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Mark Scheme (Results)

Summer 2014

Pearson Edexcel International GCSE in Mathematics B Paper 1 (4MB0/01)

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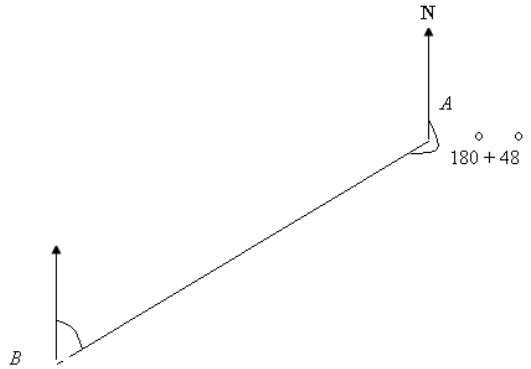
General Marking Guidance

- 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.
- 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
    - ft – follow through
    - isw – ignore subsequent working
    - SC - special case
    - oe – or equivalent (and appropriate)
    - dep – dependent
    - indep – independent
    - eeoo – each error or omission

- **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 there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
  If it is clear from the working that the “correct” answer has been obtained from incorrect working, award 0 marks.
  Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks.
  If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
  If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.
  If there is no answer on the answer line then check the working for an obvious answer.
- **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 in another.

Question Number	Answer	Notes	Marks
1	$\frac{4(x+3)}{x(x+3)}$ **Note:** Award M1 for the correct factorisation of **either** the numerator or denominator	M1	
	$\frac{4}{x}$	A1 2	**2**
2	$117\pi = \pi r^2 \times 13$ (o.e) **Note:** Allow a numerical value of π (3.14… or better)	M1	
	$r = 3$ cm (cao)	A1 2	**2**
3	$\frac{625}{1000}$ OR 0.625 **Note:** Accept any equivalent correct fraction.	M1	
	$\frac{5}{8}$ **Note:** No isw if the candidate goes on after the correct answer	A1 2	**2**
4	$\frac{360}{24}$ or $180 - \frac{180 \times (24-2)}{24}$ **Note:** $180 - \frac{360}{24}$ earns M0 unless recovered	M1	
	15^o	A1 2	**2**
5	$2x = x + 3$ (remove denom.)	M1	

	Note: $6 = x + 3$ earns M1		
	$(x =)\ 3$ **Notes:** 1. Answer only seen – full marks 2. Correct answer seen but working wrong, award M0,A0	A1 2	**2**
6(a)	0.0177 or 1.77×10^{-2}	B1 1	
6(b)	0.018	B1 1	**2**
7	 $180^o + 48^o$ or $360^o - (180^o - 48^o)$ OR diagram indicating reflex angle $\angle NAB$ **Note:** Where a diagram is drawn, we need to clearly see a numerical value assigned to the reflex angle $\angle NAB$ (It does not need to be simplified)	M1	
	228^o OR S48W	A1 2	**2**
8	a^4 as numerator or 4 as denominator	M1	

	Note: 1. Ignore any coefficient before a^4 for this M mark. 2. $a^{6\times\frac{2}{3}}$ does not earn the M mark (yet)		
	$\frac{a^4}{4}$ **Notes:** 1. Do not isw. 2. $\frac{a^4}{2^2}$ earns M1, A0 (unless continues to required solution)	A1 2	**2**
9	$\left[2(n+1)-1\right]$ - $\left[2n-1\right]$ (o.e) **OR** Any two correct consecutive numerical terms **Notes:** 1. (o.e.) $(2n+1)-(2n-1)$ 2. Award M1 for $2n-1=a+(n-1)d$ and comparing coefficients	M1	
	difference = ± 2	A1 2	**2**
10	**Two** of 30 = 5 x 6, 36 = 6x6, 138 = 23 x 6 **OR** **Two** of prime factors, factor trees, compound division or list of factors	B1	
	HCF = 6 **Note:** Award full marks for a correct answer only seen	B1	**2**
11	$x^2+bx-ax-ab=3bx$ (expand)	M1	
	$x^2+bx-3bx=ax+ab$ (isol. terms in a)	M1 (DEP)	

	OR		
	$x - a = \frac{3bx}{x+b}$	M1	
	$a = x - \frac{3bx}{x+b}$ or $-a = \frac{3bx}{x+b} - x$	M1 (DEP)	
	OR		
	$3bx + a(x+b) = x(x+b)$	M1	
	$a(x+b) = x(x+b) - 3bx$	M1 (DEP)	
	$a = \frac{x^2 - 2bx}{x+b}$ (o.e.) **Note:** 1. An example of (o.e.) $a = -\frac{x(2b-x)}{x+b}$ 2. $3bx - bx$ must be simplified before the final A mark can be awarded 3. Do **not** isw	A1 3	**3**

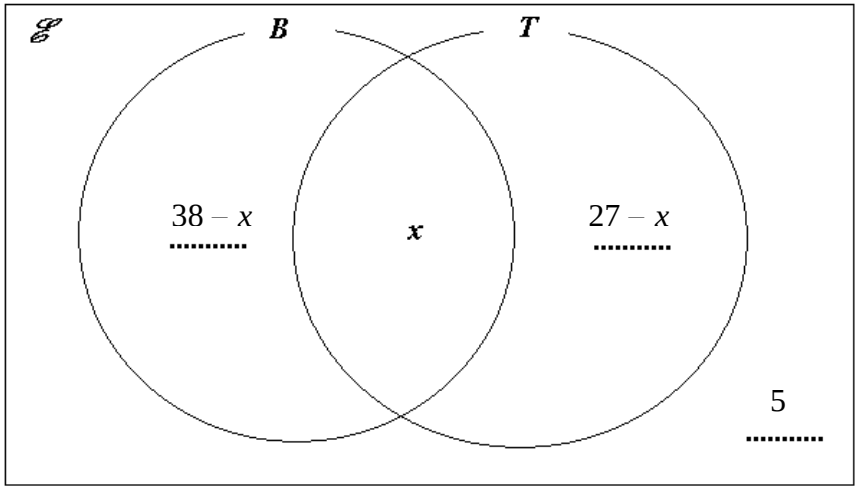
12	$\angle CDA = 70^o$ (Cyclic quad.)	B1	
	$\therefore \angle COD = 40^o$ (Isos. Triangle) **Note:** For 'isosceles triangle' *CO* = *OD* and triangle sufficient for reason	B1	
	OR		
	$\angle CBD = 20^o$ ($\angle$ in semi-circle for $\angle ABD$)	B1	
	$\therefore \angle COD = 40^o$ (angle at centre)	B1	
	Both of above reasons **Notes:** 1. Accept the required angle (*COD*) marked on the diagram for answer 2. Reasoning(s) must be consistent with a correctly calculated angle 3. Unless the candidate starts again, an incorrectly calculated angle (because of wrong reasoning) condemns further work. 4. Opp angle of a quadrilateral is not a sufficient reason. 5. Do not accept 'angle sum of a triangle' as a reason unless it is used with *CO* = *OD* 6. Accept a single letter notation (*D*) for $\angle CDA$	B1 3	**3**
	SC: One reason and correct answer, B1 B1 B0 No reasons and correct answer B1 B0 B0		
13	One of $\sqrt{245}$ or $\sqrt{45}$ rewritten as $\sqrt{5\times7\times7}$ or $\sqrt{5\times3\times3}$ (oe, eg $7\sqrt{5}$ or $3\sqrt{5}$)	M1	
	$7\sqrt{5}-3\sqrt{5}$ **Note:** Condone $7\sqrt{5}-3\sqrt{5}=7-3\sqrt{5}$	M1	
	$4\sqrt{5}$ **Note:** The A mark is dependent on the **first** M mark.	A1 3	**3**
14	$0.59\times\pi\times110$ m/ min OR $59\times\pi\times110$ cm/ min		

	(ie distance travelled in 1 min)		M1	
	”$0.59\times\pi\times110$"$\times\frac{60}{1000}$ OR “$59\times\pi\times110$”$\times\frac{60}{100000}$ ie $\left\{\begin{matrix}\text{conv to km}\\\text{conv to hrs}\end{matrix}\right\}$		M1 (DEP)	
	12.2 km (awrt) **SC:** 3.89…(or better) award M0, M1, A0		A1 3	**3**
15	$280 = \left(\frac{h}{9}\right)^2\times70$ (o.e.)	$\sqrt{\left(\frac{280}{70}\right)}$ or $\sqrt{4}$ or $\frac{9.44...}{4.72...}$ seen	M1	
	$\therefore h = 9\sqrt{\frac{280}{70}}$		M1 (DEP)	
	h = 18 cm (awrt) **Note:** If volumes are compared and the incorrect formula for the volume of a cone is used, a maximum of the first M mark can be awarded.		A1 3	**3**

16	$9 = k \times 2^3$ (o.e) $k = \frac{9}{8}$, 1.125 **Notes:** 1. k = 1.13 (or better) for A mark 2. If $9 \times k = 2^3$, award M1 $k = \frac{8}{9}$ or 0.88... award A1	$9x^3 = 8 \times 72$ (or better)	M1 A1	
	$x = \sqrt[3]{\frac{72}{"\left(\frac{9}{8}\right)"}}$ (o.e: (taking cube root))	$x = \sqrt[3]{\frac{8 \times 72}{9}}$	M1 (DEP)	
	$x = 4$		A1 4	**4**
17	Balancing either x or y in the two equations Correctly deciding whether to add or subtract	isolating x or y e.g. $x = 15 - 3y$ or $y = 2x - 2$ subst expression for x or y to obtain an equation in one unknown	M1 M1 (DEP)	
	Note: Allow a total of 1 slip in both M marks.			
	$x = 3$		A1	
	$y = 4$		A1 4	**4**
	Note: All answers only seen for full marks. One only correct answer with no working seen earns no marks			
18(a)	40		B1	

	60			B1 2	
18(b)	0.5			B1	
	7			B1 2	**4**
	Note: Allow a tolerance of $\frac{1}{2}$ small square on the graph for B marks in part (b)				
19(a)	3			B1 1	
19(b)	$5\times"3"$ (o.e.)	$\frac{1}{6}(9+"3"+x)=3$	$\frac{5}{6}(9+"3"+x)=9+x$	M1	
	"15" – 9	$9+"3"+x=18$	$45+5\times"3"+5x=54+6x$	M1 (DEP)	
	6			A1 ft 3	**4**
	Note: Award first M mark if 15 is seen anywhere in the candidate's solution to part (b).				

20	$\frac{-(-3)\pm\sqrt{(-3)^2-4\times4\times(-2)}}{2\times4}$ **Note:** Accept -3^2 in discriminant (ie brackets missing)	$\left(x-\frac{3}{8}\right)^2=\frac{9}{64}+\frac{1}{2}$	M1	
	$\sqrt{41}$ OR 6.40 (or better) **Note:** This is an independent B mark and can be earned from previous incorrect working		B1	
	1.18, -0.425 **Note:** 1. Accept answers which round to the required answers (no penalty for failing to correct) 2. Overcorrecting will **always** be penalised 3. Unrounded correct answers seen in the body of the script, then over-corrected, award corresponding A marks. **SC:** The candidate may try and factorise the given quadratic. The M mark only is available as follows: You need to multiply out their incorrect bracketed terms. If the resultant quadratic gives two of their three terms of $"4x^2-3x-2"$ then award the M mark.		A1, A1 4	**4**

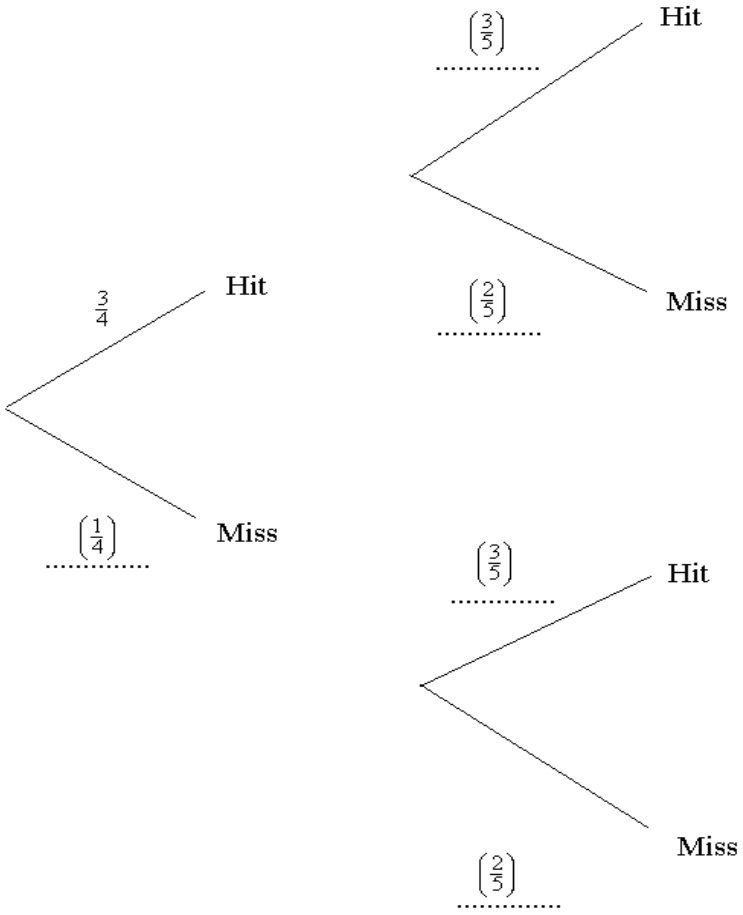
21(a)	 **Notes:** 1. $38-x$ can be anywhere inside the crescent to the left 2. $27-x$ can be anywhere inside the crescent to the right 3. The numerical value 5 can be anywhere outside the two circles 4. Ignore any other values or expressions in x that you see		B1 1	
21(b)	$"(38-x)"+x+"(27-x)"+5=50$ Note: $38+27+x+5=50$ can earn method here	$(38+27+5)-50$	M1	
	x = 20		A1 2	
21(c)	Prob = $\dfrac{38-"20"}{50}$ Notes: 1. "20" must be a positive value for method to be earned 2. If this fraction is combined with another fraction then method is lost		M1	
	$\dfrac{18}{50}$ (o.e.), 0.36, 36%		A1 ft 2	**5**

22(a)	$\overrightarrow{AB} = \begin{pmatrix}1\\2\end{pmatrix}$ Note: Penalise $\begin{pmatrix}\frac{1}{2}\end{pmatrix}$	B1 1	
22(b)	$\overrightarrow{OC} = 2"\begin{pmatrix}1\\2\end{pmatrix}" + \begin{pmatrix}1\\1\end{pmatrix} \left(=\begin{pmatrix}3\\5\end{pmatrix}\right)$	M1	
	(3, 5)	A1 2	
22(c)	$\left(\overrightarrow{AC} = 2\times"\overrightarrow{AB}" = \begin{pmatrix}2\\4\end{pmatrix}\right)$		
	$\sqrt{"2"^2+"4"^2}$ $\sqrt{"3"^2+"5"^2}$	M1	
	$\left\|\overrightarrow{AC}\right\| = 4.47$ (awrt)	A1 2	**5**
23(a)	**Penalise ncc ONCE only in the question** $\cos 15 = \frac{11}{AB}$ (o.e.) **Note:** Equivalent methods may involve sin 15, sine rule, tangent + Pythagoras The M mark is awarded for any correct trig/Pythagorean statement which involves the side AB. (It does not have to be evaluated).	M1	
	11.39 -> **11.4 cm**	A1 2	

23(b)	AC = 11 x tan 15 (oe) (=2.947)	$AC = \sqrt{"11.39"^2 - 11^2}$ (= 2.955)	$\angle DCB + \angle BDC = 165^0$	M1	
	DB = "11.39" – "2.947"	DB = "11.39" – "2.995"	$DB = \dfrac{11 \times \sin"37.5"}{\sin"127.5"}$	M1 (DEP)	
	Accept any of the following answers: 8.41, 8.44 or 8.45			A1 3	**5**
24(a)	Construction arcs **Note:** the required number of compass construction arcs are required			M1	
	Perpendicular bisector drawn intersecting BC and also AC **Notes**: 1. For the A mark, there should be no daylight between the line and the overlay **within the triangle**. 2. Must be a continuous (not dotted) line for A1.			A1 2	
24(b)	Construction arcs **Note:** the required number of compass construction arcs are required			M1	
	Angle bisector drawn (from B and intersecting AC) Notes: 1. For the A mark, there should be no daylight between the line and the overlay **within the triangle**. 2. An incorrect line drawn does not necessarily mean that M1 has not been earned (look closely at construction lines). 3. Must be a continuous (not dotted) line for A1.			A1 2	
24(c)	Region **R** within ΔABC shaded **and** labelled. **Note:** The shaded area must be within the triangle, all the region to the left of the perpendicular bisector and underneath their (complete) angle bisector.			B1 ft 1	**5**

25(a)	$\frac{£1}{2.5}$		M1	
	£0.40 **Note:** Accept £0.4 but do not accept 40p		A1 2	
25(b)	One of $1.2\times 2.5\text{kg}$ or $1.11\times £1$	One of $"0.40"\times 1.11$ or $"0.40"\div 1.2$ Note: $"0.40" < £1.00$	M1	
	$\frac{£1.11}{3}$	$\frac{"0.40"\times 1.11}{1.2}$	M1 (DEP)	
	£0.37		A1 3	**5**
26(a)	$2\times(-3)^3+13\times(-3)^2+27\times(-3)+18$	Dividing the cubic by $(x+3)$ and arriving at a quotient of $2x^2+7x...$ **Note:** Allow synthetic division method -3 | 2 13 27 18 0 -6 -21 -18 2 7	M1	
	= 0 **Note:** If we see four numerical values they must be $-54+117-81+18$. If any part of this Expression is incorrect then A0 Stating = 0 without numerical values earns the A mark	A quotient of $2x^2+7x+6$ **Note:** Using the synthetic division method, the entries in the fourth row must be 2 7 6	A1 2	

26(b)	$2x^2 + 7x\ldots$	-3 | 2 13 27 18 0 -6 -21 -18 2 7	M1		
	$2x^2 + 7x + 6$ **Note:** These two marks can be earned again here if shown in part (a)		A1		
	Factorising a trinomial quadratic **Note:** If the candidates two bracketed terms are not the required terms they can still earn the M mark here. You need to multiply out their incorrect bracketed terms. If the resultant quadratic gives two of their three terms of $"2x^2 + 7x + 6"$ then award the M mark.		M1 (INDEP)		
	$(x+3)(2x+3)(x+2)$ **Notes:** 1. Allow the A mark for $(x+3)(2x+3)(x+2)=0$ but, if the candidate goes on to solve their correct equation, they lose the last A mark. 2. For this mark, we will allow a missing trailing bracket e.g. $(x+3)(2x+3)(x+2$		A1	4	**6**

27(a)		B2(-1eeoo) 2	
	Note: -1 penalty for each incorrect pair. (Not for an individual probability) For ePen: One penalty implies B1, B0 **NOT** B0, B1		

27(b)	$\frac{3}{4}\times"\frac{2}{5}"$ (o.e.) **Note:** This probability pair must not be embedded with any other probabilities for method		M1	
	$\frac{6}{20}$, $\frac{3}{10}$, 0.3, 30%		A1 2	
27(c)	$"\frac{3}{4}\times"\frac{2}{5}"$ + $"\frac{1}{4}"\times"\frac{3}{5}"$ + $\frac{3}{4}\times"\frac{3}{5}"$			
	two "correct" products added from their diagram	$"\frac{1}{4}"\times"\frac{2}{5}"$	M1	
	all three "correct" products added from their diagram	$1-"\frac{1}{4}"\times"\frac{2}{5}"$	M1 (DEP)	
	$\frac{18}{20}$, $\frac{9}{10}$, 0.9, 90%		A1 3	**7**
28(a)	$y = x^2 + (10-x)(20-x)$	$y = 20\times10 - x(10-x) - x(20-x)$	M1	
	$y = 2x^2 - 30x + 200$ (c.c) **Notes:** 1. Algebraic errors in the candidate's working loses this A mark 2. If $"y = ..."$ does not appear in the candidate's working then A mark is lost		A1 2	
28(b)	$\frac{dy}{dx} = 4x - 30$ (1 term correctly differentiated from their y)		M1	
	$"4x-30" = 0$ **Note:** Must be a linear equation in x for method.		M1 (DEP)	
	$x = 7.5$		A1 3	
28(c)	$2\times"7.5"^2 - 30\times7.5 + 200$ (subst.)	$(10-"7.5")\times(20-"7.5") + "7.5"\times"7.5"$	M1	
	87.5 cm^2		A1 2	**7**
	TOTAL 100 MARKS			

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