Pearson

Mark Scheme (Results)

Summer 2018

Pearson Edexcel International GCSE
In Mathematics B (4MB1)
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**
  - 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
  - awrt – answer which rounds to
  - 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 part.

Question	Working	Answer	Notes	Mark	Sub-Total	Total
1(a)	$\frac{600}{4}\times(12+9+4)$ oe		Full method to find total number of seats	M1		
		3750		A1	2	
1(b)	Stalls: 1800 Dress Circle: 1350			B1		
	$(\text{"1800"}\times 65)+(0.9\times(\text{"1350"}\times 40))+(0.25\times(600\times 25))$			M1		
		\$169,350		A1	3	
1(c)	$\frac{175000-\text{"169350"}}{25}(=226)$ or $\frac{175000-\text{"117000"}-\text{"48600"}}{25}$			M1		
		376		A1	2	7

Question	Working	Answer	Notes	Mark	Sub-Total	Total
2	$AC^2 = 5^2 + 12^2$ **or** $AC = 13$ **or** $6^2 + 2.5^2$ (=42.25) (E to middle of BC)$^2 = 11^2 - 2.5^2$ or E-midBC $= \frac{3\sqrt{51}}{2}$ (E to middle of AB)$^2 = 11^2 - 6^2$ or E-midAB $= \sqrt{85}$		Correct method to find side of triangle in first stage to find height of pyramid	M1		
	$OE^2 = 11^2 - \left((0.5\times"13")^2\right)$ or $11^2 - 2.5^2 - 6^2$ oe		Correct statement for $(OE)^2$ oe	M1		
		$OE = \frac{3\sqrt{35}}{2}$	Allow 8.87(41...)	A1		
	$V = \frac{1}{3}(12)(5)(OE)$		(dep on M2) or for an answer of 177.(4823...)	M1		
		$30\sqrt{35}$	Or p = 30, q = 35	A1		5

Question	Working	Answer	Notes	Mark	Sub-Total	Total
3	$\mathbf{A}^2 = \begin{pmatrix} a^2+12 & 3a-3 \\ 4a-4 & 13 \end{pmatrix}$			B2 (-1 eeoo)		
	$\begin{pmatrix} a^2+12 & 3a-3 \\ 4a-4 & 13 \end{pmatrix} - \begin{pmatrix} 13 & 3 \\ 4 & 10 \end{pmatrix} = \lambda\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$		Their $\mathbf{A}^2 - \mathbf{B} = \lambda\mathbf{I}$	M1		
		$a = 2$ $\lambda = 3$		A1 A1		5

Question	Working	Answer	Notes	Mark	Sub-Total	Total
4(a)		$\{h, l\}$		B1	1	
4(b)		$\{a, b, c, f, g, h\}$		B1	1	
4(c)		4		B1	1	
4(d)		10		B1	1	
4(e)		$\subset$		B1	1	
4(f)		$\frac{2}{7}$	Decimals or % to 2dp truncated or rounded 0.28(5714...)	B1	1	6

Question	Working		Answer	Notes	Mark	Sub-Total	Total
5(a)	$3+5a=0$				M1		
			$a=-0.6$	oe	A1	2	
5(b)			$f(x)<3$	Accept any equivalent notation but not $x<3$	B1	1	
5(c)			$x=\frac{2}{3}$		B1	1	
5(d)	$(3+5x)(3x-2)=5-4x$			Removing denominator in a correct equation	M1oe		
	$15x^2+3x-11=0$				A1		
	$\frac{-3\pm\sqrt{3^2-4(15)(-11)}}{2(15)}=\frac{-3\pm\sqrt{69}}{30}$			Solving their 3 term quadratic	M1oe		
	0.762... and/or –0.962...			Or	A1		
	awrt −0.962		–0.962	Rejection of positive root	A1	5	
5(e)	$y=\frac{5-4x}{3x-2}$ $y(3x-2)=5-4x$	$x=\frac{5-4y}{3y-2}$ $x(3y-2)=5-4y$		Write in x or y in terms of y or x and multiply	M1		
	$3xy-2y=5-4x$ $3xy+4x=5+2y$	$3xy-2x=5-4y$ $3xy+4y=5+2x$		expand and isolate terms in x or y	M1		
	$x(3y+4)=5+2y$ $x=\frac{5+2y}{3y+4}$	$y(3x+4)=5+2x$ $y=\frac{5+2x}{3x+4}$		Factorise out x or y and divide.	M1		
			$g^{-1}:x\to\frac{5+2x}{3x+4}$	Correct answer written in fully correct form.	A1	4	13

Question	Working	Answer	Notes	Mark	Sub-Total	Total
6(a)	$x+y=12$			B1indep		
	$\dfrac{x+y+y+12+(x+y)+12}{6}=9.5$			M1indep		
	eg $2x+3y=33$		Terms in x and y and numerical terms simplified	A1		
	$2x+3(12-x)=33$		Solve simultaneous equations (dependent on previous M mark)	M1 dep		
		$x=3, y=9$		A1	5	
6(b)	Median $=\dfrac{"9"+12}{2}$		Correct calculation with their value of y	M1ft		
		10.5	cao	A1	2	7

Question	Working	Answer	Notes	Mark	Sub-Total	Total
7(a)		Triangle A drawn	**Penalise labelling ONCE only**	B1	1	
7(b)		$x=-2$ drawn	Implied by correct triangle or two correct coordinates	B1		
		Triangle B drawn	$(-5,1),(-5,3),(-4,3)$	B1	2	
7(c)	$(-4,-2),(-4,0),(-3,0)$	Triangle C drawn	ft from their B	B2 (-1 ee)	2	
7(d)	$\begin{pmatrix}-2 & 0\\ 0 & -2\end{pmatrix}"\begin{pmatrix}-4 & -4 & -3\\ -2 & 0 & 0\end{pmatrix}"$		NB: coordinates may be in any order	M1ft		
		$\begin{pmatrix}8 & 8 & 6\\ 4 & 0 & 0\end{pmatrix}$		A1ft		
		Triangle D drawn	cao	A1	3	
7(e)	$\begin{pmatrix}-0.5 & 0\\ 0 & -0.5\end{pmatrix}$	$\frac{1}{4}\begin{pmatrix}-2 & 0\\ 0 & -2\end{pmatrix}$ oe	B1 for one correct row or column & correct expression for det.	B2	2	
7(f)		enlargement scale factor -0.5 oe centre (0, 0) oe		B1 B1 B1	3	

Question	Working	Answer	Notes	Mark	Sub-Total	Total
8(a)	$y=\frac{1}{2}x^4-\frac{1}{2}x^2-\frac{5}{3}x^3+11x+\frac{1}{3}$		Expanding(at least1 term correct) and differentiating (at least one term correct)	M1		
	$\frac{\mathrm{d}y}{\mathrm{d}x}=2x^3-x-5x^2+11$ and $\frac{\mathrm{d}y}{\mathrm{d}x}=5$ when $x=p$ giving $2p^3-p-5p^2+11=5$		Sets their derivative = 5 with at least two terms differentiated correctly	M1		
		$2p^3-5p^2-p+6=0$	Dep on M2 NB: answer given	A1	3	
8(b)	$2(1.5)^3-5(1.5)^2-(1.5)+6$		Substitute 1.5 into cubic or by algebraic division	M1		
	$2(1.5)^3-5(1.5)^2-(1.5)+6=0$		Showing that the remainder is zero	A1	2	
8(c)	p^2.......		Showing division with at least p^2 in quotient	M1		
		p^2-p-2	Fully correct quotient	A1		
	$(p+1)(p-2)$		p^2-p-2 correctly factorised	M1		
		$(2p-3)(p+1)(p-2)$	Fully factorised expression	A1	4	
8(d)	$q=\frac{1}{2}(2)^2(2^2-1)-\frac{5}{3}(2)^3+11(2)+\frac{1}{3}$		substitution of 2 into y to give q	M1		
		15		A1		

Question	Working	Answer	Notes	Mark	Sub-Total	Total
9(a)(i)		$\mathbf{b}-\mathbf{a}$	Must be lower case **a**, **b**	B1		
9(a)(ii)		$-2\mathbf{a}$	Must be lower case **a**	B1	2	
9(b)(i)	$\overrightarrow{CD} = '-2\mathbf{a}' + \lambda\mathbf{b} + \mu\mathbf{a}$ **or** $\overrightarrow{AE} = 3'(\mathbf{b}-\mathbf{a})' + \lambda\mathbf{b}$			M1ft		
	$\overrightarrow{CD} = '-2\mathbf{a}' + \lambda\mathbf{b} + \mu\mathbf{a}$ **and** $\overrightarrow{AE} = 3'(\mathbf{b}-\mathbf{a})' + \lambda\mathbf{b}$	Expressions for $\overrightarrow{CD}$ and $\overrightarrow{AE}$		A1ft		
9(b)(ii)		$(\mu-2)\mathbf{a}+\lambda\mathbf{b}$ **and** $-3\mathbf{a}+(3+\lambda)\mathbf{b}$	Both expressions simplified	A1ft	3	
9(c)	$4(\mu-2)=-3$		Forming equation for **a**	M1ft		
		$\mu=\frac{5}{4}$ oe		A1		
	$4\lambda=3+\lambda$		Forming equation for **b**	M1ft		
		$\lambda=1$		A1	4	
9(d)	$\frac{1}{2}(4\mu+\lvert-2\mathbf{a}\rvert)h=5$ oe eg ½(5 + 8)h = 5		Using their $\overrightarrow{CF}$ and μ	M1		
		$h=\frac{10}{13}$		A1		
	$\sin\angle CFE=\frac{h}{\lambda} = \frac{10}{13}$			M1		
		50.3°		A1	4	13

Question	Working	Answer	Notes	Mark	Sub-Total	Total
10(a)		6.64, −3.33, 1.6	Penalise rounding once	B1,B1,B1	3	
10(b)	Curve -1 mark for straight line segments Each point missed Each missed segment Each point incorrectly plotted Tramlines Very poor curve N.B. Accuracy for both plotting and drawing is $\pm\frac{1}{2}$ss	A correct curve		B3 ft (−1 eeoo)	3	
10(c)	$x^2 - 5x + \frac{8}{x} = ax + b$ or $x^2 + \frac{8}{x} < \frac{21}{4}x + 3$ oe			M1		
	$4x^3 + 4(-5 - a)x^2 - 4bx + 32 = 0$ oe Or $x^2 - 5x + \frac{8}{x} < \frac{1}{4}x + 3$		Re-arrange and attempt to solve for *a* and *b*	M1		
	$a = \frac{1}{4}$ and $b = 3$	Draw line $y = \frac{1}{4}x + 3$		A1		
	1.1 and 5.5			A1		
		$1.1 < x < 5.5$	Dep on previous marks ft their graph. Must be correct inequality signs	A1	5	11

Question	Working	Answer	Notes	Mark	Sub-Total	Total
11(a)		$\frac{5}{14}, \frac{9}{14}$ $\frac{3}{7}, \frac{4}{7}$ $\frac{4}{13}, \frac{9}{13}$	Ignore extra branches completed oe	B1 B1 B1	3	
11(b)	$\frac{2}{5}\times'\frac{9}{14}'$ **or** $\frac{3}{5}\times'\frac{3}{7}'$ **or** $\frac{3}{5}\times'\frac{4}{7}'$ **or** $\frac{3}{5}\times 1$ **or** $\frac{6}{15}\times\frac{5}{14}$		ft their tree diagram	M1		
	$\frac{2}{5}\times'\frac{9}{14}'+\frac{3}{5}\times'\frac{3}{7}'+\frac{3}{5}\times'\frac{4}{7}'$ **or** $1-\frac{6}{15}\times\frac{5}{14}$		ft their tree diagram	M1dep		
		$\frac{6}{7}$ oe	0.85(714...) decimals and % to 2dp truncated or rounded	A1	3	
11(c)	P(A): $\left(\frac{2}{5}\times'\frac{9}{14}'\right)+\left(\frac{2}{5}\times'\frac{5}{14}'\times'\frac{4}{13}'\right)+\left(\frac{3}{5}\times'\frac{3}{7}'\right)$ oe $=\frac{254}{455}$		Complete method to calculate either 15 (A) or 20 (B) cents removed 0.55(824...)	M1ft		
	P(B): $\left(\frac{2}{5}\times'\frac{5}{14}'\times'\frac{9}{13}'\right)+\left(\frac{3}{5}\times'\frac{4}{7}'\right)$ oe $=\frac{201}{455}$		Correct probability for either 15 or 20 ft 0.44(175...)	A1ft		
		A is more likely as $\frac{254}{455}>\frac{201}{455}$	Correct conclusion with correct reason dep on both A and B correct	A1 cao	3	