(a)		Anna = $30 + 9 \times 15 = 165$ mins	M1	3.3	Attempt u_{10} for AP, using correct eqn	Method must be seen
		Ben = $30 \times 1.1^9 = 71$ mins	M1	3.3	Attempt u_{10} for GP, using correct eqn	Method must be seen
		165 - 71 = 94 minutes A.G.	A1	3.4	Obtain given answer of 94 minutes	AG so both terms need to be
					www	explicitly evaluated for the A1
						Show subtraction, or give more
						accurate value before 94
			[3]			
(b)		Anna: $u_X = 30 + 15(X - 1)$	B1	3.4	Both u_X terms correct	Condone unknown other than X
		Ben: $u_X = 30 \times 1.1^{X-1}$				
		$30 \times 1.1^{X-1} > 30 + 15(X-1)$	M1	2.1	Link correct expressions and attempt to	Condone an incorrect linking sign
		$30 \times 1.1^{X-1} > 15X + 15$			rearrange	eg = not >
		$1.1^{X-1} > 0.5X + 0.5$				Must be using a correct process, so
		$X - 1 > \log_{11}(0.5X + 0.5)$				allow sign errors only
		$X > \log_{11}(0.5X + 0.5) + 1$ A.G.	A1	2.1	Show given answer convincingly	Must now be >, with justification
						if = used in proof, and with X
			[3]			
(c)		18.9	B1	1.1a	Correct first iterate	Allow 19 or 18.8
		25.1, 28.0, 29.0, 29.4, 29.6, 29.6,	M1	1.1	Use correct iterative process to find at	Allow integer values
					least two further values	Could be truncated not rounded
		<i>X</i> = 30	A1	3.4	Obtain $X = 30$	Must be an integer
	(a) (b) (c)	(a) (b) (c)	(a) Anna = $30 + 9 \times 15 = 165$ mins Ben = $30 \times 1.1^9 = 71$ mins 165 - 71 = 94 minutes A.G. (b) Anna: $u_X = 30 + 15(X - 1)$ Ben: $u_X = 30 \times 1.1^{X-1}$ $30 \times 1.1^{X-1} > 30 + 15(X - 1)$ $30 \times 1.1^{X-1} > 15X + 15$ $1.1^{X-1} > 0.5X + 0.5$ $X - 1 > \log_{11}(0.5X + 0.5) + 1$ A.G. (c) 18.9 25.1, 28.0, 29.0, 29.4, 29.6, 29.6, X = 30	(a) Anna = $30 + 9 \times 15 = 165$ mins Ben = $30 \times 1.1^9 = 71$ mins 165 - 71 = 94 minutes A.G. (b) Anna: $u_X = 30 + 15(X - 1)$ Ben: $u_X = 30 \times 1.1^{X - 1}$ $30 \times 1.1^{X - 1} > 30 + 15(X - 1)$ $30 \times 1.1^{X - 1} > 15X + 15$ $1.1^{X - 1} > 0.5X + 0.5$ $X - 1 > \log_{11}(0.5X + 0.5) + 1$ A.G. (c) 18.9 25.1, 28.0, 29.0, 29.4, 29.6, 29.6, X = 30 (c) Anna: $u_X = 30$ X = 30 (c) Anna: $u_X = 30$ (c) Anna	(a)Anna = $30 + 9 \times 15 = 165$ mins Ben = $30 \times 1.1^9 = 71$ mins $165 - 71 = 94$ minutes A.G.M13.3 A.1(b)Anna: $u_X = 30 + 15(X - 1)$ Ben: $u_X = 30 \times 1.1^{X - 1}$ $30 \times 1.1^{X - 1} > 30 + 15(X - 1)$ $30 \times 1.1^{X - 1} > 15X + 15$ $1.1^{X - 1} > 0.5X + 0.5$ $X - 1 > \log_{1.1}(0.5X + 0.5) + 1$ M12.1(c)18.9 $25.1, 28.0, 29.0, 29.4, 29.6, 29.6,$ B11.1a M1X = 30A13.4	(a) Anna = $30 + 9 \times 15 = 165$ mins Ben = $30 \times 1.1^9 = 71$ mins 165 - 71 = 94 minutes M1 3.3 A1 Attempt u_{10} for AP, using correct eqn Attempt u_{10} for GP, using correct eqn Obtain given answer of 94 minutes (b) Anna: $u_X = 30 + 15(X - 1)$ Ben: $u_X = 30 \times 1.1^{X-1}$ $30 \times 1.1^{X-1} > 30 + 15(X - 1)$ $30 \times 1.1^{X-1} > 30 + 15(X - 1)$ $30 \times 1.1^{X-1} > 15X + 15$ $1.1^{X-1} > 0.5X + 0.5$ $X - 1 > \log_{11}(0.5X + 0.5) + 1$ B1 3.4 Both u_X terms correct (a) Bit 3.4 Both u_X terms correct Ink correct expressions and attempt to rearrange (c) 18.9 25.1, 28.0, 29.0, 29.4, 29.6, 29.6, X = 30 B1 1.1a Correct first iterate Use correct iterative process to find at least two further values Obtain $X = 30$

Question		on	Answer	Marks	AO	Guidance		
				[3]				
	(d)	(i)	Eventually there will not be enough hours in the day for revision	B1 [1]	3.5b	Comment on long-term behaviour	Allow other sensible reason	
		(ii)	Increasing by 10% will involve decimals of minutes so will no longer be accurate	B1	3.5b	Comment on not being able to measure time that accurately	Allow long-term behaviour if not already given in (i) Allow other sensible reason B0 if referring to reasons that may prevent revision from happening eg illness If a correct reason is given then ISW an incorrect numerical value	

