9.	A company	offers two	salary	schemes	for a	10-year peri	od, Year	1 to Year	10 inclusive.

Scheme 1: Salary in Year 1 is  $\pounds P$ .

Salary increases by  $\pounds(2T)$  each year, forming an arithmetic sequence.

Scheme 2: Salary in Year 1 is  $\pounds(P + 1800)$ .

Salary increases by  $\pounds T$  each year, forming an arithmetic sequence.

(a) Show that the **total** earned under Salary Scheme 1 for the 10-year period is

£
$$(10P + 90T)$$

**(2)** 

For the 10-year period, the **total** earned is the same for both salary schemes.

(b) Find the value of T.

**(4)** 

For this value of *T*, the salary in Year 10 under Salary Scheme 2 is £29 850

(c) Find the value of P.

**(3)** 



	ollowing 3 rows of				squares and	
Row 1	0					
Row 2						
Row 3						
	s that 4 sticks are re- uares in the second					
	n expression, in terr			ticks required t	o make a sir	nilar
arrange	ement of <i>n</i> squares	in the <i>n</i> th row.				(3)
	ues to make square d so on until she ha	_	-	n. She makes	4 squares in	n the
(b) Find th	ne total number of s	ticks Ann uses	in making tl	nese 10 rows.		(3)
(c) show t	hat $k$ satisfies $(3k -$		te the $(k+1)$	ii tow,		(4)
,	hat $k$ satisfies $(3k -$			.ii 10w,		(4)
,						(4)
,	hat $k$ satisfies $(3k -$					
,	hat $k$ satisfies $(3k -$					
,	hat $k$ satisfies $(3k -$			ar row,		
,	hat $k$ satisfies $(3k -$			ar row,		
,	hat $k$ satisfies $(3k -$			AI TOW,		
,	hat $k$ satisfies $(3k -$			ar row,		
,	hat $k$ satisfies $(3k -$			AI TOW,		
,	hat $k$ satisfies $(3k -$			ar row,		
,	hat $k$ satisfies $(3k -$			AI TOW,		

5. A sequence  $a_1, a_2, a_3,...$  is defined by

$$\begin{aligned} a_1 &= k, \\ a_{n+1} &= 5a_n + 3, \qquad n \geqslant 1, \end{aligned}$$

where k is a positive integer.

(a) Write down an expression for  $a_2$  in terms of k.

(1)

(b) Show that  $a_3 = 25k + 18$ .

**(2)** 

- (c) (i) Find  $\sum_{r=1}^{4} a_r$  in terms of k, in its simplest form.
  - (ii) Show that  $\sum_{r=1}^{4} a_r$  is divisible by 6.

**(4)** 

9. (a) Calculate the sum of all the even numbers from 2 to 100 inclusive,

$$2 + 4 + 6 + \dots + 100$$

**(3)** 

(b) In the arithmetic series

$$k + 2k + 3k + \dots + 100$$

k is a positive integer and k is a factor of 100.

- (i) Find, in terms of k, an expression for the number of terms in this series.
- (ii) Show that the sum of this series is

$$50 + \frac{5000}{k}$$
 (4)

(c) Find, in terms of k, the 50th term of the arithmetic sequence

$$(2k+1)$$
,  $(4k+4)$ ,  $(6k+7)$ , .....,

giving your answer in its simplest form.

1	7	ľ
	L	
١.	_	


Leave
blank

8.	A sequence	$a_1, a_2, a_3, \dots$	is	defined	by
----	------------	------------------------	----	---------	----

$$a_1 = k$$
,

$$a_{n+1} = 3a_n + 5, \qquad n \geqslant 1,$$

where k is a positive integer.

(a) Write down an expression for  $a_2$  in terms of k.

(1)

(b) Show that  $a_3 = 9k + 20$ .

(2)

(c) (i) Find  $\sum_{r=1}^{4} a_r$  in terms of k.

(4)

(ii) Show that	$\sum_{r=1}^{4} a_r$ is divisible by 10.
----------------	--

•	An athlete prepares for a race by completing a practice run on each of 11 consecutive days. On each day after the first day, he runs further than he ran on the previous day. The lengths of his 11 practice runs form an arithmetic sequence with first term $a$ km and common difference $d$ km.	
	He runs 9 km on the 11th day, and he runs a total of 77 km over the 11 day period.	
	Find the value of $a$ and the value of $d$ .	
	(7)	

		Leav
5.	A sequence $x_1, x_2, x_3, \dots$ is defined by	
	$x_1 = 1$ ,	
	$x_{n+1} = ax_n - 3,  n \geqslant 1,$	
	where $a$ is a constant.	
	(a) Find an expression for $x_2$ in terms of $a$ .	
	(1)	
	(b) Show that $x_3 = a^2 - 3a - 3$ . (2)	
	Given that $x_3 = 7$ ,	
	(c) find the possible values of <i>a</i> .	
	(3)	

7.	Sue is training for a marathon. Her training includes a run every Saturday starting w run of 5 km on the first Saturday. Each Saturday she increases the length of her run the previous Saturday by 2 km.	
	(a) Show that on the 4th Saturday of training she runs 11 km.	(1)
	(b) Find an expression, in terms of $n$ , for the length of her training run on the Saturday.	
	(c) Show that the total distance she runs on Saturdays in $n$ weeks of training is $n(n+4)$	(2) km. (3)
	On the <i>n</i> th Saturday Sue runs 43 km.	
	(d) Find the value of $n$ .	(2)
	(e) Find the total distance, in km, Sue runs on Saturdays in $n$ weeks of training.	(2)

_		Leav blanl
7.	A sequence is given by:	
	$x_1 = 1,$ $x_{n+1} = x_n (p + x_n),$	
	where $p$ is a constant $(p \neq 0)$ .	
	(a) Find $x_2$ in terms of $p$ . (1)	
	(b) Show that $x_3 = 1 + 3p + 2p^2$ . (2)	
	Given that $x_3 = 1$ ,	
	(c) find the value of $p$ , (3)	
	(d) write down the value of $x_{2008}$ . (2)	

		Leave blank
11. The first term of an arithmetic sequence is 30 and the common difference is $-1.5$		Juni
(a) Find the value of the 25th term.		
	(2)	
The <i>r</i> th term of the sequence is 0.		
(b) Find the value of <i>r</i> .		
(b) That the value of 7.	(2)	
The sum of the first $n$ terms of the sequence is $S_n$ .		
(c) Find the largest positive value of $S_n$ .	(3)	

								_
9.	The first term	of an arithm	etic series is	a and the	common	difference	is	d.

The 18th term of the series is 25 and the 21st term of the series is  $32\frac{1}{2}$ .

(a) Use this information to write down two equations for 
$$a$$
 and  $d$ .

(2)

(b) Show that 
$$a = -17.5$$
 and find the value of d.

(2)

The sum of the first n terms of the series is 2750.

(c) Show that n is given by

$$n^2 - 15n = 55 \times 40$$
.

(4)

(d) Hence find the value of n.

(3)

**4.** A sequence  $x_1, x_2, x_3,...$  is defined by

$$x_1 = 1$$

$$x_{n+1} = ax_n + 5, \qquad n \geqslant 1$$

where a is a constant.

(a) Write down an expression for  $x_2$  in terms of a.

(1)

(b) Show that  $x_3 = a^2 + 5a + 5$ 

**(2)** 

Given that  $x_3 = 41$ 

(c) find the possible values of a.

**(3)** 


4.	A girl saves money over a period of 200 weeks. She saves 5p in Week 1, 7p in Week 2, 9p in Week 3, and so on until Week 200. Her weekly savings form an arithmetic sequence.	
	(a) Find the amount she saves in Week 200.	
	(3)	
	(b) Coloulate han total acroin as even the complete 200 week maried	
	(b) Calculate her total savings over the complete 200 week period. (3)	