

Teacher: Mr Laylor

Name: _____

Question 1

(25 marks)

(a) (i) Solve for x :

$$4(5 + 2x) - 5 = 5x - 3(1 - 2x), \text{ where } x \in \mathbb{R}.$$

$$20 + 8x - 5 = 5x - 3 + 6x$$

$$8x + 15 = 11x - 3$$

$$\begin{array}{r} (-8x) \end{array} \quad \begin{array}{r} (-8x) \end{array}$$

$$15 = 3x - 3$$

$$\begin{array}{r} (+3) \end{array} \quad \begin{array}{r} (+3) \end{array}$$

$$18 = 3x$$

$$\begin{array}{r} (\div 3) \end{array} \quad \begin{array}{r} (\div 3) \end{array}$$

$$6 = x$$

ans. $x = 6$

(ii) Verify your answer to part (i) above.

$$4(5 + 2(6)) - 5 = 5(6) - 3(1 - 2(6))$$

$$4(17) - 5 = 30 - 3(-11)$$

$$68 - 5 = 30 + 33$$

$$63 = 63$$

$\therefore x = 6$ is the solution

(b) Solve the inequality:

$$2(1 + 2x) - 8x \geq -7, \quad x \in \mathbb{Z},$$

Integer

and show the solution set on the number line below.

$$2 + 4x - 8x \geq -7$$

$$2 - 4x \geq -7$$

$$\begin{array}{r} (-2) \end{array} \quad \begin{array}{r} (-2) \end{array}$$

$$-4x \geq -9$$

$$\begin{array}{r} (\div -4) \end{array} \quad \begin{array}{r} (\div -4) \end{array}$$

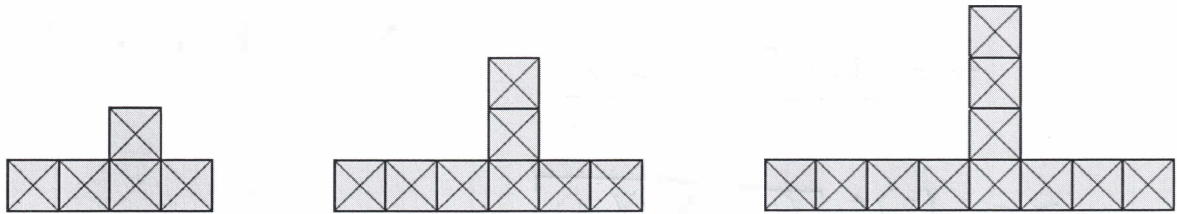
$$x \leq \frac{9}{4}$$

$$x \leq 2.25$$

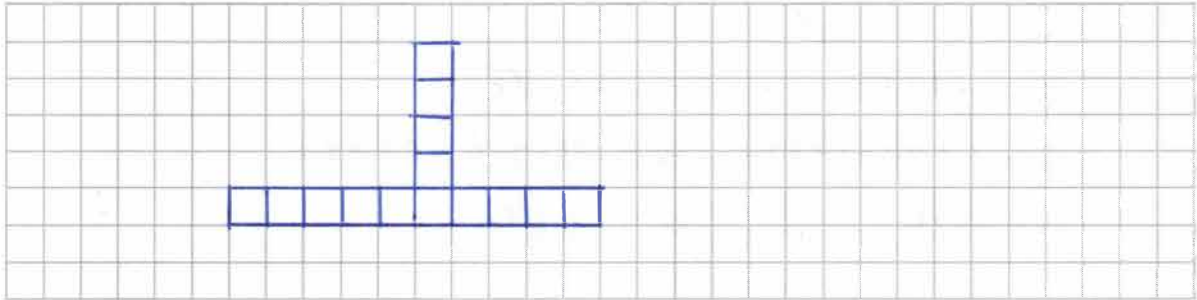
Question 2

(25 marks)

The first three patterns in a sequence of patterns formed by arranging square tiles are shown below.



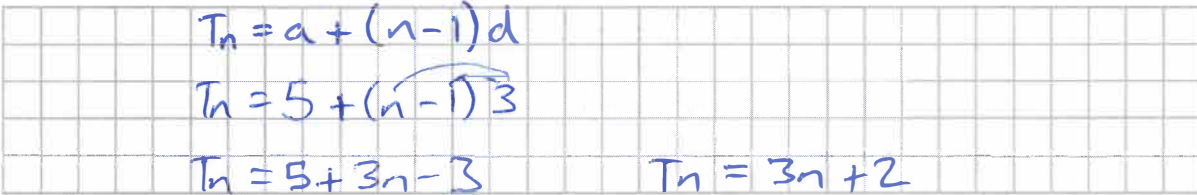
(a) Draw the fourth pattern in the sequence.



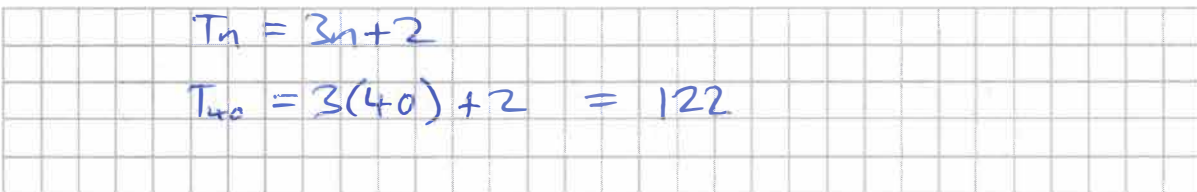
(b) (i) Complete the table below.

Pattern Number	1	2	3	4	5	6
Number of Tiles	5	8	11	14	17	20

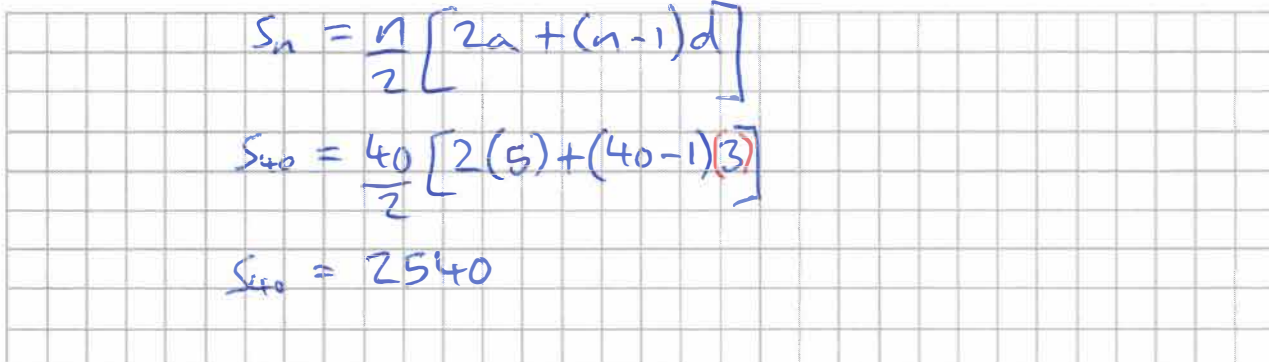
(ii) Find, in terms of n , a formula for the number of tiles in the n th pattern in the sequence.



(iii) Using your formula, or otherwise, find the number of tiles in the 40th pattern.



(iv) Find the total number of tiles used in the first 40 patterns in the sequence.



Question 3

(25 marks)

(a) Solve the equation $x^2 + 2x - 4 = 0$ and give your answers correct to two decimal places.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad a=1 \quad b=2 \quad c=-4$$

$$x = \frac{-(2) \pm \sqrt{(2)^2 - 4(1)(-4)}}{2(1)}$$

$$\swarrow \quad \searrow$$

$$x = -1 + \sqrt{5} \quad x = -1 - \sqrt{5}$$

$$x = 1.236067977 \quad x = -3.236067977$$

$$x = 1.24 \quad \text{or} \quad x = -3.24$$

(b) Show that the co-ordinates of the turning point of the function $f(x) = x^2 + 2x - 4$, $x \in \mathbb{R}$, are $(-1, -5)$.

$$f'(x) = 0$$



$$f'(x) = 2x + 2 = 0$$

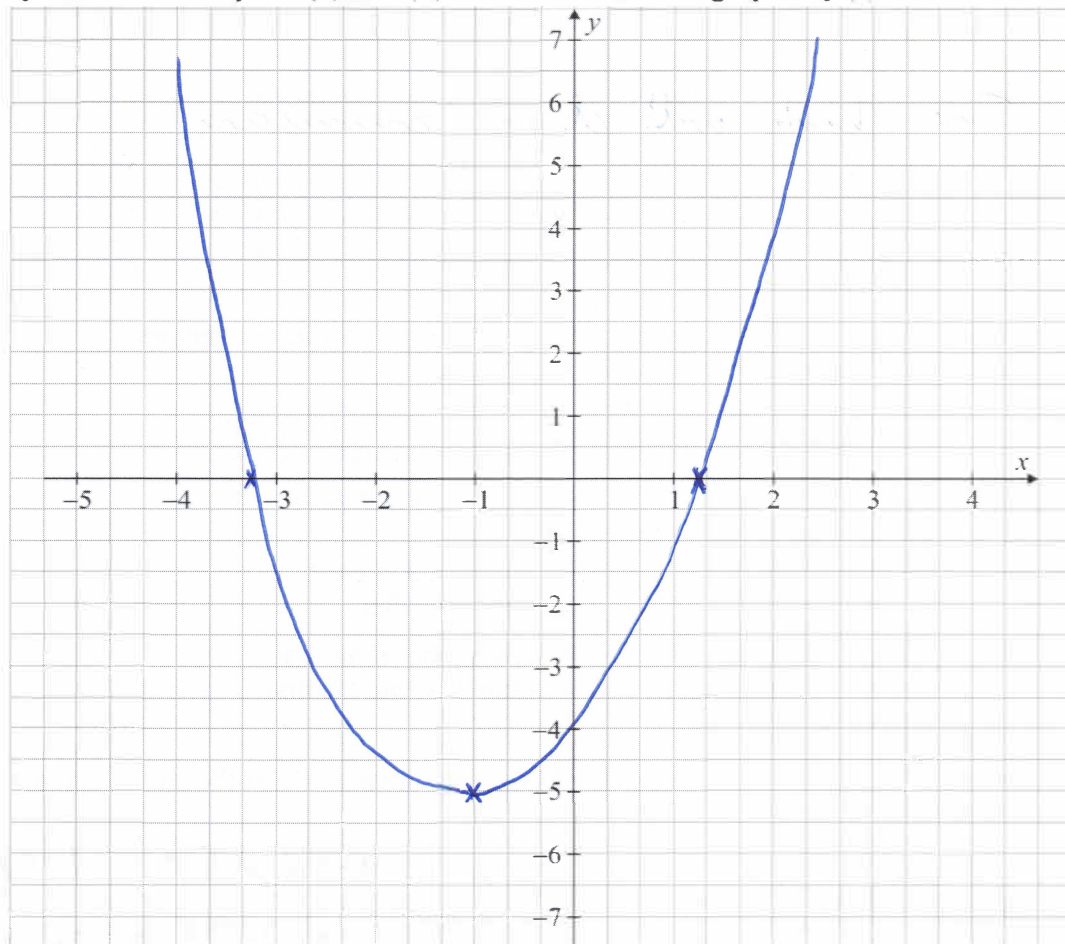
$$\begin{array}{cc} (-2) & (-2) \\ 2x & = -2 \\ (\div 2) & (\div 2) \\ x & = -1 \end{array}$$

$$f(x) = x^2 + 2x - 4$$

$$f(-1) = (-1)^2 + 2(-1) - 4 = -5$$

\therefore The turning point of $f(x)$ is $(-1, -5)$

(c) Use your answers to parts (a) and (b) above to sketch the graph of $f(x)$.



Question 4

(25 marks)

- (a) Sophie is going on holiday to America and wants to exchange €500 for US dollars. She checks online and finds the exchange rate on that day to be $\$1 = €0.88$.
- (i) Find, correct to the nearest cent, the amount that Sophie can expect to receive in dollars.

$$500 \div 0.88 = 568.1818$$
$$\$ 568.18$$

- (ii) Sophie goes into her local bank and exchanges her euro for US dollars. The exchange rate for the transaction is $\$1 = €1.0990$. Find the amount that Sophie receives in dollars.

$$500 \times 1.0990 = 549.5$$
$$\$ 549.50$$

(iii) Suggest a reason why there is a difference between the two amounts.

Reason: *The bank will charge commission*

(b) Graham wishes to invest €3000 for 3 years. His local bank offers him two options, Option 1 and Option 2, as shown in the table below.

Option 1	Option 2
2.75% compound interest per year, for 3 years	5% interest after 2 years
No penalty applies if money withdrawn at the end of any year	3% compound interest per year thereafter
	Penalty applies if money withdrawn within the first 2 years

(i) Find, correct to the nearest cent, the value of Graham's investment at the end of 3 years under both options.

Option 1: $F = P(1+i)^t$	Option 2: $100\% + 5\% = 105\%$
$i = 2.75\% = 0.0275$	$3000 \times 1.05 = 3150$
$F = 3000(1 + 0.0275)^3$	$F = P(1+i)^t \quad i = 0.03$
$F = 3254.368640$	$F = 3150(1 + 0.03)^1$
$F = 3254.37$	$F = 3244.50$
$€3254.37$	$€3244.50$

(ii) Which option would you recommend? Give a reason for your answer.

Option: *Option 1*

Reason: *The value of Graham's investment at the end of 3 years is worth more with option 1*