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Mark Scheme (Results)

January 2016

Pearson Edexcel International GCSE Mathematics B (4MB0) Paper 2R

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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
  - ee(oo) – each error (or omission)
  - awrt –answer which rounds to
  - cc – correct conclusion

- **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	Answer	Mark	Notes
1 (a)		6pm (accept 18:00)	1	B1
(b)		7pm (or 19:00) (previous day)	1	B1
(c)	Either 2.35pm (London time) = 10:35pm (Singapore time) or 9:52am (Singapore time) = 1:52am (London time)		2	M1
		11 hours 17 mins		A1
				Total 4 marks

Question		Working	Answer	Mark	Notes
2	(a)		8	1	B1
	(b)		1, 2, 3, 4, 6, 8, 12, 24	1	B1
	(c)		{3, 6, 12, 24}	2	B2 –1 eeoo Ignore missing brackets
					Total 4 marks

Question	Working	Answer	Mark	Notes
3	$4a^2 + a^2 = 80$		6	M1
		$a = 4$		A1
	$b^2 + b^2 = 18$			M1
		$b = 3$		A1
	$c = 2\times"4"\times"3"+"4"\times"3"$ or $c = 3\times"4"\times"3"$			M1
		$c = 36$		A1
				Total 6 marks

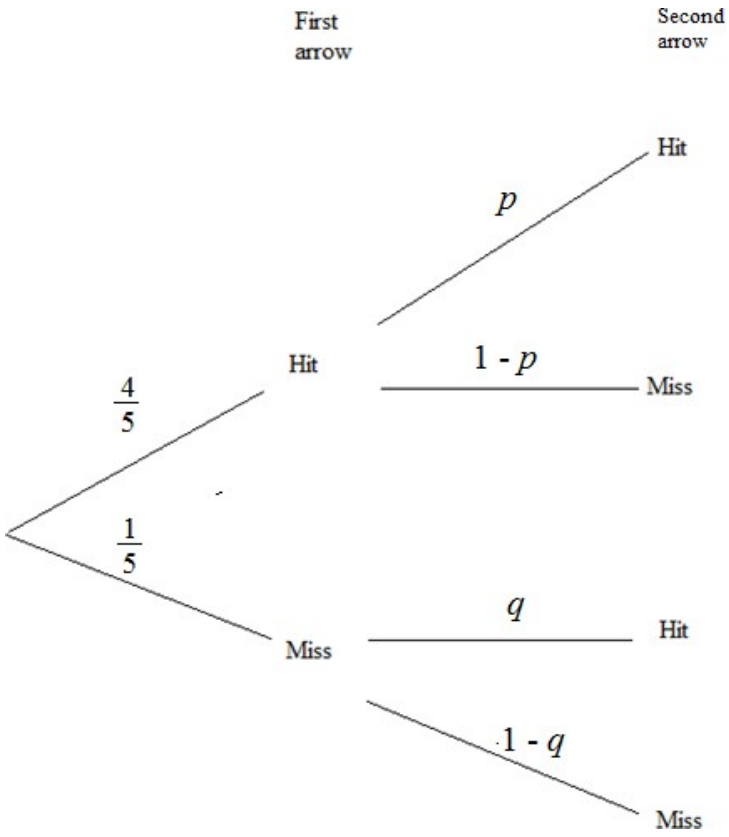
Question	Working	Answer	Mark	Notes
4 (a)	Attempt to factorise $2x^2 - x - 10$		3	M1
		$(2x - 5)(x + 2)$		A1
		$\frac{x(2x-5)}{3}$		A1
(b)	At least one term correctly differentiated from their solution to (a)		3	M1
		$\frac{4x}{3} - \frac{5}{3} = 0$ (o.e.)		A1
		$x = \frac{5}{4}$		A1
				Total 6 marks

Question	Working	Answer	Mark	Notes
5 (a)	Rotation 90° clockwise About (–3, 1)		3	B1 B1 B1
(b)	$\begin{pmatrix} 3 & 3 & 5 \\ -3 & 0 & -3 \end{pmatrix}$ (can be implied from the diagram)		3	B2
	Correctly drawn and labelled diagram			B1
				Total 6 marks

Question		Working	Answer	Mark	Notes
6	(a)		1 (accept $x \neq 1$)	1	B1
	(b)	$y(x-1) = 4$		2	M1
			$f^{-1}: x \mapsto \frac{4+x}{x}$		A1
	(c)	$4 = (3x+1)(x-1)$		5	M1
			$3x2 - 2x - 5 (= 0)$		A1
		Attempt to factorise a trinomial quadratic			M1
			$(3x - 5)(x + 1)$		A1
			$\frac{5}{3}, -1$		A1
					Total 8 marks

Question		Working	Answer	Mark	Notes
7	(a)(i)		$\mathbf{b} - \mathbf{a}$	1	B1
	(ii)		$\mathbf{b} + (k-1)\mathbf{a}$	1	B1
	(iii)		$\mathbf{b} + k\mathbf{a}$	1	B1
	(b)		$\frac{1}{m}\mathbf{b} + k\mathbf{a}$	1	B1
	(c)	$OP = \mathbf{a} + \frac{1}{n}(\mathbf{b} - \mathbf{a})$		2	M1
			$\left(1 - \frac{1}{n}\right)\mathbf{a} + \frac{1}{n}\mathbf{b}$ or $\frac{1}{n}[(n-1)\mathbf{a} + \mathbf{b}]$		A1
	(d)	Equating components of $\mathbf{b}$		2	M1
			Conclusion		A1
	(e)	$\frac{k}{n} = 1 - \frac{1}{n}$		2	M1
			$k = n - 1$		A1
	(f)		$n = 2$	1	B1
					Total 11 marks

Question	Working	Answer	Mark	Notes
8 (a)	$2x^2 - 90x - 27x + 1215$ (3 out of four terms correct earns M1)		2	M1
		$2x^2 - 117x + 1215$		A1
(b)		$\frac{15}{x}$	1	B1
(c)		$\frac{6}{x - 27}$	1	B1
(d)		$\frac{2}{3}$ (o.e.)	1	B1
(e)		$"\frac{15}{x}" + "\frac{6}{x-27}" = "\frac{2}{3}"$	1	B1
(f)	$45(x - 27) + 6 \times 3 \times x = 2x(x - 27)$		3	M1
		$45x - 1215 + 18x = 2x^2 - 54x$		A1
		Correct Conclusion		A1
(g)	Using $x = 45$		2	M1
		Showing both fractions in (b) and (c) are the same		A1
				Total 11 marks

Question	Working	Answer	Mark	Notes
9 (a)			3	B3 B1 for each correct pair

(b)(i)	$"\frac{1}{5}"\times"(1-q)" = \frac{3}{20}$		3	M1
(ii)	$1-q = \frac{3}{4}$			M1 dep
		$q = \frac{1}{4}$ (0.25, 25%)		A1
(c)(i)	$\frac{4}{5}(1-p)$ or $\frac{1}{5}\times"\frac{1}{4}"$		4	M1
	$\frac{4}{5}(1-p) + \frac{1}{5} = "\frac{1}{4}" = \frac{7}{12}$			M1 dep
(ii)	$48-48p+3=35$ (removal of fractions)			M1 dep
		$p = \frac{1}{3}$ (0.333, 33.3%)		A1
(d)	$\frac{7}{12}\times\frac{1}{10}$ or $\frac{3}{20}\times\frac{9}{10}$		3	M1
	$\frac{7}{12}\times\frac{1}{10} + 3\times\frac{9}{20}\frac{}{10}$			M1 dep
		$\frac{29}{150}$ (o.e.) (0.193, 19.3%)		A1
				Total 13 marks

Question		Working	Answer	Mark	Notes
10	(a)	$2.5(2.5 + AB) = 4\times10$		3	M1
		$2.5\times AB = 40 - 2.5\times 2.5$			M1dep
			correct conclusion		A1
	(b)	correct substitution into cosine formula using their values		3	M1
		$BC^2 = 356 - 320\cos 60$			M1dep
			$BC = 14$ (cm)		A1
	(c)	$\frac{10}{\sin\angle ABC} = \frac{"14"}{\sin 60}$		3	M1
		$\sin\angle ABC = \frac{10\times \sin 60}{"14"}$			M1 dep
			$\angle ABC = 38.2°$		A1
	(d)	$\angle DCB = 180 - (60 + "38.2")$ (=81.8)		3	M1
			$\angle PAD = 81.8$ (cyclic quad)		A1, A1
	(e)	Area of $PBC = \frac{1}{2}\times"16"\times10\times \sin 60$		4	M1
		Area of $PAD = \frac{1}{2}\times 2.5\times 4\times \sin 60$			M1
		Area of $ABCD$ = area of PBC – area of PAD			M1 dep
		65 cm^2 (64.9 cm^2 if 3 SF used from previous parts)			A1
					Total 16 marks

Question	Working	Answer	Mark	Notes
11 (a)	$x^2 + x^2 + xy + xy + xy + xy$		2	M1
		$A = 2x^2 + 4xy$		A1
(b)		$y = \frac{36}{x^2}$	1	B1
(c)	$A = 2x^2 + 4x \times \frac{36}{x^2}$		2	M1
		Correct conclusion		A1
(d)	One term correctly differentiated		4	M1
		$4x - \frac{144}{x^2}$		A1
	$"4x - \frac{144}{x^2}" = 0$			M1
		$x = 3.3$ (awrt)		A1
(e)		80, 66, 78.8 (awrt)	3	B3 B1 for each correct value

(f)	Curve drawn – 1 mark for each/any of: • straight line segments • each point missed (± ½ small square) • missing their minimum point (± ½ small square) • each missed segment • each point not plotted • each point incorrectly plotted (± ½ small square) • tramlines • very poor curve		3	B3
				Total 15 marks

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