Pearson Edexcel

Mark Scheme (Results)

Summer 2018

Pearson Edexcel International GCSE
In Mathematics B (4MB0) Paper 01

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

Summer 2018
Publications Code 4MB0_01_1806_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 always check the working in the body of the script 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 two A (or B) marks on that part, but can gain the M marks. Mark all work on follow through but enter A0 (or B0) for the first two A or B marks gained.

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 are multiple attempts shown, then all attempts should be marked and the highest score on a single attempt should be awarded.

- **Follow through marks**

  Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.

  Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

- **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 shows that the candidate did not understand the demand of the question.

- **Linear equations**

  Full marks can be gained if the solution alone is given, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

- **Parts of questions**

  Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another

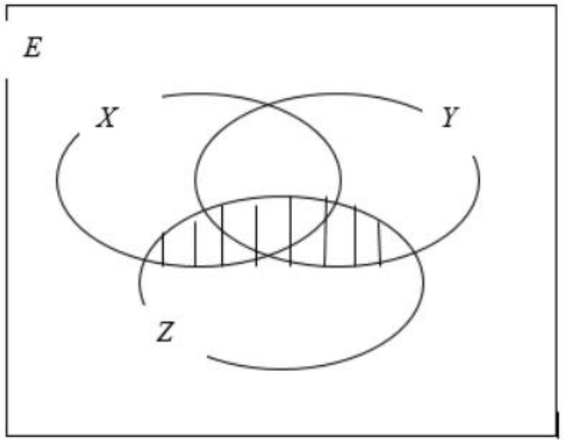
Question	Working	Answer	Mark	Notes
1	$\begin{pmatrix} 2-2 \\ 3-(-4) \end{pmatrix}$	$\begin{pmatrix} 0 \\ 7 \end{pmatrix}$	2	M1 One arithmetical error allowed in calculating both elements
				A1
				Total 2 marks
2	$\frac{27}{150} \times 360$ oe	64.8	2	M1
				A1 accept 65
				Total 2 marks
3	$\frac{3}{7} \times \frac{20}{100}$	$\frac{3}{35}$	2	M1 - seen even within an expression
				A1 oe but must be a fraction
				Total 2 marks
4	$24 \times \frac{4}{3} \times \frac{1}{4}$ OR $24 \div 3$ OR $24 \times \frac{4}{3} - 24$	8	2	M1 oe
				A1
				Total 2 marks
5	$\frac{4}{4+6} \times 9$ (oe)	3.6	2	M1
				A1
				Total 2 marks

Question	Working	Answer	Mark	Notes
6	$\frac{3x}{2x^2}+\frac{1}{2x^2}$, $\frac{1}{2x}\left(\frac{3x+1}{x}\right)$, $\frac{6x^2+2x}{4x^3}$	$\frac{3x+1}{2x^2}$ (cao)	2	M1 – Combine fractions or starting to (ie 1st expression on the left which uses a common denominator)
				A1
				Total 2 marks
7	$R=\frac{40}{2\pi}$ (=6.36619…)	**awrt** 127	3	M1 accept values lying between 6.3 and 6.4
	$A=\text{"}\left(\frac{40}{2\pi}\right)\text{"}^2\times\pi$			M1(DEP)
				A1
				Total 3 marks
8	$\frac{1}{2}\left((2a+3a)\times 16\right)$ OR Rectangle + 2 triangles eg $2a\times 16+2\times\frac{1}{2}\times\left(\frac{a}{2}\right)\times 16$ (oe)	2.5 (oe)	3	M1
	$5a=\frac{100}{8}$ (oe)			M1 (DEP) ie *a* term isolated
				A1
				Total 3 marks
9 (a)		{2, 8}	1	B1
(b)	A' = {1, 4, 6, 7, 9}	{1, 2, 4, 6, 7, 8, 9}	2	M1 (Must be correct)
				A1 (Elements can be in any order) **NB**: Repetition of elements scores A0
				Total 3 marks

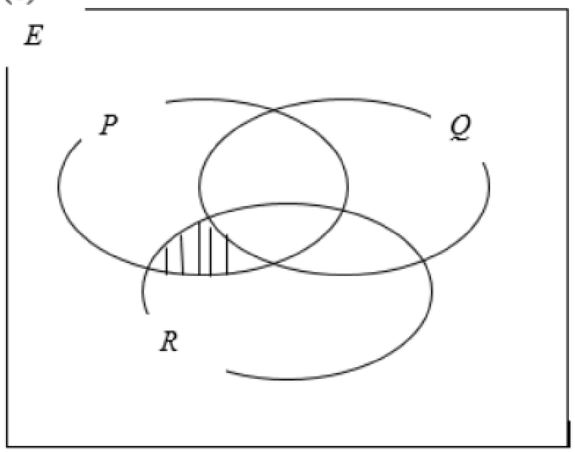
Question	Working	Answer	Mark	Notes
10	$2-4x+8=x-12$	4.4, $\frac{22}{5}$, $4\frac{2}{5}$ (cao)	3	M1 (Remove brackets)
	$2+8+12=x+4x$			M1 (DEP) Collect terms in x
				A1 (dependent on both M marks)
	NB: (1) Allow **ONE** slip when collecting the two M marks **(2) No** algebraic working seen scores M0M0A0			
				Total 3 marks
11 (a)		23	1	B1
(b)	$25-2n>n$ OR $25>3n$	8	2	M1
	OR correct list to $n = 9$			A1
				Total 3 marks

Question		Working	Answer	Mark	Notes
12		$2x-3(2x-6)=8$ (oe) leading to $4x = 10$ OR $2\left(\frac{y}{2}+3\right)-3y=8$ (oe) leading to $2y=-2$	$x = 2.5$ $y = -1$	3	M1 for correct substitution for y or x OR for correct rearrangement **and** correct process to eliminate one variable.
		NB: Allow ONE arithmetic sign error for these two M marks			M1(DEP) for **substitution** of the **value** of one variable into one equation
					A1
					Total 3 marks
13	(a)		Correct shading	1	B1
	(b)		Correct shading	1	B1
	(c)		Correct shading	1	B1
					Total 3 marks

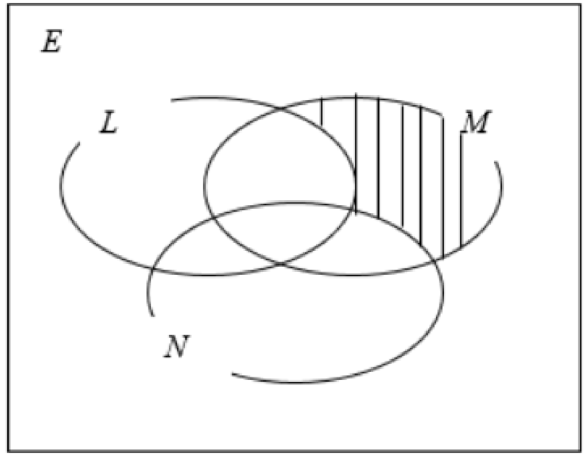
13 (a)



(b)



(c)



Question	Working	Answer	Mark	Notes
14	$6z : 3z : z = a : b : c$ **OR** $2y : y : \frac{y}{3} = a : b : c$ $(\therefore y = 3)$ **OR** $x : \frac{x}{2} : \frac{x}{6}$ $(\therefore x = 6)$	18	3	M1 (oe) Can be implied by the next line
	$6 \times 3 \times 1$			M1 (DEP) **NB:** $2 \times 1 \times \frac{1}{3}$ OR $1 \times \frac{1}{2} \times \frac{1}{6}$ scores M0
				A1
				Total 3 marks
15	$\frac{5000}{6.4 \times 10^{-6}}$ (oe) OR $\frac{5}{6.4} \times 10^{9}$ (oe)	7.8×10^{8} OR 780 000 000 (cao)	3	M1
	$= \frac{5000}{6.4} \times 10^{6}$, 781.25×10^{6} OR 781 250 000			M1(DEP)
				A1
				Total 3 marks
16	$\left(\frac{dy}{dx} =\right) 2 \times 3x^2 - 5$	19	3	M1 at least one non-constant term correctly differentiated
	At $x = 2$, " $2 \times 3 \times 2^2 - 5$"			M1 (DEP) ie subst. $x = 2$ into "derivative"
				A1
				Total 3 marks

Question	Working	Answer	Mark	Notes	
17	$4x^2+4x+1$ (oe) OR $(2x+1)\left(2x+1-(2x-2)\right)$	$6x+3$ OR $3(2x+1)$	3	M1	
	$4x^2-2x-2$ (oe) OR $(2x+1)\left(2x+1-2x+2\right)$			M1	**NB:** Allow **ONE** slip for both M marks
				A1 cao	
					Total 3 marks
18	$AX\times 3=9\times 4$	4.5	3	M1	
	$\left(AX="12"\right)$ $OX=\dfrac{"12"+3}{2}-3$			M1(DEP) for a complete method to find *OX*	
				A1	
					Total 3 marks
19	$\begin{pmatrix}2\times1+1\times3 & 2\times(-1)+1\times1\\ 1\times1+2\times3 & 1\times(-1)+2\times1\end{pmatrix}=\begin{pmatrix}5 & -1\\ 7 & 1\end{pmatrix}$	$\begin{pmatrix}6 & -2\\ 10 & 2\end{pmatrix}$	3	M1 (correct OR evidence for correct method of evaluation of *each* element) OR finding **A + I** (ditto)	
	$\begin{pmatrix}"5"+1 & "-1"-1\\ "7"+3 & "1"+1\end{pmatrix}$			M1(DEP) (Correct method of evaluation of *each* element using cand's **AB** which must be 2x2) OR finding **(A+I)B** (ditto but using cand's **A+I** which must be 2x2)	
				A1	
					Total 3 marks

Question		Working	Answer	Mark	Notes
20	(a)	$\frac{1}{2}\times 10\times 24$ or $4\times\left(\frac{1}{2}\times 5\times 12\right)$	120 (cao)	2	M1 oe
					A1
	(b)	$\sqrt{5^2+12^2}$ = $\sqrt{169}$ = 13	52 (cao)	2	M1 (one of)
					A1
					Total 4 marks
21	(a)	$175\times\frac{116}{100}$ (oe)	203	2	M1
					A1
	(b)	$\frac{750}{120}\times 100$ (oe)	625	2	M1
					A1
					Total 4 marks

Question	Working	Answer	Mark	Notes	
22	$CD = 10 \times \cos 25^o = 9.063$	7.66 (cao)	4	M1	M1 (OR $BC = 10\times\sin 25^o = 4.2262$)
	"9.063" × sin25º = 3.830… **OR** $\frac{AC}{\sin 50} = \frac{"9.063"}{\sin 65} \quad (\Delta ACD)$			M1(DEP)	(OR "4.226" × sin65º = 3.830…) **OR** $\frac{AC}{\sin 130} = \frac{"4.226"}{\sin 25}$
	2 × 3.830 OR $\frac{"9.063"\times\sin 50}{\sin 65}$			M1(DEP)	$\frac{"4.226"\times\sin 130}{\sin 25}$
				A1	A1
					Total 4 marks

Q22: Cosine Rule Method:
On Δ*ABC*:

$(\angle ABC = 130)$

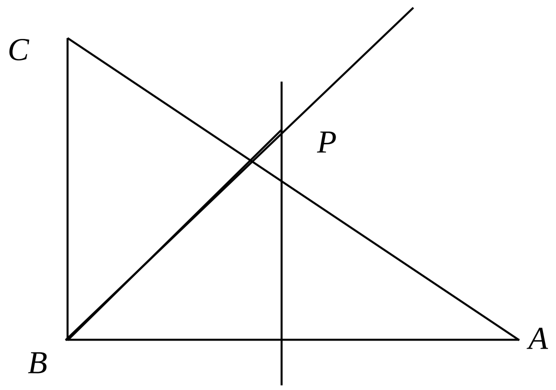
$BC = 10\times\sin 25 = 4.2262...$	M1	
$AC^2 = "4.2262..."^2 + "4.2262..."^2 - 2\times"4.2262..."^2\times\cos 130$	M1(DEP)	
$AC = \sqrt{35.72... - (-22.96)}$	M1(DEP)	
$AC = 7.66$	A1	**4**

OR on Δ*ADC*:

$CD = 10 \times \cos 25^o = 9.063$	M1	
$AC^2 = "9.063..."^2 + "9.063..."^2 - 2\times"9.063..."^2\times\cos 50$	M1(DEP)	
$AC = \sqrt{164.27... - 105.59}$	M1(DEP)	
$AC = 7.66$	A1	**4**

Question	Working	Answer	Mark	Notes
23	$\frac{0\times1+1\times5+2\times6+3\times a+4\times7+5\times1}{1+5+6+a+7+1}$	5 (cao)	4	M1 (Allow **ONE** error within a multiplication)
	$\frac{0\times1+1\times5+2\times6+3\times a+4\times7+5\times1}{1+5+6+a+7+1}$ $=\left(\frac{50+3a}{20+a}\right)=2.6$			M1(DEP) (Can be ft on above)
	$50+3a=52+2.6a$			M1(DEP) (No errors)
				A1
				Total 4 marks

Question	Working	Answer	Mark	Notes
24 (a)		Construction of perpendicular bisector of *AB*	2	M1 Arcs, centred *A* and *B*, drawn above and below *AB* and intersecting
				A1 Perpendicular bisector drawn above *AC* and intersecting *AB*
(b)		Construction of bisector of angle *ABC*	2	M1 Arc(s) of equal radii, centred *B*, drawn and intersecting *AB* at *X* and *BC* at *Y*. Arcs of equal radii, centred *X* and *Y*, drawn and intersecting at *Z* (situated in between *AB* and *BC*)
				A1 (Overlay lines must cover candidate's lines within Δ*ABC*)
(c)		3.2	1	B1 **NB: (1)** Dependent on BOTH M marks **(2)** Allowed range is 3 to 3.4
				Total 5 marks



Question	Working	Answer	Mark	Notes
25	$\sqrt{1156} = 34$	8, 9	5	B1
	$(34-2x)x = 144$ (oe)			M1
	$2x^2 - 34x + 144 = 0$ (oe)			M1(DEP) oe for a **correct** 3 term quadratic (=0)
	$2(x-9)(x-8) = 0$ (oe)			M1 (INDEP) (Factorising or solving "trinomial quadratic")
				A1 (cao) (DEP on all THREE M marks)
				Total 5 marks

OR

$\left(\frac{144}{x} + 2x\right)^2 = 1156$		B1
$4x^4 - 145x^2 + 20736 = 0$ OR $x^4 - 145x^2 + 5184 = 0$		M1
$\left(x^2-64\right)\left(x^2-81\right)$ (= 0)	(solving trinomial quadratic in x^2)	M1(INDEP)
$x^2 = 64$ and $x^2 = 81$	(cao, can be implied)	M1(DEP)
(x =) 8, 9		A1

Question	Working	Answer	Mark	Notes
26 (a)	$\dfrac{y^{\frac{3}{2}}}{y^{-2}}$, $\dfrac{y^{1+\frac{1}{2}}}{y^{-2}}$, $y^{1+\frac{1}{2}}y^{2}$ OR $y^{3}y^{\frac{1}{2}}$	$y^{\frac{7}{2}}$	2	M1
				A1
(b)	$(2^{2})^{3n} = 2\times(2^{3})^{n}$ OR $\left(8^{\frac{2}{3}}\right)^{3n} = 8^{\frac{1}{3}}\times 8^{n}$	2	3	M1 OR $3n\log(4) = \log(2) + n\log(8)$
	$6n = 1 + 3n$ or $n = \dfrac{1}{3}$ OR $2n = \dfrac{1}{3} + n$ or $n = \dfrac{1}{3}$			M1(DEP) (Equating exponents) OR $n\left(3\times 0.6021 - 0.9031\right) = 0.3010$ (depending on base) or $n = \dfrac{1}{3}$
				A1
				Total 5 marks

Question		Working	Answer	Mark	Notes
27	(a)	$(-1)^3 + k(-1)^2 + (-1) + 6 = 0$ OR $\left(\dfrac{x^3+kx^2+x+6}{x+1} = x^2 + (k-1)x + (2-k) \quad \text{Rm } (6-(2-k))\right)$ $(6-(2-k)) = 0$	-4	2	M1 A1
	(b)	$x^3 \text{"}-4\text{"} x^2 + x + 6 = (x+1)(ax^2+bx+c)$	(cao)	3	M1 for finding "a = 1" and "b = –5∀ =OR algebraic division producing "$x^2 - 5x...$" ie ft on their "$k = -4$"
		$(x^2 - 5x + 6) = (x-2)(x-3)$			M1(INDEP) attempt to factorise the "trinomial quadratic term"
		$(x+1)(x-2)(x-3)$			A1 (cao)
					Total 5 marks

Question	Working	Answer	Mark	Notes
28 (a)	$\frac{1}{2}\times 10\times 10\times \sin 60 = 25\sqrt{3}$ (=43.3…)	awrt 273	3	M1 or a complete method to find the area of one triangular face
	$4\times 25\sqrt{3}+10\times 10$			M1(DEP)
				A1
(b)	Base diagonal = $\sqrt{10^2+10^2}=10\sqrt{2}$	awrt 236	4	M1 or ht of Δ is $\sqrt{10^2-5^2}$ $\left(=\sqrt{75}=8.66025...\right)$
	Height = $\sqrt{10^2-(5\sqrt{2})^2}= 5\sqrt{2}$ (=7.07…)			M1(DEP) or ht of pyramid is $\sqrt{75-5^2}$
	Vol = $\frac{1}{3}\times 10\times 10\times 5\sqrt{2}$			M1(DEP)
				A1 awrt
				Total 7 marks

Question	Working	Answer	Mark	Notes
29	Box **A**: P_A (GG) = $\frac{7}{8}\times\frac{6}{7}$ (= $\frac{3}{4}$)	$\frac{31}{45}$	6	M1* OR Correct Tree Diagram for removal of two beads from A
	Box **A**: P_A (W and G) = $\frac{1}{8}\times\frac{7}{7}+\frac{7}{8}\times\frac{1}{7}$ (= $\frac{1}{4}$)			M1* at least one correct product seen OR $1-P(GG)\left(=1-\frac{3}{4}\right)$ OR Correct Tree Diagram for removal of two beads from A
	Box **B**: P_B (GG from **A** then GG) $\equiv$ P_B(GG) = $\frac{9}{10}\times\frac{8}{9}$ (= $\frac{4}{5}$) P_B (W and G from **A** then W and G) $\equiv$ P_B(W and G) = $\frac{2}{10}\times\frac{8}{9}+\frac{8}{10}\times\frac{2}{9}$ (= $\frac{16}{45}$) **NB:** Treat above three M marks as B marks for seeing the product (GG) or sum of products (WG) within an expression for the relevant probabilty			M1* for any one
	$P_1 = P_A$ (GG) $\times$ P_B (GG) = $\frac{3}{4}\times\frac{4}{5}$ (= $\frac{3}{5}$) $P_2 = P_A$ (W and G) $\times$ P_B (W and G) = $\frac{1}{4}\times\frac{16}{45}$ (= $\frac{4}{45}$)			M1*(DEP) for any one **NB:** M1* - any of these may be seen embedded in a probability product of 4 terms
	$P_{TOTAL} = P_1 + P_2$ = $\frac{4}{45}+\frac{3}{5}$			M1(DEP)
	NB: If the question has been done **with** replacement of beads then score **no** marks			A1oe (awrt 0.69)
				Total 6 marks

Summary: Have to move GG or WG between **A** and **B** so $P_{TOTAL} = P(GG) + P(WG)$

Tree Diagram for A