1. For each of the Arithmetic sequences below:
   • Find the $5^{th}$ term of the sequence.
   • Find the $25^{th}$ term of the sequence.
   • Find a formula for $a_n$, the $n^{th}$ term of the sequence.

(a) $3, 5, 7, 9, \ldots$  
   $11, 51, a_n = 3 + (n - 1)2$

(b) $3, 8, 13, 18, \ldots$  
   $23, 123, a_n = 3 + (n - 1)5$

(c) $-7, -6, -5, -4, \ldots$  
   $-3, 17, a_n = -7 + (n - 1)(1)$

(d) $-1, 6, 13, 20, \ldots$  
   $27, 167, a_n = -1 + (n - 1)7$

2. Find the $6^{th}$ Partial Sum of the Arithmetic Sequence $3, 5, 7, 9, \ldots$
   $S_6 = 3 + 5 + 7 + 9 + 11 + 13 = 48$ (or use the formula)

3. Find the $15^{th}$ Partial Sum of the Arithmetic Sequence $-7, -6, -5, -4, \ldots$
   $S_{15} = \frac{15}{2}(-7 + 7) = 0$

4. Find the $9^{th}$ Partial Sum of the Arithmetic Sequence $3, 8, 13, 18, \ldots$
   $S_9 = \frac{9}{2}(3 + 43) = 207$

5. Find the $100^{th}$ Partial Sum of the Arithmetic Sequence $-1, 6, 13, 20, \ldots$
   $S_{100} = \frac{100}{2}(-1 + 692) = 34,550$
6. Kevin loves to read. He currently has 150 novels in his house. Every month he buys 4 new novels.

(a) Fill in the table below:

<table>
<thead>
<tr>
<th>Month</th>
<th>Number of Novels Kevin has in indicated month</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>150</td>
</tr>
<tr>
<td>2</td>
<td>154</td>
</tr>
<tr>
<td>3</td>
<td>158</td>
</tr>
<tr>
<td>4</td>
<td>162</td>
</tr>
<tr>
<td>5</td>
<td>166</td>
</tr>
</tbody>
</table>

(b) Write a formula for $a_n$, the number of novels Kevin has in his house on month $n$.

$$a_n = 150 + (n - 1)4$$

(c) How many novels does Kevin have in his house on month 10?

$$a_{10} = 186$$

(d) How many novels does Kevin have in his house after 5 years (60 months).

$$a_{60} = 386$$

7. You make an investment of $500 that pays $\frac{1}{4}$% simple interest each month.

(a) How much in interest do you make in month 1?

Note the wording, you’re not earning $\frac{1}{4}$% simple interest, you’re earning $\frac{1}{4}$% simple interest each month, so each month you earn $1.25$

(b) How much is the investment worth in month 1?

$501.25$

(c) What is the investment worth in month 12?

$$a_{12} = 501.25 + (12 - 1) * 1.25 = 515$$

(d) Write a formula for $a_n$, the value of the investment in month $n$.

$$a_n = 501.25 + (n - 1) * 1.25$$
8. Your parents are going to sell you their old car. Since you just graduated, they know you’re a little short on cash at the moment. They agree your payment this month will be $30, and that each month your monthly payment will increase by $5.

Call this month ‘month 1’

(a) What is your monthly payment next month (month 2)?
$35

(b) Write a formula for $a_n$ your monthly payment in month $n$.
$$a_n = 30 + (n - 1) \times 5$$

(c) What is your monthly payment on month 12?
$$a_{12} = 85$$

(d) What is your monthly payment on month 36?
$$a_{36} = 205$$

(e) How much in total have you paid your parents after a year?
$$S_{12} = \frac{12}{2}(30 + 85) = 690, \text{ You have paid a total of } 690 \text{ in the first year}$$
Of, the really long way $30 + 35 + 40 + 45 + 50 + 55 + 60 + 65 + 70 + 75 + 80 + 85 = 690$

(f) How much in total have you paid your parents after 3 years?
$$S_{36} = 4,230. \text{ after 3 years you have paid your parents a total of } 4230.$$

9. This week (week 1) your small business made a profit of $-200$ (also known as a loss). You anticipate each week that your weekly profit will increase by $9$.

(a) What is your weekly profit in week 2?
$-191$

(b) What is your weekly profit at the end of the year (in week 52)?
$$a_{51} = 259$$

(c) How much money did you make (or lose) total this year?
$$S_{52} = 1,534$$

(d) Which week did you break even (make a weekly profit of $0$)?
23 weeks (note, in some contexts break even point might refer to when your total profit is 0, that’s why there is clarification in the wording of the question)
10. Sadly, Tony is addicted to drugs. This week (week 1) he spent $10 on his habit. We all know drugs are addicting and each week addicts need a little more of the drug to get the same effect. So we know that each week Tony will spend $1 more on drugs than he spent the previous week.

(a) How much does Tony spend on drugs during week 4?
   $13

(b) How much does Tony spend on drugs during week 52?
   \[a_{52} = \$61\]

(c) At the end of the year (52 weeks) how much in total has Tony spent on drugs?
   \[S_{52} = \$1,846\]