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Mark Scheme (Results)

Summer 2015

Pearson Edexcel International GCSE Mathematics B (4MB0) Paper 02R

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

- **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	Working	Marks
1	Any **one** of $3p-6=-12,\quad -9-8=r,\quad -3q-12=-24$ (o.e.) **Note:** Nothing, as yet, for $pq-9=r$ $p=-2,\ \ q=4,\ \ r=-17$ **Note:** The first A mark is for the value of *p*, the second for the value of *q*.	M1 A1.A1.A1 **[4]**
2	$\dfrac{x^2-11x+24}{x+5}\times\dfrac{2x^2+9x-5}{x-3}$ Attempt at factorising a quadratic **Note:** For method, the two bracketed terms, when multiplied out, must give at least two of the three terms from the trinomial quadratic. $(x-8)(x-3)$ $(2x-1)(x+5)$ $(x-8)(2x-1)$ or $2x^2-17x+8$ **Note:** If extra factors appear, do not penalise but apply the scheme as stated. Isw Accept (o.e.) i.e. $2(x-8)(x-0.5)$	M1 M1 A1 A1 A1 **[5]**
3	(a) $2\times1.5\times0.5\times1000000$ (o.e.) 1500000 (o.e.) **SC:** Allow (M1)(A0) for 1.5 m^3 (as long as units given & this is their **final** answer to part (a). An incorrect conversion to cm earns no marks here.)	M1 A1
	(b) $\dfrac{"1500000"}{12500}$ (M1) $"\dfrac{1500000}{12500}"\div 60$ (M1) 12500×60 (750000) $\dfrac{"1500000"}{"750000"}$	M1 M1 dep
	2 hours	A1 **[5]**

4	(a) 11, 16, 26, 7 **Note:** Order of B marks is important **If** the diagram is **not** marked in anyway, allow acceptable answers, provided the correct sets are identified. (b) "7"+"11" (18) or 60 – "16" – "26" **Note:** Ignore notation (i.e. {})	B1, B1, B1, B1 B1 ft **[5]**
5	(a) one term correctly differentiated $1+\frac{4}{x^2}$ (o.e.) **Note:** Do **not** isw here (b) $"1+\frac{4}{x^2}"=17$ **Note:** ft from their answer to part (a) $16x^2=4$ OR $x^2=\frac{1}{4}$ OR $4x^2=1$ (o.e.) **Note**: This M (dep) mark is for re-arranging their equation, removing any denominators or negative indices. The original equation however **must** have a negative index in it. (0.5, -7.5) **Notes:** Accept $x = 0.5$, $y = -7.5$ Missing bracket scores, at most, (A1)(A0) i.e. 5, -7.5 scores (A0)(A0) Extra coordinate(s) loses some mark(s), at most (A1)(A0) i.e. $(5,-7.5)$ plus an extra coordinate pair scores (A0)(A0)	M1 A1 M1 M1 dep A1. A1 **[6]**

6	(a) each correct section of journey	B1,B1ft,B1ft
	Note: 2nd B1ft is for a correct horizontal line, of the correct length drawn from the point of the end of the 1st line segment 3rd B1 ft is for their line, starting where their horizontal line finishes and terminates at Nevers at 11:45	
	(b) 11:45 – "10 : 09" (96 mins)	M1
	Note: For method, the mark is awarded for 11:45 – their start time from Autun Accept $1\frac{3}{5}$ hours (o.e.) but not 1.36 (hrs)	
	70 km/h	A1
	(c) one straight line, correct starting point	B1
	Correct finishing point	B1 ft
	Note: For ft, must finish at Beaune, 2 hours after leaving Nevers	
	SC: (B1)(B0) for the correct 'reverse' journey	
	(d) (i) 10:33 (±2 min)	B1 ft
	(ii) 28 km (±1 km)	B1 ft
	Note: Do **not** accept 0	**[9]**

7	(a) $\frac{4}{11}$; $\frac{6}{10}$, $\frac{4}{10}$; $\frac{7}{10}$, $\frac{3}{10}$	B1,B1,B1
	(b) (i) $\frac{7}{11}\times"\frac{4}{10}"$	M1
	$\frac{28}{110}$ (o.e.) ($\frac{14}{55}$, 0.255, 25.5%)	A1
	(ii) At least two of $\frac{7}{11}\times"\frac{4}{10}"$, $"\frac{4}{11}"\times"\frac{7}{10}"$, $"\frac{4}{11}"\times"\frac{3}{10}"$ added together	M1
	All 3 correct products from c's diagram added together	M1 dep
	Alternative for (b)(ii) M2	
	$1-\frac{7}{11}\times"\frac{6}{10}"$	M2
	$\frac{68}{110}$ ($\frac{34}{55}$, 0.618..., 61.8%)	A1
	(c) $"\frac{4}{11}"\times"\frac{3}{10}"+\frac{7}{11}\times"\frac{4}{10}"$	M1
	$\frac{"\frac{4}{11}"\times"\frac{3}{10}"}{"\frac{4}{11}"\times"\frac{3}{10}"+\frac{7}{11}\times"\frac{4}{10}"}$ $\left(\frac{6/55}{20/55}\right)$	M1 dep
	=12/40 = 0.3 (correct conclusion) *	A1 cso
	Note: A candidate who uses with replacement gains, at most, the method marks within the question.	**[11]**

8	(a) $\frac{60}{x}$	B1
	(b) $\frac{60}{x-27}$	B1
	(c) $"\frac{60}{x-27}"-"\frac{60}{x}"=2$ (o.e.)	B1
	(d) Removing denominators and brackets from their equation (allow one sign slip)	M1
	Note: Must be two denominators removed which both involve an expression in *x*.	
	$60x-60x+1620=2x^2-54x+1620$ (o.e.)	A1
	completely correct working	A1
	(e) Attempt to solve quadratic	M1
	Note: **Either** Attempt to factorise (see Question 2)	
	Or correct substitution into a correct formula	
	Or completing the square as far as:	
	$\left(x-\frac{27}{2}\right)^2-\left(\frac{27}{2}\right)^2=810$	
	$(x-45)(x+18)\ (=0)$	A1
	$x=45$	A1
	Note: Ignore x = -18 as a solution	
	(f) $\frac{10.80}{"45"-27}$	M1
	Note: "45" must be positive Accept $\frac{60}{10/3}=\frac{10.80}{x}$ (o.e.) for method	
	(£) 0.60 or 60 (pence)	A1
	Note: Accept £ 0.6 with the '£' sign	**[11]**

9	**Penalise incorrect rounding once only in the question, the first time it occurs**	
	(a) $AC^2 = 12^2 + 9^2 - 2\times12\times9\times\cos100$	M1
	$AC^2 = 225 + 37.5...$	M1 dep
	16.2 m (16.2020…)	A1
	(b) $\dfrac{9}{\sin CAB} = \dfrac{"16.2"}{\sin100}$ $\sin CAB = \dfrac{9\times\sin100}{"16.2"}$ 33.2° (33.164492…) **OR** $9^2 = 12^2 + "16.2"^2 - 2\times12\times"16.2"\times\cos\angle BAC$ $\cos\angle BAC = \dfrac{12^2 + "16.2"^2 - 9^2}{2\times12\times"16.2"}$ 33.2° (33.164492…)	M1 M1 dep A1
	(c) $\angle BDA = 180 - 50 - "33.2"$ (96.8°) **OR** $\angle BCD = 180 - 100 - "33.2"$ (46.8°) **OR** $\angle BDC = 50 + "33.2"$ (83.2°)	B1 ft
	$\dfrac{BD}{\sin"33.2"} = \dfrac{12}{\sin"96.8"}$ $BD = \dfrac{12\times\sin"33.2"}{\sin"96.8"}$ $BD = 6.61 \rightarrow 6.62$ (awrt) Area $\Delta BDC = \dfrac{1}{2}\times9\times"6.62"\times\sin50$ **OR** $\dfrac{DC}{\sin50} = \dfrac{9}{\sin"83.2"}$ $DC = \dfrac{9\times\sin50}{\sin"83.2"}$ $DC = 6.94$ (6.94756…) (awrt) Area $\Delta BDC = \dfrac{1}{2}\times9\times"6.94"\times\sin"46.8"$	M1 M1 dep A1 M1 ind
	Note: Apply an equivalent scheme to: Finding $AD = 9.26$ (9.25834…) leading to Area $\Delta BAD = \dfrac{1}{2}\times12\times"9.26"\times\sin"33.2"$ **Note:** Applying the formula $\dfrac{1}{2}bc\sin A$ for the area of **any** triangle earns an independent method mark 22.8 (m^2)	A1 **[12]**

10	(a) (i) $\frac{1}{3}\mathbf{a}$ (ii) $\frac{3}{4}\mathbf{b}$ (iii) $"\frac{1}{3}\mathbf{a}"-"\frac{3}{4}\mathbf{b}"$ (iv) $\mathbf{a}-\mathbf{b}$	B1, B1 B1ft,B1
	(b) $\overrightarrow{AP}=\lambda("\frac{1}{3}\mathbf{a}"-"\frac{3}{4}\mathbf{b}")$	M1
	$\overrightarrow{XP}="\frac{3}{4}\mathbf{b}"+\lambda("\frac{1}{3}\mathbf{a}"-"\frac{3}{4}\mathbf{b}")$	M1 dep
	Correct conclusion from correct working	A1
	(c) $-\mathbf{a}+\mu("\mathbf{a}-\mathbf{b}")$ (o.e.)	B1ft
	(d) comparing one of c's coefficients of their components	M1
	Note: Do not penalise method if the vector(s) are left in the comparison	
	A correct equation in one parameter from c's equations	M1
	Note: $\frac{1}{3}\lambda=\mu-1,\quad \frac{3}{4}(\lambda-1)=\mu$	
	$\mu=\frac{12}{5},\quad \lambda=\frac{21}{5}$ (o.e.)	A1, A1
	(e) 2 (cm)	B1
	(f) $\frac{3}{4}y$ seen	B1
	Note: Accept $\frac{3}{4}\lvert\mathbf{b}\rvert$ for $\frac{3}{4}y$ for (B1)	
	$y\times\frac{3}{4}y=6\times"2"$	M1
	Note: Must be an equation in *y*.	
	$y=4$	A1
		[16]

11	(a) $\frac{1}{2}\times 3x\times 4x$ (isw)	B1
	(b) $(AC^2 =)\ (3x)^2+(4x)^2$	M1
	$3x + 4x +$ "$5x$"	A1 ft
	Note: Do not accept $\sqrt{25x^2}$	
	(c) $60-"12x"$	M1
	$y=\frac{60-12x}{6}$ $(10\ -\ 2x)$	A1
	(d) area of rectangle = $2\times("10-2x")("10-2x")$	M1
	Total area = $"\frac{1}{2}\times 3x\times 4x"+2\times("10-2x")("10-2x")$	M1 dep
	correct conclusion	A1
	(e) 134, 86	B1,B1
	(f) -1 mark for straight line segments each of their points missed each missed segment each of their points not plotted each of their points incorrectly plotted tramlines very poor curve	B3
	Notes: ft from their table values Accuracy: ±1 s.s. If a point is not plotted, it can be inferred from their curve passing through (within tolerance) the required point.	
	(g) line drawn on graph at A =120	M1
	Note: The line may be implied from their value(s) of x or simply from two points marked at the intersection of their curve and A =120	
	x = 4.4/4.5 (awrt)	A1
	Note: Ignore the second answer	
	Accept answer in range 116 – 122 (must be an integer)	

	Alternative to part (g)	A1
	attempt to solve $14x^2 - 80x + 80\ (= 0)$	M1
	Note: Either correct substitution into a correct formula	
	Or Attempt to factorise (see Question 2)	
	Or completing the square as far as: $\left(x - \frac{80}{28}\right)^2 - \left(\frac{80}{28}\right)^2 = \frac{-80}{14}$	
	x= 4.4 (or better)	A1
	answer 117	A1
		[16]

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