Grade 7 – Book B

(Teacher's Guidelines)

(Revised CAPS edition)

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Chapter B1

Numeric Patterns

B1.1 Completion of numeric patterns:

E.g.1 Write down the following five numbers in the sequences:

(a) 2 ; 4 ; 6 ; …… *(b)* 1 ; 3 ; 9 ; ……

****

(a) 2 ; 4 ; 6 ; **8 ; 10 ; 12 ; 14 ; 16** *(b)* 1 ; 3 ; 9 ; **27 ; 81 ; 243 ; 729 ; 2 187**

Exercise 1: Date: _____

(1) Write down the next seven numbers in each sequence:

(a) 5 ; 7 ; 9 ; 11 ; 13 ; 15 ; 17 ; 19 ; 21 ; 23 ; 25

(b) 52 ; 49 ; 46 ; 43 ; 40 ; 37 ; 34 ; 31 ; 28 ; 25 ; 22

(c) 7 ; 12 ; 17 ; 22 ; 27 ; 32 ; 37 ; 42 ; 47 ; 52 ; 57

(d) 10 ; 20 ; 30 ; 40 ; 50 ; 60 ; 70 ; 80 ; 90 ; 100 ; 110

(e) 1 ; 2 ; 4 ; 8 ; 16 ; 32 ; 64 ; 128 ; 256 ; 512 ; 1 024 ; 2 048

(f) 103 ; 106 ; 109 ; 112 ; 115 ; 118 ; 121 ; 124 ; 127 ; 130 ; 133

(g) 3 ; 4 ; 6 ; 9 ; 13 ; 18 ; 24 ; 31 ; 39 ; 48 ; 58 ; 69

(h) $5\frac{1}{2}$; $6\frac{1}{2}$; $7\frac{1}{2}$; $8\frac{1}{2}$; $9\frac{1}{2}$; $10\frac{1}{2}$; $11\frac{1}{2}$; $12\frac{1}{2}$; $13\frac{1}{2}$; $14\frac{1}{2}$; $15\frac{1}{2}$; $16\frac{1}{2}$

(i) 115 ; 113 ; 111 ; 109 ; 107 ; 105 ; 103 ; 101 ; 99 ; 97 ; 95

(j) 1 ; 4 ; 9 ; 16 ; 25 ; 36 ; 49 ; 64 ; 81 ; 100 ; 121 ; 144

(k) 7,2 ; 7,6 ; 8 ; 8,4 ; 8,8 ; 9,2 ; 9,6 ; 10 ; 10,4 ; 10,8 ; 11,2

(l) 1 024 ; 512 ; 256 ; 128 ; 64 ; 32 ; 16 ; 8 ; 4 ; 2 ; 1

(m) $3\frac{1}{2}$; 4 ; $4\frac{1}{2}$; 5 ; $5\frac{1}{2}$; 6 ; $6\frac{1}{2}$; 7 ; $7\frac{1}{2}$; 8 ; $8\frac{1}{2}$

(n) 1 100 ; 1 250 ; 1 400 ; 1 550 ; 1 700 ; 1 850 ; 2 000 ; 2 150 ; 2 300 ; 2 450 ; 2 600

(o) 3,1 ; 2,9 ; 2,7 ; 2,5 ; 2,3 ; 2,1 ; 1,9 ; 1,7 ; 1,5 ; 1,3 ; 1,1

(p) 5 ; 50 ; 500 ; 5 000 ; 50 000 ; 500 000 ; 5 000 000 ; 50 000 000 ; 500 000 000 ; 5 000 000 000 ; 50 000 000 000

(q) 13 ; 25 ; 37 ; 49 ; 61 ; 73 ; 85 ; 97 ; 109 ; 121 ; 133

(r) 1 ; 8 ; 27 ; 64 ; 125 ; 216 ; 343 ; 512 ; 729 ; 1000 ; 1331

1^3 2^3 3^3 4^3 5^3 ---

(2) Fill in the missing numbers in each sequence:

(a) 24 ; 26 ; 28 ; 30 ; 32 ; 34

(b) 7 ; 11 ; 15 ; 19 ; 23 ; 27 ; 31

(c) 4 ; 5 ; 6 ; 7 ; 8 ; 9 ; 10 ; 11

(d) $4\frac{2}{3}$; $4\frac{1}{3}$; 4 ; $3\frac{2}{3}$; $3\frac{1}{3}$; 3 ; $2\frac{2}{3}$; $2\frac{1}{3}$

(e) 10 ; 15 ; 20 ; 25 ; 30 ; 35 ; 40

(f) 1 ; 2 ; 4 ; 8 ; 16 ; 32 ; 64

(g) 329 ; 322 ; 315 ; 308 ; 301 ; 294 ; 287; 280; 273

(h) 640 000 ; 320 000 ; 160 000 ; 80 000 ; 40 000 ; 20 000 ; 10 000

(i) 3,425 ; 3,525 ; 3,625 ; 3,725 ; 3,825 ; 3,925 ; 4,025 ; 4,125

(j) 1 ; 4 ; 9 ; 16 ; 25 ; 36 ; 49 ; 64 ; 81

E.g.2 Complete the next four numbers in the sequence and write down the pattern in words:
1 ; 2 ; 4 ; 7 ; 11 ; .....

****

+1 +2 +3 +4 +5 +6 +7 +8
1 ; 2 ; 4 ; 7 ; 11 ; ***16 ; 22 ; 29 ; 37***
∴ The number added, increases by one every time!

Exercise 2: Date: _____

(1) Complete the next five numbers in each sequence and write down the pattern in words:

(a) 18 ; 21 ; 24 ; 27 ; 30 ; 33 ; 36 ; 39 ; 42
Add 3

(b) 12 ; 13 ; 15 ; 18 ; 22 ; 27 ; 33 ; 40 ; 48
+1 +2 +3 +4 +5 +6
The number added increases by 1 each time

(c) 1 ; 3 ; 9 ; 27 ; 81 ; 243 ; 729 ; 2 187 ; 6561
Multiply with 3

(d) $21\frac{1}{2}$; 23 ; $24\frac{1}{2}$; 26 ; $27\frac{1}{2}$; 29 ; $30\frac{1}{2}$; 32 ; $33\frac{1}{2}$
Add $1\frac{1}{2}$

(e) 972 ; 966 ; 960 ; 954 ; 948 ; 942 ; 936 ; 930 ; 924
Subtract 6.

(f) 100 ; 81 ; 64 ; 49 ; 36 ; 25 ; 16 ; 9 ; 4
Perfect squares from 10^2 backwards.

(g) 16,5 ; 16,8 ; 17,1 ; 17,4 ; 17,7 ; 18,0 ; 18,3 ; 18,6 ; 18,9

Add 0,3

(h) $\frac{1}{3}$; $\frac{2}{3}$; 1 ; $1\frac{1}{3}$; $1\frac{2}{3}$; 2 ; $2\frac{1}{3}$; $2\frac{2}{3}$; 3

Add $\frac{1}{3}$

(i) 1 ; 3 ; 7 ; 13 ; 21 ; 31 ; 43 ; 57 ; 73

+2 +4 +6 +8 +10

The number added increases by 2 each time.

(j) 19 683 ; 6 561 ; 2 187 ; 729 ; 234 ; 81 ; 27 ; 9 ; 3

Divide by 3.

(2) In each question the five numbers should form a sequence, but the terms are shuffled. Place the five numbers in the correct order and write the rule for each sequence.
[Start with the smallest number each time.]

(a)	7	16	13	19	10

7 ; 10 ; 13 ; 16 ; 19 * (Can also be the other way around) e.g. 19 ; 16 ; 13 ; 10 ; 7

Add 3

(b)	194	206	210	202	198

194 ; 198 ; 202 ; 206 ; 210 *

Add 4

(c)	81	121	49	100	64

49 ; 64 ; 81 ; 100 ; 121 *

Perfect squares from $(7)^2$

(d)	5,4	3,3	4	6,1	4,7

3,3 ; 4 ; 4,7 ; 5,4 ; 6,1 *

Add 0,7

(e)	$\frac{1}{16}$	$\frac{1}{2}$	1	$\frac{1}{8}$	$\frac{1}{4}$

$\frac{1}{16}; \frac{1}{8}; \frac{1}{4}; \frac{1}{2}; 1$ *

Multiply with 2.

(3) The rule for a certain sequence is: $4 \times P + 1$

(a) Calculate the first five terms of the sequence. ∴ 5; 9; 13; 17; 21

T_1: $4 \times 1 + 1 = 4 + 1 = 5$

T_2: $4 \times 2 + 1 = 8 + 1 = 9$

T_3: $4 \times 3 + 1 = 12 + 1 = 13$

T_4: $4 \times 4 + 1 = 16 + 1 = 17$

T_5: $4 \times 5 + 1 = 20 + 1 = 21$

(b) Determine the 100th term of the sequence.

$T_{100} = 4 \times 100 + 1$

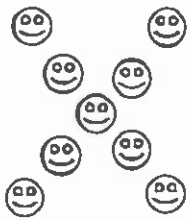
$= 400 + 1 = 401$

(4) Consider the following:

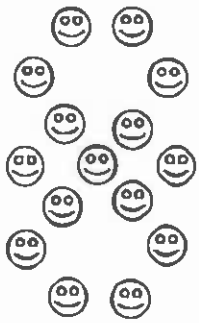
Pattern 1:

Pattern 2:

Pattern 3:



Pattern 4:



(a) Write a sequence representing the number of faces in each pattern.

3; 5 (+2); 9 (+4); 15 (+6)

(b) Predict the number of faces in the fifth pattern: 23

(c) Use your answer in (a) and complete the following:

(i) Faces in pattern 2 – faces in pattern 1 = A. ∴ A = 2

(ii) Faces in pattern 3 – faces in pattern 2 = B. ∴ B = 4

(iii) Faces in pattern 4 – faces in pattern 3 = C. ∴ C = 6

(d) Does A, B and C form a sequence? If it does, check your answer in (b) and write the rule for the sequence.

Yes, increases by 1.

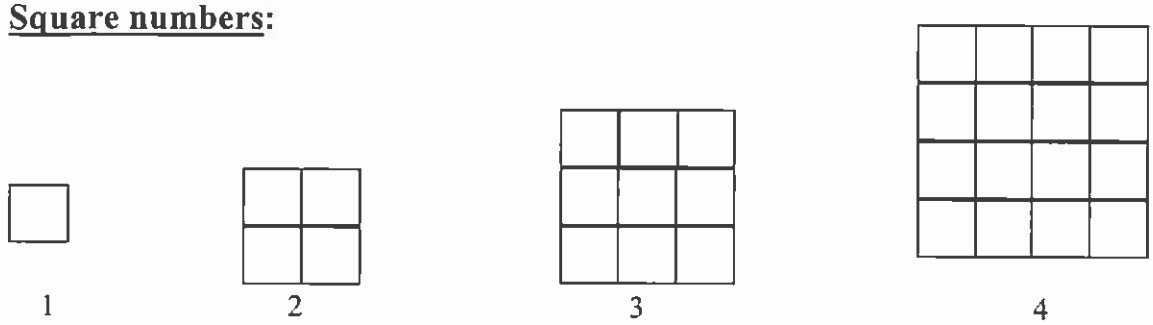
(e) Determine the number of faces in pattern 7.

; P_5 23; P_6 33; P_7 45 ∴ $P_7 = 45$

+10 +12

B1.2 Other interesting numeric patterns:

B1.2.1 Square numbers:



Exercise 3: Date: _____

(1) The relation between the side lengths of each square and the surface of each square can therefore be summarised as follows in a table. Complete the table.

Side length (L):	1	2	3	4	5	6	7	8	9	10
Area (A):	1	4	9	16	25	36	49	64	81	100

(2) Write down the relationship between L and A in words:

A is the square of L.

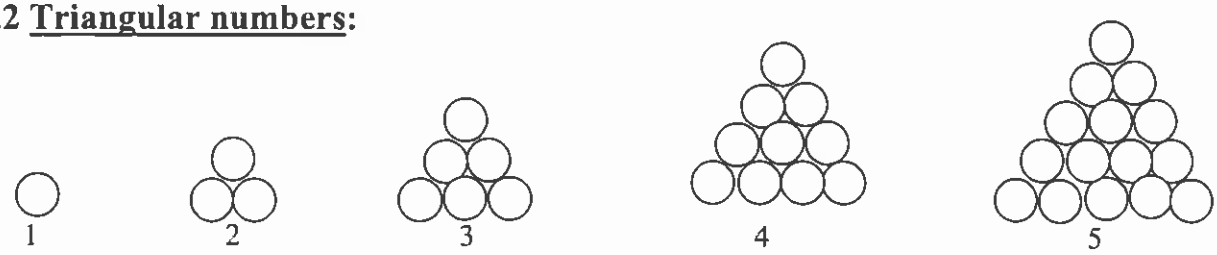
(3) Then also write down this relation as an equation:

$A = L^2$

(4) Use the equation in (3) and calculate the area of a square of which the side length is $5\frac{1}{2}$ units:

$A = (5\frac{1}{2})^2 = (\frac{11}{2})^2 = \frac{121}{4} = 30,25$

B1.2.2 Triangular numbers:



Exercise 4: Date: _____

(1) The link between every triangular number and the number of circles in that triangular number is summarised as follows in a table. Complete the table.

Triangular number (T):	1	2	3	4	5	6	7	8	9	10
Number of circles (N):	1	3	6	10	15	21	28	36	45	55

+2 +3 +4 +5 +6

(2) Write down the relationship between T and N in words.

N → add 1 more each time.

(3) Which triangular number's bottom row will contain 9 circles?

The 9th triangular number

(4) Which triangular number's second last row will contain 6 circles?

The 7th triangular number

B1.2.3 Rectangular numbers:

Exercise 5: Date: _____

(1) The link between each rectangular number and the number of stars in that rectangular number is summarised as follows in a table. Complete the table by drawing the other rectangular numbers.

Rectangle number (R):	1	2	3	4	5	6	7	8	9	10
Number of stars (N):	2	6	12	20	30	42	56	72	90	110

(2) Write down the relationship between R and N in words.

A increases with 2 more each time

(3) Which rectangular number's rows will each contain 7 stars? The 6th rectangular number

(4) Which rectangular number's columns will each contain 7 stars? The 7th rectangular number.

(5) Compare the triangular numbers in exercise 4 to the above-mentioned rectangular numbers and determine whether there is any relationship between the two. If the answer is "yes", describe the relationship in words.

Yes, each rectangular number is twice the corresponding triangular number.

B1.2.4 Fibonacci numbers:

This numeric pattern was developed many centuries ago by an Italian mathematician, Leonardo da Pisa (also known as Fibonacci).

Exercise 6: Date: _____

(1) The table shows the first six Fibonacci numbers.
Complete the table.

What Fibonacci number (N):	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Fibonacci number (F):	1	1	2	3	5	8	13	21	34	55	89	144	233	377

(2) Write down in words the pattern of the Fibonacci numbers.

Each F-number is the sum of the two previous F-numbers.

(3) Which of the first six Fibonacci numbers are also prime numbers?

2; 3; 5

☺ **(1) Develop two numeric sequences of your own. Each sequence has to be extended to ten terms. The same calculation(s) may not be used in both sequences.**
(2) Also describe the pattern of each sequence in words in each case.

Own work.

B1.3 REVISION EXERCISE:

Date: _____

(1) Complete the next six numbers in the sequence and write down the pattern in words:

(a) 125 ; 120 ; 115 ; 110 ; 105 ; 100 ; 95 ; 90 ; 85 ; 80

Add 5

(b) 81 ; 27 ; 9 ; 3 ; 1 ; $\frac{1}{3}$; $\frac{1}{9}$; $\frac{1}{27}$; $\frac{1}{81}$; $\frac{1}{243}$

Divide by 3.

(c) 11,4 ; 11,6 ; 11,8 ; 12 ; 12,2 ; 12,4 ; 12,6 ; 12,8 ; 13 ; 13,2

Add 0,2

(d) 1 ; 3 ; 6 ; 10 ; 15 ; 21 ; 28 ; 36 ; 45 ; 55

+2 +3 +4 +5 +6 +7 +8 +9 +10

The number added increases with 1 each time

(e) 13 ; 130 ; 1 300 ; 13 000 ; 130 000 ; 1 300 000 ; 13 000 000 ; 130 000 000 ; 1 300 000 000 ; 13 000 000 000

Multiply with 10

(f) 1 ; 5 ; 1 ; 7 ; 1 ; 9 ; 11 ; 1 ; 13 ; 1 ; 15 ; 1

Each 2nd term 2 is added ; alt terms all 1.

(g) 1 230 ; 1 180 ; 1 130 ; 1 080 ; 1 030 ; 980 ; 930 ; 880 ; 830 ; 780

Subtract 50

(h) $\frac{1}{2}$; $\frac{1}{4}$; $\frac{1}{8}$; $\frac{1}{16}$; $\frac{1}{32}$; $\frac{1}{64}$; $\frac{1}{128}$; $\frac{1}{256}$; $\frac{1}{512}$; $\frac{1}{1024}$

Multiply with $\frac{1}{2}$ or divide by 2.

(i) $24\frac{1}{2}$; 31 ; $37\frac{1}{2}$; 44 ; $50\frac{1}{2}$; 57 ; $63\frac{1}{2}$; 70 ; $76\frac{1}{2}$; 83

Add $6\frac{1}{2}$

(j) 2 ; 5 ; 10 ; 17 ; 26 ; 37 ; 50 ; 65 ; 82 ; 101 ; 122

+3 +5 +7 +9 +11 +13 +15 +17 +19 +21

Each time add 2 more

(2) Fill in the missing numbers in each sequence:

(a) 109 ; 105 ; 101 ; 97 ; 93 ; 89 (−4)

(b) $12\frac{1}{2}$; $12\frac{1}{4}$; 12 ; $11\frac{3}{4}$; $11\frac{1}{2}$; $11\frac{1}{4}$; 11 $(-\frac{1}{4})$

(c) 59 ; 52 ; 45 ; 38 ; 31 ; 24 ; 17 ; 10 (−7)

(d) 11 000 ; 10 000 ; 9 000 ; 8 000 ; 7 000 ; 6 000 ; 5 000 ; 4 000 (−1 000)

(e) 48 ; 60 ; 72 ; 84 ; 96 ; 108 ; 120 (+12)

(f) 1 ; 3 ; 9 ; 27 ; 81 ; 243 ; 729 ( )

(3) Consider the following sequence (two in one):

50 ; 4 ; 44 ; 6 ; 38 ; 8 ; 32 ; 10 ; .....

(a) Identify the two sequences. Write the rule for each sequence.

50 ; 44 ; 38 ; 32 ; --- ; 26 ; 20 ; 14

Subtract 6

4 ; 6 ; 8 ; 10 ; ---- ; 12 ; 14

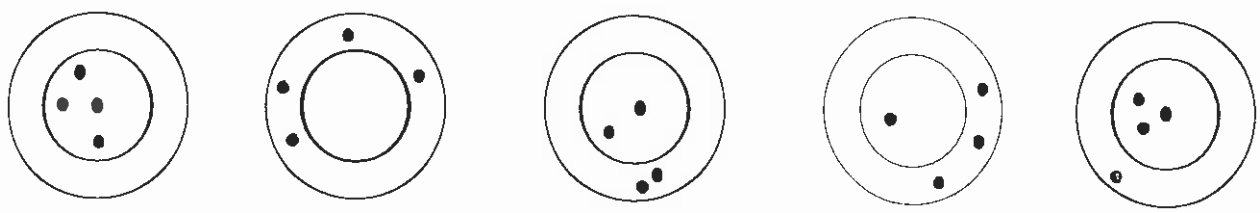
Add 2

(b) Is it possible that there will be two consecutive terms of the same value in the original sequence? If so, which two terms will it be and what is the number that will be repeated?

See (a) 12th and 13th both 14.

(4) Five riflemen each shot four shots to a target in a round. Their total points scored per round is calculated as follows:
A shot in the inner circle = 7 points and a shot in the outer circles = 4 points.

Rifleman 1 Rifleman 2 Rifleman 3 Rifleman 4 Rifleman 5



(a) Calculate the total points scored by each respective rifleman in this round.

Rifleman 1 = 4×7 = 28

Rifleman 2 = 4×4 = 16

Rifleman 3 = 2×7 + 2×4 = 22

Rifleman 4 = 1×7 + 3×4 = 19

Rifleman 5 = 3×7 + 1×4 = 25

(b) Arrange the scores of the riflemen in ascending order.

16 ; 19 ; 22 ; 25 ; 28

(c) Do the scores in (b) form a sequence? If it does, write the rule for the sequence.

Yes, it does form a sequence.
Rule : add 3

(5) Consider the following sequence: (1 + 1) : (2 + 3) : (4 + 5) ; (8 + 7) : (16 + 9) ; .....

(a) Describe the pattern of this sequence in words.

1st number in brackets → x2
2nd number in brackets → +2

(b) Write down the following four terms in the sequence and simplify the terms:

(32+11) ; (64+13) ; (128+15) ; (256+17)
2 ; 5 ; 9 ; 15 ; 25 ; 43 ; 77 ; 143 ; 273

(c) Also describe the pattern (if applicable) of the simplified sequence.

No pattern!

****