Must Know Questions To Ace
Number Patterns

1.	Consider the sequence 27 , 25 , 23 , 21 , ….
	a) Write down the next two terms of the sequence.
	b) Write down an expression, in terms of n, for the nth term.
	c) Find $T_{90.}$
2.	The first three terms of a sequence of numbers, T_1 , T_2 , T_3 , … are given below. $$T_1 = 2 + 1^2 = 3$$ $$T_2 = 4 + 2^2 = 8$$ $$T_3 = 6 + 3^2 = 15$$ $$.$$ $$.$$ $$.$$ a) Find T_4 and $T_{5.}$ b) Write down an expression, in terms of n, for T_n. c) Evaluate T_{88}.
3.	Consider the following number pattern: $$1^3 = (\frac{1 \times 2}{2})^2$$ $$1^3 + 2^3 = (\frac{2 \times 3}{2})^2$$ $$1^3 + 2^3 + 3^3 = (\frac{3 \times 4}{2})^2$$ $$.$$ $$.$$ $$.$$ a) Write down the 4th line in the pattern. b) Write down the nth line, in terms of n, in the pattern.

4. The first few rows of a number pattern are shown in the table.

Row Number	Numbers				Sum of Numbers
1	1				1
2	3	5			8
3	7	9	11		27
4	13	15	17	19	p
5					125

a) Find the value of p in the 4th row.

b) Write down all the numbers in the 5th row.

c) Write down a formula in terms of n, for
   i)   the total number of numbers in the nth row.
   ii)   the sum of the numbers in the nth row.

d) The sum of all the numbers in the kth row is 1000. Find the value of
   i) k
   ii)   the first number in kth row.

Answer Key:

1. a) 19 and 17

b) $29 - 2n$

c) -151

2. a) T$_4$ = $8 + 4^2 = 24$
   T$_5$ = $10 + 5^2 = 35$

b) T$_n$ = 2n + n²

c) 7920

3. a) $1^3 + 2^3 + 3^3 + 4^3 = (\frac{4 \times 5}{2})^2$

b) $1^3 + 2^3 + 3^3 + 4^3 + \ldots + n^3 = (\frac{n(n+1)}{2})^2$

4. a) $p = 64$

b) 21   23   25   27   29

ci) n

cii) n^3

di) $k = 10$

dii) Let the first number in the row k be x.
$x + (x + 2) + (x + 4) + \ldots + (x + 18) = 1000$
$10x + 2 + 4 + 6 + 8 + 10 + 12 + 14 + 16 + 18 = 1000$
$10x + 90 = 1000$
$10x = 1000 - 90$
$x = 91$