| Question Number | Scheme | Notes | Marks |
|---|---|---|---|
| **5(a)** | $t_{40} = 100 + (40-1)\times 5$ | Uses $a + (n-1)d$ with $a = 100$, $d = 5$ and $n = 40$. This may be implied by a correct expression e.g. $100 + 39\times 5$ | M1 |
| | = (£)295 | Cao. Correct answer with no working scores both marks. | A1 |
| | | | **(2)** |
| **(b)** | $S_{60} = \frac{1}{2}(60)(2\times 100 + (60-1)\times 5)$<br>or<br>$l = 100 + (60-1)\times 5 = 395$<br>$S_{60} = \frac{1}{2}(60)(100+395)$ | Uses a correct sum formula with $a = 100$, $d = 5$ and $n = 60$ **or $n = 40$**. May be implied by a correct numerical expression.<br>If using $\frac{1}{2}n(a+l)$ with $n = 40$ you may see $\frac{1}{2}(40)(100+295)$ using their result from (a) and this scores M1 also. | M1 |
| | | **Correct** numerical expression **with $n = 60$**. If there are any missing brackets then this mark should be withheld unless the correct expression is implied by their answer. | A1 |
| | = (£)14 850 | Cao. Correct answer with no working scores 3 marks. Apply isw if necessary and award this mark once a correct answer is seen. | A1 |
| | | | **(3)** |
| **(c)** | $\frac{1}{2}n(2\times 600 + (n-1)\times -10) = 18200$ | Attempts to use a correct sum formula with $a = 600$, $d = -10$ and sets = 18 200. Condone poor use of brackets. | M1 |
| | | Correct equation which may be implied by subsequent work. | A1 |
| | $600n - 5n^2 + 5n = 18200$<br>$5n^2 - 605n + 18200 = 0$<br>$n^2 - 121n + 3640 = 0$ * | Obtains the printed answer with at least one intermediate line and no errors. Allow other variables to be used for $n$ but the final answer must be as printed including "= 0" | A1* |
| | | | **(3)** |
| **(d)** | $(n-56)(n-65) = 0$<br>$\Rightarrow (n =) 56, 65$ | Attempts to solve the given quadratic. This may be implied by correct answers. Apply general guidance if necessary but must reach at least one value for $n$. (Allow them to use $x$ rather than $n$) | M1 |
| | | Correct values (ignore how they are labelled e.g. allow $x = \ldots$) | A1 |
| | | | **(2)** |
| **(e)** | E.g.<br>($n =$) 65 because e.g. the money has already been saved after 56 months | States ($n =$) 65 and gives a suitable reason – see below for examples of acceptable comments. There must be no contradictory statements and any calculations must be correct. | B1 |
| | | | **(1)** |
| | | | **Total 11** |

**Acceptable comments for 5(e):**

$n = 65$ means $t = 600 - 10\times 64 = -40$ which is not possible/doesn't make sense/etc.

$n = 65$ because Lina will have saved the money after 56 months

$n = 65$ because Lina will have saved the money before then

$600 + (n-1)\times -10 = 0 \Rightarrow n = 61$ so she will have paid off the loan before $n = 65$

Condone "because 65 > 60" or equivalent e.g. it is only over 60 months (or 5 years)

$n = 65$ means $t = 600 - 10\times 64 = -40$ so reject (but not just "it is negative")

| Question Number | Scheme | Notes | Marks |
|---|---|---|---|
| **6(a)** | $x^3-6x+9=-2x^2+7x-1$<br>$\Rightarrow ...$ | Sets $C_1 = C_2$, and collects terms | M1 |
| | $\Rightarrow \pm\left(x^3+2x^2-13x+10\right)=0$ | Correct cubic equation. The "= 0" may be implied by their attempt to solve. | A1 |
| | **Examples:**<br>$x^3+2x^2-13x+10=\left(x-1\right)\left(x^2+...x+...\right)=(x-1)(x+...)(x+..)\Rightarrow x=...$<br>Attempts to factorise using $(x-1)$ as a factor or uses long division by $(x-1)$ to obtain a quadratic factor and proceeds to solve quadratic or factorise and solve<br>NB $x^3+2x^2-13x+10=\left(x-1\right)\left(x^2+3x-10\right)$<br>or<br>$x^3+2x^2-13x+10=(x-1)(x+...)(x+..)\Rightarrow x=...$<br>Attempts 3 factors directly (by considering roots)<br>or<br>$x^3+2x^2-13x+10=0\Rightarrow x=...$<br>Solves (using calculator) to obtain 3 roots (may need to check if cubic incorrect) | | M1 |
| | $x=2,\ y=5$ or $\left(2,\ 5\right)$<br>Correct values **from a correct cubic.**<br>Allow as a coordinate pair or written separately.<br>If there are any errors in the algebra e.g. wrong factors, wrong working etc. this mark should be withheld even if they have (2, 5) and score as M1A1B1(**Second M on EPEN**)A0 | | A1 |
| | **Special Case**<br>If you see: $x^3-6x+9=-2x^2+7x-1\Rightarrow x^3+2x^2-13x+10=0$<br>$\Rightarrow x=2,\ y=5$ or $\left(2,\ 5\right)$<br>Score M1A1B1(**Second M on EPEN**)A0 | | |
| | | | **(4)** |

| | | | |
|---|---|---|---|
| **(b)** | $x^n \rightarrow x^{n+1}$ | For increasing any power of $x$ by 1 for $C_1$ or $C_2$ or for $\pm(C_1 - C_2)$ | M1 |
| | $\pm\int\left\{-2x^2+7x-1-\left(x^3-6x+9\right)\right\}\mathrm{d}x = \pm\int\left(-x^3-2x^2+13x-10\right)\mathrm{d}x$<br>$= \pm\left(-\frac{x^4}{4}-\frac{2x^3}{3}+\frac{13x^2}{2}-10x\right)$<br>or<br>$\pm\left\{\int\left(-2x^2+7x-1\right)\mathrm{d}x-\int\left(x^3-6x+9\right)\mathrm{d}x\right\}$<br>$= \pm\left(-\frac{2x^3}{3}+\frac{7x^2}{2}-x-\left(\frac{x^4}{4}-\frac{6x^2}{2}+9x\right)\right)$<br>or<br>$\int\left(-2x^2+7x-1\right)\mathrm{d}x = -\frac{2x^3}{3}+\frac{7x^2}{2}-x,\ \int\left(x^3-6x+9\right)\mathrm{d}x = \frac{x^4}{4}-\frac{6x^2}{2}+9x$<br>dM1: For correct integration of 1 term for $C_1$ **and** one term for $C_2$<br>or for correct integration for 2 terms of <u>their</u> $\pm(C_1 - C_2)$<br>A1: Fully correct integration of both $C_1$ and $C_2$ or for $\pm(C_1 - C_2)$. **Award this mark as soon as fully correct integration is seen and ignore subsequent work.** | | dM1A1 |
| | $= -\frac{2^4}{4}-\frac{2(2)^3}{3}+\frac{13(2)^2}{2}-10(2)-\left(-\frac{1^4}{4}-\frac{2(1)^3}{3}+\frac{13(1)^2}{2}-10(1)\right)$<br>Fully correct strategy for the area. Depends on both previous M marks.<br>Uses the limits "2" and 1 in their "changed" expression(s) and subtracts either way round. | | ddM1 |
| | $= \frac{13}{12}$<br>If the attempt is correct apart from subtracting the wrong way round (for limits or functions) and $-\frac{13}{12}$ is obtained, allow recovery if they then make their answer positive. | | A1 |
| | | | **(5)** |
| | | | **Total 9** |

**<u>Some values for reference:</u>**

$$\left[\frac{-2x^3}{3}+\frac{7x^2}{2}-x\right]_1^2 = \frac{20}{3}-\frac{11}{6}=\frac{29}{6} \qquad \left[\frac{x^4}{4}-\frac{6x^2}{2}+9x\right]_1^2 = 10-\frac{25}{4}=\frac{15}{4}$$

$$= -\frac{2^4}{4}-\frac{2(2)^3}{3}+\frac{13(2)^2}{2}-10(2)-\left(-\frac{1^4}{4}-\frac{2(1)^3}{3}+\frac{13(1)^2}{2}-10(1)\right) = -\frac{10}{3}-\left(-\frac{53}{12}\right)$$