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Mark Scheme (Results)

June 2016

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

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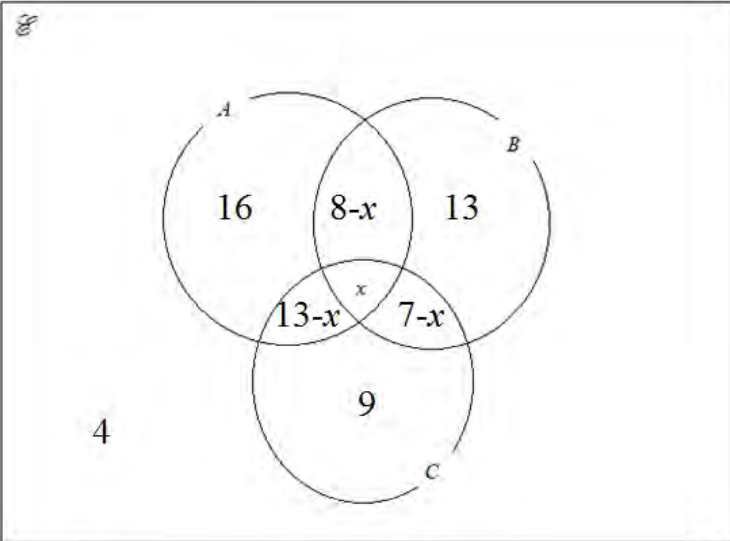
General Marking Guidance

- 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
    - o M marks: method marks
    - o A marks: accuracy marks
    - o B marks: unconditional accuracy marks (independent of M marks)
- Abbreviations
    - o cao – correct answer only
    - o ft – follow through
    - o isw – ignore subsequent working
    - o SC - special case
    - o oe – or equivalent (and appropriate)
    - o dep – dependent
    - o indep – independent
    - o 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.

International GCSE Maths				
Apart from question 15 (where the mark scheme states otherwise) the correct answer, unless obtained from an incorrect method, should be taken to imply a correct method.				
Q	**Working**	**Answer**	**Mark**	**Notes**
1 a	550×1.852		2	M1
		1019 (km/h) (1018.6)		A1
b	$\dfrac{500}{1.852}$ (o.e.)		2	M1
		270 (knots) (269.978…)		A1
				Total 4 marks

2		$(\mathbf{AB}) = \begin{pmatrix} -8 & -1 \\ 14 & 2 \end{pmatrix}$	5	B2 (-1ee)
	$"\begin{pmatrix} -8 & -1 \\ 14 & 2 \end{pmatrix}" - \begin{pmatrix} 4 & 7 \\ -6 & -10 \end{pmatrix}$			M1
		$\begin{pmatrix} -12 & -8 \\ 20 & 12 \end{pmatrix}$ (at least one term correct) OR at least one correct equation in λ		A1
		$\lambda = 4$		A1 no incorrect working seen
				Total 5 marks

3	a		4	5	B1
			$8 - x$, $13 - x$, $7 - x$		B1
			16, 13, 9		B1
	bi	Equating all their terms, from their diagram, (at least 7 terms) to 60 (o.e.)			M1
	bii	$x = 5$			A1
					Total 5 marks

The Venn diagram shows three intersecting circles A, B, C within a universal set $\mathscr{E}$. The regions are labelled: 16 (A only), $8-x$ (A∩B), 13 (B only), $13-x$ (A∩C), x (A∩B∩C), $7-x$ (B∩C), 9 (C only), and 4 (outside the circles).

4	a	$-1 = a + b$ (o.e.)		1	B1	accept $-1 = a \times 1^2 + b$
	b	$23 = 9a + b$ (o.e.)		1	B1	accept $23 = a \times 3^2 + b$
	c	attempt to eliminate either a or b (allow one slip)		3	M1	
			$a = 3, \quad b = -4$		A1	
					A1	
	d	$f(x) \geq "-4"$ Critical value identified $"-4"$ in a range statement		2	B1 ft	This could be in the form $-4 \leq x \leq 3$
		A correct mathematical statement (Accept: $f(x) \geq "-4", \ y \geq "-4", ["-4", \infty),$ $\{x : f(x) \geq "-4"\}$			B1 ft	Accept strong inequality at infinity
						Total 7 marks

5	a		Seeing a mid-class value	4	B1
		One correct *fx*/100 OR a completely correct numerator			M1
		$$\frac{5\times10+25\times30+33\times45+22\times55+15\times75}{100}$$ $$\left(=\frac{4620}{100}\right)$$			M1
			46.2 (km/h) (accept 46 from correct working)		A1
	b		22+15 seen	2	B1
			$\frac{37}{100}$ (0.37, 37%)		B1
	c		Heights of 1, 13.2, 8.8 and 2 and correct widths	4	B1, Tolerance of $\pm1/2$ small square B1, B1, B1
					Total 10 marks

6	attempt to factorise $x^2 + 3x - 28$		5	M1
		$(x+7)(x-4)$		A1
	$x^2 + 6x + 9 - 16$ (one error) OR $(x+3+4)(x+3-4)$ (one error)			M1 ind
		$(x+7)(x-1)$		A1
		$\dfrac{(x-4)}{(x-1)}$		A1 Do not isw
				Total 5 marks

7	ai		80° (opposite angles of cyclic quadrilateral)	4	B1 B1
	aii		62° (alternate segment)		B1 B1
	b		$\angle AOE = 124^\circ$ (angle at the centre)	4	B1 B1
			$\angle OAE = \dfrac{180-124}{2}$ (isosceles triangle)		B1 B1
			conclusion (last mark lost if no conclusion)		
			ALT 1 $\angle ADE = 62^\circ$ and $\angle DEA = 90^\circ$ One reason (i.e. same segment or angle in a semi-circle) $\angle DAE = 180^\circ - (62^\circ + 90^\circ)$ Reason: Angle sum of triangle Conclusion (last mark lost if no conclusion)		B1 B1 B1 B1
			ALT 2 $\angle ACD = 90^\circ$ and $\angle ECD = 28^\circ$ One reason (i.e. angle in a semi-circle) $\angle DAE = 28^\circ$ Reason: Angles in same segment		B1 B1 B1 B1
			ALT 3 $\angle OEQ / OEP = 90^\circ$ (tangent/radius) $\angle OEA = 90^\circ - 62$ and $\angle OAE = 28^\circ$ Reason: isosceles triangle		B1, B1 B1 B1

		Alt 4: $\angle DEA = 90°$ (angle in a semicircle) $\angle DEP = 28° = (\angle OAE)$ (alternate segment)		B1 B1 B1 B1
c	"62"-28 or $180-($"80"$+28+38)$		2	M1
		$34°$		A1
				Total 10 marks

8	a	$5x.x + 5x(-80) + 192.x + 192(-80)$		2	M1	
			$5x^2 - 208x - 15360$ (cwo) (isw)		A1	
	b		$\dfrac{480}{x}$	1	B1	
	c	$\dfrac{480}{x} + 2.5$		2	M1	
			$\dfrac{480 + 2.5x}{x}$		A1	(Accept $\dfrac{960 + 5x}{2x}$)
	d		$(x-16)"\left(\dfrac{480 + 2.5x}{x}\right)" = 544$ (o.e.)	1	B1 ft	
	e	$(x-16)(480 + 2.5x) = 544x$		3	M1	removing denominator(s) in x
			$480x + 2.5x^2 - 7680 - 40x = 544x$		A1	
			Correct conclusion from cc work		A1	
	f	$5x^2 - 208x - 15360 = (5x + 192)(x - 80)$ OR Correct substitution into formula		3	M1	
			X=80		A2	
					Total 12 marks	

9	ai		$2\mathbf{a} + \mathbf{b}$	3	B1
	aii		$\dfrac{5}{4}\mathbf{b}$		B1
	aiii		$\mathbf{a} + "\dfrac{5}{4}\mathbf{b}"$		B1ft
	b		$\mu("2\mathbf{a} + \mathbf{b}")$	1	B1ft
	c		$\mathbf{a} + \lambda\left("\mathbf{a} + \dfrac{5}{4}\mathbf{b}"\right)$	1	B1ft
	d	Equating components of one of $\mathbf{a}$ or $\mathbf{b}$.		5	M1
			$2\mu = 1+\lambda, \quad \mu = \dfrac{5}{4}\lambda$		A1 A1
			$\lambda = \dfrac{2}{3}, \quad \mu = \dfrac{5}{6}$		A1 A1
	e	$\dfrac{20}{\text{Area of } ADB} = \dfrac{"5/6"}{1-"5/6"}$ OR Area $ADB = 20\times"\dfrac{6}{5}" - 20$		2	M1
			4 square units		A1
					Total 12 marks

10	a	$\dfrac{360}{5}$ $(=72°)$ OR $(2\times5-4)\times90$ $(=540°)$		2	M1	
		$180-\dfrac{360}{5}$ $(=108°)$ AG OR $\dfrac{(2\times5-4)\times90}{5}(=108°)$ AG			M1 (dep)	
	b	$AG^2=10^2+5^2-2\times10\times5\times\cos"108°\,"$		3	M1	**Penalise incorrect rounding only once in the remainder of the question** Only accept 72° for 108 and only award marks for Method
		$=125-100\cos"108°\,"$			M1 (dep)	
			$AG=12.5$ (12.48606...)		A1	
	c	$\dfrac{5}{\sin\angle GAB}=\dfrac{"12.5"}{\sin"108°\,"}$		3	M1	
		$\sin\angle GAB=\dfrac{5\times\sin"108°\,"}{"12.5"}$			M1 (dep)	
			$\angle GAB=22.4$		A1	(Accept 22.3)
		Alt: $5^2=10^2+"12.5"^2-2\times10\times"12.5"\times\cos\angle GAB$ $\cos\angle GAB=\dfrac{10^2+"12.5"^2-5^2}{2\times10\times"12.5"}$			M1 M1 (dep)	

d	$\angle GAF = "108" - 2 \times "22.4"$ (=63.2)		3	M1	
	Area = $\frac{1}{2} \times "12.5" \times "12.5" \times \sin(108 - 2 \times "22.4")$			M1 (dep)	
		69.6 cm^2		A1	(Accept 69.5. 69.6, 69.7, 69.8 or 69.9)
e	$\frac{"69.6"}{172} \times 100$	3	3	M1	
	$\left(1 - \frac{"69.6"}{172}\right) \times 100$ (o.e.)			M1 (dep)	
		59.5%		A1	(Accept 59.4, 59.5 or 59.6)
					Total 14 marks

11	a		$h-20$	1	B1	
	b		$V = \dfrac{1}{3}\pi r^2 ("h-20")$ (o.e.)	1	B1 ft	
	c	$V = \dfrac{1}{3}\pi r^2 (32 - r - 20)$		2	M1	Substituting $32-r$ into their $\dfrac{1}{3}\pi r^2 ("h-20")$
			correct conclusion (from completely correct working)		A1	
	d		43, 85, 67	3	B1, B1, B1	
	e		**-1 mark for**: any straight line segments each point missed ($\pm$ ½ small square) each missed segment each point incorrectly plotted ($\pm$ ½ small square) tramlines very poor curve	3	B3	ft from their table values
	f	$y = 80$ drawn (can be implied by values)		3	M1	
			6.8, 9.1 ($\pm 1/2$) small square		A1 A1	

g	$\pi\times"6.8"\times"6.8"\times20$ or $\pi\times"9.1"\times"9.1"\times20$		3	M1	For this first M mark, the required expression may be embedded with anything else So, accept $\pi\times"6.8"\times"6.8"\times20+80\pi$ (o.e.) or $\pi\times"9.1"\times"9.1"\times20+80\pi$ (o.e.)
	$\pi\times"9.1"\times"9.1"\times20-\pi\times"6.8"\times"6.8"\times20$			M1 (dep)	For the 2nd M1 (dep), if embedded it must be with a correct expression As for the first M mark accept expressions involving 80π
		2300 cm^3 (Accept answers in the range $1900\rightarrow2500$)		A1 ft	2300 cm^3 (Accept answers in the range $1900\rightarrow2500$)
					Total 16 marks