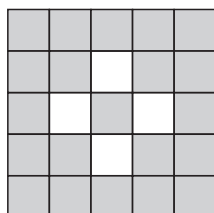
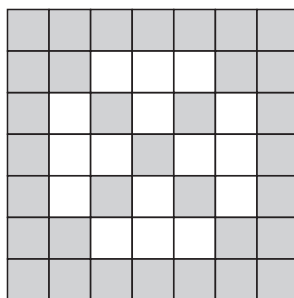


SAMPLE PAPER 2014 (SET F): PAPER 1

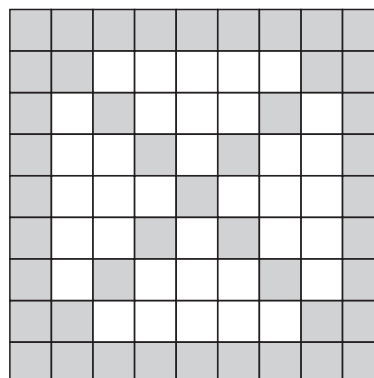
QUESTION 7 (50 MARKS)



1st pattern



2nd pattern



3rd pattern

QUESTION 7 (a)

Count the number of tiles in the first 3 patterns. Notice that there is a constant difference of 12 between each pattern. Therefore, add 12 each time to get the number of tiles in the 4th and 5th patterns.

Pattern	1	2	3	4	5
Number of tiles	21	33	45	57	69

QUESTION 7 (b)

First term $a = 21$, Common difference $d = 12$

$$\begin{aligned} T_n &= 21 + (n-1)(12) \\ &= 21 + 12n - 12 \\ &= 12n + 9 \end{aligned}$$

QUESTION 7 (c)

The number of tiles in the tenth pattern is T_{10} .
Replace n by 10 in the general term T_n .

$$n = 10$$

$$T_{10} = 12(10) + 9 = 120 + 9 = 129$$

QUESTION 7 (d)

$T_n = 399$ ← Put the general term T_n equal to 399 and solve for n .

$$12n + 9 = 399$$

$$12n = 399 - 9 = 390$$

$$n = \frac{390}{12} = 32.5 \leftarrow \text{With 399 tiles she can go up to the 32nd pattern.}$$

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Sequences and series:
Arithmetic series or sequence
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$$T_n = a + (n-1)d$$

$$S_n = \frac{n}{2}[2a + (n-1)d]$$

a is the first term

d is the common difference

QUESTION 7 (e)

You are asked to add the number of tiles in the first n patterns: $21 + 33 + 45 + \dots + n$

$$a = 21, d = 12$$

$$\begin{aligned} S_n &= \frac{n}{2}[2a + (n-1)d] \\ &= \frac{n}{2}[2(21) + (n-1)(12)] \\ &= \frac{n}{2}[42 + 12n - 12] \\ &= \frac{n}{2}[12n + 30] \\ &= n[6n + 15] \end{aligned}$$

QUESTION 7 (f)

$S_n = 399$ ← Put S_n equal to 399 and solve for n .

$$n[6n + 15] = 399$$

$$6n^2 + 15n - 399 = 0$$

$$2n^2 + 5n - 133 = 0 \leftarrow \text{Factorise the quadratic.}$$

$$(2n + 19)(n - 7) = 0 \leftarrow \text{Put each bracket equal to zero and solve for } n.$$

$$\therefore n = 7, \cancel{\frac{19}{2}} \leftarrow \text{Ignore the fractional solution as } n \text{ is a natural number.}$$

She can make the first 7 patterns with her 399 tiles.
