Mark Scheme (Results)

Summer 2017

Pearson Edexcel International GCSE

In Mathematics B (4MB0) 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
    - 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

1	1	B1	
	0.25 or $\frac{1}{4}$ or 4^{-1}	B1	**2**

Total 2 marks

2	$\frac{6+20-15}{5\times3\times2}$ **or** $\frac{26-15}{30}$ after $\frac{3+10}{15}$ or $\frac{6+5}{30}$ after $\frac{4-3}{6}$ (oe)	M1	
	$\frac{11}{30}$	A1	**2**

NB: M0 A0 if no working seen.

NB: Allow M1 for $\frac{6+20+15}{30}$ *oe*

Total 2 marks

3	(a) 12	B1	1	
	(b) g(x) ≤ 12	B1 ft	1	**2**

NB: (1) ft on (a)

(2) Allow y ≤ “12” and g ≤ “12” or (-∞, 12] or or] -∞, 12]

Total 2 marks

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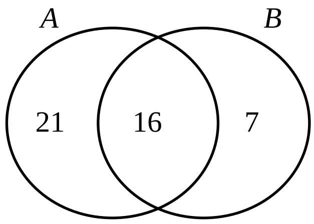
4 $n(A\cup B)\quad (= n(A)+n(B)-n(A\cap B)) \quad = 37+23-16$ M1

NB: M1 for diagram oe



Or 21 + 16 + 7

44 A1 **2**

Total 2 marks

5	$\frac{40}{30}$ or $1\frac{1}{3}$ or 1 h 20 mins or 1.33 or better	M1	
	16 05 or 4.05 pm (allow 4.05 but not 4.05am)	A1	**2**

Total 2 marks

6 labelled diagram showing correct angle at A or B with $180 \le \textit{angle at } B \le 270$

OR 235° – 180° **OR** 180° – 125°	M1	
55, 055, N55E, N55°E	A1	**2**
		Total 2 marks

7 $2(-3)^3 + 7(-3)^2 + k(-3) - 30 = 0$ ($-54 + 63 - 3k - 30 = 0$) M1

(OR method leading to a correct linear equation in k, e.g.

$$x+3\overline{\smash{\big)}2x^3+7x^2+kx-30}^{\;2x^2+x+(k-3)}$$ requires $-30-3(k-3)=0$ oe (M1))

(OR comparing coefficients: $(x + 3)(ax^2 + bx + c) = 2x^3 + 7x^2 + kx + c$

with $a = 2$, $3a + b = 7$ ($b = 1$), $3c = -30$ ($c = -10$), $k = 3b + c$ oe (M1))

$k = -7$	A1	**2**	
			Total 2 marks
8 (a) 2	B1	1	
(b) 2	B1	1	**2**
			Total 2 marks

9 Probability = ($(1\times)\dfrac{9}{39}\times\dfrac{8}{38}$ oe or $\left(\dfrac{10}{40}\times\dfrac{9}{39}\times\dfrac{8}{38}\right)$ ($\times n$) [n is an integer] M1

$\dfrac{72}{1482}$, $\dfrac{12}{247}$, oe or awrt 0.049, awrt 4.9% A1 **2**

SC: $4\left(\dfrac{1}{4}\right)^3$ oe or $1\times\dfrac{1}{4}\times\dfrac{1}{4}$ **(=** $\dfrac{1}{16}$ [must see working]) scores M1 A0

Total 2 marks

10 Breaking 432 into (144) × 3 or (16) × 27 AND 243 into (81) × 3 or (9) × 27 where bracketed number may be written as a product

OR 432 AND 243 as a product of prime factors ($432 = 2^4\times3^3$, $243 = 3^5$) M1

$\sqrt{\left(3\times2^2\right)^2\times3}-\sqrt{9^2\times3}$ or $\left(3\times2^2\right)\sqrt{3}-9\sqrt{3}$ or $4\sqrt{27}-3\sqrt{27}$

oe, e.g. (from working) $12\sqrt{3}-9\sqrt{3}(=3\sqrt{3})$ [manipulating both surds correctly]

NB:$12\sqrt{3}-9\sqrt{3}\ or 3\sqrt{3}$ with no working gains M0M0A0 M1 (DEP)

$\sqrt{27}$ or $n = 27$ A1 **3**

Total 3 marks

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11 $AP\times9=6\times3$ or AP = 2 or 9 + 2 (=11) M1

$r=\dfrac{9+"AP"}{2}$ M1 (DEP)

r = 5.5, $5\frac{1}{2}$, $\frac{11}{2}$ A1 **3**

Total 3 marks

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12 $x^2 - 4x - x + 4$ (= −2) or $x^2 - 5x + 4$ (= −2) or $x^2 - 5x + 6$ (= 0)

(oe, expanding with at least three terms from x^2, $-4x$, $-x$, +4 correct) M1

(Factorising any 3 term quadratic)

$(x-2)(x-3)$(= 0) or $\dfrac{5\pm\sqrt{25-4\times1\times6}}{2}$ oe M1

Or factorising which when expanded, the result must give at least 2 of their 3 terms from their trinomial, e.g. $(x - 6)(x - 1)$(=0) will give x^2 and +6 terms

x = 2, 3 (cao dependent on M1 earned earlier) A1 cao **3**

Total 3 marks

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13 $\dfrac{\sin\angle ACB}{5}=\dfrac{\sin40}{6}$ oe M1

$\angle ACB=\sin^{-1}\left(\dfrac{5\times\sin40}{6}\right)$ ($\sin^{-1}$((0.535)656341..) M1 (DEP)

$\angle ACB$ = 32.3 - 32.4 (32.3884...) A1 **3**

Total 3 marks

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14 (9 – 5) :(x – 5) = 2 : 5 oe or 2 : 5 = 4 : 10 or car B was 10 (yrs) M1

$\dfrac{9-5}{x-5}=\dfrac{2}{5}$ oe, e.g. $2x - 10 = 20$ or 10 + 5 M1

x = 15 A1 **3**

SC B1 for 5 × 14 = 10 + 2*x*, *x* = 30 (5 yrs time)[working needed]

Total 3 marks

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15 $\overrightarrow{AP} = \frac{1}{2}\begin{pmatrix}6\\2\end{pmatrix}$ (= $\begin{pmatrix}3\\1\end{pmatrix}$)	M1	
$\overrightarrow{OP} = \overrightarrow{OA} + \overrightarrow{AP} = \begin{pmatrix}1\\1\end{pmatrix} + "\begin{pmatrix}3\\1\end{pmatrix}"$	M1(DEP)	
OR *C* is the point (6 + 1, 2 + 1) [= (7, 3)] or OC = $\begin{pmatrix}7\\3\end{pmatrix}$ (M1) *P* is the mid-point of *AC* so *P* is $\left(\frac{7+1}{2}, \frac{3+1}{2}\right)$ (M1)		
(4, 2)	A1	**3**

Total 3 marks

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16 $\frac{1}{b} = \frac{2}{c} - \frac{1}{a}$ or $-\frac{1}{b} = \frac{1}{a} - \frac{2}{c}$	M1	
$\frac{1}{b} = \frac{2a-c}{ac}$ or $b = \frac{1}{\left(\frac{2a-c}{ca}\right)}$ or $b = \frac{1}{\left(\frac{2}{c} - \frac{1}{a}\right)}$ oe (positive *b*)	M1	
[OR $ca = 2ab - bc$ oe (remove denominators and collect terms in *b*) (M1) $ca = b(2a-c)$ (factorises) (M1)]		
NB: Allow a maximum of 1 sign slip in the 2 M marks $b = \frac{ac}{2a-c}$ or. $b = \frac{-ac}{c-2a}$	A1	**3**

Total 3 marks

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17 (i)

$$\left.\begin{aligned}84 &= 2^2 \times 3 \times 7\\ 126 &= 2 \times 3^2 \times 7\\ 294 &= 2 \times 3 \times 7^2\end{aligned}\right\}$$ (prime factors of at least 2 of 84, 126 and 294)

OR
$$\begin{aligned}84 &= 42 \times 2\\ 126 &= 42 \times 3\\ 294 &= 42 \times 7\end{aligned}$$
M1

OR $2^2 \times 3^2 \times 7^2$ or $2 \times 3 \times 7$			
LCM = 1764	A1	2	
(ii) HCF = 42	B1	1	**3**

NB: The M mark can be awarded in either (i) or (ii), so if one is correct M1A1B0 or M1A0B1

Special Case: If LCM & HCF are correct but wrong way round award M1A0B1.

One correct in wrong place is M1A0B0 **Total 3 marks**

18 Numerator: $y(2w+x)-3x(x+2w)$ OR $2w(y-3x)+x(y-3x)$ (oe)	M1		
Denominator: $2y(y-3x)$	M1 (INDEP)		
$\dfrac{(2w+x)(y-3x)}{2y(y-3x)}$	A1		
$\dfrac{2w+x}{2y}$	A1		**4**

Total 4 marks

19 (a) (i) 0.048	B1		
(ii) 0.05	B1	2	
(b) 1.8×10^n or 0.18 ($\frac{9}{50}$ or their attempt at 9÷50) $\times 10^{-148}$ or $m \times 10^{-149}$ where $0 < m \leq 10$	M1		
1.8×10^{-149}	A1	2	**4**

Total 4 marks

20 $6-4 < x-2x$ (oe, e.g. $2 < -x$) or for an answer of $x = -2$ or x and -2 written with wrong inequality sign	M1	
$4-28 \leq 2x+2x$ (oe) or for an answer of $x = -6$ or x and -6 written with wrong inequality sign	M1	
$x < -2$ and $x \geq -6$ oe, e.g. $-6 \leq x < -2$	A1	
$-6, -5, -4, -3$	A1	**4**

Total 4 marks

21 (a) $\angle CAD = 34^{\circ}$	B1	1	
(b) $\angle CBD = "34°"$ clearly defined (could be on diagram)	B1ft		
$\angle ABC = 124^{\circ}$	B1		
Angle in semicircle and Angles in the same segment (oe wording)	B1	3	**4**

[OR $\angle ODC = 56°$ clearly defined (B1)

$\angle ABC = 124^{\circ}$ (B1)

Isosceles triangle (ΔOCD) or right angled triangle (ACD) or angles in a triangle and Cyclic Quad (B1)]

[OR $\angle AOC = 180 + 68 (= 248)$ clearly defined (B1)

$\angle ABC = 124$ (B1)

Straight line & angle at centre double angle at circumference (oe wording) B1]

NB: Accept angles on their diagram
Other methods are acceptable, but reasons must be relevant to method used – at least 2 relevant correct reasons needed.

Total 4 marks

22 (a) $\begin{pmatrix} 7 & 17 \\ -15 & 14 \end{pmatrix}$	B1, B1 (-1eeoo)		2
(b) $\begin{pmatrix} 26 & -38 \\ -38 & 31 \end{pmatrix}$	B1 (1st row)		
	B1 (2nd row)	2	**4**

Total 4 marks

23 $900 = k \times 2^2$	M1
$k = \dfrac{900}{2^2}$, 225	M1 (DEP)

[OR $k = \dfrac{900}{4} = \dfrac{36}{x^2}$ (M1)

$x^2 = \dfrac{36 \times 4}{900}$ (oe) (M1 (DEP))]

$x = \sqrt{\dfrac{36}{"225"}}$ oe, e.g. $\sqrt{\dfrac{4}{25}}$ or $\sqrt{0.16}$ or $x = 0.4$ or $\dfrac{2}{5}$ oe e.g. $\dfrac{6}{15}$ — M1 (DEP)

$x = \pm\dfrac{2}{5}, \pm\dfrac{6}{15}, \pm 0.4$ — A1 — **4**

Total 4 marks

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24 (a) $\dfrac{-2+14+18+2x+3x}{5} = \dfrac{5x+2}{4}$ oe e.g. $\dfrac{30+5x}{5} = \dfrac{5x+2}{4}$ — M1

e.g. $4(30 + 5x) = 5(5x + 2)$ or $24 + 4x = 5x + 2$ oe
i.e. correct rearrangement with no denominators — M1

$x = 22$ — A1 — 3

(b) 18 — B1ft — 1 — **4**

NB: ft on "$x = 22$"

Total 4 marks

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25 (a) $v = -12t + 57$ (one term correct) — M1

Correct — A1 — 2

(b) "$-12t + 57$" = 0 ft their (a) [but not displacement] — M1

$t = \dfrac{57}{12}$, 4.75 (s) oe, e.g. $\dfrac{19}{4}$ — A1 — 2

(c) $x = -6 \times \left(\dfrac{"57"}{12}\right)^2 + 57 \times \left(\dfrac{"57"}{12}\right) + 27$ — M1

$x = 162.375$ accept answers in range 162 – 162.4 — A1 — 2 — **6**

Total 6 marks

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26 (a) Triangle *ABC* drawn correctly. — B1 — 1

(b)(i) Arc, radius 4 cm, centre *B*, drawn within triangle *ABC* — B1ft

(ii) Three sets of arcs of correct radii, one of which is centred at *B*,
one centred on correct point on *BC* and ditto on *AB* — M1ft

Angle bisector drawn so that it intersects *AC* A1 3

(c) Correct region shaded or clearly indicated on correct diagram.
[bordered by 3 straight lines and 1 curve] B1ft 1 **5**

Total 5 marks

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27 Cosine Rule: $(x+9)^2 = 7^2 + (2x)^2 - 2\times 7\times(2x)\times\cos 65$

[Or $\cos 65 = \dfrac{(2x)^2+7^2-(x+9)^2}{2\times 7\times 2x}$]

(Condone lack of brackets but other than this, cosine rule must be correctly stated)

B1

$x^2+18x+81=49+4x^2-11.8x$ (expanding $(x+9)^2$ and $(2x)^2$ condone 1 error only in cosine rule for this mark

or

$x^2+18x+81=49+4x^2-28x\cos(65^0)$

or

$\cos 65 = \dfrac{4x^2+49-(x^2+18x+81)}{28x}$

or

Cos65 × 28x = 4x^2 + 49 – (x^2 + 18x + 81) oe M1

NB: 11.8 or better can be used throughout (11.83331133…)

$3x^2-29.8x-32(=0)$ (or better ie 29.83331…) A1

$$x=\frac{-"(-29.8)"\pm\sqrt{\left("(-29.8)"^2-4\times"3"\times"(-32)"\right)}}{2\times"3"}$$

(solving a trinomial quadratic, values correctly subst'd) M1 INDEP

($\sqrt{1272}\rightarrow\sqrt{1274}$) (= 35.7) B1

(x_+ = 10.9(2114), x_- = –0.976(7))

x = 10.9 (given as the only answer) cao A1 **6**

Total 6 marks

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28 (a) $\left(\dfrac{27}{729}\right)^{\frac{1}{3}}$ (oe, eg $\dfrac{1}{3}$) or as a ratio, e.g. $27^{\frac{1}{3}}:729^{\frac{1}{3}}$ (o.e.eg 1 : 3) M1

$\left(\dfrac{27}{729}\right)^{\frac{1}{3}}\times 15$ oe M1 (DEP)

5 (cm)	A1	3	
(b) [Finds height of *C* and then base area of *C*]			
$\left(\frac{1728}{729}\right)^{\frac{1}{3}}\times 15$	M1		
20 (cm)	A1		
Base area × "20" = 1728 or $\pi r^2 \times 20 = 1728$ or 1728 ÷ 20	M1 (DEP)		
OR [Finds radius of *B*, then radius of *C* and then base area of *C*]			
$\left(729 = \pi r_B{}^2 \times 15 \quad \text{gives} \quad r_B = 3.93317435..\right)$	(M1)		
$r_C = \left(= "3.93292" \times \left(\frac{1728}{729}\right)^{1/3}\right) = 5.244$	(A1)		
Base area = $\pi \times "r_C"^2$	(M1(DEP))		
OR [Finds base area of *B*, then area SF (B to C) then uses these for base area of *C*]			
Base area of *B* = $\frac{729}{15} = 48.6$	(M1)		
Area scale factor = $\left(\frac{1728}{729}\right)^{2/3}$	(A1)		
Base area = $\frac{729}{15}\times\left(\frac{1728}{729}\right)^{2/3}$ $(48.6\times\frac{16}{9})$	(M1(DEP))		
Base area = 86.3 – 86.4 (cm^2)	A1	4	**7**
			Total 7 marks

NB: students who use height A can be awarded ft marks for an incorrect (a)

Volume A:C = 27:1728 (=1:64) (M1)

Height A:C = $1^{\frac{1}{3}} : 64^{\frac{1}{3}}$ (= 1: 4) (A1)

Height of C = 4 × "5" (=20)

Base area of C = 1728 ÷ "20" (M1)

29 (a) Relating area to frequency e.g. by showing:

FD of 5 seen or written on top of FD axis oe

OR 2 cm × 2 cm square = (frequency) 10

OR 1 cm × 1 cm square = (frequency) 2.5

OR 10 × 2 mm squares = (frequency) 1

OR 1 × 2 mm square = (frequency) 0.1 — B1

Passengers travelling ≤ 20 km: 2 × 20 (using FD × width of bar)

4 × 10, 16 × 2.5, 40 × 1, 400 × 0.1

(i.e. method that follows from previous mark) — M1

Number of passengers = 40 — A1 — 3

(b) using FDs: number of passengers = "40" + 50 + 4 × 15 + 3 × 5

OR "40" + 50 + 6 × 10 + 1.5 × 10

OR "40" + 50 + 24 × 2.5 + 6 × 2.5

OR "40" + 50 + 60 × 1 + 15 × 1

OR "40" + 50 + 600 × 0.1 + 150 × 0.1

(i.e. 40 + 50 + 60 + 15) — M1

Total number of passengers = 165 — A1 — 2

(c) $\frac{75}{165}, \frac{15}{33}, \frac{5}{11}$ awrt 0.455 — B1 — 1 — **6**

Total 6 marks

TOTAL 100 MARKS

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