Pearson Edexcel

Mark Scheme (Results)

November 2020

Pearson Edexcel International GCSE
In Mathematics B (4MB1)
Paper 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.
- 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.

  If a candidate misreads a number from the question. Eg. Uses 252 instead of 255; method marks may be awarded provided the question has not been simplified. Examiners should send any instance of a suspected misread to review.

  If there is a choice of methods shown, mark the method that leads to the answer on the answer line; where no answer is given on the answer line, award the lowest mark from the methods shown.

  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 to another.

Question	Working	Answer	Mark	Notes	Total
1	eg $7x - 4x \leq -15 - 3$		2	M1 for collecting terms in x on one side and numerical terms the other side, allow an equation or incorrect inequality sign.	
		$x \leq -6$		A1 Do not ISW.	
					2

2	$\frac{30}{7} \times \frac{21}{5}$ oe or $\frac{90}{21} \div \frac{5}{21}$ oe		2	M1 must see correct fractions for multiplying or correct fraction division both over the same common denominator	
	eg $\frac{\cancel{30}^{6}}{\cancel{7}} \times \frac{\cancel{21}^{3}}{\cancel{5}} = 18$ or $6 \times 3 = 18$ or $\frac{630}{35} = 18$ or $\frac{90}{5} = 18$	shown		A1 dep on M1 must see at least one additional stage of working after the M1	
					2

3	$3 \times 6^2 + 11 (=119)$ or $3 \times 9^2 + 11 (=254)$ or $3 \times 9^2 - 3 \times 6^2$	135	2	M1 A1 allow -135	
					2

4 (i)		$2^3\times3^2\times5^2\times7$ or 12 600	1	B1	SC (i) 60 or $2^2 \times 3 \times 5$ and (ii) 12 600 or $2^3\times3^2\times5^2\times7$ scores B0B1	
(ii)		$2^2 \times 3 \times 5$ or 60	1	B1		
						2

5	$3.64 \div 1.04$ (=3.50) oe or $3.64 \div \frac{104}{4}$ oe		2	M1 allow $\frac{3.64\times100}{104}$ NB 3.5, 3.50 or 0.14 seen from a 4% decrease do not award any marks	
		0.14		A1 NB 0.14 seen with no incorrect working score full marks.	
					2

6	[$a : b$ =] 21 : 35 and [$a : c$ =] 21 : 12 oe or (3 : 5) × 7 and (7 : 4) × 3		2	M1 two correct two part ratios with equal a or correct 3 part ratio but not in simplest form eg 42 : 70 : 24 or 3 : 5 : $\frac{12}{7}$ or 7 : $\frac{35}{3}$: 4	
		21 : 35 : 12		A1	
					2

7	Method 1 Corresponding sides $\frac{8.5}{6.8}$ and $\frac{9}{7.2}$ and $\frac{9.5}{7.6} = 1.25$ **or** $\frac{6.8}{8.5}$ and $\frac{7.2}{9}$ and $\frac{7.6}{9.5} = 0.8$ Method 2 Angles (Any 2 of these required) • $\frac{9.5^2+9^2-8.5^2}{2\times9.5\times9}$ and $\frac{7.6^2+7.2^2-6.8^2}{2\times7.6\times7.2}$ and 0.579 or 54.6 • $\frac{9.5^2+8.5^2-9^2}{2\times9.5\times8.5}$ and $\frac{7.6^2+6.8^2-7.2^2}{2\times7.6\times6.8}$ and 0.505 or 59.7 • $\frac{8.5^2+9^2-9.5^2}{2\times8.5\times9}$ and $\frac{7.2^2+6.8^2-7.6^2}{2\times7.2\times6.8}$ and 0.412 or 65.7 Method 3 Ratio (Any 2 of these required) • $\frac{8.5}{9} = \frac{6.8}{7.2}$ and awrt 0.94 • $\frac{8.5}{9.5} = \frac{6.8}{7.6}$ and awrt 0.89 • $\frac{9}{9.5} = \frac{7.2}{7.6}$ and 0.95 or awrt 0.947		2	B2 for calculating or finding any of the following: • SF for all three pairs of corresponding sides, and the 1.25 or 0.8 seen (Method 1) • Two pairs of corresponding angles from each triangle with either the corresponding cosine value 0.579 or 0.505 or 0.412 or angle 59.7 or 65.7 or 54.6 correct to 3sf. (Method 2) • Two pairs of corresponding ratios with the corresponding value 0.94 or 0.89 or 0.95 correct to 2 sf (Method 3) B1 for evaluating or equating • two pairs of corresponding sides • one pair of corresponding angles • one pair of corresponding ratios	
					2

8		$4x^3 + 16x^{-3}$ or $4x^3 + \frac{16}{x^3}$	2	B2 oe (B1 for one correct term)		
						2

9	(0×5+)1×2+2×8+3×4+4×1 (=34) Or (0+)2+16+12+4		3	M1 for correct products allowing one error with intention to add	
	$\frac{(0 \times 5) + 1 \times 2 + 2 \times 8 + 3 \times 4 + 4 \times 1}{5+2+8+4+1}$ (34÷20)			M1 fully correct method (condone one error in products)	
		1.7		A1 oe	
					3

10	$(\sqrt{180} =)\sqrt{36 \times 5}$ or $(\sqrt{180} =)2\sqrt{45}$ or $(\sqrt{180} =)3\sqrt{20}$ or (180 =) $2^2 \times 3^2 \times 5$ or $(\sqrt{147} =)\sqrt{49 \times 3}$ or (147 =) 3×7^2		3	M1 for clearly showing understanding of surd form must include a decomposition of either 180 or 147	
	$6\sqrt{5} - 3\sqrt{3} - 2\sqrt{5} + 7\sqrt{3}$			M1 dep at least 3 terms correct	
	$4(\sqrt{5} + \sqrt{3})$	4		A1 dep on both M marks	
					3

11	$\frac{5(x+5)}{20}+\frac{4(x-3)}{20}(=2)$ or $\frac{5(x+5)+4(x-3)}{20}(=2)$ or $5(x+5)+4(x-3)=2\times 20$		3	M1 For clear intention to multiply **all** terms by 20 or a multiple of 20. Do not award if one term is not multiplied. LHS over common denominator or equation with no fractions	
	$5x+25+4x-12=40$ $(9x=27)$			M1 dep an equation with brackets expanded and no denominators (allow a single numerical or sign error)	
		3		A1 dep on first M1	
					3

12	$\frac{1}{2}\times\pi\times\left(\frac{5}{2}\right)^2\times x\ (=35\pi)$ oe		3	M1 oe	
	$x=35\times\left(\frac{2}{5}\right)^2\times 2$			M1 dep oe	
		11.2		A1 oe SC If no marks awarded otherwise 5.6 or 2.8 given as final answer award B1	
					3

13 (a)		m^9	1	B1	
(b)		$25p^6w^2$	2	B2 (B1 for 2 correct part of a product, may be seen in working) NB $5^2p^6w^2$ gains B1	
					3

14	$(p=)\dfrac{2}{\frac{6\times5}{4m+2}+5}$ oe or $\left(\dfrac{30}{4m+2}+5\ =\right)\dfrac{30+5(4m+2)}{4m+2}$ oe or $n=\dfrac{2-5p}{6p}$ oe		3	M1 correct expression for p in terms of m **or** correct simplification of $6n+5$ **or** correct simplified expression for n in terms of p	
	$(p=)\dfrac{2(4m+2)}{30+5(4m+2)}$ oe or $\dfrac{2}{p}=\dfrac{30+5(4m+2)}{4m+2}$ oe or $\dfrac{2-5p}{p}=\dfrac{5}{4m+2}$ oe			M1 correct equation linking p and m with no nested fractions	
		$p=\dfrac{2m+1}{10+5m}$		A1 or $p=\dfrac{2m+1}{5(m+2)}$ oe simplified form	
					3

15	For 192.5 or 187.5		3	M1	
	For 61.5 or 62.5			M1	
	"192.5" ÷ "61.5" (=3.13...)			M1 where $190 < \text{"192.5"} \leq 195$ and $61 \leq \text{"61.5"} < 62$	
		3hrs 8 mins		A1 cao	
					4

16	$\tan 75^\circ = \frac{x}{5}$ oe		4	M1 Correct expression involving x must use correct angle. Allow $\tan 15^\circ = \frac{5}{x}$	
	$x = 5\tan 75^\circ$ (=18.7)			M1 Correct expression for x condone use of 15º in place of 75º (or value of 1.34)	
	Height = 5tan75° + 1.4			M1 Correct expression for height condone use of 15º in place of 75º (or value of 2.74)	
		20.1		A1 awrt 20.1	
					4

17	1.4 or $\frac{7}{5}$ or 2 × 10 (=20) or 2.5 × 30 (=75) or 0.9 × 20 (=18) seen		3	M1	
	2 × 10 + 2.5 × 30 + 0.9 × 20 oe			M1 Allow an error on one bar, but must see all 3 bars added.	
		113		A1	
					3

18	950 = k × 5² or k = 38 or $\frac{950}{5^2} = \frac{A}{7^2}$ oe		3	M1	
	(A =) $\frac{950}{5^2} \times 7^2$ or (A =) "38" × 7^2 oe			M1 dep	
		1862		A1	
					3

19	$20x - 12y = 84$ – $9x - 12y = 67.5$ $(11x = 16.5)$ or $15x - 9y = 63$ – $15x - 20y = 112.5$ $(11y = -49.5)$	$y = \frac{5x-21}{3}$ giving $3x - 4\left(\frac{5x-21}{3}\right) = 22.5$ or $x = \frac{21+3y}{5}$ giving $3\left(\frac{21+3y}{5}\right) - 4y = 22.5$		4	M1 for a correct method to eliminate x or y: coefficients of x or y the same **and** correct operation to eliminate selected variable (condone 1 arithmetical error) **or** for correctly writing x or y in terms of the other variable and correctly substituting (condone 1 arithmetical error)	
			$x = 1.5$ or $y = -4.5$ oe		A1 dep on M1	
	$5 \times$ "1.5" $- 3y = 21$ or $3 \times$ "1.5" $- 4y = 22.5$ or $5x - 3 \times$ "–4.5" $= 21$ or $3x - 4 \times$ "–4.5" $= 22.5$				M1 dep on M1 for substitution of found variable **or** repeating the steps in first M1 for the second variable	
			$x = 1.5$ and $y = -4.5$ oe		A1 dep on M1	
						4

20 (a)		$\begin{pmatrix} 11 & 5 \\ -3 & -2 \end{pmatrix}$	2	B2 −1 eeoo	
(b)		$\begin{pmatrix} -25 & 1 \\ 15 & 7 \end{pmatrix}$	2	B2 −1 eeoo	
					4

21	$BAD = 180 - 96(=84)$ or $OAD = 90 - 78(=12)$		4	M1 may be marked on diagram. Must be clear it is the correct angle. We will allow $A = 180 - 96(=84)$	
	$EAB = 180 - 78 - $ "84"$(=18)$ or $ABD = 0.5 \times (180 - 2 \times$ "12"$)(=78)$			M1 may be marked on diagram. Must be clear it is the correct angle.	
		18°		A1	
				NB an answer of 18° gains 3 marks.	
	Opposite angles of a cyclic quad Angle between tangent and radius Angle at centre = 2 × angle at circumference oe Alternate segment theorem Angles in a triangle total 180° Angles in a straight line total 180º			B1 2 correct reasons for method used, one must be a circle theorem. NB Assuming the triangle BCD is isosceles (42) is automatically B0	
					4

22	$25^{5n+3} = 5^{2(5n+3)}$ oe		4	M1	
	$\left(\sqrt{125}\right)^{4n+2} = 5^{\frac{3}{2}(4n+2)}$ oe			M1	
	Simplify numerator to $5 \times 5^{10n+6}$ or 5^{10n+7}			M1 dep on first M1	
		$4n + 4$		A1 oe Allow 5^{4n+4}	
					4

23	$9 - 5(2x + x^2)$ **or** $(g'(x) =) -10 - 10x$ **or** $\frac{- -10}{2\times -5}$ **or** –2.67 and 0.67 (or better)		3	M1 differentiating one term correctly or using $\frac{-b}{2\times a}$ or for expressing in the form $9 - 5(2x + x^2)$ or $-5(-\frac{9}{5} + 2x + x^2)$ or for correct solution of the quadratic to at least 2dp. Accept exact solution $\left(\frac{-5\pm\sqrt{70}}{5}\right)$ or equivalent surd form	
	$9 - 5[(x + 1)^2 - 1]$ **or** "$-10 - 10x$" $= 0$ **or** $x = -1$			M1 dep equating their 2 term derivative to zero, $x = -1$ seen or an expression containing a single x	
	$(y =) 14$			M1 dep $y=14$ must follow from algebraic working	
		$g \leq 14$	1	A1 (accept $g(x) \leq 14$ or $y \leq 14$ or $(-\infty, 14]$ or $]-\infty, 14]$, Condone $-\infty, 14]$ Do not accept answers from trials of multiple values of x unless correct, clear algebraic working is seen.	
					4

24 (a)		Arc centre *B*, radius 4 cm	1	B1 4cm ± 2 mm must touch both *AB* and *BC*	
(b)			2	M1 arcs centred on *B* and *C* drawn correctly to enable bisector to be drawn, must intersect twice	
		Correct perpendicular bisector		A1 dep on M1	
(c)			2	M1 arcs centred on *D* along *DC* and *DA*, and arcs from these points meeting correctly to enable angle bisector to be drawn.	
		Correct angle bisector		A1 dep on M1	
(d)		Correct section labelled	1	B1 Must fit within the tramlines on the overlay Does not need to be labelled but must be clearly indicated.	
					6

25 (a)	$B - de = ac$ or $\frac{B}{c} = a + \frac{de}{c}$ or $\frac{B-de}{c}$		2	M1	
		$a = \frac{B-de}{c}$		A1 oe	
(b)		$7x^2y^2(2y - 3x^3)$	2	B2 (B1 for a correct but partially factorised expression but must have at least 2 factors outside eg. $7x(2xy^3 - 3x^4y^2)$, or $7x^2y^2(ay^n - bx^m)$ where *a, b*, *m* and *n* are positive integers any of these values may be 1.) Condone missing trailing brackets.	
					4

26	Any one of 30,60,120,240 identified correctly or used or the length $\sqrt{3}x$ identified or used.			M1 oe	
	$0.5 \times 2x \times 2x \times \sin 60$ $(= \sqrt{3}x^2)$ or $0.5 \times 2x \times 2x \times \sin 120$ $(= \sqrt{3}x^2)$ or $0.5 \times 2x \times \sqrt{3}x$ $(= \sqrt{3}x^2)$ or $0.5 \times x \times \sqrt{3}x = \left(= \frac{\sqrt{3}}{2}x^2\right)$			M1 dep first M mark	
	$\frac{240}{360} \times \pi \times (2x)^2 \left(= \frac{8}{3}\pi x^2\right)$ or $\frac{120}{360} \times \pi \times (2x)^2 \left(= \frac{4}{3}\pi x^2\right)$ or $\frac{60}{360} \times \pi \times (2x)^2 \left(= \frac{2}{3}\pi x^2\right)$ or $\frac{30}{360} \times \pi \times (2x)^2 \left(= \frac{1}{3}\pi x^2\right)$			M1 dep first M mark	
	$\frac{240}{360} \times \pi \times (2x)^2 + 2 \times 0.5 \times 2x \times 2x \times \sin 60$ or $\pi \times (2x)^2 - 2 \times \left(\frac{60}{360} \times \pi \times (2x)^2 - 0.5 \times 2x \times 2x \times \sin 60\right)$			M1 dep on previous M marks Fully correct method to find the required area	
		$2\sqrt{3} + \frac{8}{3}\pi$		A1 oe	
					5

27 (a)	1 – (0.22 + 0.34 + 0.12)(= 0.32) oe		3	M1 Use of the total probability =1 (award if their two answer sum to 0.32)	
	"0.32" ÷ 4 (=0.08)			M1 dep allow $4x$ = "0.32" for this mark	
		pink = 0.08, orange = 0.24		A1	
(b)	90 ÷ 0.12 oe		2	M1	
		750		A1	
					5

28	(*GFE* =) 135º		7	B1 finding interior angle of octagon	
	$0.5 \times FE \times GF \times \sin$ "135°" = $4\sqrt{2}$			M1 for use of sine rule	
	$(GF =)\sqrt{\frac{2\times 4\sqrt{2}}{\sin 135°}}$ (=4)			M1 for a correct rearrangement to find the length of a side of the octagon	
	$(GE =)\sqrt{4^2 + 4^2 - 2 \times 4 \times 4 \times \cos 135°}$			M1 for a correct method to find length *GE*	
	GE = 7.4 or better			A1 **NB** *GE* = 7.4 gains first 5 marks	
	$BG = 4 + 2 \times 4\cos 45°$ (=4+4√2=9.66) or $\frac{BG}{\sin(67.5)} = \frac{"7.39"}{\sin(45)}$			M1 correct method for finding the length of *BG* eg $4 + 2 \times 4\tan 67.5°$ or $4 + 2 \times \frac{"\text{their } GE"}{2\cos 67.5}$	
		26.7		A1 awrt 26.7	
					7

SC for using $4\sqrt{2}$ as the area of *BEG* can get B1M1M1M1A0M0A0

	(*GFE* =) 135º		7	B1 finding interior angle of octagon. Implied by use of $\angle GBE = 45°$	
	$0.5 \times BG \times BE \times \sin 45° = 4\sqrt{2}$			M1 for use of sine rule	
	$BG = \sqrt{\frac{2\times 4\sqrt{2}}{\sin 45^\circ}} (= 4)$			M1 for a correct rearrangement to find the length of a side of the octagon	
	$GE = \sqrt{4^2 + 4^2 - 2\times 4\times 4\times \cos 45^\circ}$			M1 for a correct method to find length *BG* **NB** *GE* = 3.06 gains first 4 marks	
					7

29 (a)	$5^3 - 6 \times 5^2 - 7 \times 5 + 60$		2	M1	
		Shows that substitution of 5 gives zero		A1 Must see = 0 as a conclusion.	
(b)	$x^3 - 6x^2 - 7x + 60 = (x-5)(ax^2 + bx + c)$		3	M1 for any correct method leading to at least two of $a = 1$ and $b = -1$ and $c = -12$ correct. This may be seen in part (a) For synthetic long division we expect 2 out of the 3 numbers in bold to be correct. 5 | 1 –6 –7 60 5 5 –5 60 **1 –1 –12** | 0	
	$x^2 - x - 12 = (x-4)(x+3)$			M1 indep for attempt to factorise their trinomial quadratic their brackets must expand to give 2 out of 3 terms of their quadratic factor	
		$(x-5)(x+3)(x-4)$		A1 CAO Condone =0 but do not ISW solution of cubic.	
					5

24