Grade 8 – Textbook Memo

(Revised CAPS edition)

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ISBN 978-1-920505-01-1

Chapter A1

Integers

A1.1 Number systems and properties of integers:

Exercise 1:

Complete: * Natural numbers: $N = \{1; 2; 3; \ldots\}$

* Whole numbers $N_0 = \{0; 1; 2; 3; \ldots\}$

* Integers: $Z = \{\ldots; -2; -1; 0; 1; 2; \ldots\}$

A1.2 Rules for divisibility:

Exercise 2:

Determine whether the following numbers are divisible by the numbers in the above table:

(1) 1 275:

2: No, end on uneven.
3: Yes, 1+2+7+5=15 and 15 divisible by 3.
4: No, 75 not divisible by 4.
5: Yes, end on 5.
6: No, not divisible by 2.
8: No, not divisible by 4.
9: No, 1+2+7+5=15 and is is not divisible by 9.
10: No, last digit not 0.
11: No, (1+7)-(2+5)=8-7=1 and that is not 0 or 11.

(2) 2 772:

2: Yes, ends on even.
3: Yes, 2+7+7+2=18 and 18 divisible by 3.
4: Yes, 72 divisible by 4.
5: No, do not end on 0 or 5.
6: Yes, divisible by 2 and 3.
8: No, 772 not divisible by 8.
9: Yes, 2+7+7+2=18 and 18 is divisible by 9.
10: No, last digit not 0.
11: Yes, (2+7)-(7+2)=0.

(3) 7 920:

2: Yes, ends on 0.
3: Yes, 7+9+2+0=18 and 18 divisible by 3.
4: Yes, 20 divisible by 4.
5: Yes, ends on 0.
6: Yes, divisible by 2 and 3.
8: Yes, 920 is divisible by 8.
9: Yes, 7+9+2+0=18 and 18 divisible by 9.
10: Yes, ends on 0.
11: Yes, (7+2)-(9+0)=0.

☺ **A certain number is divisible by 2, 3, 5 and 11. This number is not divisible by 8 and 9, but it is divisible by 4. Determine the smallest number that meets these conditions.**

$4 \times 3 \times 5 \times 11 = 660$

(4 is also divisible by 2!)

A1.3 Factors:

Exercise 3:

Complete:

(1) $F_{20} = \{1; 2; 4; 5; 10; 20\}$

(2) $F_{16} = \{1; 2; 4; 8; 16\}$

(3) $F_5 = \{1; 5\}$

(4) $F_{32} = \{1; 2; 4; 8; 16; 32\}$

(5) $F_{15} = \{1; 3; 5; 15\}$

(6) $F_{28} = \{1; 2; 4; 7; 14; 28\}$

(7) $F_{12} = \{1; 2; 3; 4; 6; 12\}$

(8) $F_7 = \{1; 7\}$

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

(10) $F_{11} = \{1; 11\}$

A1.4 Multiples:

Exercise 4:

Complete:

(1) $M_6 = \{6; 12; 18; \ldots\}$

(2) $M_{20} = \{20; 40; 60; \ldots\}$

(3) $M_7 = \{7; 14; 21; \ldots\}$

(4) $M_{12} = \{12; 24; 36; \ldots\}$

(5) $M_{36} = \{36; 72; 108; \ldots\}$

(6) $M_9 = \{9; 18; 27; \ldots\}$

(7) $M_{35} = \{35; 70; 105; \ldots\}$

(8) $M_{16} = \{16; 32; 48; \ldots\}$

(9) $M_{11} = \{11; 22; 33; \ldots\}$

(10) $M_3 = \{3; 6; 9; \ldots\}$

☺ **Determine the multiples of 6 which are also factors of 120.**

{6; 12; 24; 30; 60; 120}

A1.5 Prime numbers and compound numbers:

Exercise 5:

Complete:

(1) The definition of a prime number is: all natural numbers with only 2 factors → 1 and the number itself.

(2) The smallest prime number is: 2

(3) The only even prime number is: 2

(4) The definition of a compound number is: all natural number with more than 2 factors.

(5) Which natural number is **neither** a prime number nor a compound number? 1

(6) Which natural numbers smaller than 50, are prime numbers?
(Do the following: Encircle 2 ; 3 ; 5 and 7 and cross out all the multiples of 2 ; 3 ; 5 ; and 7.
The numbers which are left will be the prime numbers. Remember to cross out 1 as well!)

~~1~~	(2)	(3)	~~4~~	(5)	~~6~~	(7)	~~8~~	~~9~~	~~10~~
(11)	~~12~~	(13)	~~14~~	~~15~~	~~16~~	(17)	~~18~~	(19)	~~20~~
~~21~~	22	(23)	~~24~~	~~25~~	~~26~~	~~27~~	~~28~~	(29)	~~30~~
(31)	~~32~~	~~33~~	~~34~~	~~35~~	~~36~~	(37)	~~38~~	~~39~~	~~40~~
(41)	~~42~~	(43)	~~44~~	~~45~~	~~46~~	(47)	~~48~~	~~49~~	~~50~~

∴ The prime numbers smaller than 50 are: {2; 3; 5; 7; 11; 13; 17; 19; 23; 29; 31; 37; 41; 43; 47}

A1.6 Prime factors:

Exercise 6:

Determine the prime factors of:

(1)
2	12
2	6
3	3
	1

$12 = 2^2 \times 3$

(2)
5	35
7	7
	1

$35 = 5 \times 7$

(3)
2	32
2	16
2	8
2	4
2	2
	1

$32 = 2^5$

(4)
2	44
2	22
11	11
	1

$44 = 2^2 \times 11$

(5)
2	48
2	24
2	12
2	6
3	3
	1

$48 = 2^4 \times 3$

(6)
3	27
3	9
3	3
	1

$27 = 3^3$

(7)
2	56
2	28
2	14
7	7
	1

$56 = 2^3 \times 7$

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

$100 = 2^2 \times 5^2$

(9)
2	18
3	9
3	3
	1

$18 = 2 \times 3^2$

(10)
2	168
2	84
2	42
3	21
7	7
	1

$168 = 2^3 \times 3 \times 7$

(11)
2	588
2	294
3	147
7	49
7	7
	1

$588 = 2^2 \times 3 \times 7^2$

(12)
2	450
3	225
3	75
5	25
5	5
	1

$450 = 2 \times 3^2 \times 5^2$

A1.7 LCM and HCF:

Exercise 7:

(1) Determine the HCF of the following by finding the prime factors first:

(a) $14 = 2 \times 7$

$21 = 3 \times 7$ ∴HCF = 7

$35 = 5 \times 7$ =

(b) $27 = 3 \times 3 \times 3$

$45 = 3 \times 3 \times 5$ ∴HCF = 3×3

$72 = 2 \times 2 \times 2 \times 3 \times 3$ = 9

(c) $12 = 2 \times 2 \times 3$ ∴HCF = $2 \times 2 \times 3$

$168 = 2 \times 2 \times 2 \times 3 \times 7$ = 12

(d) $38 = 2 \times 19$

$57 = 3 \times 19$ ∴HCF = 19

$95 = 5 \times 19$ =

(e) $10 = 2 \times 5$

$15 = 3 \times 5$ ∴HCF = 5

$105 = 3 \times 5 \times 7$ =

(2) Determine the LCM of the following by finding the prime factors first:

(a) 6 = 2x3

12 = 2x2x3 ∴LCM = 2x3x2x3

18 = 2x3x3 = 36

(b) 8 = 2x2x2 ∴LCM = 2x2x2x5

20 = 2x2x5 = 40

(c) 2 = 2

6 = 2x6 ∴LCM = 2x3x11

11 = 11 = 66

(d) 21 = 3x7 ∴LCM = 7x3x7

49 = 7x7 = 147

(e) 3 = 3

9 = 3x3

12 = 2x2x3 ∴LCM = 3x2x2x3x5

60 = 2x2x3x5 = 180

(f) 15 = 3x5

45 = 3x3x5 ∴LCM = 3x5x3x2x3

270 = 2x3x3x3x5 = 270

(3) Determine the LCM and the HCF:

(a) 16 = 2x2x2x2 ∴LCM = 2x2x2x2x3x7

48 = 2x2x2x2x3 = 336

56 = 2x2x2x7 ∴HCF = 2x2x2

= 8

(b) 5 = 5 ∴LCM = 5x2x2x2x3

24 = 2x2x2x3 = 120

∴HCF = 1

☺ **Mounting boards of (a) 24cm², (b) 36cm² and (c) 18cm² have to be cut. Determine the size of the smallest mounting board panel (determine the area) that should be used so that any combination of (a), (b) and/or (c) can be cut from it, without wasting any board. [Make use of prime factors**

24 = 2x2x2x3

36 = 2x2x3x3

18 = 2x3x3

∴LCM = 2x3x2x3x2 = 72 cm²

24	36	18
2	2	2
2	2	3
2	3	3
3	3	

A1.8 Square roots and cube roots:

Exercise 8:

Calculate: (by using prime factors)

(1) $\sqrt{576} = \sqrt{2x2x2x2x2x2x3x3}$

$= \sqrt{2^2 \times 2^2 \times 2^2 \times 3^2}$

$= 2x2x2x3$

$= 24$

576
2
288
2
144
2
72
2
36
2
18
3
9
3
3
1

(2) $\sqrt[3]{343} = \sqrt[3]{7x7x7}$

$= \sqrt[3]{7^3}$

$= 7$

343
7
49
7
7
1

(3) $\sqrt{225} = \sqrt{3x3x5x5}$

$= \sqrt{3^2 \times 5^2}$

$= 3x5$

$= 15$

225
3
75
3
25
5
5
1

(4) $\sqrt{1\,024} = \sqrt{2\times2\times2\times2\times2\times2\times2\times2\times2\times2}$

$= \sqrt{2^2 \times 2^2 \times 2^2 \times 2^2 \times 2^2}$

$= 2\times2\times2\times2\times2$

$= 32$

2	1024
2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

(5) $\sqrt[3]{1\,000} = \sqrt[3]{2\times2\times2\times5\times5\times5}$

$= \sqrt[3]{2^3 \times 5^3}$

$= 2\times5$

$= 10$

2	1000
2	500
2	250
5	125
5	25
5	5
	1

(6) $\sqrt[3]{4\,096} = \sqrt[3]{2\times2\times2\times2\times2\times2\times2\times2\times2\times2\times2\times2}$

$= \sqrt[3]{2^3 \times 2^3 \times 2^3 \times 2^3}$

$= 2\times2\times2\times2$

$= 16$

2	4096
2	2048
2	1024
2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

(7) $\sqrt[3]{729} = \sqrt[3]{3\times3\times3\times3\times3\times3}$

$= \sqrt[3]{3^3 \times 3^3}$

$= 3\times3$

$= 9$

3	729
3	243
3	81
3	27
3	9
3	3
	1

(8) $\sqrt{5\,184} = \sqrt{2\times2\times2\times2\times2\times2\times3\times3\times3\times3}$

$= \sqrt{2^2 \times 2^2 \times 2^2 \times 3^2 \times 3^2}$

$= 2\times2\times2\times3\times3$

$= 72$

2	5 184
2	2 592
2	1 296
2	648
2	324
2	162
3	81
3	27
3	9
3	3
	1

A1.9 Squares and cubes:

Exercise9:

Calculate, without using a calculator:

(1) $\sqrt{144} = 12$

(2) $(6-2)^3 = (4)^3 = 64$

(3) $2^3 + 1^3 = 8+1 = 9$

(4) $\sqrt{36} - \sqrt{4} = 6-2 = 4$

(5) $\left(\sqrt{26}\right)^2 = 26$

(6) $5^2 + 5^3 = 25+125 = 150$

(7) $\sqrt{100-64} - \sqrt{1}$

$= \sqrt{36} - 1$

$= 6-1 = 5$

(8) $\sqrt[3]{27} + \sqrt{121}$

$= 3+11$

$= 14$

(9) $(2+6)^3 + (11-7)^3$

$= (8)^3 + (4)^3$

$= 512 + 64 = 576$

(10) $\sqrt[3]{216} + \sqrt{1\,024}$

$= 6+32$

$= 38$

(11) $\sqrt{\sqrt{81}} = \sqrt{9} = 3$

(12) $\sqrt{\frac{144}{4}} = \sqrt{36} = 6$

(13) $(2\times3)^2 = 6^2 = 36$

(14) $2^2 \times 3^2 = 4\times9 = 36$

(15) $5^3 - 3^3 = 125-27 = 98$

(16) $(5-3)^3 = (2)^3 = 8$

(17) $2\times9^2 = 2\times81 = 162$

(18) $\left(\sqrt{9}\right)^3 = (3)^3 = 27$

(19) $\sqrt[3]{1} - 1^3 = 1-1 = 0$

(20) $3\times\sqrt{25} = 3\times5 = 15$

☺ **Calculate:** $\sqrt[5]{25^5} + (2)^5 - \left(\sqrt[3]{8}\right)^8 - (5-4)^{100}$

$= 25 + 32 - 8 - (1)^{100}$

$= 49 - 1$

$= 48$

A1.10 Order of integers:

Exercise 10:

(1) What will the reading on a thermometer be if the temperature:

(a) rises from 5°C by 3°C? 8°C

(b) rises from -2°C by 7°C? 5°C

(c) drops from 4°C by 6°C? -2°C

(d) drops from -3°C by 4°C? -7°C

(e) drops from 8°C by 3°C and then rise by 5°C? 10°C

(f) rises from 2°C by 6°C and then drops by 11°C? -3°C

(2) What will your bank balance be if you have R100 in your account and then:
(Use the original balance to answer each question!)

(a) withdraw R70? R30

(b) deposit R40 and then withdraw R60? R80

(c) withdraw R140? Owe R40 ∴ -R40

(d) withdraw R20 and then later withdraw another R80? R0

(3) State whether the following is false or true:

(a) 2 is a positive number. True

(b) -6 is a whole number. False

(c) 0 is a natural number. False

(d) 4 is an even, negative number. False

(e) $\frac{2}{3}$ is an integer. False

(f) 0 is an integer. True

(g) {1 ; 3 ; 5 ; ....} is the set of uneven natural numbers. True

(h) {.... ; -2 ; -1 ; 0 ; 1} is the set of integers less than 2. True

(4) Arrange the following integers in ascending order:

(a) 4 ; -1 ; 5 ; 0 ; 3 ; -7: -7; -1; 0; 3; 4; 5

(b) -5 ; -6 ; -1 ; 2 ; 8 ; -11: -11; -6; -5; -1; 2; 8

(c) -200 ; -202 ; -201 ; -205: -205; -202; -201; -200

(5) Arrange the following integers in descending order:

(a) 10 ; -20 ; 30 ; -40 ; 50: 50; 30; 10; -20; -40

(b) 3 ; 4 ; 5 ; -3 ; -4 ; -5: 5; 4; 3; -3; -4; -5

(c) 36 ; -3 ; -27 ; 18 ; -15: 36; 18; -3; -15; -27

A1.11 Properties of integers:

Exercise 11: Date: _____

(1) Complete:

(a) The additive inverse of 6 is: -6

(b) The additive inverse -3 is: +3

(c) The identity element for addition is: 0

(d) The identity element for multiplication is: 1

(2) Find the value for:

(a) 2 + 0 = 2 (b) 1 × -10 = -10

(c) 6 × 1 = 6 (d) -5 ÷ 0 = undef

(e) -5 + 0 = -5 (f) (7) + (−7) = 0

(g) 0 ÷ 3 = 0 (h) 8 ÷ 1 + 0 = 8 + 0 = 8

(i) $\frac{6}{5-5} = \frac{6}{0}$ undef. (j) -20 × -3 × 0 = 0

(k) (6 ×0) + (-5 ×0) = 0 + 0 = 0

(l) (3 ÷ 3) × (0 ÷ 3) = 1 × 0 = 0

(m) $\frac{0 \times 8}{5-1} \times \frac{2}{1} = \frac{0}{2} \times 2 = 0 \times 2 = 0$

(n) 0 + 1 + 2 × 0 = 0 + 1 + 0 = 1

(o) -11 + 11 = 0

(3) For which values of x will the following be undefined?

(a) $\frac{7}{x}$ ∴ $x \neq 0$ (b) $\frac{-3}{x-1}$ ∴ $x \neq 1$

(c) $\frac{0+1}{x+1}$ ∴ $x \neq -1$ (d) $\frac{-8}{4+x}$ ∴ $x \neq -4$

(4) Find the value for y in each of the following mathematical sentences:

(a) $y + 2 = 0$ ∴ $y =$ -2 (c) $-11 + y = 0$ ∴ $y =$ +11

(b) $(-4) + y = 0$ ∴ $y =$ +4 (d) $y + (+7) = 0$ ∴ $y =$ -7

A1.12 The addition of integers:

Exercise 12:
(1) Find the value of:

(a) (-5) + (6) = 1 (b) (-2) + (-4) = -6 (c) (7) + (3) = 10

(d) (-11) + (2) = -9 (e) (5) + (-8) = -3 (f) (-4) + (0) = -4

(g) (18) + (-7) = 11 (h) (-1) + (-1) = -2 (i) (9) + (-9) = 0

(j) (13) + (2) = 15

(k) (7) + (-7) + (-2) = -2

(l) (-3) + 2 + (-6) = -7

(m) (-1) + (-2) + (-3) = -6

(n) 4 + (-8) + 17 = 13

(o) 3 + 5 + 2 + 1 = 11

(p) (-10) + (-6) + 2 = -14

(q) (8) + (-5) + (-6) = -3

(r) -6 + 7 + 3 + 1 = 5

(s) -1 + (-1) + 1 + 1 = 0

(t) 12 + (-12) + (-3) = -3

(u) (7) + (-3) + 5 = 9

(2) Find the sum of each of the following:

(a) 3 and - 8

$(3)+(-8) = -5$

(b) - 2 ; 5 and - 7

$(-2)+(5)+(-7) = -4$

(c) 4 ; - 5 and - 1

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

(d) - 2 ; - 15 ; - 1 and 4

$(-2)+(-15)+(-1)+(4) = -14$

(e) - 2 ; - 3 and 6

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

(f) 17 ; - 5 ; 7 and - 3

$(17)+(-5)+(7)+(-3) = 16$

☺ **Complete, by writing the next three numbers in the sequence:**

(a) **2 ; 5 ; 8 ; 11 ;** 14 ; 17 ; 20 (Add 3)

(b) **1 ; 4 ; 9 ; 16 ;** 25 ; 36 ; 49 ($1^2 ; 2^2 ; 3^2 ; \ldots$)

(c) **-17 ; -11 ; -6 ; -2 ;** 1 ; 3 ; 4 ($+6 ; +5 ; +4 ; \ldots$)

(d) **-2 ; -3 ; -5 ; -8 ;** -12 ; -17 ; -23 ($-1 ; -2 ; -3 ; \ldots$)

A1.13 Subtraction of integers:

Exercise 13:

(1) Calculate:

(a) (-6) - (9) = -6 - 9 = -15

(b) (-9) - (-9) = -9 + 9 = 0

(c) (5) - (-1) - (3) = 5 + 1 - 3 = 3

(d) 13 - (-4) = 13 + 4 = 17

(e) 11 - (-3) - (8) = 11 + 3 - 8 = 6

(f) (11) - (-6) = 11 + 6 = 17

(g) -4 - (-4) - 6 = -4 + 4 - 6 = -6

(h) (-3) - (5) = -3 - 5 = -8

(i) 16 - 12 - 4 - 1 = -1

(j) (-6) - (-2) - (5) = -6 + 2 - 5 = -9

(k) (-2) - (-7) - (3) = -2 + 7 - 3 = 2

(l) -6 - (-2) - 5 - (-1) = -6 + 2 - 5 + 1 = -8

(m) (7) + (5) - (-2) = 7 + 5 + 2 = 14

(n) 6 + 7 - (-3) - 8 = 6 + 7 + 3 - 8 = 8

(o) (-15) - (-7) + (-3) = -15 + 7 - 3 = -11

(p) (-3) - (-2) + (2) = -3 + 2 + 2 = 1

(2) Subtract 11 from 6.

6 - 11 = -5

(3) Subtract -5 from -1.

-1 - (-5) = -1 + 5 = 4

(4) Subtract -11 from 2 and then add 6.

2 - (-11) + 6 = 2 + 11 + 6 = 19

(5) Calculate the sum of 3 and -5 and subtract 2.

3 + (-5) - 2 = 3 - 5 - 2 = -4

(6) Subtract the sum of -4 and -3 from the sum of 6 and -5.

$[(6)+(-5)] - [(-4)+(-3)] = [6-5] - [-4-3]$

$= [1] - [-7]$

$= 1 + 7$

$= 8$

☺ **Complete, by writing the next six numbers in the sequence:**

(a) **1 ; -2 ; -5 ;** -8 ; -11 ; -14 ; -17 ; -20 ; -23 (add -3)

(b) **1 ; 0 ; 2 ; -1 ; 3 ; -2 ;** 4 ; -3 ; 5 ; -4 ; 6 ; -5

(+1, +1, −1, −1)

A1.14 Multiplication of integers:

Exercise 14:

Calculate:

(1) (-2) × (5) = -10

(2) (6) × (-7) = -42

(3) (-4) × (-7) = 28

(4) (-9) × (0) = 0

(5) $(11) \times (3)$

$= 33$

(6) $(-4)(-6)(2)$

$= 48$

(7) $(12) \times (-6)$

$= -72$

(8) $(-20) \times (3)$

$= -60$

(9) $(-1) \times (-7)$

$= 7$

(10) $(14) \times (4)$

$= 56$

(11) $(-2) \times (-5) \times (6) \times (1)$

$= 60$

(12) $(-1) \times (-1) \times (-1) \times (-1) \times (-1)$

$= -1$

(13) $(9) \times (-12) \times (0) \times (18) \times (67) \times (-16)$

$= 0$

(14) $(-3)(-6)(3)$

$= 54$

(15) $(-1)(-1)(-1)(-1)(-2)(-1)(-1)(-1)(-1)$

$= -2$

(16) $(9) \times (-1) \times (-2) \times (1) \times (2)$

$= 36$

☺ **Calculate:** (a) $(-1)^{100} \times (-2)^5 = (+1) \times (-32) = -32$

(b) $\{-2[-3(2 \times -1)]\} = [-2[-3(-2)]] = [-2(+6)]] = -12$

A1.15 Division of integers:

Exercise 15:

Calculate the following:

(1) $15 \div (-3)$

$= -5$

(2) $(-55) \div (-11)$

$= 5$

(3) $(144) \div 12$

$= 12$

(4) $\frac{35}{-7}$

$= -5$

(5) $(-22) \div (0)$

$=$ undef.

(6) $(-24) \div (-8)$

$= 3$

(7) $\frac{64}{4}$

$= 16$

(8) $0 \div (14)$

$= 0$

(9) $\frac{-48}{8} \div -3$

$= -6 \div -3 = 2$

(10) $-28 \div -7$

$= 4$

(11) $\frac{-20-2}{11}$

$= \frac{-22}{11} = -2$

(12) $-88 \div -2 \div -4$

$= 44 \div -4 = -11$

(13) $(36) \div (-3)$

$= -12$

(14) $\frac{-27}{-9}$

$= 3$

(15) $(-40) \div (-2) \div (-4)$

$= 20 \div (-4) = -5$

(16) $64 \div 8$

$= 8$

A1.16 Combination of operations:

Exercise 16:

Calculate:

(1) $[15 - (-2)] \times (-3)$

$= [15+2] \times (-3)$

$= [17] \times (-3)$

$= -51$

(2) $-11 - (-16 \div 4) + 3$

$= -11 - (-4) + 3$

$= -11 + 4 + 3$

$= -4$

(3) $[4 + (-3)]^3 + 3^2$

$= [4-3]^3 + 9$

$= [1]^3 + 9$

$= 1 + 9 = 10$

(4) $4 \times 0 + (-3)(1) - 15(0)$

$= 0 + (-3) - 0$

$= -3$

(5) $-4 \times (25 \div -5) \div 2$

$= -4 \times (-5) \div 2$

$= 20 \div 2$

$= 10$

(6) $[-3 \times (-8) \div (-4)] \times 2 - (-7)$

$= [24 \div (-4)] \times 2 + 7$

$= -6 \times 2 + 7$

$= -12 + 7 = -5$

(7) $\sqrt{(-8)(-2) + 18 + 2}$

$= \sqrt{16 + 9}$

$= \sqrt{25}$

$= 5$

(8) $-50 \times 3 \div (-5) + (-1 - 2)$

$= -150 \div (-5) + (-3)$

$= 30 - 3$

$= 27$

(9) $-37 \div 37$

$= -1$

(10) $14 \div 1 + 0 \times -6$

$= 14 + 0$

$= 14$

(11) $\frac{36}{6} - \frac{-42}{-2}$

$= 6 - (21)$

$= 6 - 21$

$= -15$

(12) $\frac{(-14)(7)}{50 - 1}$

$= \frac{-98}{49}$

$= -2$

(13) $(5 - 3)^3 - (-4 - 2) + 0 \times 16$

$= (2)^3 - (-6) + 0$

$= 8 + 6$

$= 14$

(14) $17 - [-7 + 8 - (-3)]$

$= 17 - [-7 + 8 + 3]$

$= 17 - [4]$

$= 17 - 4 = 13$

(15) $-5 - [2 \times (-4)] - (-1)$

$= -5 - [-8] + 1$

$= -5 + 8 + 1$

$= 4$

(16) $3[15 \div (-3)] \times (-2)$

$= 3[-5] \times (-2)$

$= -15 \times -2$

$= 30$

(17) $\frac{60 \div 15}{12 - 16}$

$= \frac{4}{-4}$

$= -1$

(18) $\sqrt[3]{(13 - 9) \times (-10 + -5)}$

$= \sqrt[3]{(4) \times (2)}$

$= \sqrt[3]{8}$

$= 2$

(19) $(-3)^3 + 2[3 - 6]$

$= -27 + 2[-3]$

$= -27 - 6$

$= -33$

(20) $(3)^3 - (-2)^2 + (-1)^7$

$= 27 - (4) + (-1)$

$= 27 - 4 - 1$

$= 22$

(21) $\sqrt{(-1 - 2)^2 + [1 - (-3)]^2}$

$= \sqrt{(-3)^2 + [1 + 3]^2}$

$= \sqrt{9 + (4)^2}$

$= \sqrt{9 + 16} = \sqrt{25}$

$= 5$

(22) $\frac{5 - (-3) + 2^2}{(2)(-3)}$

$= \frac{5 + 3 + 4}{-6}$

$= \frac{12}{-6}$

$= -2$

☺ **Twelve people owe the bank a total amount of R12 430. They have paid back R620. A further loan of R3 730 is granted to them. If they are all responsible for the loan, how much does each person owe?**

$R12\,430 - R620 + R3\,730$

$= R11\,810 + R3\,730$

$= R15\,540$

$\therefore \frac{R15\,540}{12}$

$= R1\,295$

A1.17 Substitution:

Exercise 17:

(1) Calculate the value of the following expressions, if $x = -2$; $y = 4$ and $z = 5$:

(a) xyz

$= (-2)(4)(5)$

$= -40$

(b) $x^2 - y^2$

$= (-2)^2 - (4)^2$

$= 4 - 16$

$= -12$

(c) $(x - y)^2$

$= [(-2) - (4)]^2$

$= [-2 - 4]^2$

$= [-6]^2$

$= 36$

(d) $x^2y + zy + z$

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

$= (4)(4) + 20 + 5$

$= 16 + 20 + 5$

$= 41$

(e) $\frac{yz}{x}$

$= \frac{(4)(5)}{(-2)}$

$= \frac{20}{-2}$

$= -10$

(f) $z - x$

$= (5) - (-2)$

$= 5 + 2$

$= 7$

(2) If $a = 0$; $b = -3$ $c = -1$ and $d = 7$, calculate:

(a) $2(a + b + d)$

$= 2[0 + (-3) + (7)]$

$= 2[0 - 3 + 7]$

$= 2[4]$

$= 8$

(b) $abcd$

$= (0)(-3)(-1)(7)$

$= 0$

(c) $c^3 + b^2 - d$

$= (-1)^3 + (-3)^2 - (7)$

$= -1 + 9 - 7$

$= 1$

(d) $3b + 2c - 5a$

$= 3(-3) + 2(-1) - 5(0)$

$= -9 - 2 - 0$

$= -11$

(e) $(d - c)^2$

$= [(7) - (-1)]^2$

$= [7 + 1]^2$

$= (8)^2$

$= 64$

(f) $\sqrt{-bd - 4c}$

$= \sqrt{-(-3)(7) - 4(-1)}$

$= \sqrt{21 + 4}$

$= \sqrt{25}$

$= 5$

☺ **The speed (v) of a motor after t seconds is determined by the formula: $v = u + at$. If $u = -3$ and $a = -5$, determine the speed of the motor after 6 seconds.**

$\therefore V = (-3) + (-5)(6)$

$= -3 - 30 \qquad \therefore V = -33$

A1.18 REVISION EXERCISE:

(1) Tabulate:

(a) the factors of 30: $F_{30} = \{1; 2; 3; 5; 6; 10; 15; 30\}$

(b) the prime factors of 30: $2 \times 3 \times 5$

(c) the smallest multiple of 30: 30

(d) the factors of 30 which are complete squares: 1

(2) (i) Determine the prime factors of:

(a)
5	25
5	5
	1

$25 = 5^2$

(b)
2	40
2	20
2	10
5	5
	1

$40 = 2^3 \times 5$

(c)
2	60
2	30
3	15
5	5
	1

$60 = 2^2 \times 3 \times 5$

(d)
2	12
2	6
3	3
	1

$12 = 2^2 \times 3$

(e)
2	30
3	15
5	5
	1

$30 = 2 \times 3 \times 5$

(f)
2	98
7	49
7	7
	1

$98 = 2 \times 7^2$

(g)
5	35
7	7
	1

$35 = 5 \times 7$

(h)
2	64
2	32
2	16
2	8
2	4
2	2
	1

$64 = 2^6$

(i)
2	90
5	45
3	9
3	3
	1

$90 = 2 \times 3^2 \times 5$

(ii) Use (i) and calculate the following:

(a) The HCF of 25; 40 and 60:

$25 = 5 \times 5$

$40 = 2 \times 2 \times 2 \times 5$

$60 = 2 \times 2 \times 3 \times 5$

$\therefore HCF = 5$

(b) The LCM of 12; 30 and 64:

$12 = 2 \times 2 \times 3$

$30 = 2 \times 3 \times 5$

$64 = 2 \times 2 \times 2 \times 2 \times 2 \times 2$

$\therefore LCM = 2 \times 2 \times 3 \times 5 \times 2 \times 2 \times 2 \times 2$

$= 960$

(c) The HCF and the LCM of 30; 35 and 90:

$30 = 2 \times 3 \times 5$

$35 = 5 \times 7$

$90 = 2 \times 3 \times 3 \times 5$

$\therefore HCF = 5$

$\therefore LCM = 2 \times 3 \times 5 \times 7 \times 3 = 630$

(3) Calculate the following, without using a calculator. If necessary, use prime factors:

(a) $\sqrt{1\,296}$

2	1296
2	648
2	324
2	162
3	81
3	27
3	9
3	3
	1

$= \sqrt{2^2 \times 2^2 \times 3^2 \times 3^2}$

$= 2 \times 2 \times 3 \times 3$

$= 36$

(b) $\sqrt{144} + \sqrt{9}$

$= 12 \div 3$

$= 4$

(c) $\sqrt[3]{(1 + 26)^3}$

$= \sqrt[3]{27^3}$

$= 27$

(d) $(4 + 2)^2 - 3^3$

$= (6)^2 - 27$

$= 36 - 27$

$= 9$

(e) $\sqrt{\sqrt{6 \times 18 \times 12}}$

$= \sqrt{\sqrt{1296}}$ sien (a)

$= \sqrt{36}$

$= 6$

(f) $\sqrt{1\,089}$

3	1089
3	363
11	121
11	11
	1

$= \sqrt{3 \times 3 \times 11 \times 11}$

$= \sqrt{3^2 \times 11^2}$

$= 3 \times 11 = 33$

(g) $1^2 + 7^2 - \sqrt[3]{64}$

$= 1 + 49 - 4$

$= 46$

(h) $\sqrt{10^2 + 3^2 + 3 \times 2^2}$

$= \sqrt{100 + 9 + 12}$

$= \sqrt{121}$

$= 11$