Pearson Edexcel

Mark Scheme (Results)

January 2019

Pearson Edexcel International GCSE
Mathematics A (4MA0) Higher Tier
Paper 4H

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk. Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

January 2019
Publications Code 4MA0_4H_1901_MS

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
- **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, 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

Apart from Questions 2(a)(ii), 8a, 9 and 16b, where the mark scheme states otherwise, the correct answer, unless clearly obtained by an incorrect method, should be taken to imply a correct method.					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(a)	$\frac{30}{20}\times 240$ or $240 + \frac{1}{2}\times 240$	360	2	M1 A1
	(b)	$\frac{150}{125}\times 100$ or $\left(\frac{150}{125}\times 20\right)\times\frac{100}{20}$ or $\left(150\div\frac{125}{20}\right)\times\frac{100}{20}$ or $\frac{100}{20}\times 24$ oe	120	2	M1 A complete method. A1
	(c)	$125:75$	0.6	2	M1 Any correct ratio eg 5:3 A1 $1:0.6$ or $1:\frac{3}{5}$
2	(a) (i)		58	1	B1
	(ii)		Alternate (angles)	1	B1 dep on (i) correct or other **complete** reason
	(b)	$180 + 58$ or $360-(180-58)$	238	2	M1 A1

Question		Working	Answer	Mark	Notes
3	(a)	$1-0.43$	0.57	2	M1 A1 oe
	(b)	200×0.43	86	2	M1 Accept 200×0.57 ft from (a) for value between 0 and 1. A1 Award M1 A0 for $\frac{86}{200}$
4	(a)		$3xy+y^2$	2	M1 for two terms with one term correct. A1
	(b)	$6^2-4(-5)$ or $6^2-4\times-5$ or 6^2+20	56	2	M1 A1
	(c)	$8w<41-7$ or 4.25 oe	$w<4.25$	2	M1 Accept with $\leqslant$ A1 Accept $w<4\frac{1}{4}$, $w<\frac{17}{4}$, $w<\frac{34}{8}$

Question	Working	Answer	Mark	Notes
5 (a)	(5, 4), (5, 3), (8, 3), (8, 5), (7, 5), (7, 4)	Correct shape	2	B2 B1 for any translation of the correct reflection.
(b)		rotation 90^o clockwise (centre) (1, 6)	3	B1 B1 $270^o, -90^o$ B1 A description that involves more than one transformation scores B0.
6	$1\times10.5+5\times30.5+8\times50.5+10\times70.5+6\times90.5$ or 10.5 + 152.5 + 404 + 705 + 543 or 1815	60.5	4	M2 At least four correct products with evidence of addition. Award M1 for at least four products using consistent values within the intervals which are not mid-values (including ends) and evidence of addition, or for at least four correct products with no evidence of addition.
	$(1\times10.5+5\times30.5+8\times50.5+10\times70.5$ $+6\times90.5)\div30$ or (10.5 + 152.5 + 404 + 705 + 543)/30 or 1815/30			M1 dep on M1
				A1 Accept 60 or 61 if correct working is shown.

Question	Working	Answer	Mark	Notes	
7	$(AC^2 =) 12.5^2 + 30^2$ $(= 156.25 + 900 = 1056.25)$ $(AC =) \sqrt{12.5^2 + 30^2}$	32.5	3	M1 M1	**SC** M2 for 2.5×13 oe
				A1	oe
8 (a)	eg 2, 5, 98 eg 5, 7, 28 2, 2, 5, 7, 7	$2^2 \times 5 \times 7^2$	3	M1 M1 A1	At least two correct steps, which may be seen in a factor tree. dep on M1 correct factors (condone inclusion of 1) dep on M1
(b)	$\frac{3^{11}}{3^5}$ or $3^4 \times 3^2$ or $\frac{3^7}{3}$	3^6	2	M1 A1	
9	$7x + 3x = 25$ oe or $7 \times \frac{1}{3} y + y = 25$ oe $y = 3 \times "2.5"$ or $7 \times "2.5" + y = 25$ or $"7.5" = 3x$ or $7x + "7.5" = 25$	x = 2.5, y = 7.5	3	M1 M1 A1	Complete, correct method to eliminate one variable. dep on M1 Substitute to find second variable. dep on M1
10	(0, 4), (1, 3), (2, 2), (3, 1), (4, 0)	Correct region identified	2	M1 A1	Line $x + y = 4$ drawn to cross **L** and **M**. Between **L**, **M** and $x + y = 4$ Condone no label if unambiguous.

Question	Working	Answer	Mark	Notes
11	$(\angle BAE =)\dfrac{(2\times5-4)\times90}{5}$ oe or $(ext\angle =)\dfrac{360}{5}$ $(\angle JAE =)\dfrac{(2\times6-4)\times90}{6}$ oe or $(ext\angle =)\dfrac{360}{6}$ $(\angle JAB =)360-\dfrac{(2\times5-4)90}{5}-\dfrac{(2\times6-4)90}{6}$ oe or $(\angle JAB =)\dfrac{360}{5}+\dfrac{360}{6}$ or $(\angle JAB =)\ 360-108-120$ or $72+60$ (= 132) $(x =)\dfrac{180-"132"}{2}$	24	5	M1 Method for an interior or exterior angle of a pentagon (108 or 72). M1 Method for an interior or exterior angle of a hexagon (120 or 60). M1 M1 A1

Question		Working	Answer	Mark	Notes
12	(a)	$\frac{-2-1}{8-4}$ **oe**	$-\frac{3}{4}$	2	M1 A1 or -0.75
	(b)	$1=-\frac{3}{4}\times 4+c$ or $-2=-\frac{3}{4}\times 8+c$ or $c=4$ $y=-\frac{3}{4}x+4$ oe or $y-1=-\frac{3}{4}(x-4)$ oe or $y+2=-\frac{3}{4}(x-8)$ oe	$3x+4y=16$	3	M1 ft gradient from (a) A1 ft gradient from (a) Any decimal values used must be exact. A1 oe equation with 3 non-zero terms in which the constant and the coefficients are all integers.
	(c)		$y=-\frac{3}{4}x+7$	1	B1 oe eg $3x+4y=28$ ft gradient from (a)

Question	Working	Answer	Mark	Notes
13 (a)		$\frac{1}{6}, \frac{5}{6}$ $\frac{1}{6}, \frac{5}{6}, \quad \frac{1}{6}, \frac{5}{6}$	2	B1 left branch B1 right branches
(b)		$\frac{1}{36}$	1	B1 ft from (a) for probabilities $0 < p < 1$ 0.02777... rounded or truncated to at least 2SF.
(c)	$\left(\frac{5}{6}\right)^3$ or $\left(\frac{1}{6}\right)^3$ or $\left(\frac{5}{6}\right)^2\left(\frac{1}{6}\right)$ or $\left(\frac{5}{6}\right)\left(\frac{1}{6}\right)^2$ $1-\frac{5}{6}\times\frac{5}{6}\times\frac{5}{6}$ or $\left(\frac{1}{6}\right)^3+3\left(\frac{5}{6}\right)^2\left(\frac{1}{6}\right)+3\left(\frac{5}{6}\right)\left(\frac{1}{6}\right)^2$	$\frac{91}{216}$	3	M1 ft (a) and/or (b) for probabilities $0 < p < 1$ M1 Fully correct method ft (a) and/or (b) for probabilities $0 < p < 1$ A1 0.42129… rounded or truncated to at least 2SF.

Question		Working	Answer	Mark	Notes
14	(a)		630 000	1	B1
	(b)		7.2×10^{-3}	1	B1
	(c)	81×10^{130}	8.1×10^{131}	2	M1 A1
15	(a)	$d = kt^2$ $12.5 = k\times5^2$ or $k = 0.5$ oe	$d = \frac{1}{2}t^2$	3	M1 Accept $md = t^2$ oe where $m \neq 1$ M1 Accept $m\times12.5 = 5^2$ oe or $m = 2$ A1 $d = 0.5t^2$ d must be the subject of the equation.
	(b)		40.5	1	B1 ft for equations of the form $d = kt^2$

Question	Working	Answer	Mark	Notes
16 (a)	$3x^2, 6x$	$3x^2 + 6x$	2	M1 for $3x^2$ or $6x$ A1
(b)	$3x^2 + 6x = 0$ $x = 0, x = -2$ $y = (0^3 + 3\times 0^2) + 1$ (= 1) and $y = (-2)^3 + 3\times(-2)^2 + 1$ (= 5)	Minimum (0, 1) and Maximum $(-2, 5)$	4	M1 ft dep on M1 in (a). A1 dep on first M1 both x values M1 dep on first M1 Method to find both y values using correct x values. A1 dep on first M1 Both sets of coordinates with correct classifications.
17	$2(9x^2 - 16)$ or $(6x - 8)(3x + 4)$ or $(3x - 4)(6x + 8)$	$2(3x - 4)(3x + 4)$	2	M1 Correct partial factorisation A1
18	$8\times(13 + 8) = 6\times CE$ or $8\times(13 + 8) = 6\times(x + 6)$ $CE = \frac{8\times 21}{6}$ (=28) or $x + 6 = \frac{8\times 21}{6}$	22	3	M1 M1 A1

Question	Working	Answer	Mark	Notes
19	$2\pi r^2 = 10\pi + 2\pi r \times 4$ oe or $2\pi r^2 = 10\pi + 2\pi rh$ oe $r^2 - 4r - 5 (= 0)$ $(r-5)(r+1) = 0$ or $\frac{-(-4) \pm \sqrt{(-4)^2 - 4 \times 1 \times (-5)}}{2 \times 1}$	$r = 5$	4	M1 A correct equation M1 Correct three term quadratic, all terms on one side. Condone = 0 missing. Allow if coefficients are not simplified eg $2\pi r^2 - 8\pi r - 10\pi = 0$ M1 Condone = 0 missing. Quadratic formula may be simplified as far as $\frac{4 \pm \sqrt{36}}{2}$ A1 Do not award if $r = -1$ is also given in the final answer.

Question		Working	Answer	Mark	Notes
20	(a)	1 square = 2.5 days or 10 small squares = 1 day or frequency density scale 0.5, 1, 1.5, … or $\frac{6}{34}\times 85$ or 6×2.5 or 5×3	15	2	M1 Establish a correct frequency density scale (show at least three consistent labels) or give the scale for one square or one day, or a correct calculation (eg using number of squares) A1
	(b)	$20\times 0.5+10\times 2+3\times 3$ or $4\times 2.5+8\times 2.5+\frac{3}{5}\times 6\times 2.5$ or 10 + 20 + 9 or $\frac{4+8+\frac{3}{5}\times 6}{34}\times 85$ or $85-\frac{6+10+\frac{2}{5}\times 6}{34}\times 85$ or 390×0.1	39	2	M1 A1

Question	Working	Answer	Mark	Notes
21	$(36\pi =)\pi(2\sqrt{3})^2 + \pi(2\sqrt{3})\text{l}$	$2\sqrt{12}$	5	M1 Correct expression for total surface area.
	$36\pi = \pi(2\sqrt{3})^2 + \pi(2\sqrt{3})\text{l}$ or $36\pi = 12\pi + (2\sqrt{3})\pi\text{l}$			M1 Form equation
	$(\text{l} =)\dfrac{36\pi - (2\sqrt{3})^2\pi}{(2\sqrt{3})\pi}$ or $(\text{l} =)\dfrac{36\pi - 12\pi}{(2\sqrt{3})\pi}$			M1 Make l the subject.
	$(\text{l} =)\dfrac{24}{2\sqrt{3}}$			
	$(\text{l} =)\dfrac{24}{2\sqrt{3}} \times \dfrac{\sqrt{3}}{\sqrt{3}}$ or $4\sqrt{3}$ or $\dfrac{4\sqrt{36}}{2\sqrt{3}}$			M1 Accept $\dfrac{24^2}{12} = 4a$ A1
	Special Case (base area omitted) $36\pi = (2\sqrt{3})\pi\text{l}$ $(\text{l} =)\dfrac{36}{2\sqrt{3}}$ or $6\sqrt{3}$	$2\sqrt{27}$		**SC** Maximum of 3 marks. M1 M1 A1

Question	Working	Answer	Mark	Notes
22	$\frac{12}{\sin 70} = \frac{BE}{\sin 50}$ $BE = \frac{12\sin 50}{\sin 70}$ (= 9.7(824…)) $(AB =) \frac{12\sin 50}{\sin 70} \times \sin 60$ $(= "9.78..." \times \sin 60)$ or $(AB =) "9.78..." \times \cos 30$	8.47	4	M1 Accept $\frac{12}{\sin 70} = \frac{EC}{\sin 60}$ For all method marks, accept $180 - 50 - 60$ in place of 70. M1 Accept $EC = \frac{12\sin 60}{\sin 70}$ (= 11.0(592...)) M1 Accept $(AB =) \frac{12\sin 60}{\sin 70} \times \sin 50$ $(= "11.05"... \times \sin 50)$ or $AB = "11.05..." \times \cos 40$ A1 Accept 8.469 to 8.472

Question	Working		Answer	Mark	Notes	
23	$2(y-3)^2+y^2=15$	$2x^2+(x+3)^2=15$		5	M1	Eliminate one variable
	$3y^2-12y+3=0$ or $y^2-4y+1=0$	$3x^2+6x-6=0$ or $x^2+2x-2=0$			M1	Correct three term quadratic, with all non-zero terms on one side. Condone missing = 0
	$(y=)\dfrac{-(-12)\pm\sqrt{(-12)^2-4\times3\times3}}{2\times3}$ or $(y=)\dfrac{-(-4)\pm\sqrt{(-4)^2-4\times1\times1}}{2\times1}$	$(x=)\dfrac{-6\pm\sqrt{6^2-4\times3\times(-6)}}{2\times3}$ or $(x=)\dfrac{-2\pm\sqrt{2^2-4\times1\times(-2)}}{2\times1}$			M1	Correct use of quadratic formula on a correct quadratic equation, may be (partially) simplified.
			x = -2.73(2…), x = 0.73(2...) or y = 0.26(8…), y = 3.73(2…) or $x=-1\pm\sqrt{3}$ or $y=2\pm\sqrt{3}$		A1	For both correct x values or both correct y values or one correct pair of corresponding x and y values (correct to at least 2DP)
			x = -2.732 , y = 0.268 and x = 0.732 , y = 3.732		A1	Full answer correctly paired. Accept as coordinates. (correct to at least 3DP)