Grade 7 – Book A

(Teacher's Guidelines)

(Revised CAPS edition)

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Chapter A1

Whole numbers

A1.1 Natural and Whole Numbers:

Exercise 1: Date: _____

Complete: * Natural numbers: $\mathbb{N}$ = {1; 2; 3; 4; ---}
* Whole numbers: $\mathbb{N}_0$ = {0; 1; 2; 3; 4; ---}

A1.2 Characteristics of Whole Numbers – Revision grade 6:

* Prime numbers are numbers with only two factors, namely 1 and the number itself. Therefore, the number 1 is **not** a prime number, because it has only one factor!

* Compound numbers are numbers with more than two factors.

* The number 0 is the identity element for addition, which means that: 0 + any number = the number. E.g. 0 + 5 = 5

* The number 1 is the identity element for multiplication, which means that: 1 × any number = the number itself. E.g. 1 × 7 = 7

* If we multiply any number with 0, the answer is 0. E.g. 0 × 16 = 0

* If we divide 0 by any number, the answer is 0: E.g. 0 ÷ 189 = 0

* **If we divide by 0, the answer will be undefined.**
E.g. 24 ÷ 0 = undefined

* Factors are the numbers by which a number is dividable without a remainder.
E.g. the factors of 6 are 1 ; 2 ; 3 and 6. We write it as: F_6 = {1 ; 2 ; 3 ; 6}

* Multiples are the numbers where a number can be divided without a remainder.
E.g. multiples of 6 are 6 ; 12 ; 18.... We write it as: M_6 = {6 ; 12 ; 18 ; 24 ; .....}

* Commutative property: E.g. 4 + 5 = 5 + 4 or 4 × 5 = 5 × 4

* Associative property: E.g. (2 + 3) + 4 = 2 + (3 + 4) or (2 × 3) × 4 = 2 × (3 × 4)

* Distributive property: E.g. 2 × (3 + 4) = 2 × 3 + 2 × 4 or 2 × (3 - 4) = 2 × 3 - 2 × 4

* **Remember the order of operations:** (1) Brackets
(2) Powers and roots
(3) Of → ×
(4) Multiplication and division
(5) Plus and minus

Exercise 2: Date: _____

(1) Complete:

(a) The natural numbers smaller than 10: 1; 2; 3; 4; 5; 6; 7; 8; 9

(b) The five uneven numbers just before 10 000: 9 991; 9993; 9 995; 9 997; 9 999

(c) The first five prime numbers: 2; 3; 5; 7; 11

(d) The even whole numbers between 325 and 341: 326; 328; 330; 332; 334; 336; 338; 340

(e) The first four natural numbers greater than 25: 26; 27; 28; 29

(f) The factors of 12: 1; 2; 3; 4; 6; 12

(g) The multiples of 12 between 20 and 80: 24; 36; 48; 60; 72

(h) The multiples of 9, from 18 to 54: 18; 27; 36; 45; 54

(i) The largest six-digit number. Write this number in words as well: 999 999
Nine hunded nighty nine thousand nine hunded and nighty nine.

(j) Add the largest five-digit number to the smallest three-digit number: _____
99 999 + 100 = 10099 $\quad 99999 + 100 = 10099$

(k) Subtract the largest two-digit number from the smallest four-digit number: _____
1000 − 99 = 901 $\quad 1000 - 99 = 901$

(l) Is the number 1 a prime number or a compound number? None

(m) The months of the year that consist of an even number of days in the year 2007.
February; April; June; September; November

(n) The factors of 36: 1; 2; 3; 4; 6; 9; 12; 18; 36

(o) The multiples of 8: 8; 16; 24; 32; ----

(p) The factors of 60 that are also prime numbers: 2; 3; 5

(2) Complete the next four numbers of each of the following sequences:

(a) 4 567 ; 4 570 ; 4 573 ; 4 576 ; 4579; 4582; 4585; 4588 (+3)

(b) 12 346 ; 12 246 ; 12 146 ; 12 046 ; 11 946; 11 846; 11 746; 11 646 (−100)

(c) 128 ; 130 ; 133 ; 137 ; 142; 148; 155; 163 (+2; +3; +4; +5; +6; +7; +8)

(d) 26 ; 28 ; 30 ; 32 ; 34; 36; 38; 40 (+2)

(e) 144 578 ; 144 538 ; 144 498 ; 144 458 ; 144 418; 144 378; 144 338; 144 298 (−40)

(f) 2 ; 4 ; 8 ; 16 ; 32; 64; 128; 256 (×2)

(g) 1 ; 4 ; 5 ; 9 ; 14 ; 23; 37; 60; 97 (+)

(h) 1 ; 3 ; 5 ; 7 ; 9; 11; 13; 15 (+2)

(i) 1 999 ; 1 899 ; 1 799 ; 1 699 ; 1599; 1499; 1399; 1299 (−100)

(j) 1 ; 4 ; 9 ; 16 ; 25; 36; 49; 64 [1x1; 2x2; 3x3; 4x4; ----]

(k) 1 ; 8 ; 27 ; 64 ; 125; 216; 343; 512 [1x1x1; 2x2x2; 3x3x3; 4x4x4; ---]

(3) Determine the value of: **[Remember the order of operations!]**

(a) $17 \div 1 = \frac{17}{1} = 17$

(b) $1 \times 1 \times 1 + 0 = 1 + 0 = 1$

(c) $2 + 2 \times 0 + 2 \times 1 = 2 + 0 + 2 = 4$

(d) $389 \div 0 = \frac{389}{0} =$ undef

(e) $0 \div 983 = \frac{0}{983} = 0$

(f) $64 - 0 = 64$

(g) $\frac{0 + 5 \times 1}{7 - 7}$

$= \frac{0+5}{0} = \frac{5}{0} \rightarrow$ undef

(h) $\frac{(14 - 14) \times 0}{18 \div 1 + 0}$

$= \frac{0 \times 0}{18 + 0} = \frac{0}{18} = 0$

(4) Round the following off to the nearest number, as indicated in brackets:

(a) 3 472 (nearest 10)

≈ 3 470

(b) 3 472 (nearest 5)

≈ 3 470

(c) 3 475 (nearest 100)

≈ 3 500

(d) 769 909 (nearest 10)

≈ 769 910

(e) 769 909 (nearest 1 000)

≈ 770 000

(f) 769 909 (nearest 100)

≈ 769 900

(g) 769 909 (nearest 5)

≈ 769 910

(h) 567 (nearest 10)

≈ 570

(i) 567 (nearest 5)

≈ 570

(j) 567 (nearest 100)

≈ 600

(5) Write the following answers:

(a) 34 × 1 000

= 34 000

(b) 50 × 400

= 20 000

(c) 48 000 ÷ 1 000

= 48

(d) 680 ÷ 10

= 68

(e) 5 600 ÷ 100

= 56

(f) 300 × 10 000

= 3000 000

(g) 800 × 120

= 96 000

(h) 451 × 100

= 45 100

(i) 770 ÷ 110

= 7

(j) 350 000 ÷ 50

= 7 000

(6) Fill in: < ; = or >

(a)	25 026	>	25 025	(b)	8 100	=	81 × 100 → 8 100
(c)	123 587	<	123 588	(d)	487	>	477
(e)	1 987	<	1 989	(f)	100 999	<	101 000
(g)	520 520	>	520 250	(h)	2 345	<	2 453
(i)	7 070	=	70 700 ÷ 10 → 7 070	(j)	2 300 ÷ 10 → 230	>	23 000 ÷ 1 000 → 23

(7)(a)

$$\begin{array}{r} {}^{2\,3}345 \\ \times \quad 6 \\ \hline 2070 \\ +\ 3450 \\ \hline 5520 \end{array}$$

(b)

$$\begin{array}{r} {}^{2\,3}257 \\ \times \quad 5 \\ \hline 1285 \\ +\ 5140 \\ \hline 6425 \end{array}$$

(c)

$$\begin{array}{r} 12\,{}^{1}340 \\ +\ 2\,468 \\ \hline 14\,808 \end{array}$$

(d)

$$\begin{array}{r} {}^{3}780 \\ \times \quad 4 \\ \hline 3120 \\ +23\,400 \\ \hline 26\,520 \end{array}$$

(7) Use the distributive property to calculate the following:

(a) E.g. 345 × 16 = 345 × (6 + 10)
= 345 × 6 + 345 × 10
= 2 070 + 3 450
= 5 520

(b) 257 × 25 = 257 × (20 + 5)
= 257 × 20 + 257 × 5
= 5 140 + 1 285
= 6 425

(c) 1 234 × 12 = 1 234 × (10 + 2)
= 1 234 × 10 + 1 234 × 2
= 12 340 + 2 468
= 14 808

(d) 780 × 34 = 780 × (30 + 4)
= 780 × 30 + 780 × 4
= 23 400 + 3 120
= 26 520

(8) Identify the property used. Write A – associative property, C – commutative property and D – distributive property or N – if none of the properties apply.

(a) 45 + 67
= 67 + 45 — C

(b) 18 × 12
= 18 × (10 + 2) — D

(c) 56 - 44
= 44 - 56 — N

(d) 2 × 6 × 18
= 2 × (6 × 18) — A

(e) (29 + 35) + 15
= 29 + (35 + 15) — A

(f) 7 × 234
= 234 × 7 — C

(g) 450 × 36
= 450 × 40 - 450 × 4 — D

(h) 128 ÷ (8 × 8)
= (128 ÷ 8) × 8 — N

A1.3 Prime factors:

The prime factors of a number are the factors that are also prime numbers.
E.g. the factors of 12 are 1 ; 2 ; 3 ; 4 ; 6 and 12. But the prime factors of 12 are only 2 and 3.

E.g. 1 The factors of 6 are: $F_6 = \{1 ; 2 ; 3 ; 6\}$
∴ The prime factors of 6 are: ***2 and 3****. (I.e. they are the factors that are prime numbers.)*

E.g. 2 The factors of 20 are: $F_{20} = \{1 ; 2 ; 4 ; 5 ; 10 ; 20\}$
∴ The prime factors of 20 are: ***2 and 5****.*

E.g. 3 Determine the prime factors of 60:

2	60
2	30
3	15
5	5
	1

∴ 60 = $2 \times 2 \times 3 \times 5$

Exercise 3: Date: _____

Determine the prime factors of the following numbers:

(1)

2	12
2	6
3	3
	1

∴ 12 = 2 × 2 × 3

(2)

2	56
2	28
2	14
7	7
	1

∴ 56 = 2 × 2 × 2 × 7

(3)

2	30
3	15
5	5
	1

∴ 30 = 2 × 3 × 5

(4)

2	44
2	22
11	11
	1

∴ 44 = 2 × 2 × 11

(5)
2	148
2	74
37	37
	1

$\therefore 148 = 2 \times 2 \times 37$

(6)
3	27
3	9
3	3
	1

$\therefore 27 = 3 \times 3 \times 3$

(7)
2	18
3	9
3	3
	1

$\therefore 18 = 2 \times 3 \times 3$

(8)
2	100
2	50
5	25
5	5
	1

$\therefore 100 = 2 \times 2 \times 5 \times 5$

(9)
2	24
2	12
2	6
3	3
	1

$\therefore 24 = 2 \times 2 \times 2 \times 3$

(10)
2	640
2	320
2	160
2	80
2	40
2	20
2	10
5	5
	1

$\therefore 640 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 5$

(11)
2	36
2	18
3	9
3	3
	1

$\therefore 36 = 2 \times 2 \times 3 \times 3$

(12)
5	75
5	15
3	3
	1

$\therefore 75 = 5 \times 5 \times 3$

A1.4 LCM and HCF:

LCM = Lowest common multiple.
HCF = Highest common factor.

*E.g.4 The multiples of 3 are M_3 = {3 ; 6 ; 9 ; **12** ; 15 ; 18 ; 21 ; **24** ; ……}*
*The multiples of 4 are M_4 = {4 ; 8 ; **12** ; 16 ; 20 ; **24** ; 28 ; ……}*
The common multiples of 3 and 4 are all the multiples that occur with both, namely: 12 ; 24 ; ……
*Therefore the **LCM** of 3 and 4 is **12**, because it is the **lowest** common multiple!*

E.g.5 The factors of 12 are F_{12} = {1 ; 2 ; 3 ; 4 ; 6 ; 12}
The factors of 18 are F_{18} = {1 ; 2 ; 3 ; 6 ; 9 ; 18}
The common factors of 12 and 18 is thus: 1 ; 2 ; 3 and 6.
*Therefore the **HCF** of 12 and 18 is **6**, because it is the **highest** common factor!*

Exercise 4: Date: _____

Complete:

(1) (a) The multiples of 2: {2; 4; 6; 8; 10; 12; 14; 16; 18; ---}

(b) The multiples of 3: {3; 6; 9; 12; 15; 18; 21; ---}

(c) The common multiples of 2 and 3: 6; 12; 18; ---

(d) The LCM of 2 and 3: 6

(2) (a) M_6 = {6; 12; 18; 24; 30; 36; 42; 48; 54; 60; ---}

(b) M_{15} = {15; 30; 45; 60; ---}

(c) The common multiples of 6 and 15: 30; 60; ---

(d) The LCM of 6 and 15: 30

(3) (a) F_{12} = {1; 2; 3; 4; 6; 12}

(b) F_8 = {1; 2; 4; 8}

(c) The common factors of 12 and 8: 1; 2 and 4

(d) HCF of 12 and 8: 4

(4) (a) M_{10} = {10; 20; 30; ---} F_{10} = {1; 2; 5; 10}

(b) M_{15} = {15; 30; 45; ---} F_{15} = {1; 3; 5; 15}

(c) LCM of 10 and 15: 30

(d) HCF of 10 and 15: 5

(5) (a) The multiples of 3: 3; 6; 9; 12; 15; 18; 21; 24; 27; 30; 33; 36; 39; 42; 45; 48; 51; 54; 57; 60--

(b) The multiples of 4: 4; 8; 12; 16; 20; 24; 28; 32; 36; 40; 44; 48; 52; 56; 60; ----

(c) The multiples of 5: 5; 10; 15; 20; 25; 30; 35; 40; 45; 50; 55; 60; --

(d) The LCM of 3; 4 and 5: 60

(6) (a) M_3 = 3; 6; 9; 12; 15; 18; 21; 24; 27; 30; 33; 36; 39; 42; 45; 48; ---

(b) M_5 = 5; 10; 15; 20; 25; 30; 35; 40; 45; ----

(c) M_9 = 9; 18; 27; 36; 45; 54---

(d) LCM of 3; 5 and 9: 45

(7) (a) F_{20} = {1; 2; 4; 5; 10; 20}

(b) F_{36} = {1; 2; 3; 4; 6; 9; 12; 18; 36}

(c) F_{28} = {1; 2; 4; 7; 14; 28}

(d) HCF of 20; 36 and 28: 4

(8) Paul and John are on a hike to raise funds. Paul hikes exactly 12 kilometers every day and John hikes exactly 10 kilometers every day. Calculate how many days it will take them to hike exactly the same number of kilometers. How many kilometers in total did each of them hike?

Total after	①	②	③	④	⑤	⑥	⑦ days
Paul:	12	24	36	48	60	72	84
John:	10	20	30	40	50	60	70

After Paul hikes for 5 days and John for 6 days, both hiked 60 km in total.

(9) The product of two numbers is 588. The HCF of the numbers is 14. Give all the possible combinations of numbers to which these conditions apply.

✓ 14 × 42, because 14 and 42 are both divisible by 14.
× 28 × 21 = 588, but 21 is not divisible by 14.

☺ **The ancient Romans used certain symbols to represent their numbers. Do research to find out which symbols they used for each of the following:**

1 → I **5 →** V **10 →** X

50 → L **100 →** C **500 →** D

1 000 → M

(1) Which number is represented by the following: MCXLVI ? 1 146

(2) Present the following number as a Roman numeral: 3 914 MMM CM XIV

A1.5 REVISION EXERCISE:

Date: _____

(1) Complete:

(a) The uneven compound numbers, larger than 10 and smaller than 20: 15

(b) The factors of 12 which are also multiples of 2: 2; 4; 6; 12

(c) All even prime numbers: 2

(d) The five whole numbers just greater than 9 998:

9 999; 10 000; 10 001; 10 002; 10 003

(e) Write 2 344 298 in words: Two million three hundred forty four thousand two hundred and ninety eight

(f) The first four whole numbers just smaller than 12: 11; 10; 9; 8

(2) (a) M_6 = {6; 12; 18; 24; 30; 36; 42; 48; ---}

(b) M_8 = {8; 16; 24; 32; 40; 48; ---}

(c) F_{18} = {1; 2; 3; 6; 9; 18}

(d) F_{24} = {1; 2; 3; 4; 6; 8; 12; 24}

(3) Use your answer in (2) and determine the LCM of 6 and 8: 24

(4) Use your answer in (2) and determine the HCF of 18 and 24: 6

(5) Complete the next five numbers of each of the following sequences:

(a) 97 ; 96 ; 94 ; 91 ; 87 ; 82; 76; 69; 61; 52
(−1, −2, −3, −4, −5, −6, −7, −8, −9)

(b) 14 ; 17 ; 20 ; 23 ; 26 ; 29; 32; 35; 38; 41
(+3)

(c) 144 ; 132 ; 120 ; 108 ; 96; 84; 72; 60; 48.

(6) Determine the prime factors of the following numbers:

(a)

5	315
3	63
3	21
7	7
	1

∴ 315 = 5 × 3 × 3 × 7

(b)

2	144
2	72
2	36
2	18
3	9
3	3
	1

∴ 144 = 2 × 2 × 2 × 2 × 3 × 3

(c)

2	98
7	49
7	7
	1

∴ 98 = 2 × 7 × 7

(d)

5	525
5	105
3	21
7	7
	1

∴ 525 = 5 × 5 × 3 × 7

****

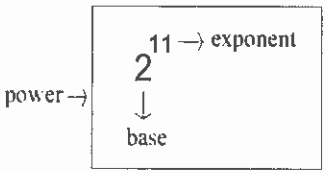
Chapter A2

Exponents

A1.2 Numbers in exponential format:

* Exponential format is a way to write large numbers in a shorter format.
  E.g. $2\times2\times2\times2\times2\times2\times2\times2\times2\times2\times2 = 2^{11} = 2\ 048$

* We read 2^{11} as "two to the power of 11", where 2 is called the base number and 11 the exponent:



* We read 2^2 as "two to the power of two" or, "2 squared" which means that it is $2 \times 2 = 4$, where 4 is a perfect square.

* Also $2^3 = 2 \times 2 \times 2 = 8$, where 8 is therefore a perfect cube.

* Any number to the power of 1, is equal to the number itself. E.g. $6^1 = 6$.

** Any number to the power of 0, is equal to 1. E.g. $6^0 = 1$. **(Only for enrichment!)**

E.g. 1 (a) Write in exponential format: $5\times2\times2\times2\times5\times5\times2$
$= 2\times2\times2\times2 \times 5\times5\times5$
$= \underline{2^4 \times 5^3}$

(b) Write in expanded format: $3^5 = \underline{3\times3\times3\times3\times3}$

(c) Calculate: Remember the order of operations!

(i) $2^3 + 7^2 - 9^1 = 2\times2\times2 + 7\times7 - 9 = 8 + 49 - 9 = \underline{48}$

(ii) $(4 \times 10^4) + (7 \times 10^3) + (2 \times 10^2) + (6 \times 10^1) + (5 \times 1)$
$= 40\ 000 + 7\ 000 + 200 + 60 + 5$
$= \underline{47\ 265}$

Because $[4 \times 10^4 = 4 \times 10\ 000 = \mathbf{40\ 000}]$ *and* $[7 \times 10^3 = 7 \times 1\ 000 = \mathbf{7\ 000}]$ *and* $[2 \times 10^2 = 2 \times 100 = \mathbf{200}]$ *and* $[6 \times 10^1 = 6 \times 10 = \mathbf{60}]$ *and* $[5 \times 1 = \mathbf{5}]$

Exercise 1: Date: _____

(1) Redraw the following table and complete. Mark only with ✓ in each applicable block.

Number:	1	6	8	9	12	16	25	27	30	36	64	80	100	125
Perfect square	✓			✓		✓	✓			✓	✓		✓	
Perfect cube	✓		✓					✓			✓			✓

(2) Write in exponential format:

(a) $3\times3\times3\times3\times3\times3\times3 = 3^7$

(b) $7\times7\times7\times7\times7\times7\times7\times7 = 7^8$

(c) $10\times10\times7\times10\times10\times10 = 7^1 \times 10^5$

(d) $5\times2\times5\times2\times5\times2\times5\times2 = 2^4 \times 5^4$

(3) Write in expanded format:

(a) $6^8 = 6\times6\times6\times6\times6\times6\times6\times6$

(b) $3^4 = 3\times3\times3\times3$

(4) Calculate: (Without using a calculator!)

(a) $4^2 - 3^2 = 16 - 9 = 7$

(b) $1^3 + 1^2 + 2^2 = 1 + 1 + 4 = 6$

(c) $5^2 - 4^2 - 3^2$
$= 25 - 16 - 9 = 0$

(d) $4^3 \times 10^2 - 5^3$
$= 64 \times 100 - 125 = 6\,275$

(e) $5^3 \div 5^2$
$= 125 \div 25 = 5$

(f) $12^2 - 11^2$
$= 144 - 121 = 23$

(g) $5^1 + 1^5 = 5 + 1 = 6$

(h) $7^2 - 2^3 = 49 - 8 = 41$

(i) $2 \times 6^2 + 8^2$
$= 2 \times 36 + 64 = 72 + 64 = 136$

(j) $(20 - 2\times4)^2$
$= (20 - 8)^2 = (12)^2 = 144$

(k) $2^2 \times 2^3$
$= 4 \times 8 = 32$

(l) $3^3 - 3^2$
$= 27 - 9 = 18$

(m) $10^3 \div 10^3$
$= 1000 \div 1000$
$= 1$

(n) $9^2 \times 1^2 \div 3^2$
$= 81 \times 1 \div 9$
$= 81 \div 9$
$= 9$

(o) $(4^2 + 2^2) \times (1^2 + 1^3)$
$= (16 + 4) \times (1 + 1)$
$= (20) \times (2)$
$= 40$

(p) $(7 - 3)^3 + (4 + 1)^2$
$= (4)^3 + (5)^2$
$= 64 + 25$
$= 89$

(q) $(3^3 \times 8^2)^0 + 10^2 \times 10^3$
$= 1 + 100 \times 1000$
$= 1 + 100\,000$
$= 100\,001$

(r) $4^2 + (8 - 3)^3 + (8 + 3)^2$
$= 16 + (5)^3 + (11)^2$
$= 16 + 125 + 121$
$= 262$

(5) Calculate:

(a) $(4\times10^3)+(3\times10^2)+(2\times10^1)+(1\times10^0)$

$= 4000 + 300 + 20 + 1 = 4\ 321$

(b) $(7\times10^6)+(2\times10^5)+(2\times10^4)+(1\times10^3)+(2\times10^2)+(6\times10)+(9\times10^0)$

$= 7000\ 000 + 200\ 000 + 20\ 000 + 1\ 000 + 200 + 60 + 9$

$= 7\ 221\ 269$

(c) $(5\times10^5)+(6\times10^3)+(6\times10)$

$= 500\ 000 + 6\ 000 + 60$

$= 506\ 060$

☺ **The American government decides to donate one trillion $ to Africa for the treatment and prevention of AIDS. If one $ is equal to R7, calculate how many rand will be donated to Africa. Write your answer in shortened format by using exponential notation. Remember:**

1 milliard = 1 thousand million
1 billion = 1 million million
1 trillion = 1 million billion

Donation = 1 trillion x 7
= 7 trillion
= 7 million billion
= 7 million million million
$= 7 \times 10^6 \times 10^6 \times 10^6 = R7 \times 10^{18}$

1.3 Square roots en cube roots:

The opposite calculation of powers is called the calculation of roots.
E.g. if $5^2 = 25$, then $\sqrt{25} = 5$. We read it as: the square root of 25 is equal to 5.
Or if $2^3 = 8$, then $\sqrt[3]{8} = 2$. We read it as: the cube root of 8 is equal to 2.

E.g. 2 Calculate: (a) $\sqrt{100} - \sqrt{64} = 10 - 8 = \underline{2}$

(b) $\sqrt{100 - 64} = \sqrt{(100 - 64)} = \sqrt{36} = \underline{6}$

(c) $\sqrt[3]{4^2 - 8} = \sqrt[3]{(16 - 8)} = \sqrt[3]{8} = \underline{2}$