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Mark Scheme (Results)

Summer 2016

Pearson Edexcel Mathematics in Context [Level 3 Core Maths] Paper 2 (7MC0/02)

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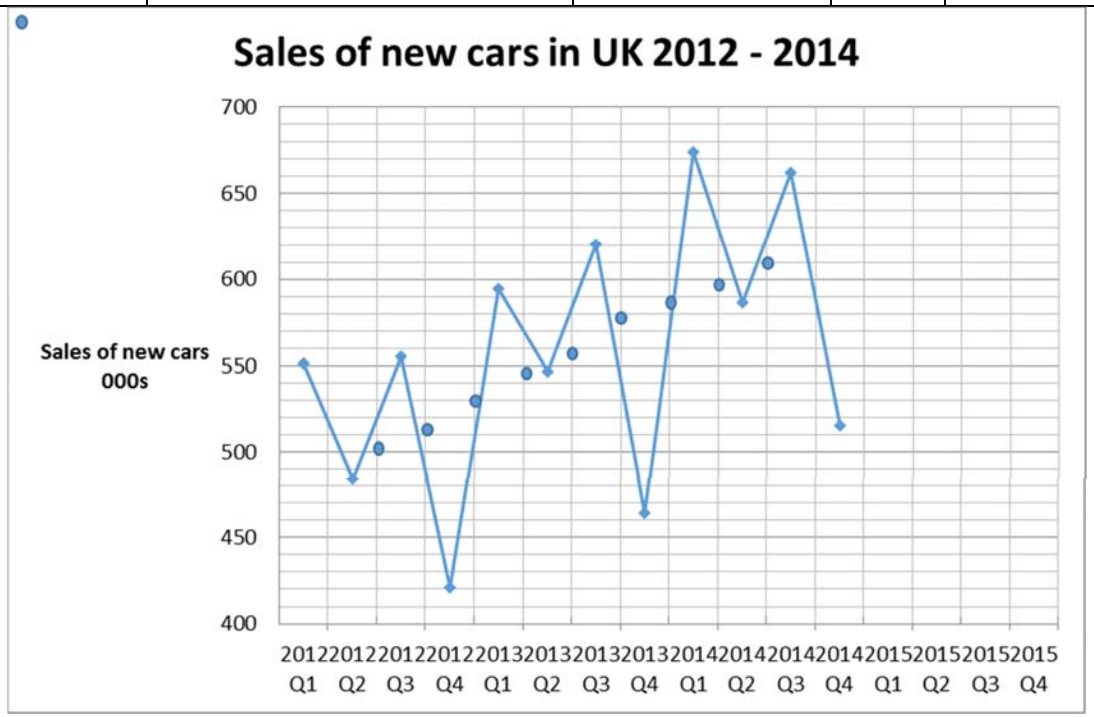
General Marking Guidance

- 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.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question	Working	Answer	Marks	Notes
1(a)	(674.4+586.6+662.1+515.2)/4	609.6	2	M1 Complete method to calculate moving average. A1 awrt 609.6
1(b)		Points correctly plotted	2	B2 All points plotted correctly. (B1 At least 5 points plotted correctly.)
1(c)	Line of best fit or attempt to work out equation of line	Answers in the range 2600000-2700000	2	M1 Evidence of use of graph for 2015 OR finding values for all four quarters in 2015. A1 Answers in the range 2600000-2700000



Question	Working	Answer	Marks	Notes
2(a)		$30000\times(0.7)^n$	2	B1 $30000xk^n$ (Condone $30000ak^n$) OR $(0.7)^n$ B1 $30000\times(0.7)^n$
2(b)	"30000"×("0.7")^3 OR Year 1: 30000×0.7 = 21000 Year 2: 21000×0.7 = 14700 Year 3: 14700×0.7 = 10290	£10290	2	M1 Full method to evaluate their ak^3 OR full method to calculate values for year 1, 2 and 3 A1 (£)10290 cao
2(c)		5 years	1	B1 5 (years) cao
2(d)	(30000-24000)/30000×100 = 20%	20%	2	M1 (30000-24000)/30000 OR 24000/30000 OR sight of 80% oe A1 20(%) cao

Question	Working	Answer	Marks	Notes
3(a)	Petrol 3011+10000×0.2114 = £5125 Diesel 3411+10000×0.1825 = £5236	Petrol £5125 Diesel £5236	3	M1 Sight of Either: 3011 with 21.14 OR 3411 with 18.25 M1 Either: 3011+10000×0.2114 OR 3411+10000×0.1825 (Condone 10000×21.14 and 10000×18.25) A1 Petrol £5125 AND Diesel £5236
3(b)	Cost Petrol = 3011+0.2114m Cost Diesel = 3411+0.1825m 3411+0.1825m = (or <) 3011+0.2114m m = 13840.83	13841	4	M1 Method to set up an appropriate equation M1 Cost Petrol = 3011+0.2114m AND Cost Diesel = 3411+0.1825m (can be implied). (Condone 21.14 and 18.25) M1 Method to solve 2 SEs or inequality set up A1 13840.83 or 13840 or 13841 OR B1 Strategic use of Trial and Improvement B1 14000 awrt

Question	Working	Answer	Marks	Notes
4 (i)		True Positive	1	C1 Correct statement e.g.: True Positive OR Individual is correctly identified as having diabetes.
4 (ii)		False Negative	1	C1 Correct statement e.g.: False Negative OR Individual has tested negative but has diabetes.
4 (iii)		True Negative	1	C1 Correct statement e.g.: True Negative OR individual is correctly identified as not having diabetes.

Question	Working	Answer	Marks	Notes
5 (a)	199/400 OR (144+55)/400	199/400	2	M1 199/a OR b/400 where a>199 or b<400 A1 199/400 o.e.
5 (b) (i) 5 (b) (ii)	Sensitivity = 144/180×100 = 80% Specificity = 165/220×100 = 75%	Sensitivity = 80% Specificity = 75%	4	M1 144/180×100 A1 Sensitivity = 80% shown **(AG)** M1 165/220×100 A1 Specificity = 75% shown **(AG)**
5 (c)	2/100×3000	60	2	M1 2/100×3000 A1 60 cao
5 (d) (i)	80/100×60	48	2	M1ft 80/100×"60" o.e. A1ft 48
5 (d) (ii)	75/100×(3000-60)	2205	2	M1ft 75/100×(3000-"60") o.e. A1ft 2205

Question	Working	Answer	Marks	Notes
6	Manufacture itself = (0.2×8000+0.5×4000+0.3×-2000) = 3000 Take royalties = (0.2×5000+0.5×3000+0.3×1000) = 2800 (Sell all rights = 2500) Best course of action is to manufacture itself.	Manufacture itself.	5	M1 One correct calculation shown in method for calculating expected value of one option e.g. 0.2×8000(000) M1 Complete method for Manufacture itself OR Take royalties M1 Complete method for both Manufacture itself AND Take royalties A1 Manufacture itself = 3000(000) AND Take royalties = 2800(000) C1ft (Dependent on M2). Correct choice based on their two calculated values and the given value for Sell all rights (may be implied)

Question	Working	Answer	Marks	Notes
7 (a)	$P=340\times268/19=4795.789\ldots$	4795 or 4796	2	M1 $P=340\times268/19$ A1 4795 or 4796
7 (b)		A correct assumption	1	C1 A correct assumption e.g. All fish are equally likely to be caught. No fish enter or leave the lake. Marking a fish doesn't affect its chance of being caught.

Question	Working	Answer	Marks	Notes
8 (a)	$u_1 = 4000\times(1+70/1000-20/1000) = 4200$	$u_1 = 4200$	2	M1 $u_1 = 4000\times(1+70/1000-20/1000)$ A1 $u_1 = 4200$ SC B1 4201
8 (b)	n=1, population = 4200 n=2, population = 4410 n=3, population = 4630.5 n=4, population = 4862.025 n=5, population = 5105.12625 ALTERNATIVE METHOD 4000×(1.05)^n>5000 n log(1.05)>log(5000/4000) n>log(5000/4000)/log(1.05) n>4.57353557 n=5	5	3	M1 Population calculated for any two of n=2 TO n=5 (ft candidate's sensible (<1) birth and death RATES.) M1 Population calculated for n=4 AND n=5 A1 awrt 4900 AND 5100 AND n = 5 ALTERNATIVE METHOD M1 4000×(1.05)^n>5000 (accept ≥ or =) M1 Correct removal of logs A1 n=5
8 (c)		The model predicts unlimited growth.	1	C1 Correct statement

Question	Working	Answer	Marks	Notes
8 (d)		e.g The death rate will increase and the population will settle down to a stable level as there will not be enough space and there will be increased competition for food.	2	C1 A correct statement with reference to behaviour of the population. C1 A correct reason.
8 (e)	P_6=14000-10000×1.05^6= 599.0435938 P_7=14000-10000×1.05^7= -71.00422656	P_6= 599.0435938 P_7=-71.00422656 Correct conclusion with supporting reason	5	M1 Either 14000-10000×1.05^6 OR 14000-10000×1.05^7 A1 P_6= 599.0435938 A1 P_7=-71.00422656 C2 Correct interpretation in context e.g The population will reach zero during year 7 (C1 Correct statement e.g. The population decreases each year)

Question	Working	Answer	Marks	Notes
9	$a = 10$ $r = 3$ $S_4 = 10\times(1 - 3^5)/(1-3)= 1210$ $1210 - 10 = 1200$ OR $(u_0=10)$ $u_1=3\times10=30$ $u_2=3\times30=90$ $u_3=3\times90=270$ $u_4=3\times270=810$ Total = 1200	1200	4	M1 $10\times(1 - 3^n)/(1-3)$ where n = 4 or 5 OR method to calculate u_1 to u_3 with a=10 and r=3. A1 $10\times(1 - 3^5)/(1-3)$ OR u_1 to u_4 calculated correctly OR 810 M1 $10\times(1 - 3^5)/(1-3)$ -10 OR u_1 to u_4 summed A1 1200

Question	Working	Answer	Marks	Notes
10(a)		$3x+6y\leq 46800$ to give $x+2y\leq 15600$ $8x+20y\leq 150000$ to give $2x+5y\leq 37500$	3	M1 $3x+6y\leq(46800)$ OR $8x+20y\leq(150000)$ (accept < or =) A1 $3x+6y\leq 46800$ OR $8x+20y\leq 150000$ A1 $x+2y\leq 15600$ AND $2x+5y\leq 37500$
10(b)		$x\geq 2500$ $y\geq 1500$ $x+y\leq 12000$	3	B1 $x\geq 2500$ OR $y\geq 1500$ OR $x>2500$ OR $y>1500$ B1 $x\geq 2500$ AND $y\geq 1500$ B1 $x+y\leq 12000$
10(c)	$x+2y=15600$ $x+y=12000$ $2x+5y=37500$ $x=2500$ $y=1500$ drawn correctly Feasible region labelled.	Correctly drawn graph with FR labelled	5	B1 $x+2y=15600$ drawn correctly B1 $2x+5y=37500$ drawn correctly B1ft "$x+y=12000$" drawn correctly B1ft "$x=2500$" AND "$y=1500$" drawn correctly B1 cao Feasible region labelled. (see diagram below)
10(d)		$P=12x+15y$ or $0.12x+0.15y$	1	B1 $(P=)12x+15y$ or $0.12x+0.15y$ cao

<table>
<tr><th>Question</th><th>Working</th><th>Answer</th><th>Marks</th><th>Notes</th></tr>
<tr><td>10(e)</td><td>Objective line drawn, point found using SEs

OR

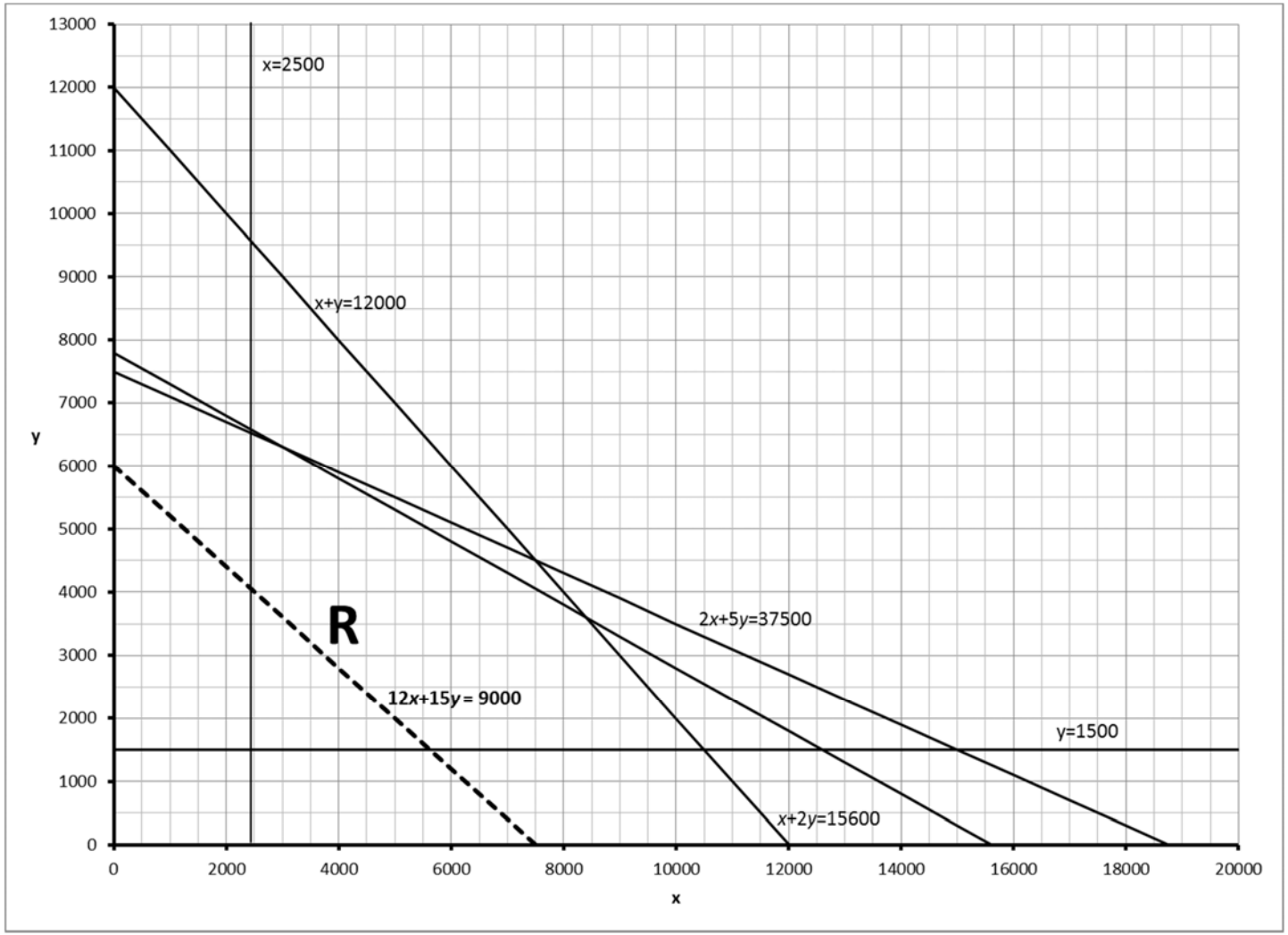
Point testing in FR</td><td>No of Standard packets = 8400,
No of Delux packets = 3600
profit = 154800p or £1548</td><td>6</td><td>Objective line:
M1 Writes down possible equation for objective line (e.g. 12x+15y=600) or writes down gradient of -12/15 or -15/12.
M1 Draws an objective line with gradient of -12/15 or -15/12.
A1 A correct objective line drawn (see diagram below)
M1 (dep M2) Optimal point identified as intersection of $2x+5y=37500$ and $x+y=12000$
A1optimal point = (8400,3600) o.e
A1 profit = 154800p or £1548 cao

Point testing:
M1 One vertex in their FR tested using Objective function.
A1ft one correct profit.
M1 Testing at least two points
M1(dep on M2) Optimal point tested and identified as intersection of $2x+5y=37500$ and $x+y=12000$
A1optimal point = (8400,3600) o.e
A1 profit = 154800p or £1548 cao

<table><tr><th>x</th><th>y</th><th>profit (£)</th></tr><tr><td>2500</td><td>1500</td><td>525</td></tr><tr><td>2500</td><td>6500</td><td>1275</td></tr><tr><td>3000</td><td>6300</td><td>1305</td></tr><tr><td>8400</td><td>3600</td><td>1548</td></tr><tr><td>10500</td><td>1500</td><td>1485</td></tr></table>
Special case: No method shown or method unclear
B1optimal point = (8400,3600) o.e</td></tr>
</table>

				B1profit = 154800p or £1548 cao
Question	**Working**	**Answer**	**Marks**	**Notes**
10(f)		Increasing the amount of production time will increase profit as there is currently no production time left. Increasing the amount of fibre available will not increase profit as there is currently still some fibre available.	2	C2 A fully correct statement (C1 A partially correct statement)

Diagram for 10c/e



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