss francs.
		$"22400"+"18000"-250\times 80$ Or $40400-250\times 80$			M1 If working shown allow $"\text{their } 0.64\times 250\times 140"+n-250\times 80$ or $m+"\text{their } \left(250-0.64\times 250\right)\times\frac{216}{1.08}"-250\times 80$ where m and n are any number. This may be embedded in a calculation eg $\frac{40400-20000}{20000}\left[\times 100=102\right]$ or implied by a profit of 102[%]
			20400		A1 do not ISW
		cas			***Total 12 marks***

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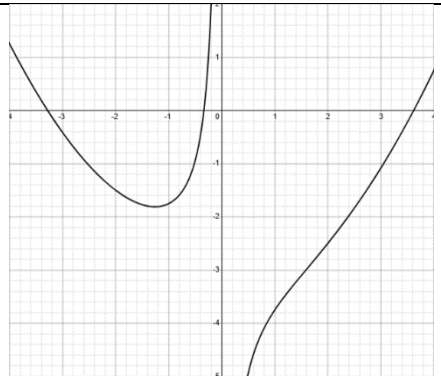
Question		Working	Answer	Mark	Notes
9	(a)		–1.5, –1.75, –3.75	2	B2 All 3 values correct (B1 2 values correct or if have –1.5, –1.8, –3.8)
	(b)			3	B1 correct shape between $x =$ –0.5 and $x = 0$ Points not joined and the curve must go above the x – axis between –0.5 and 0 and not cross the y-axis. B2 At least 8 points plotted correctly and joined with a reasonably smooth curve to form the 2 parts. Condone the points at $x =$ –0.5 and $x = 0.5$ being joined to form 1 curve (ie condone crossing the y-axis) Do not allow straight lines for B2 (B1 for at least 6 points plotted correctly) NB for the 2 points at $x = 0.5$ and 3 check they are close to –1
	(c)		3.6, –3.3, –0.3	1	B1 Allow ±0.1 Do not allow extra values
	(d)	Line $y = -1$ drawn		4	M1 for the line $y = -1$ drawn on the grid from –4 to 4
		–2.5, –0.5, 3.1			A1 dep on M1 For 3 correct values allow ±0.2 must agree with their horizontal line and graph. Condone incorrect extras. May be seen as part of inequalities or coordinates A0 if values are given to 3dp or more For reference $x =$ –2.534070197, –0.517304045, 3.051374242
		$-2.5 \leqslant x \leqslant -0.5$ or $0 < x < 3.1$			M1 dependent on a horizontal line being drawn at $y =$ –1 One correct range using the correct values ±0.2 which must agree with their horizontal line and graph. Allow < for $\leqslant$ and $\leqslant$ for < SC If drawn $y = 1$ allow for a correct inequality $-3.9 \leqslant x \leqslant -0.3$ or $0 < x < 4.1$ (all values ±0.2)
			$-2.5 \leqslant x \leqslant -0.5$ and $0 < x < 3.1$		A1 dep on first M1 Allow $x \geqslant -2.5$ [and] $x \leqslant -0.5$ for $-2.5 \leqslant x \leqslant -0.5$ Allow $x > 0$ [and] $x < 3.1$ for $0 < x < 3.1$ must have 0 < but the others we will allow < or $\leqslant$ or > Allow other notation eg [–2.5, –0.5] or (0,3.1] allow curved brackets for square brackets NB Allow –2.5, –0.5 and 3.1 all ± 0.2 but must have 0
					Total 10 marks

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Question		Working	Answer	M	Notes
10	(a)	$6\times\left(-\frac{1}{2}\right)^3-(6p-1)\left(-\frac{1}{2}\right)^2-(5p+q)\left(-\frac{1}{2}\right)+2$		2	M1 for substitution of $x = -0.5$ into equation. Allow one slip of 0.5 indicated rather than –0.5
		wr eg $-\frac{3}{4}-\frac{3}{2}p+\frac{1}{4}+\frac{5}{2}p+\frac{1}{2}q+2=0\ \therefore 2p+q=-3$ or $-3-6p+1+10p+2q+8=0\therefore 2p+q=-3$			A1 dep on M1 awarded. For equating to zero (may be implied). A fully correct solution with at least one line of working with all the brackets removed. .Do not allow $2p + q – 3 = 0$
	(b)	$6p^3-(6p-1)p^2-(5p+q)p+2$ **or** $6x^3-(6p-1)x^2-(5p+(-3-2p))x+2$ **or** $6x^3-\left(6\left(\frac{-3-q}{2}\right)-1\right)x^2-\left(5\left(\frac{-3-q}{2}\right)+q\right)x+2$ **or**		7	M1 Substituting p in for x **or** $-3-2p$ for q **or** $\frac{-3-q}{2}$ for p or for correct remainder $-4p^2-pq+2$ from long division. This needs to be a correct expression. We will condone the use of an incorrect equation found in part(a)
		$6p^3-(6p-1)p^2-(5p+(-3-2p))p+2[=0]$ **or** $6\left(\frac{-3-q}{2}\right)^3-\left(6\left(\frac{-3-q}{2}\right)-1\right)\left(\frac{-3-q}{2}\right)^2-\left(5\left(\frac{-3-q}{2}\right)+q\right)\left(\frac{-3-q}{2}\right)+2[=0]$ **or** $-4p^2-p(-3-2p)+2$ **or** $-4\left(\frac{-3-q}{2}\right)^2-\left(\frac{-3-q}{2}\right)q+2[=0]$			M1 Substituting p in for x **and** $-3-2p$ for q **or** $\frac{-3-q}{2}$ for p or subst $-3-2p$ for q **or** $\frac{-3-q}{2}$ for p into their remainder to form an expression in terms of either p or q. Allow substitution into their expression (allow if subst into an incorrect expression) We will condone the use of an incorrect equation found in part(a)
		$2p^2-3p-2[=0]$ oe **or** $q^2+9q+14[=0]$ oe			A1 dependent on both previous M marks being awarded correct 3 term quadratic in terms of p or q
		$(2p+1)(p-2)[=0]$ **or** $(q+7)(q+2)[=0]$			M1 dep on at least 1 of the previous method marks being awarded for solving their **3 term quadratic** equation by factorisation or correct use of formula/ completing the square. If the equation is incorrect working must be shown. (eg substitution into the formula with no simplification)
		$p=2$ or $q=-7$			A1 dep on the previous A1 being awarded. For a correct value of p or q This implies 4th M1
		$2\times"2"+q=-3$ oe $[q=]-3-2\times"2"$ **or** $2p+("-7")=-3$ oe $[p=]\frac{-3-("-7")}{2}$			M1 dependent on at least 1 method mark being awarded. For substituting their value of p into a correct equation to find q or their value of q into a correct equation to find p. Allow written as an expression. Working must be shown if the value of p or q is incorrect. Allow for a correct equation in terms of the second variable. Implied by $p=2$ and $q=-7$ We will condone the use of an incorrect equation found in part(a)
		wr	$p=2$ and $q=-7$		A1 dep on the 1st M1, 2nd M1 and 1st A1 being awarded. Correct values with $p=-0.5$, $q=-2$ both eliminated

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	(c)	$(2x+1)(x-"2")\left(3x-\frac{2}{"2"}\right)$		2	M1 ft their value of p must be of the form $(2x+1)(x-"p")\left(3x-\frac{2}{"p"}\right)$
		cas	$(2x+1)(x-2)(3x-1)$		A1 cao do **not** ISW. Mark final answer. NB $\left(x+\frac{1}{2}\right)(x-2)\left(x-\frac{1}{3}\right)$ is M0A0
					Total 11 marks

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Question		Working	Answer	Mark	Notes
11	(a)	$2m-5=0$		2	M1 Setting f(m) = 0 allow any letter for m
		cas	2.5		A1 oe eg 5/2 or f(2.5)[=0]
	(b)	*cas*	–15	1	B1oe cao
	(c)	*cas*	$-\frac{1}{2}$	1	B1oe allow $x = -0.5$ or $x \neq -0.5$ **ISW** **DO NOT** allow $x < -0.5$ or $x > -0.5$ Must be a single value
	(d)	$(2x-5)(2x+1)=7-8x$ oe		4	M1 for a correct equation with the fraction removed. Brackets may be expanded. Condone missing brackets if recovered. If only seen expanded allow 2 sign errors.
		$4x^2+2x-10x-5=7-8x$			M1 dependent on M1 awarded. multiplying out brackets. Allow one incorrect term.
		$x^2=3$			M1 gaining a value for x^2 ft their equation if the x terms cancel. May be implied by correct answer
		wr	1.73		A1 dependent on the 1st and 2nd M1 being awarded. awrt 1.73 or $\sqrt{3}$ (condone ±)
	(e)	$2(x^2+2x)-5$ or $2\left(x^2+2x-\frac{5}{2}\right)$		3	M1 allow for $a = 2$ or $b = 1$ or $c = 7$ Allow these seen in an expression of the form $a(x+b)^2-c$ This may be implied by the 2nd M1
		$\left[2(x+1)^2-2\right]-5$ or $2\left[(x+1)^2-1-\frac{5}{2}\right]$			M1 allow for 2 of $a = 2$ or $b = 1$ or $c = 7$ Allow these seen in an expression of the form $a(x+b)^2-c$
		cas	$2(x+1)^2-7$		A1 if a correct expression is not seen we allow $a = 2$ and $b = 1$ and $c = 7$ clearly stated
	(f)	$\frac{y+"7"}{"2"}=(x+"1")^2$ or $\frac{x+"7"}{"2"}=(y+"1")^2$ oe		2	M1 Allow any 2 different letters to be used ft their $a \neq 1$, b and c (a, b and $c \neq 0$) from part (e) for $\frac{y\pm"c"}{"a"}=(x+"b")^2$ oe We will allow $\pm$ "their c"
		cas	$\sqrt{\frac{x+"7"}{"2"}}-"1"$		A1ft their a, b and c from part (e) Must be in terms of x (if ± given award M1 only eg $-"1"\pm\sqrt{\frac{x+"7"}{"2"}}$)
					Total 13 marks

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