Modelling with Series 2 - Edexcel Past Exam Questions MARK SCHEME

Question 1

Question	Scheme	Marks
(a)	$S_{10}=\frac{10}{2}[2P+9\times 2T]$ or $\frac{10}{2}(P+[P+18T])$	M1
	e.g. $5[2P+18T]$ $=(£)\,(10P+90T)$ or $(£)\,10P+90T$ (*)	A1cso (2)
(b)	Scheme 2: $S_{10}=\frac{10}{2}[2(P+1800)+9T]=\{10P+18000+45T\}$	M1A1
	$10P+90T=10P+18000+45T$	M1
	$90T=18000+45T$	
	$T=400$ (only)	A1 (4)
(c)	Scheme 2, Year 10 salary: $[a+(n-1)d=](P+1800)+9T$	B1ft
	$P+1800+$ "3600" $=29850$	M1
	$P=(£)\,\underline{24450}$	A1 (3)
		9 marks

	Notes
(a)	M1 for identifying $a=P$ or $d=2T$ and attempt at S_{10}. Using $n=10$ and one of a or d correct. Must see evidence for M mark, at least one line before the answer.
	A1cso for simplifying to given answer. No incorrect working seen. Do not penalise missing end bracket in working eg $5(2P+18T$
List	M1A1 for a full list seen (with + signs or written in columns) and no incorrect working seen. Any missing terms is M0A0
(b)	1st M1 for attempting S_{10} for scheme 2 (allow missing (…) brackets e.g. $2P+1800+9T$) Using $n=10$ and at least one of a or d correct.
	1st A1 for a correct expression for S_{10} using scheme 2 (needn't be multiplied out)
List	Allow M1A1 if they reach $10P+18000+45T$ with no incorrect working seen $10P+18000+45T$ with no working is M1A1
	2nd M1 for forming an equation using the two sums that would enable P to be eliminated. Follow through their expressions provided P would disappear.
	2nd A1 for $T=400$ Answer only (4/4)
(c)	B1 for using u_{10} for scheme 2. Can be $9T$ or follow through their value of T
	M1 for forming an equation based on u_{10} for scheme 2 and using 29850 and their value of T
	A1 for 24450 seen Answer only (3/3)
MR	If they misread scheme 2 as scheme 1 in part (c) apply MR rule and award B0M1A0 max for an equation based on u_{10} for scheme 1 and using 29850 and their value of T

Question 2

Question Number	Scheme	Marks
	Boy's Sequence: 10, 15, 20, 25, ...	
(a)	$\{a=10, d=5 \Rightarrow T_{15}=\}\ a+14d=10+14(5);=80$ or $0.1+14(0.05);=£0.80$	M1; A1 [2]
(b)	$\{S_{60}=\}\ \frac{60}{2}[2(10)+59(5)]$	M1 A1
	$=30(315)=9450$ or £94.50	A1 [3]
	Boy's Sister's Sequence: 10, 20, 30, 40, ...	
(c)	$\{a=10, d=10 \Rightarrow S_m=\}\ \frac{m}{2}(2(10)+(m-1)(10))$ $\left(\text{or } \frac{m}{2}\times 10(m+1) \text{ or } 5m(m+1)\right)$	M1 A1
	$63 \text{ or } 6300=\frac{m}{2}(2(10)+(m-1)(10))$	dM1
	$6300=\frac{m}{2}(10)(m+1)$ or $12600=10m(m+1)$	
	$1260=m(m+1)$	
	$35\times 36=m(m+1)$ (*)	A1 cso [4]
(d)	$\{m=\}\ 35$	B1 [1]
		10

Notes

(a)

M1: for using the formula $a+14d$ with either a or d correct.

A1: for 80 or 80p or £0.80 or £0.80p and apply ISW. Otherwise, £80 or 0.80 or 0.80p would be A0.

Award M0 if candidate applies $a+59d$.

Listing the first 15 terms and highlighting that the 15th term is 80 or listing 15 terms with the final 15th term aligned with 80 will then be awarded all two marks of M1A1.

Writing down 80 with no working is M1A1.

(b)

M1: for use of correct $\frac{60}{2}[2(10)+59(5)]$ or $\frac{15}{2}(2(10)+14(5))$

with $a=10$, $d=5$ and $n=60$ or $a=10$, $d=5$ and $n=15$.

If a candidate uses $\frac{n}{2}(a+l)$ with $n=60$ or 15, there must be a full method of finding or stating l as either $a+59d\ (=305)$ or $a+14d\ (=80)$, respectively.

1st A1: for a correct expression for S_{60}. ie. $\frac{60}{2}[2(10)+59(5)]$ or $\frac{60}{2}[2(0.1)+59(0.05)]$

or $\frac{60}{2}[10+305]$ or $\frac{60}{2}[0.10+3.05]$. This mark can be implied by later working.

2nd A1: for 9450 or 9450p or £94.50 and apply ISW. Otherwise, £9450 or 94.50 without £ sign is A0.

Note: the bracketing error of $\frac{60}{2}2(10)+59(5)$ is A0 unless recovered from later working.

Adding together the first 60 terms to obtain 9450 will then be awarded all three marks of M1A1A1.

Question 3

Question Number	Scheme		Marks
(a)	$120000\times(1.05)^3=138915*$	Or $120000\times1.05\times1.05\times1.05=138915$ Or 120000, 126000, 132300, 138915 Or $a=120000$ and $a\times(1.05)^3=138915$	B1
			(1)
(b)	$120000\times(1.05)^{n-1}>200000$	Allow n or $n-1$ and ">", "<", or "=" etc.	M1
	$\log1.05^{n-1}>\log\left(\frac{5}{3}\right)$	Takes logs correctly Allow n or $n-1$ and ">", "<", or "=" etc.	M1
	$(n-1>)\frac{\log\left(\frac{5}{3}\right)}{\log1.05}$ or equivalent e.g $(n>)\frac{\log\left(\frac{7}{4}\right)}{\log1.05}$	Allow n or $n-1$ and ">", "<", or "=" etc. Allow $1.\dot{6}$ or awrt 1.67 for 5/3.	A1
	2024	M1: Identifies a calendar year using their value of n or n - 1 A1: 2024	M1A1
			(5)
(c)	$\frac{a(1-r^n)}{1-r}=\frac{120000\left(1-1.05^{11}\right)}{1-1.05}$	M1: Correct sum formula with $n=10$, 11 or 12 A1: Correct numerical expression with $n=11$	M1 A1
	1704814	Cao (Allow 1704814.00)	A1
			(3)
			[9]
	Listing or trial/improvement in (b)		
	$U_{10}=186\,159.39$, $U_{11}=195\,467.36$, $U_{12}=205\,240.72$		
	Attempt to find at least the 10^{th} or 11^{th} or 12^{th} terms correctly using a common ratio of 1.05 (all the terms need **not** be listed)		M1
	Forms the geometric progression correctly to reach a term > 200 000		M1
	Obtains an "11^{th}" term of awrt 195 500 **and** a "12^{th}" term of awrt 205 200		A1
	Uses their number of terms to identify a calendar year		M1
	2024		A1
			(5)

Question 4

Question Number	Scheme	Marks
(a)	Lewis; arithmetic series, $a = 140$, $d = 20$. $T_{20} = 140 + (20-1)(20); = 520$ **Or** lists 20 terms to get to 520 OR $120 + (20)(20)$	M1; A1 [2]
(b)	Method 1 **Either:** Uses $\frac{1}{2}n(2a + (n-1)d)$ $\frac{20}{2}(2\times140 + (20-1)(20))$ 6600	Method 2 **Or:** Uses $\frac{1}{2}n(a + l)$ $\frac{20}{2}(140 + "520")$ ft 520 M1 A1 A1 [3]
(c)	Sian; arithmetic series, $a = 300$, $l = 700$, $S_n = 8500$ **Either:** Attempt to use $8500 = \frac{n}{2}(a + l)$ $8500 = \frac{n}{2}(300 + 700)$ $\Rightarrow n = 17$	**Or:** May use both $8500 = \frac{1}{2}n(2a + (n-1)d)$ and $l = a + (n-1)d$ **and eliminate** d $8500 = \frac{n}{2}(600 + 400)$ M1 A1 A1 [3]
		8 marks

	Notes
(a)	**M1:** Attempt to use formula for **20th term** of Arithmetic series with first term **140** and $d = 20$. **Normal formula rules** apply – see General principles at the start of the mark scheme re "Method Marks" **Or:** uses $120 + 20n$ with $n = 20$ **Or: Listing method :** Lists 140, 160, 180, 200, 220, 240, 260, 280, … 520. M1A1 if correct M0A0 if wrong. (So 2 marks or zero) **A1:** For 520
(b)	**M1:** An attempt to apply $\frac{1}{2}n(2a + (n-1)d)$ **or** $\frac{1}{2}n(a + l)$ with their values for a, n, d and l **A1:** Uses $a = 140$, $d = 20$, $n = 20$ in their formula (two alternatives given above) but **ft on their value of** l from (a) if they use Method 2. **A1:** 6600 cao **Or: Listing method :** Lists 140, 160, 180, 200, 220, 240, 260, 280, … 520 and adds **6600** gets M1A1A1- any other answer gets M1 A0A0 provided there are 20 numbers, the first is 140 and the last is 520.
(c) **First method**	**M1:** Attempt to use $S_n = \frac{n}{2}(a + l)$ with their values for a, and l and S =8500 **A1:** Uses formula with correct values **A1:** Finds exact value 17
Alternative method	**M1:** If both formulae $8500 = \frac{1}{2}n(2a + (n-1)d)$ and $l = a + (n-1)d$ are used, then d **must be eliminated** before this mark is awarded by valid work. Should not be using $d = 400$. This would be **M0**. **A1:** Correct equation in n only then **A1** for 17 exactly **Trial and error methods:** Finds $d = 25$ and $n = 17$ and list from 300 to 700 with total checked – 3/3

Question 5

Question Number	Scheme		Marks
(a)	$600 = 200 + (N-1)20 \Rightarrow N = ...$	Use of 600 with a **correct** formula in an attempt to find N. A correct formula could be implied by a correct answer.	M1
	$N = 21$	cso	A1
	Accept correct answer only.		
	$600 = 200 + 20N \Rightarrow N = 20$ is M0A0 (wrong formula) $\frac{600-200}{20} = 20 \therefore N = 21$ is M1A1 (correct formula implied)		
	Listing: All terms must be listed up to 600 and 21 correctly identified. A solution that scores 2 if fully correct and 0 otherwise.		
			(2)
(b)	**Look for an AP first:**		
	$S = \frac{21}{2}(2\times 200 + 20\times 20)$ or $\frac{21}{2}(200+600)$ or $S = \frac{20}{2}(2\times 200 + 19\times 20)$ or $\frac{20}{2}(200+580)$ (= 8400 or 7800)	M1: Use of correct sum formula with their **integer** $n = N$ or $N-1$ from part (a) where $3 < N < 52$ and $a = 200$ and $d = 20$. A1: Any correct un-simplified numerical expression with $n = 20$ or $n = 21$ (No follow through here)	M1A1
	Then for the constant terms:		
	$600\times(52-"N")(= 18600)$	M1: $600\times k$ where k is an integer and $3 < k < 52$ A1: A correct un-simplified follow through expression with their k consistent with n so that $n + k = 52$	M1A1ft
	So total is 27000	Cao	A1
	Note that for the constant terms, they may correctly use an AP sum with $d = 0$.		
	There are no marks in (b) for just finding S_{52}		
			(5)
			[7]
	If they obtain $N = 20$ in (a) (0/2) and then in (b) proceed with, $S = \frac{20}{2}(2\times 200 + 19\times 20) + 32\times 600 = 7800 + 19\ 200 = 27\ 000$ allow them to 'recover' and score full marks in (b) Similarly If they obtain $N = 22$ in (a) (0/2) and then in (b) proceed with, $S = \frac{21}{2}(2\times 200 + 20\times 20) + 31\times 600 = 8400 + 18\ 600 = 27\ 000$ allow them to 'recover' and score full marks in (b)		

Question 6

Question Number	Scheme	Notes	Marks
(a)	$U_{10} = 500 + (10-1) \times 200$	Uses $a+(n-1)d$ with a=500, d=200 and $n = 9,10$ or 11	M1
	=(£)2300		A1
	If the term formula is not quoted and the numerical expression is incorrect score M0. A correct answer with no working scores full marks.		**(2)**
(b)	**Mark parts (b) and (c) together**		
	$\frac{n}{2}\{2\times 500 + (n-1)\times 200\} = 67200$	M1: Attempt to use $S = \frac{n}{2}\{2a+(n-1)d\}$ with , $S_n = 67200$, $a = 500$ *and* $d = 200$	M1A1
		A1: Correct equation	
	If the sum formula is not quoted and the equation is incorrect score M0.		
	$n^2 + 4n - 672 = 0$	M1: An attempt to remove brackets and collect terms. **Dependent on the previous M1**	dM1A1
		A1: A correct **three term** equation in any form	
	E.g. allow $n^2 + 4n = 672$, $n^2 = 672 - 4n$, $672 - 4n - n^2 = 0$, $200n^2 + 800n = 134400$ etc.		
	$n^2 + 4n - 24\times 28 = 0$ *	Replaces 672 with 24×28 with the equation **as printed** (including = 0) with no errors. (= 0 may not appear on the last line but must be seen at some point)	A1
			(5)
(c)	$(n-24)(n+28) = 0 \Rightarrow n = ..$ or $n(n+4) = 24\times 28 \Rightarrow n = ..$	Solves the **given** quadratic in an attempt to find n. They may use the quadratic formula.	M1
	24	States that $n = 24$, or the number of years is 24	A1
	Allow correct answer only in (c)		
			(2)
			[9]

Question 7

Question Number	Scheme	Marks
	(a) Use n^{th} term $= a+(n-1)d$ with $d = 10$; $a = 150$ and $n = 8$, or $a = 160$ and $n = 7$, or $a = 170$ and $n = 6$: $= 150+7\times10$ or $160+6\times10$ or $170+5\times10$ $= 220^*$ (Or gives clear list – see note)	M1 A1* (2)
Or	If answer 220 is assumed and $150 + (n - 1)\ 10 = 220$ or variation is solved for n= Then $n = 8$, so 2007 is the year (must conclude the year)	M1 A1* (2)
	(b) Use $S_n = \frac{n}{2}\{2a+(n-1)10\}$ | Or $S_n = \frac{n}{2}\{a+l\}$ **and** $l = a + (n-1)10$ $= 7(300+13\times10)$ or $7(150 + 280)$ $= 7\times430$ $= 3010$	M1 A1 A1 (3)
	(c) Cost in year n $= 900+(n-1)\times-20$ Sales in year $n = 150+(n-1)\times10$ Cost $= 3\times$Sales $\Rightarrow 900+(n-1)\times-20 = 3\times(150+(n-1)\times10)$ $900-20n+20 = 450+30n-30$ $500 = 50n$ $n = 10$ Year is 2009 As n is not defined they may work correctly from another base year to get the answer 2009 and their n may not equal 10. If doubtful – send to review.	M1 M1 M1 A1 (4) (9 marks)

Notes

(a) M1 Attempt to use $n^{th}\text{term} = a+(n-1)d$ with $d = 10$, and correct combination of a and n i.e. $a = 150$ and $n = 8$ or $a = 160$ and $n = 7$, or $a = 170$ and $n = 6$

A1 * Shows that 220 computers are sold in 2007 with no errors

Note that this is a given solution, so needed 150+7×10 or 160+6×10 or 170+5×10 or equivalent.

Accept a correct list showing all values and years for both marks Just 150,160,170,180,190,200,210,220 is M1A0

Need some reference to years as well as the list of numbers of computers for A1.

(b) M1 Attempts to use $S_n = \frac{n}{2}\{2a+(n-1)d\}$ with $d = 10$, and correct combination of a and n i.e. $a = 150$ and $n = 14$, or a = 160 and $n = 13$, or $a = 170$ and $n = 12$

A1 Uses $S_n = \frac{n}{2}\{2a+(n-1)d\}$ with $a = 150$, $d = 10$ and $n = 14$ [N.B. $S_n = \frac{n}{2}\{a+l\}$ needs $l = a + (n - 1)d$ as well

NB A0 for $a = 160$ and $n = 13$ or $a = 170$ and $n = 12$ unless they then add the first, or first two terms respectively.

A1 Cao 3010 . This answer (with no working) implies correct method M1A1A1.

Special case: If a complete list 150+160+170+180+190+200+210+220+230+240+250+260+270+280 is seen, then there is an error finding the sum then score M1A1A0, but incomplete or wrong lists score M0A0A0

(c) M1 Writes down an expression for the cost = 900+(n–1)×–20 or writes 900 + (n – 1) d and states d = -20

Allow 900 + n ×–20. Allow recovery from invisible brackets.

M1 **Attempts** to write down an equation in n for statement 'cost =3×sales'

900+(n-1)×-20 = 3×(150+(n-1)×10). Accept the 3 on the wrong side and allow use of 20 instead of -20 and allow n (consistently) instead of n – 1 for this mark. Ignore £ signs in equation.

M1 Solves the correct linear equation in n to achieve n = 10 (for those using n – 1) or n = 9 (for those using n). Ignore £ signs.

A1 Cso Year 2009 (A0 for the answer Year 10 if 2009 is not given)

Special case. **Just answer or trial and improvement** with no equation leading to answer scores SC 0,0,1,1

Equations satisfying the method mark descriptors followed by trial and improvement could get all four marks

Question 8

Question Number	Scheme	Marks
(a).	Attempts to use $a+(n-1)"d"$ with $a=A$ and "d"$=d+1$ and $n=14$ $A+13(d+1)=A+13d+13$ *	M1 A1* (2)
(b)	Calculates time for Yi on Day 14$=(A-13)+13(2d-1)$ Sets **times** equal $A+13d+13=(A-13)+13(2d-1)\Rightarrow d=...$ $d=3$	M1 M1 A1 cso (3)
(c)	Uses $\frac{n}{2}\{2A+(n-1)(D)\}$ with $n=14$, and with $D=d$ or $d+1$ Attempts to solve $\frac{14}{2}\{2A+13\times'(d+1)'\}=784\Rightarrow A=...$ $A=30$	M1 dM1 A1 (3) (8 marks)

(a) M1 Attempts to use $a+(n-1)d$ with $a=A$ and $d=d+1$ AND $n=14$

A1* cao This is a given answer and there is an expectation that the intermediate answer is seen and that **all work is correct** with correct brackets.

The expressions $A+13(d+1)$ and $A+13d+13$ should be seen

N.B. If **brackets are missing and formula is not stated**

e.g. $A+13d+1\Rightarrow A+13d+13$ or $A+(13)d+1\Rightarrow A+13d+13$ then this is **M0A0**

If **formula is quoted and $a=A$ and $d=d+1$ is quoted or implied**, then M1 A0 may be given

So $a+(n-1)d$ followed by $A+(13)d+1=A+13d+13$ achieves **M1A0**

(b) M1 States a time for Yi on Day 14 $=(A-13)+13(2d-1)$

M1 Sets their **time** for Yi, equal to $A+13d+13$ and uses this equation to proceed to $d=$

A1 cso $d=3$ Needs both M marks and must be simplified to 3 (not 39/13)

[NB Setting **each** of the times separately equal to 0 leads to $d=3$ – this will gain M0A0]

(c) M1 Uses the sum formula $\frac{n}{2}\{2A+(n-1)(D)\}$ with $n=14$ and $D=d+1$ or allow $D=d$ (usually 4 or 3)

NB May use $\frac{n}{2}\{A+(A+13D)\}$ with $n=14$ and and $D=d+1$ or allow $D=d$ (usually 4 or 3)

dM1 Attempts to solve $\frac{14}{2}\{2A+13\times'4'\}="784"\Rightarrow A=...$ (Must use their $d+1$ this time)

Allow miscopy of 784

A1 cao $A=30$

Question 9

Question Number	Scheme		Marks
(a)	$32000 = 17000 + (k-1)\times 1500 \Rightarrow k = \ldots$	Use of 32000 with a **correct** formula in an attempt to find k. A correct formula could be implied by a correct answer.	M1
	$(k=)\ 11$	Cso (Allow $n = 11$)	A1
	Accept correct answer only.		
	$32000 = 17000 + 1500k \Rightarrow k = 10$ is M0A0 (wrong formula) $\frac{32000-17000}{1500} = 10 \therefore k = 11$ is M1A1 (correct formula implied)		
	Listing: All terms must be listed up to 32000 and 11 correctly identified. A solution that scores 2 if fully correct and 0 otherwise.		
			(2)
(b)	M1: $S = \frac{k}{2}(2\times 17000 + (k-1)\times 1500)$ or $\frac{k}{2}(17000 + 32000)$ $S = \frac{k-1}{2}(2\times 17000 + (k-2)\times 1500)$ or $\frac{k-1}{2}(17000 + 30500)$ A1: $S = \frac{11}{2}(2\times 17000 + 10\times 1500)$ or $\frac{11}{2}(17000 + 32000)$ $S = \frac{10}{2}(2\times 17000 + 9\times 1500)$ or $\frac{10}{2}(17000 + 30500)$ $(= 269\,500$ or $237\,500)$	M1: Use of correct sum formula with their **integer** $n = k$ or $k-1$ from part (a) where $3 < k < 20$ and $a = 17000$ and $d = 1500$. **See below for special case for using $n = 20$.** A1: Any correct un-simplified numerical expression with $n = 11$ or $n = 10$	M1A1
	$32000 \times \alpha$	$32000 \times \alpha$ where α is an integer and $3 < \alpha < 18$	M1
	$288\,000 + 269\,500 = 557\,500$ or $320\,000 + 237\,500 = 557\,500$	M1: Attempts to add their two values. It is dependent upon the two previous M's being scored and must be the sum of 20 terms i.e. $\alpha + k = 20$ A1: 557 500	ddM1A1
	Special Case: If they just find S_{20} (£625 000) in (b) score the first M1 otherwise apply the scheme.		
			(5)
			(7 marks)

Listing:

n	1	2	3	4	5	6	7	8	9	10
u_n	17000	18500	20000	21500	23000	24500	26000	27500	29000	30500
n	11	12	13	14	15	16	17	18	19	20
u_n	32000	32000	32000	32000	32000	32000	32000	32000	32000	32000

Look for a sum before awarding marks. Award the M's as above then A2 for 557 500
If they sum the 'parts' separately then apply the scheme.

Question 10

Question Number	Scheme	Notes	Marks
(a)	John; arithmetic series, $a = 60$, $d = 15$.		
	$60 + 75 + 90 = 225^*$ or $S_3 = \frac{3}{2}(120 + (3-1)(15)) = 225^*$	Finds and adds the first 3 terms or uses sum of 3 terms of an AP and obtains the printed answer, with no errors.	B1 *
	Beware: **The 12th term of the sequence is 225 also so look out for** $60 + (12-1)\times 15 = 225$. **This is B0.**		
			[1]
(b)	$t_9 = 60 + (n-1)15 = (£)180$	M1: Uses $60 + (n-1)15$ with $n = 8$ or 9 A1: (£)180	M1 A1
	Listing: M1: Uses $a = 60$ and $d = 15$ to select the 8th or 9th term (allow arithmetic slips) A1: (£)180 (Special case (£)165 **only** scores M1A0)		
			[2]
(c)	$S_n = \frac{n}{2}(120 + (n-1)(15))$ or $S_n = \frac{n}{2}(60 + 60 + (n-1)(15))$	Uses correct formula for sum of n terms with $a = 60$ and $d = 15$ (must be a correct formula but ignore the value they use for n or could be in terms of n)	M1
	$S_n = \frac{12}{2}(120 + (12-1)(15))$	Correct numerical expression	A1
	$= (£)1710$	cao	A1
	Listing: M1: Uses $a = 60$ and $d = 15$ and finds the sum of at least 12 terms (allow arithmetic slips) A2: (£)1710		
			[3]
(d)	$3375 = \frac{n}{2}(120 + (n-1)(15))$	Uses correct formula for sum of n terms with $a = 60$, $d = 15$ and puts = 3375	M1
	$6750 = 15n(8 + (n-1)) \Rightarrow 15n^2 + 105n = 6750$	**Correct three term** quadratic. E.g. $6750 = 105n + 15n^2$, $3375 = \frac{15}{2}n^2 + \frac{105}{2}n$ This may be implied by equations such as $6750 = 15n(n+7)$ or $3375 = \frac{15}{2}(n^2 + 7n)$	A1
	$n^2 + 7n = 25\times 18^*$	Achieves the printed answer with no errors but must see the 450 or 450 in factorised form or e.g. 6750, 3375 in factorised form i.e. an intermediate step.	A1*
			[3]
(e)	$n = 18 \Rightarrow$ Aged 27	M1: Attempts to solve the given quadratic or states $n = 18$ A1: Age = 27 or just 27	M1 A1
	Age = 27 only scores both marks (i.e. $n = 18$ need not be seen)		
	Note that (e) is not hence so allow valid attempts to solve the given equation for M1		
			[2]
			11 marks

Question 11

Question Number	Scheme		Marks
(a)	$206=140+(12-1)\times d \Rightarrow d=...$	Uses $206=140+(12-1)\times d$ and proceeds as far as $d=...$	M1
	$(d=)6$	Correct answer only can score both marks.	A1
			(2)
(b)	$S_{12}=\frac{12}{2}(140+206)$ or $S_{12}=\frac{12}{2}(2\times140+(12-1)\times"6")$ or $S_{11}=\frac{11}{2}(140+206-"6")$ or $S_{11}=\frac{11}{2}(2\times140+(11-1)\times"6")$	Attempts $S_n=\frac{n}{2}(a+l)$ or $S_n=\frac{n}{2}(2a+(n-1)d)$ with $n=12$, $a=140, l=206, d='6'$ **WAY 1** Or Attempts $S_n=\frac{n}{2}(a+l)$ or $S_n=\frac{n}{2}(2a+(n-1)d)$ with $n=11$, $a=140, l=206-'6', d='6'$ **WAY2** If they are using $S_n=\frac{n}{2}(2a+(n-1)d)$, the n must be used consistently.	M1
	$S=2076$ **WAY1** or $S=1870$ **WAY 2**	Correct sum (may be implied)	A1
	$(52-12)\times206=...$ or $(52-11)\times206=...$	Attempts to find $(52-12)\times206$ or $(52-11)\times206$. Does **not** have to be consistent with their n used for the first Method mark.	M1
	Total $="2076"+"8240"=...$ **(WAY 1)** or Total $="1870"+"8446"=...$ **(WAY 2)**	Attempts to find the total by adding the sum to 12 terms with (52 - 12) lots of 206 or attempts to find the total by adding the sum to 11 terms with (52 - 11) lots of 206. I.e. consistency is now required for this mark. **Dependent on both previous method marks.**	**dd**M1
	10316	cao	A1
			(5)
			(7 marks)

Listing in (b):

Week	1	2	3	4	5	6	7
Bicycles	140	146	152	158	164	170	176
Total	140	286	438	596	760	930	1106

8	9	10	11	12	13	...	52
182	188	194	200	206	206	...	206
1288	1476	1670	1870	2076	2282	...	10316

M1: Attempts the sum of either 12 or 11 terms of a series with first term 140 and their d up to $140 + 11d$ or $140 + 10d$.
A1: S = 2076 or 1870
Then follow the scheme

Special case in (b) – Treats as single AP with $n = 52$

$$S_n = \frac{52}{2}(2\times 140 + (52-1)\times "6") = 15236 \text{ Scores 11000}$$

M1: $S_n = \frac{n}{2}(2a + (n-1)d)$ with $n = 52$, $a = 140$, $d =$ "6" **A1:** 15236