Mark Scheme (Results)

Summer 2018

Pearson Edexcel Mathematics in Context

Level 3 Core Maths (7MC0)

Paper 02

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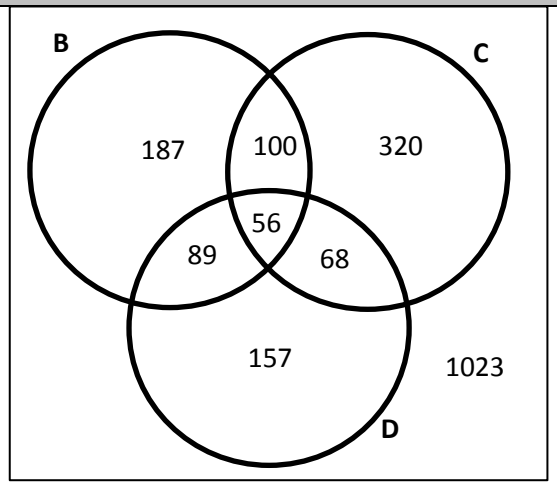
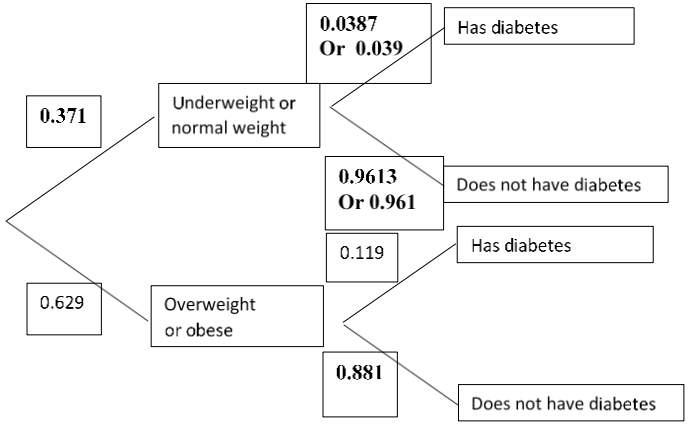
General Marking Guidance

- 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.

Question	Working	Answer	Mark	Notes
1			5	B1 3 intersecting circles with 56 in the middle M1 at least one correctly calculated value seen A1 At least 3 correct values in circles (not including 56) A1 All correct values in circles B1 Correct labels **and** 1023
2		Correct interpretation	1	C1 E.g. People (who are obese) who have high cholesterol levels but don't have diabetes. Ignore any reference to number or probability
3a(i)	370/2000	370/2000	1	B1 370/2000 (0.185) o.e.
(ii)		1023/2000	1	B1ft "1023"/2000 (0.5115) Please check decimal answers for ft
(iii)	P(B | D)= P(B ∩ D) /P(D) =(145/2000)/(370/2000) =(0.0725/0.185) OR N(B ∩ D) /N(D) =145/370	145/370	2	M1 ("89"+"56")/"370" OR ("145"/2000)/("370"/2000) OR x/"370" OR "145"/y (y<2000) A1ft (dependent on M1) 145/370 oe accept awrt 0.39

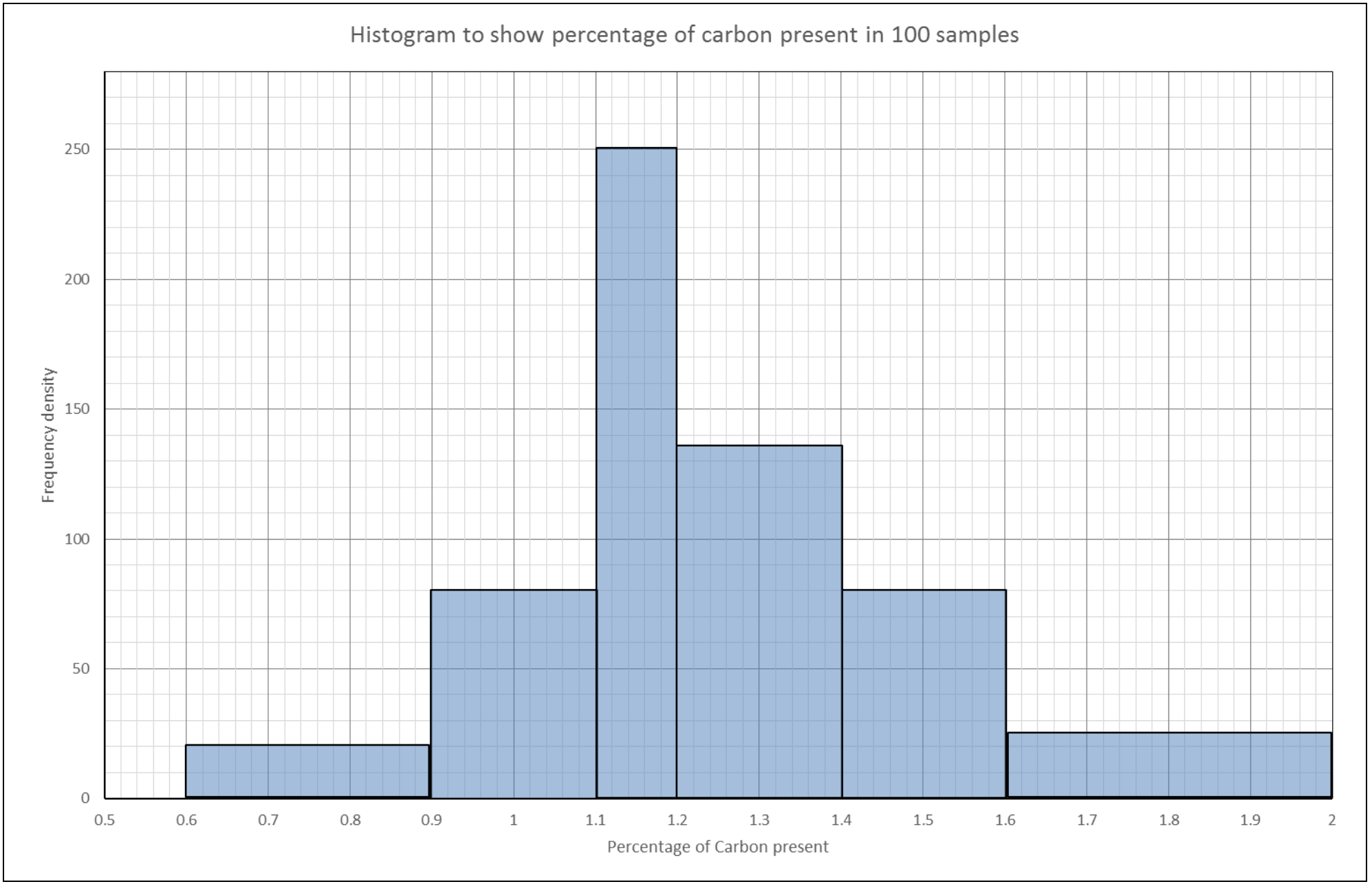
b (i)	P(B)=432/2000 P(B ⎮ D)= 145/370 OR P(B)×P(D)= (432/2000)×(370/2000)= 0.03996 P(B ∩ D)= 145/2000	Not independent	2	M1 P(B)=432/2000 (0.216) C1ft P(B)=432/2000 AND statement P(B)≠P(B ⎮ D) ft a(iii) therefore not independent OR M1 P(B)= 432/2000 (0.216) OR P(B ∩ D)= 145/2000 (0.0725) C1ft P(B)×P(D)= (432/2000)×(370/2000)= 0.03996 AND P(B ∩ D)= 145/2000 (0.0725) AND statement P(B)×P(D) ≠ P(B ∩ D) therefore not independent (allow for sight of "not independent" in pt ii)
(ii)		Correct statement	1	C1 e.g. "Pedro is correct" dependent on M1 in pt (i) accept "there is a relationship" (not enough to just say they are "dependent") o.e.
4(a)	(41791+33117)/119161×100	62.9%	2	M1 (41791+33117)/119161 A1 awrt 62.9(%) from correct working
(b)		Correct probabilities	2	B2 all probabilities correct allow rounding to 3dp 0.371, 0.0387 (Or 0.039), 0.9613 (Or 0.961), 0.881 (B1 one probability correct)



(c)	e.g. (0.629×0.119)/(0.371×0.0387) OR (3267+5662)/(128+1586)	5.211 and correct conclusion	3	M1 ft (0.629×0.119) (=0.074…) OR (0.371×"0.0387") (=0.014...) M1 ft (0.629×0.119)/(0.371×"0.0387") can be implied by sight of 5.2… OR 5×(0.371×"0.0387") C1 ft "5.2" (awrt) OR "0.072" o.e (awrt) and "the claim is correct" o.e. OR M1 ft (3267+5662) (=8929) OR (128+1586)(=1714) OR (3267+5662)/10643(=0.838…) OR (128+1586)/10643(=0.161…) M1ft (3267+5662)/(128+1586) OR 0.838…/0.161… can be implied by sight of 5.2… OR 5×1714 OR 8929÷5… C1 ft "5.2" (awrt) OR 8570 OR 1785.8 and "the claim is correct" o.e. OR M1 ft 74908×11.9/100(=8914…) OR 42539×3.87/100(=1646…) OR M1 ft 8914/1646 OR 5×1646… OR 8914…÷5 C1 ft "5.4" (awrt) OR 8230 OR 1783 and "the claim is correct" o.e.

Question	Working	Answer	Mark	Notes
5	(199-135)/199×100	±32.2%	3	B1 for 199±0.5 OR 135±0.5 M1 (“199”-“135”)/ “199” OR (“135”-“199”)/ “199” A1 answers in the range ±(31.6-32.6)(%)
6(a)		Correct interpretation	2	C2 A fully correct interpretation e.g. The world record **falls** by **0.147 minutes (o.e.)** per **year** (C1 A partially correct interpretation referencing 2 of the 3 points in **bold**)
(b)	x=(418-120)/0.147 OR y_1=418-0.147×2027 AND y_1=418-0.147×2028	2027.21	2	M1 (418-t)/0.147 $119 \leq t \leq 120$ o.e. A1 2027 (awrt) OR M1 y_1=418-0.147×2027 OR y_1=418-0.147×2028 A1 120.03 AND 119.9 (awrt) OR 120.03 and comment that record will fall (by 0.147) during 2027
(c)	mean of x=1980 (4sf or better) mean of y=161 b=-4590/3403=-1.3488.. a=161.0-(-1.3488×1980) =2831.2…	y_2=2830-1.35x	5	M1 b=-4590/3403 OR -1.349 M1 45530/23 OR 3703/23 OR 1980 (4sf or better) OR 161 M1 45530/23 AND 3703/23 OR 1980 (4sf or better) AND 161 M1 (“161” – “-1.349” × “1980”) A1 y_2=2830-1.35x (coeffs which round to 3sf)
(d)	e.g. x=(2830-120)/1.35 OR Trial and Improvement 2830-1.35×2008 = 119.2 so 2007	2007	2	M1 “2830”-“1.35”x**120 (where ** is =, <, ≤, >, ≥) OR “2830”-“1.35”×“2008” A1 2007-2010 For T and I must have at least correct year in calculation for M1 and correct year stated for A1.
(e)		Correct comment	1	C1 e.g. The model predicts that the women’s world record should already be below 2 hours… OR the points do not follow a linear trend
7(a)	t=0 => 132=120+k	k=12	2	M1 use of t=0 to give 132=120+k A1 12

(b)	120+12×1.029^-(2020-1965)	122.5 minutes	2	M1ft 120+*k*×1.029^-(2020-1965) A1ft (on *k* only) awrt 122.5
(c)		Correct explanation	1	C1 e.g. k×1.029^-t > 0
8(a)	6/(0.9-0.6)	6/(0.9-0.6)=20	1	B1 6/(0.9-0.6)=20 OR 6÷0.3=20 OR $6\times{}^{10}/_{3}$ o,e, (Must be exact so don't accept 3.3)
(b)		Correct diagram (see below)	3	B1 3 of 80, 250, 135, 80, 25 (Can be implied by 3 correct bars if not stated) B1 Appropriate vertical scale for their frequency densities but not just using frequencies B1 All bars drawn correctly
(c)	e.g. 1.2+(50-(6+16+25)) ×0.2/27	1.21-1.24	3	B1 Correct class interval identified ($1.2\leq C<1.4$) Can be implied by a value stated between 1.2 and 1.4 M1 Appropriate method used A1 1.21-1.24 (no follow through)
(d)	e.g. 2+8+10	20	3	M1 1/3×6 or 0.1×20(=2) OR 1/2×16 or 0.1×80(=8) OR 0.4×25(=10) accept 2 OR 8 OR 10 seen with no incorrect working M1 "2"+"8"+"10" A1 20 **Alt** M1 2/3×6 or 0.2×20 (=4) OR 1/2×16 or 0.1×80(=8) accept 4 OR 8 OR 10 seen with no incorrect working M1 100-("4"+16+25+27+"8") A1 20


Histogram to show percentage of carbon present in 100 samples
Frequency density
0
50
100
150
200
250
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
Percentage of Carbon present

<table>
<tr><td>9</td><td>1.26+1.28×0.261=1.59408
1.26-1.28×0.261=0.92592</td><td>1.59408
0.92592</td><td>3</td><td>M1 1.26+1.28×0.261 OR 1.26-1.28×0.261
A1 1.59 (awrt)
A1 0.93 (awrt)</td></tr>
<tr><td>10</td><td>(100×8.4+50×7.8)/150</td><td>8.2kg</td><td>2</td><td>M1 (100×8.4+50×7.8)/150 o.e.
A1 8.2(kg)</td></tr>
<tr><td>11(a)</td><td>20×1.02^9
OR repeated multiplication by 1.02
<table><tr><td>2016</td><td>20.00</td></tr><tr><td>2017</td><td>20.40</td></tr><tr><td>2018</td><td>20.81</td></tr><tr><td>2019</td><td>21.22</td></tr><tr><td>2020</td><td>21.65</td></tr><tr><td>2021</td><td>22.08</td></tr><tr><td>2022</td><td>22.52</td></tr><tr><td>2023</td><td>22.97</td></tr><tr><td>2024</td><td>23.43</td></tr><tr><td>2025</td><td>23.90</td></tr></table></td><td>£23.9million</td><td>2</td><td>M1 20×1.02^9 o.e.
A1 awrt (£)23.9million o.e</td></tr>
<tr><td>(b)</td><td>20×(1-1.02^10)/(1-1.02)
OR attempt to sum first 10 terms</td><td>£218.9944million</td><td>3</td><td>M1 20×(1-1.02^n)/(1-1.02) n=9, 10, 11 OR at least 9 terms from the table correct
M1 20×(1-1.02^10)/(1-1.02) OR attempt to sum first 10 terms in a GP where a=20 and r=1.02
A1 awrt (£)219 million o.e.</td></tr>
</table>

12(a)		$4x+4y+4z\leq100$ $(x+y+z\leq25)$ $32x+50y+110z\leq1200$ $(16x+25y+55z\leq600)$	2	M1 $4x+4y+4z$**100 OR $32x+50y+110z$**1200 o.e. where ** is < or ≤ or = or > or ≥ A1 o.e. (ISW for simplification) (condone inclusion of units) Ignore any additional incorrect inequalities
(b)	e.g. $x/(x+y+z)\geq0.2$ $x\geq0.2(x+y+z)$ $0.8x\geq0.2y+0.2z$ $4x\geq y+z$	$x/(x+y+z)\geq0.2$ $x\geq0.2(x+y+z)$ $0.8x\geq0.2y+0.2z$ $4x\geq y+z$	3	M1 $x/(x+y+z)$**0.2 OR x**0.2$(x+y+z)$ OR 5x**$(x+y+z)$ where ** is > or ≥ or = M1 collects like terms e.g. $0.8x$**$0.2y+0.2z$ where **is > or ≥ or = A1cso $4x\geq y+z$ (AG)
(c)		(P=) $80x+100y+180z$	1	B1 $80x+100y+180z$ Don't isw any simplification.
13(a)	P= $80x+100y+180y$ => P=$80x+280y$ $4x+4y+4y\leq100$ => $x+2y\leq25$ $32x+50y+110y\leq1200$ => $2x+10y\leq75$ $4x\geq y+y$ => $y\leq2x$		3	M1 replaces z with y in either the objective function or at least one of the constraints. Can be implied by sight of $32x+160y$ or $4x+8y$ or $4x\geq2y$ A1 any 2 correct A1 all 3 **inequalities** correct
(b)	$x+2y=25$ drawn correctly (passing through (25,0) and (0,12.5)) $2x+10y=75$ drawn correctly (passing through (37.5,0) and (0,7.5)) $y=2x$ drawn correctly (passing through (0,0) and (5,10)) tolerance of ±2mm	see graph below	4	B3 All three lines correct (B2 Two lines correct) (B1 One line correct) B1 R identified correctly (depends on 3 previous marks being awarded)

<table>
<tr>
<td>(c)</td>
<td>At least two non-zero vertices of the FR found and tested.
<table>
<tr><th>x</th><th>y</th><th>P</th></tr>
<tr><td>75/22</td><td>150/22</td><td>$2181^{9}/_{11}$</td></tr>
<tr><td>(3)</td><td>(7)</td><td>(2200)</td></tr>
<tr><td>25</td><td>0</td><td>2000</td></tr>
<tr><td>50/3</td><td>25/6</td><td>2500</td></tr>
<tr><td>(17)</td><td>(4)</td><td>(2480)</td></tr>
</table>
OR
Correct objective line drawn and method to solve
$x+2y=25$ and $2x+10y=75$</td>
<td>$x=50/3$, $y=25/6$</td>
<td>4</td>
<td>M1 attempt to test one vertex of their FR
A1ft one vertex of their FR tested correctly with P stated
M1 at least two vertices of the correct FR tested correctly
A1 $x=50/3$, $y=25/6$ clearly identified as maximum
For all four marks accept readings from the graph as fractions, decimals or rounded to the nearest integer.

OR

M1 Objective line with gradient of -280/80 or -80/280 drawn
A1 A correct objective line drawn
M1 Method to solve
$x+2y=25$ and $2x+10y=75$
A1 $x=50/3$, $y=25/6$ clearly identified as maximum</td>
</tr>
<tr>
<td>(d)</td>
<td>P = $80\times17+100\times4+180\times4=2480$
OR $80\times17+280\times4=2480$</td>
<td>17 28 inch

4 32 inch

and 4 48 inch

P=£2480</td>
<td>3</td>
<td>C1 17 28 inch, 4 32 inch, and 4 48 inch cao

M1 Using objective function to calculate profit using integer values with $y=z$ Can be implied by use of $80\times$“17”$+280\times$“4” if a value for z isn’t stated
A1 (£)2480 cao</td>
</tr>
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