Mr. Rogers' current health prognosis:

Can you and your peers switch roles with Mr. Rogers for today's math class?

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me = Mitch

Today's learning objective:

By the end of class, I will be able to solve arithmetic sequences and series problems.

Today's language objective:

$a_1 =$

Arithmetic vs Geometric

d =

Sequence vs Series

1.1	The nth term of an arithmetic sequence	$u_n = u_1 + (n-1)d$
	The sum of n terms of an arithmetic sequence	$S_n = \frac{n}{2}(2u_1 + (n-1)d) = \frac{n}{2}(u_1 + u_n)$

1.) In an arithmetic sequence, $u_1 = 2$ and $u_3 = 8$.

(a) Find d. **(2)**

$2 + (n-1)d$ $\boxed{3}$ $2 + 3 = 5 + 3 = 8$

(b) Find u_{20}. **(2)**

$\boxed{57}$ $2 + (20-1)3$ $(19)3$ $57 + 2$

(c) Find S_{20}. **(2)**

$\frac{20}{2}(2 + 59)$ $20 + 590$ $\boxed{610}$

(Total 6 marks)

2.) In an arithmetic sequence $u_1 = 7$, $u_{20} = 64$ and $u_n = 3709$.

(a) Find the value of the common difference. **(3)**

$u_{20} = 64 = 7 + 19d$

$-7 \quad -7$

$57 = d = \boxed{3}$

(b) Find the value of n. **(2)**

$3709 = 7 + (n-1)3$

$3709 = 3n + 4$ $3n - 3 + 7$

$\frac{3705}{3} = n$

$19 = \boxed{1235}$

(Total 5 marks)

1.1	The nth term of an arithmetic sequence	$u_n = u_1 + (n-1)d$
	The sum of n terms of an arithmetic sequence	$S_n = \frac{n}{2}(2u_1 + (n-1)d) = \frac{n}{2}(u_1 + u_n)$

3.) Consider the arithmetic sequence 3, 9, 15, ..., 1353.

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(a) Write down the common difference. **(1)**

$9-3=6$

(b) Find the number of terms in the sequence. **(3)**

$1353-3=1350/6$ $\quad 1353=3+(n-1)6=226$

(c) Find the sum of the sequence. **(2)**

$S_n=\frac{226}{2}(3+1353)=153,228$

(Total 6 marks)

4.) An arithmetic sequence, $u_1, u_2, u_3, \ldots$, has $d = 11$ and $u_{27} = 263$.

$263=u_1+(27-1)11$

$263=u_1+286$

$-286 \quad -286$

$\boxed{-23=u_1}$

(a) Find u_1. **(2)**

$S_{50}=\frac{50}{2}(-23+516)$

$S_{50}=25(493)$

$\boxed{S_{50}=12325}$

(b) (i) Given that $u_n = 516$, find the value of n.

$516=-23+(n-1)11$

$516=-23+11n-11$

$516=-34+11n$

$+34 \quad +34$

$\frac{550}{11}=\frac{11n}{11}$ $\quad \boxed{n=50}$

(ii) For this value of n, find S_n. **(4)**

(Total 6 marks)

1.1	The nth term of an arithmetic sequence	$u_n = u_1 + (n-1)d$
	The sum of n terms of an arithmetic sequence	$S_n = \frac{n}{2}(2u_1 + (n-1)d) = \frac{n}{2}(u_1 + u_n)$

Naptime ends

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6.) The nth term of an arithmetic sequence is given by $u_n = 5 + 2n$.

(a) Write down the common difference.

(1)

(b) (i) Given that the nth term of this sequence is 115, find the value of n.

(ii) For this value of n, find the sum of the sequence.

(5)

(Total 6 marks)

7.) In an arithmetic series, the first term is –7 and the sum of the first 20 terms is 620.

$620 = \frac{20}{2}(2(-7)+(20-1)d)$

(a) Find the common difference.

(3)

(b) Find the value of the 78th term.

(2)

(Total 5 marks)

1.1	The nth term of an arithmetic sequence	$u_n = u_1 + (n-1)d$
	The sum of n terms of an arithmetic sequence	$S_n = \frac{n}{2}(2u_1 + (n-1)d) = \frac{n}{2}(u_1 + u_n)$

10.) In an arithmetic sequence, $S_{40} = 1900$ and $u_{40} = 106$. Find the value of u_1 and of d.

(Total 6 marks)

$1900 = 20(2u_1 + (40-1)d) \rightarrow 1900 = 40u_1 + 780d$

$106 = u_1 + (40-1)d$ $\quad [106 = u_1 + 39d] \cdot -40$

$106 = u_1 + 39(3) = 106 = u_1 + 117$ $\quad -4240 = -40u_1 - 1560d$

$-117 \quad -117$

$\boxed{u_1 = -11}$ $\quad -2340 = -780d$

$\frac{-2340}{-780} = \frac{-780d}{-780}$

$\boxed{d = 3}$

11.) Consider the arithmetic sequence 2, 5, 8, 11, ...

(a) Find u_{101}. **(3)**

(b) Find the value of n so that $u_n = 152$. **(3)**

(Total 6 marks)

1.1	The nth term of an arithmetic sequence	$u_n = u_1 + (n-1)d$
	The sum of n terms of an arithmetic sequence	$S_n = \frac{n}{2}(2u_1 + (n-1)d) = \frac{n}{2}(u_1 + u_n)$

14.) In an arithmetic sequence $u_{21} = -37$ and $u_4 = -3$.

(a) Find

(i) the common difference; $\boxed{-2}$

(ii) the first term. 3

(b) Find S_{10}. $\boxed{-60}$

$-3 = u_1 + (4-1)d$

$-37 = u_1 + (21-1)d$

$-3 = u_1 + 3d$

$-37 = u_1 + 20d$

$\times -1$

$-3 = u_1 + 3d$

$37 = -u_1 - 20d$

$\frac{34}{-17} = \frac{-17d}{-17}$

$-3 + -6 = 3$

$-2 \times 3 = -6$

$3 + (9) \cdot -2$

$3 - 18$

$\frac{10}{2}(3 - 15)$

$5(-12)$

$15 - 45$

(4)

(3)

(Total 7 marks)

1.1	The nth term of an arithmetic sequence	$u_n = u_1 + (n-1)d$
	The sum of n terms of an arithmetic sequence	$S_n = \frac{n}{2}(2u_1 + (n-1)d) = \frac{n}{2}(u_1 + u_n)$

20.) (a) Write down the first three terms of the sequence $u_n = 3n$, for $n \geq 1$.

$u1=3 \quad u2=6 \quad u3=9$

(1)

(b) Find

(i) $\sum_{n=1}^{20} 3n$; $S_{20}=10(3+60) \rightarrow \boxed{630}$

(ii) $\sum_{n=21}^{100} 3n$. $S_{100}=50(3+300) \rightarrow 15150$

$S_{20}=10(3+60) \rightarrow 630$

(5)

(Total 6 marks)

$$\begin{array}{r} 15150 \\ -\ 630 \\ \hline 14520 \end{array} = \boxed{14,520}$$

1.1	The nth term of an arithmetic sequence	$u_n = u_1 + (n-1)d$
	The sum of n terms of an arithmetic sequence	$S_n = \frac{n}{2}(2u_1 + (n-1)d) = \frac{n}{2}(u_1 + u_n)$

27.) Let S_n be the sum of the first n terms of an arithmetic sequence, whose first three terms are u_1, u_2 and u_3. It is known that $S_1 = 7$, and $S_2 = 18$.

(a) Write down u_1. 7

(b) Calculate the common difference of the sequence.

$18 - 7 = 11 \quad 11 - 7 = \boxed{4 = d}$

(c) Calculate u_4.

$7 + 4 = 11 + 4 = 15 + 4 = \boxed{19 = u_4}$

31.) Gwendolyn added the multiples of 3, from 3 to 3750 and found that

$$3 + 6 + 9 + \ldots + 3750 = s.$$

Calculate s.

$u_n = 3750 = 3 + 3n - 3$

$3750 = 3n$

$1250 = n$

$S_{1250} = 625(3 + 3750)$

$625(3753)$

$\boxed{S_{1250} = 2{,}345{,}625}$

1.1	The nth term of an arithmetic sequence	$u_n = u_1 + (n-1)d$
	The sum of n terms of an arithmetic sequence	$S_n = \frac{n}{2}(2u_1 + (n-1)d) = \frac{n}{2}(u_1 + u_n)$