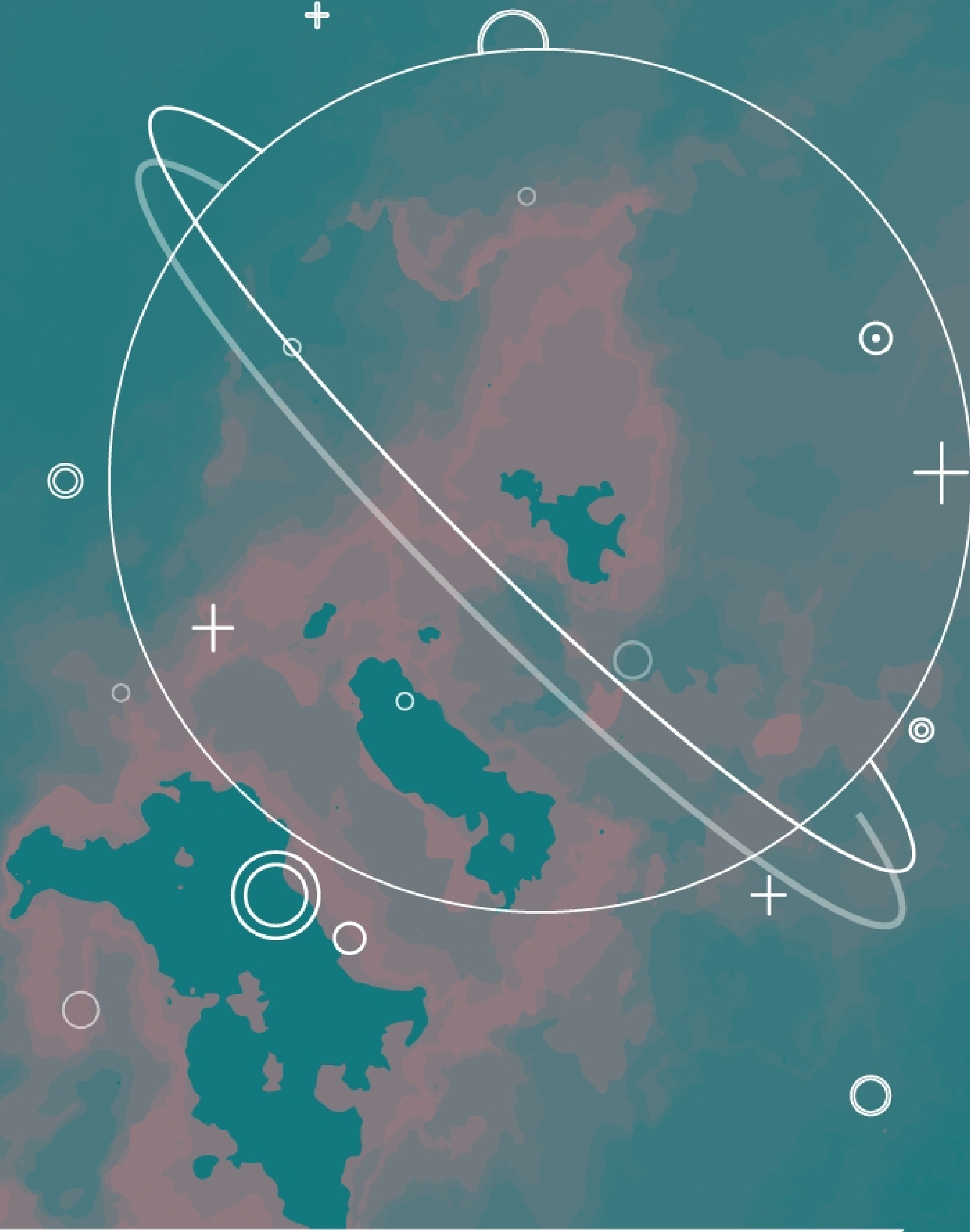

CHAPTER 1

Whole Numbers

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MathU Teaching® Emporium

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In this chapter you will engage with different kinds of numbers that are used for counting, measuring, solving equations and many other purposes.

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1 PROPERTIES OF NUMBERS

1.1 Different types of numbers

The natural numbers

The numbers that we use to count are called **natural numbers**:

$1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8 \quad 9 \quad 10 \quad 11 \quad 12 \quad 13 \quad 14$

Natural numbers have the following properties:

> **Note**
>
> When you add two or more natural numbers, you get a natural number again.
>
> When you multiply two or more natural numbers, you get a natural number again.

> **Note**
>
> Mathematicians describe this by saying: The system of natural numbers is **closed under addition and multiplication.**

However, when a natural number is subtracted from another natural number the answer is not always a natural number again. For example, there is no natural number that provides the answer to $5-20$.

Similarly, when a natural number is divided by another natural number the answer is not always a natural number again. For example, there is no natural number that provides the answer to $10 \div 3$.

> **Note**
>
> When subtraction or division is done with natural numbers, the answers are not always natural numbers.

> **Note**
>
> The system of natural numbers is **not closed under subtraction or division.**

1.2 The whole numbers

Although we don't use 0 for counting, we need it to write numbers. Without 0, we would need a special symbol for 10, all multiples of 10 and some other numbers. For example, all the numbers that belong in the yellow cells below would need a special symbol.

	41	42	43	44	45	46	47	48	49
	51	52	53	54	55	56	57	58	59
	61	62	63	64	65	66	67	68	69
	71	72	73	74	75	76	77	78	79
	81	82	83	84	85	86	87	88	89
	91	92	93	94	95	96	97	98	99
	111	112	113	114	115	116	117	118	119

The natural numbers combined with 0 is called the system of **whole numbers**.

If you are working with natural numbers and you add two numbers, the sum will always be different from any of the two numbers added. For example: $21 + 25 = 46$ and $24 + 1 = 25$. If you are working with whole numbers, in other words including 0, this is not the case. When 0 is added to a number the answer is just the number you start with: $24 + 0 = 24$.

For this reason, 0 is called the **identity element** for addition. In the set of natural numbers there is no identity element for addition.

1.3 The integers

In the set of whole numbers, no answer is available when you subtract a number from a number smaller than itself. For example there is no whole number that is the answer for $5 - 8$. But there is an answer to this subtraction in the system of integers.

$5 - 8 = -3$. The number -3 is read as "negative 3" or "minus 3".

The whole numbers start with 0 and extend in one direction:

$$0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad \rightarrow \quad \rightarrow \quad \rightarrow \quad ......$$

The integers extend in both directions:

$$...... \quad \leftarrow \quad \leftarrow \quad \leftarrow \quad -5 \quad -4 \quad -3 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad \rightarrow \quad \rightarrow \quad \rightarrow \quad ......$$

All whole numbers are also integers. The set of whole numbers forms part of the set of integers. For each whole number, there is a negative number that corresponds with it. The negative number -5 corresponds to the whole number 5 and the negative number -120 corresponds to the whole number 120.

Within the set of integers, the sum of two numbers can be 0.

For example $20 + (-20) = 0$ and $135 + (-135) = 0$.

20 and -20 are called **additive inverses** of each other.

1.4 The rational numbers

The system of integers does not provide an answer for all possible division questions. For example, as we see above, the answer for $12 \div 5$ is not an integer.

To have answers for all possible division questions, we have to extend the number system to include fractions and negative fractions, in other words, numbers of the form $\frac{\text{integer}}{\text{integer}}$. This system of numbers is called the **rational numbers**. We can represent rational numbers as common fractions or as decimal numbers.

1.5 The irrational numbers

Rational numbers do not provide for all situations that may occur in mathematics. For example, there is no rational number which will produce the answer 2 when it is multiplied by itself.

$(\text{number}) \times (\text{same number}) = 2$
$2 \times 2 = 4$ and $1 \times 1 = 1$, so clearly, this number must be between 1 and 2.

But there is no number which can be expressed as a fraction, in either the common fraction or the decimal notation, which will solve this problem. Numbers like these are called **irrational numbers**.

Here are some more examples of irrational numbers:

$$\sqrt{5} \quad \sqrt{10} \quad \sqrt{3} \quad \sqrt{7} \quad \pi$$

Note

The rational and the irrational numbers together are called the **real numbers**.

2 CALCULATIONS WITH WHOLE NUMBERS

Do not use a calculator at all in Section 1.2.

2.1 Estimating, rounding off and compensating

What you were trying to do in question 1 is called **estimation**. To estimate, when working with numbers, means to try to get close to an answer without actually doing the calculations. However, you can do other, simpler calculations to estimate.

When the goal is not to get an accurate answer, numbers may be rounded off. For example, the cost of 51 chickens at R38 each may be **approximated** by calculating 50×40. This is clearly much easier than calculating $51 \times R\,38$.

> **Note**
>
> To approximate something means to try to find out more or less how much it is, without measuring or calculating it precisely.

The cost of 51 chickens at R38 each is approximately R$2\ 000$.

This approximation was obtained by rounding both 51 and 38 off to the nearest multiple of 10, and then calculating with the multiples of 10.

Suppose you have to calculate $R\,823 - R\,273$.

An estimate can be made by rounding the numbers off to the nearest 100:

$R\,800 - R\,300 = R\,500$.

2.2 Adding in columns

You can calculate $3\ 758 + 5\ 486$ as shown on the left below.

	3 758
	5 486
Step 1	8 000
Step 2	1 100
Step 3	130
Step 4	14
	9 244

You can do this in short, as shown on the right. This is a bit harder on the brain, but it saves paper!

3 758
5 486
9 244

It is only possible to use the shorter method if you add the units first, then add the tens, then the hundreds and finally, the thousands.

2.3 Multiplying in columns

7×3489 may be calculated as shown on the left below.

	3 489
	$\times 7$
Step 1	63
Step 2	560
Step 3	2 800
Step 4	21 000
	24 423

A shorter method is shown on the right.

3 489
$\times 7$
24 423

47×3489 may be calculated as shown on the left below.

	3 489		3 489
	$\times 47$		$\times 47$
Step 1	63		24 423
Step 2	560		139 560
Step 3	2 800		163 983
Step 4	21 000	*A shorter method is shown on the right.*	
Step 5	360		
Step 6	3 200		
Step 7	16 000		
Step 8	120 000		
	163 983		

2.4 Subtracting in columns

$8432 - 3957$ can be calculated as shown below.

	8432
	-3957
Step 1	5
Step 2	70
Step 3	400
Step 4	4000
Step 5	4475

To do the subtraction in each column, you need to think of 8432 as $8000 + 400 + 30 + 2$, in fact you have to think of it as $7000 + 1300 + 120 + 12$.
In step 1, the 7 of 3 957 is subtracted from 12.

2.5 Long division

Study this method for calculating $13254 \div 56$:

	13 254	
$\mathbf{200} \times 56 = 11200$	11 200	(200 is a rough estimate of the answer for $13254 \div 56$)
	2 054	(2 054 remains after 11 200 is taken from 13 254)
$\mathbf{30} \times 56 = 1680$	1 680	(30 is a rough estimate of the answer for 2 054 $\div$ 56)
	374	(374 remains after 1 680 is taken from 2 054)
6 $\times$ 56 = 336	336	(6 is an estimate of the answer for 374 $\div$ 56)
236 $\times$ 56 = 13 216	38	(38 remains)

So $13254 \div 56 = 236$ remainder 38, or $13254 \div 56 = 236\frac{38}{56} = 236\frac{19}{28}$, which can also be written as 236,68 (correct to two decimal figures).

The work can also be set out as follows:

	6			
	30			
	200			236
56	13 254	or more briefly as	56	13 254
	11 200			11 200
	2 054			2 054
	1 680			1 680
	374			374
	336			336
	38			38

Note

90 is a multiple of 6, it is also a multiple of 15.

90 is called a **common multiple** of 6 and 15, it is a multiple of both.

The smallest number that is a multiple of both 6 and 15 is the number 30.

30 is called the **lowest common multiple** or **LCM** of 6 and 15.

Note

The LCM of two numbers can be found by multiplying all the prime factors of both numbers, without repeating (except where a number is repeated as a factor in one of the numbers). The HCF of two numbers can be found by multiplying the factors that are common to the two numbers, i.e. in the list of prime factors of both numbers.

3 SOLVING PROBLEMS ABOUT RATIO, RATE AND PROPORTION

3.1 Ratio and rate problems

4 SOLVING PROBLEMS IN FINANCIAL CONTEXTS

Another word for hundredths is **percent**.

Instead of $\frac{5}{100}$ we can write 5%. The symbol % means exactly the same as $\frac{}{100}$.

Note

The amount that a dealer pays for an article is called the **cost price**. The price marked on the article is called the **marked price** and the price of the article after discount is the **selling price**.

4.1 Hire purchase

Sometimes you need an item but do not have enough money to pay the full amount immediately. One option is to buy the item on **hire purchase (HP)**. You will have to pay a deposit and sign an agreement in which you undertake to pay monthly instalments until you have paid the full amount. Therefore:

HP price = deposit + total of instalments

The difference between the HP price and the cash price is the interest that the dealer charges you for allowing you to pay off the item over a period of time.

4.2 Simple interest

When interest is calculated for a number of years on an amount (i.e. a fixed deposit) without the interest being added to the amount each year for the purpose of later interest calculations, it is referred to as simple interest. If the amount is invested for part of a year, the time must be written as a fraction of a year.

Note

Per annum means "per year".

4.3 Compound interest

When the interest earned each year is added to the original amount, and the interest for the following year is calculated on this new amount, the result is known as **compound interest**.

Example:

R$2\ 000$ is invested at 10% per annum compound interest:

End of 1st year: Amount = R$2\ 000$ + R200 interest = R$2\ 200$

End of 2nd year: Amount = R$2\ 200$ + R220 interest = R$2\ 420$

End of 3rd year: Amount = R$2\ 420$ + R242 interest = R$2\ 662$

5 EXERCISES

5.1 Exercise 1

1. In each of the following cases, say whether the answer is a natural number or not:

   1.1 $100 + 400$

   1.2 $100 - 400$

   1.3 100×400

   1.4 $\frac{100}{400}$

2. Answer the following:

   2.1 Is there a smallest natural number, in other words, a natural number that is smaller than all other natural numbers? If so, what is it?

   2.2 Is there a largest natural number, in other words, a natural number that is larger than all other natural numbers? If so, what is it?

3. Is there an identity element for multiplication in the whole numbers? Explain your answer.

4. Answer the following:

   4.1 What is the smallest natural number?

   4.2 What is the smallest whole number?

5. Calculate the following without using a calculator:

   5.1 $100 - 165$

   5.2 $300 - 700$

6. You may use a calculator to calculate the following:

   6.1 $123 - 765$

   6.2 $385 - 723$

7. Five people will share 12 slabs of chocolate equally among them.

   7.1 Will each person get more or less than two full slabs of chocolate?

   7.2 Can each person get another half of a slab?

   7.3 How much more than two full slabs can each person get if the two remaining slabs are divided as shown here?

   7.4 Will each person get $2, 4$ or $2\frac{2}{5}$

8. Express the answers for each of the following division problems in two ways. Firstly, using the common fraction notation and secondly, using the decimal notation for fractions.

   8.1 $\frac{23}{10}$

   8.2 $\frac{23}{5}$

   8.3 $\frac{230}{100}$

   8.4 $\frac{8}{10}$

9. Copy the table and answer the statement by writing "yes" or "no" in the appropriate cell.

Statement	Natural numbers	Whole numbers	Integers	Rational numbers
The sum of two numbers is a number of the same kind (closed under addition).				
The sum of two numbers is always bigger than either of the two numbers.				
When one number is subtracted from another, the answer is a number of the same kind (closed under subtraction).				
When one number is subtracted from another, the answer is always smaller than the first number.				
The product of two numbers is a number of the same kind (closed under addition).				
The product of two numbers is always bigger than either of the two numbers.				
The quotient of two numbers is a number of the same kind (closed under division).				
The quotient of two numbers is always smaller than the first of the two numbers.	(e.g $\cdot \frac{2}{1}$)	(e.g.$\frac{2}{1}$)		

5.2 Exercise 2

1. A shop owner wants to buy chickens from a farmer. The farmer wants **R** 38 for each chicken. Answer the following questions without doing written calculations:

   1.1 If the shop owner has R$10\ 000$ to buy chickens, do you think he can buy more than 500 chickens?

   1.2 Do you think he can buy more than 200 chickens?

   1.3 Do you think he can buy more than 250 chickens?

2. Answer the following:

   2.1 5×4

   2.2 5×40

   2.3 50×40

3. In each case, estimate the cost by rounding off to calculate the approximate cost, without using a calculator. In each case, make two estimates. First make a rough estimate by rounding the numbers off to the nearest 100 before calculating. Then make a better estimate by rounding the numbers off to the nearest 10 before calculating.

   3.1 83 goats are sold for R243 each

   3.2 121 chairs are sold for R258 each

   3.3 R$5\ 673$ is added to R$3\ 277$

   3.4 R874 is subtracted from R$1\ 234$

4. Suppose you have to calculate R823 - R273. An estimate can be made by rounding the numbers off to the nearest 100: R 800 - R300 = R500.

   4.1 By working with R800 instead of R823, an error was introduced into your answer. How can this error be corrected: by adding R23 to the R500, or by subtracting it from R500?

   4.2 Correct the error to get a better estimate.

   4.3 Now also correct the error that was made by subtracting R300 instead of R273.

5. Estimate each of the following by rounding off the numbers to the nearest 100:

   5.1 $812 - 342$

   5.2 $812 + 342$

   5.3 $9 + 278$

   5.4 $8\ 234 - 2\ 776$

   5.5 $2\ 342 - 1\ 876$

   5.6 $2\ 342 + 1\ 876$

   5.7 $3\ 231 - 1\ 769$

   5.8 $5\ 213 - 3\ 768$

6. Find the exact answer for each of the calculations in question 5 by working out the errors caused by rounding, and compensating for them.

   6.1 $812 - 342$

   6.2 $812 + 342$

   6.3 $9 + 278$

   6.4 $8\ 234 - 2\ 776$

   6.5 $2\ 342 - 1\ 876$

   6.6 $2\ 342 + 1\ 876$

   6.7 $3\ 231 - 1\ 769$

   6.8 $5\ 213 - 3\ 768$

5.3 Exercise 3

1. Answer the following:

   1.1 Write $8\ 000 + 1\ 100 + 130 + 14$ as a single number

   1.2 Write $5\ 486$ in expanded notation, as shown in the previous question.

   1.3 Write $3\ 000 + 700 + 50 + 8$ as a single number

2. You can calculate $3\ 758 + 5\ 486$ as shown.

	$3\ 758$
	$5\ 486$
Step 1	$8\ 000$
Step 2	$1\ 100$
Step 3	130
Step 4	14

   Explain how the numbers in each of Steps 1 to 4 are obtained.

3. Calculate each of the following:

   3.1 $3\ 878 + 3\ 784$

   3.2 $10\ 921 + 2\ 472$

   3.3 $298 + 8\ 594$

   3.4 $1\ 298 + 18\ 782$

4. A farmer buys a truck for R$645\ 840$, a tractor for R$783\ 356$, a plough for R$83\ 999$ and a bakkie for R$435\ 690$.

    4.1 Estimate to the nearest R$100\ 000$ how much these items will cost altogether.

    4.2 Use a calculator to calculate the total cost.

5. An investor makes R$543\ 682$ in one day on the stock market and then loses R$264\ 359$ on the same day.

    5.1 Estimate to the nearest R$100\ 000$ how much money she has made in total on that day.

    5.2 Use a calculator to determine how much money she has made.

6. Write each of the following as a single number:

    6.1 $8\ 000 + 400 + 30 + 2$

    6.2 $7\ 000 + 1\ 300 + 120 + 12$

    6.3 $3\ 000 + 900 + 50 + 7$

7. Form an expression like the expression in question 1.1 for each of the following:

    7.1 $8\ 000 + 200 + 100 + 4$

    7.2 $3\ 000 + 400 + 30 + 1$

8. Write expressions like in question 1.2 for the following numbers:

    8.1 $7\ 214$

    8.2 $8\ 103$

9. $8\ 492 - 3\ 957$ can be calculated as shown :

	$8\ 432$
	$-3\ 957$
Step 1	5
Step 2	70
Step 3	400
Step 4	$4\ 000$
Step 5	$4\ 475$

    9.1 How is the 70 in Step 2 obtained?

    9.2 How is the 400 in Step 3 obtained?

    9.3 How is the $4\ 000$ in Step 4 obtained?

    9.4 How is the $4\ 475$ in Step 5 obtained?

10. Calculate each of the following:

    10.1 $9\,123 - 3\,784$

    10.2 $8\,284 - 3\,547$

11. Calculate each of the following:

    11.1 $7\,243 - 3\,182$

    11.2 $6\,221 - 1\,888$

12. Bettina has R$87\,456$ in her savings account. She withdraws R$44\,800$ to buy a car. How much money is left in her savings account?

13. Liesbet starts a savings account by making a deposit of R$40\,000$. Over a period of time she does the following transactions on the savings account:
    a withdrawal of (R$4\,000$)
    a withdrawal of (R$2\,780$)
    a deposit of (R$1\,200$)
    a deposit of (R$7\,550$)
    a withdrawal of(R$5\,230$)
    a deposit of (R$8\,990$)
    a deposit of (R$1\,234$)
    How much money does she have in her savings account now?

14. Solve the following:

    14.1 R$34\,537 -$ R$13\,267$

    14.2 R$135\,349 -$ R$78\,239$

5.4 Exercise 4

1. Solve the following:

    1.1 Write $3\,489$ in expanded notation.

    1.2 Write an expression without brackets that is equivalent to $7 \times (3\,000 + 400 + 80 + 9)$.

2. $7 \times 3\,489$ may be calculated as shown

	$3\,489$
	$\times 7$
Step 1	63
Step 2	560
Step 3	$2\,800$
Step 4	$21\,000$
	$24\,423$

Explain how the numbers in each of Steps 1 to 4 are obtained.

3. 47×3489 may be calculated as shown.

	3489
	$\times \quad 47$
Step 1	63
Step 2	560
Step 3	$2\,800$
Step 4	$21\,000$
Step 5	360
Step 6	$32\,00$
Step 7	$16\,000$
Step 8	$120\,000$

Explain how the numbers in each of Steps 5 to 8 are obtained.

4. Consider the shorter form of the above calculation:

$3\,489$
$\times \quad 47$
$24\,423$
$139\,560$
$163\,983$

Explain how the number $139\,560$ is obtained.

5. Solve the following:

	463
Step 1	78
|	36177
Step 2	
	31 200
Step 3	
	4 680
Step 4	
	297
Step 5	
	234
	63

5.1 Mlungisi's work to do a certain calculation is shown. What is the question that Mlungisi tries to answer?

5.2 Where does the number $31\ 200$ in Step 1 come from? How did Mlungisi obtain it, and for what purpose did he calculate it?

5.3 Explain Step 2 in the same way as you explained Step 1.

5.4 Explain Step 3.

6. Calculate each of the following without using a calculator:

6.1 $\frac{33\ 030}{63}$

6.2 $\frac{18\ 450}{27}$

7. Calculate each of the following:

7.1 $\frac{76\ 287}{287}$

7.2 $\frac{65\ 309}{44}$

8. A municipality has budgeted R$85\ 000$ for putting up new street name boards. The street name boards cost R72 each. How many new street name boards can be put up, and how much money will be left in the budget?

9. A furniture dealer quoted R$840\ 000$ for supplying $3\ 450$ school desks. A school supply company quoted R$760\ 000$ for supplying $2\ 250$ of the same desks. Which provider is cheapest, and what do the two providers actually charge for one school desk?

5.5 Exercise 5

1. Consecutive multiples of 6, starting at 6 itself, are shown in the following table:

6	12	18	24	30	36	42	48	54	60
66	72	78	84	90	96	102	108	114	120
126	132	138	144	150	156	162	168	174	180
186	192	198	204	210	216	222	228	234	240

   1.1 The following table also shows multiples of a number. What is the number?

15	30	45	60	75	90	105	120	135	150
165	180	195	210	225	240	255	270	285	300
315	330	345	360	375	390	405	420	435	450
465	480	495	510	525	540	555	570	585	600

   1.2 Indicate all the numbers that occur in both tables.

   1.3 What is the smallest number that occurs in both tables?

2. Calculate, without using a calculator:

   2.1 $2 \times 3 \times 5 \times 7 \times 11$

   2.2 $2 \times 2 \times 5 \times 7 \times 13$

   2.3 $2 \times 3 \times 3 \times 3 \times 13$

   2.4 $3 \times 5 \times 5 \times 17$

3. Solve the following:

   3.1 Is 2×3, in other words, 6, a common factor of $2\ 310$ and $3\ 510$?

   3.2 Is $2 \times 3 \times 5$, in other words, 30 , a common factor of $2\ 310$ and $3\ 510$?

   3.3 Is there any bigger number than 30 that is a common factor of $2\ 310$ and $3\ 510$?

4. In each case, find the HCF and LCM of the numbers:

   4.1 $1\ 820$ and $3\ 510$

   4.2 $2\ 310$ and $1\ 275$

   4.3 $1\ 820$ and $3\ 510$ and $1\ 275$

   4.4 $2\ 310$ and $1\ 275$ and $1\ 820$

   4.5 780 and $7\ 700$

   4.6 360 and $1\ 360$

5.6 Exercise 6

1. Moeneba collects apples in the orchard. She picks about five apples each minute. Approximately how many apples will Moeneba pick in each of the following periods of time?

   1.1 eight minutes

   1.2 eleven minutes

   1.3 fifteen minutes

   1.4 twenty minutes

2. Garth and Kate also collect apples in the orchard, but they both work faster than Moeneba. Garth collects at a rate of about 12 apples per minute, and Kate collects at a rate of about 15 apples per minute. Copy and complete the following table to show approximately how many apples they will each collect in different periods of time

Period of time in min	1	2	3	8	10	20
Moeneba						
Garth						
Kate						
The three together						

3. Answer the following:

   3.1 What is the ratio between the numbers of apples collected by Kate and Garth during a period of time?

   3.2 Would it be correct to also say that the ratio between the numbers of apples collected by Kate and Garth is $5 : 4$?

4. To make biscuits of a certain kind, five parts of flour are to be mixed with two parts of oatmeal, and one part of cocoa powder. How much oatmeal and how much cocoa powder must be used if 500g of flour is used?

5. A motorist covers a distance of 360 Km in exactly four hours.

   5.1 Approximately how far did the motorist drive in one hour?

   5.2 Do you think the motorist covered exactly 90 Km in each of the four hours? Explain your answer briefly.

   5.3 Approximately how far will the motorist drive in seven hours?

   5.4 Approximately how long will the motorist need to travel 900 Km?

6. Some people use these formulae to do calculations like those in question 5:

   average speed $= \frac{\text{distance}}{\text{time}}$,which means distance $\div$ time;

   distance = average speed $\times$ time;

   time $= \frac{\text{distance}}{\text{average speed}}$, which means distance $\div$ average speed.

   6.1 For each of questions $5c$ and $5d$, state which formula will produce the correct answer.

7. A motorist completes a journey in three sections, making two long stops to eat and relax between sections. During section A he covers 440Km in four hours. During section B he covers 540 in six hours. During section C he covers 280Km in four hours.

   7.1 Calculate his average speed over each of the three sections.

   7.2 Calculate his average speed for the journey as a whole.

   7.3 On the next day, the motorist has to travel 874 Km. How much time (stops excluded) will he need to do this? Justify your answer with calculations.

8. Different vehicles travel at different average speeds. A large transport truck with a heavy load travels much slower than a passenger car. A small bakkie is also slower than a passenger car. In the table on the following page, some average speeds and the times needed are given for different vehicles that all have to be driven for the same distance of 720 Km. Complete the table:

Time in hours	12	9	8	6	5
Average speed in km/h	60				

9. Refer to the table you have just completed.

   9.1 What happens to the time needed if the average speed increases?

   9.2 What happens to the average speed if the time is reduced?

   9.3 What can you say about the product average speed $\times$ time, for the numbers in the table?

6 ANSWERS FOR EXERCISES

6.1 Exercise 1

1.1 Yes

1.2 No

1.3 Yes

1.4 No

2.1 Yes, 1

2.2 No

3.1 Yes. If you multiply by 1, the number stays the same.

4.1 1

4.2 0

5.1 -65

5.2 -400

6.1 -642

6.2 -338

7.1 They will get more than two.

7.2 No

7.3 Two pieces of the chocolate

7.4 Both are correct.

8.1 $2{,}3$ and $2\frac{3}{10}$

8.2 $4{,}6$ and $4\frac{6}{10}$

8.3 $2{,}3$ and $2\frac{3}{10}$

8.4 $0{,}8$ and $\frac{8}{10}$

9.

Statement	Natural numbers	Whole numbers	Integers	Rational numbers
The sum of two numbers is a number of the same kind (closed under addition).	Yes	Yes	Yes	Yes
The sum of two numbers is always bigger than either of the two numbers.	Yes	Yes	No	No
When one number is subtracted from another, the answer is a number of the same kind (closed under subtraction).	No	No	Yes	Yes
When one number is subtracted from another, the answer is always smaller than the first number.	Yes	Yes	No	No
The product of two numbers is a number of the same kind (closed under addition).	Yes	Yes	Yes	Yes
The product of two numbers is always bigger than either of the two numbers.	Yes	Yes	No	No
The quotient of two numbers is a number of the same kind (closed under division).	No	No	No	Yes
The quotient of two numbers is always smaller than the first of the two numbers.	No (e.g $\cdot \frac{2}{1}$)	No (e.g.$\frac{2}{1}$)	No	No

6.2 Exercise 2

1.1 No

1.2 Yes

1.3 Yes

2.1 20

2.2 200

2.3 $2\ 000$

3.1 R $20\ 000$;
R $19\ 200$

3.2 R 30 000;
R 31 200

3.3 R 9 000;
R 8 950

3.4 R 300;
R 360

4.1 By adding it.

4.2 R523

4.3 R 550

5.1 500

5.2 1 100

5.3 300

5.4 5 400

5.5 400

5.6 4 200

5.7 1 400

5.8 1 400

6.1 470

6.2 1 154

6.3 287

6.4 5 458

6.5 466

6.6 4 218

6.7 1 462

6.8 1 445

6.3 Exercise 3

1.1 $9\ 244$

1.2 $5\ 486 = 5\ 000 + 400 + 80 + 6$

1.3 $3\ 758$

2. Step 1: Add $3\ 000$ and $5\ 000$. Step 2: Add 700 and 400. Step 3: Add 50 and 80. Step 4: Add 8 and 6.

3.1 $7\ 662$

3.2 $13\ 393$

3.3 $8\ 892$

3.4 $20\ 080$

4.1 R $1\ 900\ 000$

4.2 R $1\ 948\ 885$

5.1 R $200\ 000$

5.2 R $279\ 323$

6.1 $8\ 432$

6.2 $8\ 432$

6.3 $3\ 957$

7.1 $7\ 000 + 1\ 100 + 190 + 14$

7.2 $2\ 000 + 1\ 300 + 120 + 11$

8.1 $6\ 000 + 1\ 100 + 100 + 14$

8.2 $7\ 000 + 1\ 000 + 90 + 13$

9.1 $120 - 50 = 70$

9.2 $1\ 300 - 900 = 400$

9.3 $7\ 000 - 3\ 000 = 4\ 000$

9.4 $4\ 000 + 400 + 70 + 5 = 4\ 475$

10.1 $5\ 339$

10.2 $4\ 737$

11.1 $4\ 061$

11.2 $4\ 333$

12. R $42\ 656$

13. R $46\ 964$

14.1 R $21\ 270$

14.2 R $57\ 110$

6.4 Exercise 4

1.1 $3\ 489 = 3\ 000 + 400 + 80 + 9$

1.2 $7 \times 3\ 489$

2. Step $1 : 7 \times 9 = 63$
   Step $2 : 7 \times 80 = 560$
   Step $3 : 7 \times 400 = 2\ 800$
   Step $4 : 7 \times 3\ 000 = 21\ 000$

3. Step $5 : 40 \times 9 = 360$
   Step $6 : 40 \times 80 = 3\ 200$
   Step $7 : 40 \times 400 = 16\ 000$
   Step $8 : 40 \times 3\ 000 = 120\ 000$

4. $40 \times 3\ 000 + 40 \times 400 + 40 \times 8 + 40 \times 9 = 120\ 000 + 16\ 000 + 3\ 200 + 360 = 139\ 560$

5.1 $36\ 177 \div 78$

5.2 $78 \times 400 = 31\ 200; 400$ is an estimate of the answer to $36\ 177 \div 78$

5.3 $4\ 977$ remains after subtracting $31\ 200$ from $36\ 177$

5.4 60 is an approximation of $4\ 977 \div 78.(60 \times 78 = 4\ 680)$

6.1 524 remainder 18

6.2 683 remainder 9

7.1 265 remainder 232

7.2 $1\ 484$ remainder 13

8. $1\ 180, 5555 \ldots \approx 1\ 180$ street name boards
   $1\ 180 \times 72 = 84\ 960; 85\ 000 - 84\ 960 =$ R 40. There will be R 40 left.

9. The furniture dealer is cheaper.

6.5 Exercise 5

1.1 15

1.2 $30, 60, 90, 120, 150, 180, 210, 240$

1.3 30

2.1 $2\,310$

2.2 $1\,820$

2.3 $3\,510$

2.4 $1\,275$

3.1 Yes

3.2 Yes

3.3 No

4.1 HCF $= 130$
LCM $= 49\,140$

4.2 HCF $= 15$
LCM $= 196\,350$

4.3 HCF $= 5$
LCM $= 4\,176\,900$

4.4 HCF $= 5$
LCM $= 5\,105\,100$

4.5 HCF $= 20$
LCM $= 300\,300$

4.6 HCF $= 40$
LCM $= 12\,240$

6.6 Exercise 6

1.1 40

1.2 55

1.3 75

1.4 100

2.

Period of time in min	1	2	3	8	10	20
Moeneba	5	10	15	40	50	100
Garth	12	24	36	96	120	240
Kate	15	30	45	120	150	300
The three together	32	64	96	256	320	640

3.1 $15 : 12$

3.2 Yes

4. $5 : 2 : 1$ so500 g flour200 g oatmeal and 100 g cocoa powder

5.1 90 km

5.2 No, this is just an average of the total distance travelled. He probably did more in some hours and less in the others.

5.3 630 km

5.4 10 hours

6.1 For 5c : distance $=$ average speed $\times$ time; For 5d : time $= \frac{\text{distance}}{\text{average speed}}$

7.1 Section A: 110 km/h
Section B: 90 km/h
Section C: 70 km/h

7.2 90 km/h

7.3 9 hours and 43 min

8.

Time in hours	12	9	8	6	5
Average speed in km/h	60	90	80	124	148

9.1 It decreases.

9.2 It increases.

9.3 The product speed $\times$ time stays constant.