

CHAPTER 14

Fractions In Decimal Notation

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1 MATHEMATICAL BACKGROUND

It is important to always keep in mind that the **common fraction notation**, the **decimal notation** and the **percentage notation** are just different ways to represent the same numbers.

- **Decimals** are used to describe a limited range of fractional units, namely tenths, hundredths, thousandths, and so on. In this chapter you will do more work with fractions written in decimal notation. When fractions are written in the decimal form, calculations can be done in the same way as for whole numbers.
- **Percentages** make up an even more limited system of describing quantities, in the sense that they allow hundredths only. In practice, however, percentages are extended to include fractional percentages, for example 25,5%.

The **calculator** is an efficient teaching aid for learners to explore and investigate decimals. Learners should know how to program their calculators to add or subtract a decimal number repeatedly. This could assist them in evaluating their ability to count forwards or backwards in decimals. It can also be used to explore the rules for multiplication and division by powers of 10, for example: 10; 100; 1000; 0,1; 0,01 and 0,001 as well as to discover general rules such as the following:

- If you multiply a number by a number less than 1, the answer will be less than the original number.
- When you divide a number by a number between 0 and 1 ($0 < n < 1$), the answer is more than the original number.

2 FRACTIONS IN DECIMAL NOTATION

Background examples

1. $\frac{1}{10}$ (common fraction notation) = 0,1 (decimal notation) therefore $\frac{2}{10} = 0,2$; $\frac{3}{10} = 0,3$; and so on.
2. $\frac{1}{100}$ (common fraction notation) = 0,01 (decimal notation) therefore $\frac{2}{100} = 0,02$; $\frac{3}{100}$; and so on.
3. one tenth is equivalent to ten hundredths therefore $0,1 = 0,10$.
4. 0,35(35 hundredths) can be expressed as any of the following:
 - 1 tenth + 25 hundredths (10 hundredths + 25 hundredths)
 - 2 tenths + 15 hundredths (20 hundredths + 15 hundredths)
 - 3 tenths + 5 hundredths (30 hundredths + 5 hundredths).

This is the normal way of expressing these quantities because, by international agreement, the number of hundredths should be kept below 10.

2.1 Equivalent forms

2.1.1 Fractions in decimal notation

Decimal fractions and common fractions are simply different ways of expressing the same number. We call them different **notations**. To write a **common fraction as a decimal fraction**, we must first express the common fraction with a power of ten (10, 100, 1 000, etc) as the denominator.

Worked Example 1: Common fraction as a decimal fraction

$$\frac{9}{20} = \frac{9}{20} \times \frac{5}{5} = \frac{45}{100} = 0,45$$

If you have a calculator, you can also divide the numerator by the denominator to get the decimal form as a fraction.

Worked Example 2: Using a calculator

$$\frac{9}{20} = 9 \div 20 = 0,45$$

To write a **decimal fraction as a common fraction** we must first express it as a common fraction with a power of ten as the denominator and then simplify if necessary:

Worked Example 3: Decimal fraction as a common fraction

$$\text{For example: } 0,65 = \frac{65}{100} = \frac{65 \div 5}{100 \div 5} = \frac{13}{20}$$

2.1.2 Hundredths, percentages and decimals

It is often difficult to compare fractions with different denominators. Fractions with the same denominator are easier to compare. For this and other reasons, fractions are often expressed as hundredths we can say 6 percent, $\frac{6}{100}$ or 0,06. 6 percent, $\frac{6}{100}$ or 0,06 are just three different ways of writing the same number.

The symbol % is used for percent. Instead of writing "17" percent, we may write 17%.

2.2 Rounding off decimal fractions

Decimal fractions can be rounded in the same way as whole numbers. They can be rounded to the nearest whole number or to one, two or three, etc. figures after the comma.

5mm: If the last digit of the number is 5 or bigger, it is rounded **up** to the next number.

Worked Example 4

1. 13,5 rounded to the nearest whole number is 14.
2. 13,526 rounded to two figures after the comma is 13,53.

If the last digit is 4 or less it is rounded **down** to the previous number

Worked Example 5

1. 13,4 rounded to the nearest whole number is 13.

2.3 Calculations with decimal fractions

To **add** and **subtract** decimal fractions

- tenths may be added to tenths
- tenths may be subtracted from tenths
- hundredths may be added to hundredths
- hundredths may be subtracted from hundredths, etc.

2.3.1 Lets do calculations!

To **multiply** fractions written as decimals, convert the fractions to whole numbers by multiplying to the powers of 10 (for example, $0,3 \times 10 = 3$), do your calculations with whole numbers, and then convert back to decimals again.

Worked Example 6: Multiplying fractions

For example: $13,1 \times 1,01$

$$13,1 \times \mathbf{10} \times 1,01 \times \mathbf{100}$$

$$= 131 \times 101$$

$$= 13\,231$$

$$\therefore 13\,231 \div \mathbf{10} \div \mathbf{100} = 13,231$$

When you do division you can first multiply the number and the divisor by the same number to make the working easier.

Worked Example 7: Multiplying fractions

For example: $21 \div 0,7$

$$= (21,7 \times \mathbf{10}) \div (0,7 \times \mathbf{10})$$

$$= 217 \div 7$$

$$= 31$$

3 EXERCISES

3.1 Exercise 1

1. What fraction of each rectangle is coloured in:

1.1

1.1.1 Red?

1.1.2 What fraction is not coloured in?



1.2

1.2.1 Blue?

1.2.2 Yellow?

1.2.3 What fraction is not coloured in?



1.3

1.3.1 Blue?

1.3.2 Yellow?

1.3.3 What fraction is not coloured in?



1.4

1.4.1 Yellow?

1.4.2 Blue?

1.4.3 What fraction is not coloured in?



2. Give the decimal form of each of the following numbers: (Correct to two decimals)

2.1 $\frac{1}{2}$

2.2 $\frac{3}{4}$

2.3 $\frac{4}{5}$

2.4 $\frac{7}{5}$

2.5 $\frac{7}{2}$

2.6 $\frac{65}{100}$

3. Write each of the following numbers as decimal fractions:

3.1 $2 \times 10 + 1 \times \frac{3}{10}$

3.2 $3 \times 1 + 6 \times \frac{1}{100}$

3.3 three hundredths

3.4 $7 \times \frac{1}{1000}$

4. Write each of the following numbers as fractions in their simplest form:

4.1 0,2

4.2 0,85

4.3 0,07

4.4 12,04

4.5 40,006

5. Write each of the following in the decimal notation:

5.1 five +12 tenths

5.2 two + three tenths + 17 hundredths

5.3 13 hundredths +15 thousandths

5.4 seven hundredths + 154

3.2 Exercise 2

1. Answer the following:

1.1 What is the common fraction notation of 0,3?

1.2 What is the percentage notation of 0,3 ?

1.3 What is the decimal fraction notation of $\frac{1}{4}$?

1.4 What is the percentage notation of $\frac{1}{4}$?

- 1.5 What is the common fraction notation of 15% ?
- 1.6 What is the decimal fraction notation of 15%?
- 1.7 What is the decimal fraction notation of $\frac{1}{8}$?
- 1.8 What is the percentage notation of $\frac{1}{8}$?
- 1.9 What is the common fraction notation of 0,55?
- 1.10 What is the percentage notation of 0,55?
- 1.11 What is the common fraction notation of 1%?
- 1.12 What is the decimal fraction notation of 1%?

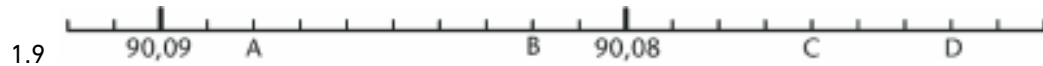
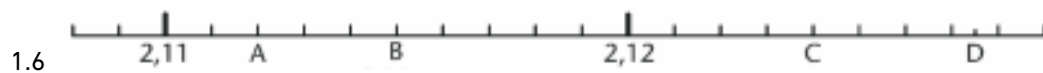
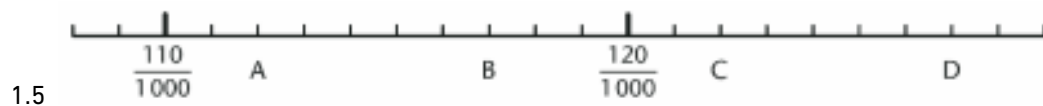
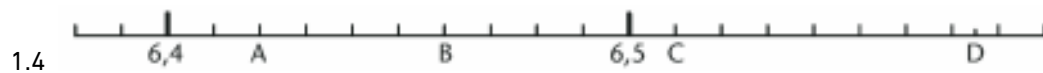
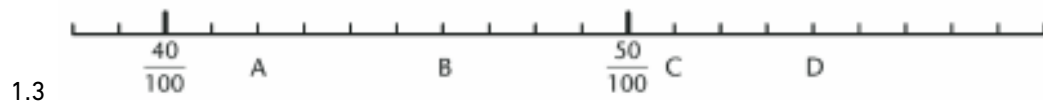
2. Complete the following:

- 2.1 80 hundredth?
 - 2.1.1 In decimal notation?
 - 2.1.2 In percentage notation?
 - 2.1.3 In common fraction notation?
- 2.2 five hundredths
 - 2.2.1 In decimal notation?
 - 2.2.2 In percentage notation?
 - 2.2.3 In common fraction notation?
- 2.3 60 hundredths?
 - 2.3.1 In decimal notation?
 - 2.3.2 In percentage notation?
 - 2.3.3 In common fraction notation?
- 2.4 35 hundredths?
 - 2.4.1 In decimal notation?
 - 2.4.2 In percentage notation?
 - 2.4.3 In common fraction notation?

3.3 Exercise 3

1. Write the values of the marked points (A to D) as accurately as possible in decimal notation.





2. Order the following numbers from biggest to smallest.

5267 1263 1300 12689 365 1267 125 126 12

3. Order the following numbers from biggest to smallest.

0,8 0,05 0,901 0,15 0,465 0,55 0,75 0,4 0,62

4. Select which of the following are not in between the numbers listed below?

4.1 5 and 5,1

4.2 5,1 and 5,11

4.3 5,11 and 5,12

4.4 5,111 and 5,116

4.5 0 and 0,001

4.6 $\frac{1}{2}$ and 1

5. Which is the bigger of the two numbers?

5.1 2,399 and 2,6

5.2 5,604 and 5,64

5.3 0,11 and 0,087

5.4 $\frac{3}{4}$ and 50%

5.5 $\frac{75}{100}$ and $\frac{50}{100}$

5.6 0,125 and 0,25

6. The table gives information about two world-champion heavy weight boxers. If they fight against one another, select which boxer would have the advantage?

	Wladimir Klitschko	Alexander Povetkin
Height (m)	1,98	1,88
Weight (kg)	112	103,3
Reach (m)	2,03	1,91

7. True or false?

7.1 $3,09 < 3,9$

7.2 $3,197 < 3,2$

7.3 $2,31 > 3,30$

7.4 $3,9 < 3,90$

7.5 $4,867 < 5,987$

7.6 $123,321 < 123,3$

8. How many numbers are there between 3,1 and 3,2?

3.4 Exercise 4

1. Round each of the following numbers off to the nearest whole number:

1.1 29,34?

1.2 3,65?

1.3 14,452?

1.4 3,299?

1.5 39,1?

1.6 564,85

1.7 1,768

2. Round each of the following numbers off to one decimal places:

2.1 19,47?

2.2 421,34?

2.3 489,99?

2.4 24,37?

2.5 6,77?

3. Round each of the following numbers off to two decimal places:

3.1 8,345?

3.2 6,632?

3.3 5,555?

3.4 34,239?

3.5 21,899?

4. Mr Peters buys a radio for R206,50. The shop allows him to pay it over six months. How must he pay the money back?

Can he can pay R34,42 for four months (R137,68) and R34,41 for two months (R68,82)?

5. Answer the following:

5.1 Mrs Smith buys a box of 10 kg grapes at the market for R24,77. She must divide it between herself and two friends. If she gets 3,4 kg how much must each of her friends get?

5.2 How much must each person pay Mrs Smith for the grapes?

6. Estimate the answers for each of the following by rounding off the numbers:

6.1 $1,43 \times 1,62$

6.2 $3,89 \times 4,21$

3.5 Exercise 5

1. Four consecutive stages in a cycling race are 21,4 km, 14,7 km, 31 km and 18,6 km long. How long is the whole race?

2. Calculate each of the following:

2.1 $16,52 + 2,35$

2.2 $16,52 + 9,38$

2.3 $16,52 + 9,78$

2.4 $30,08 + 2,9$

2.5 $0,042 + 0,103$

2.6 $9,99 + 0,99$

3. Calculate each of the following:

3.1 $45,67 - 23,25$

3.2 $45,67 - 23,80$

3.3 $187,6 - 98,45$

3.4 $1,009 - 0,998$

3.5 $0,9 - 0,045$

3.6 $65,7 - 37,6$

4. The following set of measurements (in cm) was recorded during an experiment: 56,8 ; 55,4 ; 78,9 ; 57,8 ; 34,2 ; 67,6 ; 45,5 ; 34,5 ; 64,5 ; 88

4.1 Find the sum of the measurements and round to off to the nearest whole number.

4.2 First round off each measurement to the nearest whole number and then find the sum.

4.3 Which of your answer in 4.1 and 4.2 is closest to the actual sum?

5. By how much is 0,7 greater than 0,07?

6. The difference between two numbers is 0,75. The bigger number is 18,4. What is the other number?

7. Calculate each of the following:

7.1 $0,12 \times 0,3$

7.2 $0,12 \times 0,03$

7.3 $1,2 \times 0,3$

7.4 $350 \times 0,043$

7.5 $0,035 \times 0,043$

7.6 $0,13 \times 0,16$

7.7 $1,3 \times 1,6$

7.8 $0,13 \times 1,6$

8. $30,5 \times 1,3 = 39,65$. Use this answer to work out the following:

8.1 $3,05 \times 1,3$

8.2 $305 \times 1,3$

8.3 $0,305 \times 0,13$

8.4 305×13

8.5 $39,65 \div 30,5$

8.6 $39,65 \div 0,305$

8.7 $39,65 \div 0,13$

8.8 $3,965 \div 130$

9. $3,5 \times 4,3 = 15,05$. Use this answer to work out each of the following:

9.1 $3,5 \times 43$

9.2 $0,35 \times 43$

9.3 $3,5 \times 0,043$

9.4 $0,35 \times 0,43$

9.5 $15,05 \div 0,35$

9.6 $15,05 \div 0,043$

10. Calculate each of the following. You may convert to whole numbers to make it easier.

10.1 $62,5 \div 2,5$

10.2 $6,25 \div 2,5$

10.3 $6,25 \div 0,25$

10.4 $0,625 \div 2,5$

3.6 Exercise 6

1. Answer the following:

1.1 Divide R44,45 between seven people so that each one receives the same amount.

1.2 John saves R15,25 every week. He now has R106,75 saved up. For how many weeks has been saving?

2. Answer the following:

2.1 Calculate $14,5 \div 6$, correct to two decimal places

2.2 Calculate $7,41 \div 5$, correct to one decimal place.

3. Determine the value of x . (Give answers rounded to two decimal places)

3.1 $7,1 \div x = 4,2$

3.2 $x \div 0,7 = 6,2$

3.3 $12 \div x = 6,4$

3.4 $x \div 3,5 = 7$

3.5 $2,3 \times x = 6$

3.6 $0,023 \times x = 8$

4. Answer the following:

4.1 1ℓ of water weighs almost $0,995\text{ kg}$.

4.1.1 What will 50ℓ of water weigh?

4.1.2 What will $0,5\ell$ of water weigh?

4.2 Mince meat costs $\text{R}36,65$ per kilogram (kg).

4.2.1 What will $3,125\text{ kg}$ of mince meat cost?

4.2.2 What will $0,782\text{ kg}$ of mince meat cost?

4 ANSWERS FOR EXERCISES

4.1 Exercise 1

1.1.1 0,36

1.1.2 0,46

1.2.1 0,17

1.2.2 0,28

1.2.3 0,55

1.3.1 0,17

1.3.2 0,28

1.3.3 0,55

1.4.1 0,34

1.4.2 0,38

1.4.3 0,28

2.1 0,50

2.2 0,75

2.3 0,80

2.4 1,40

2.5 3,50

2.6 0,65

3.1 21,3

3.2 3,06

3.3 0,03

3.4 0,007

4.1 $\frac{1}{5}$

4.2 $\frac{17}{20}$

4.3 $\frac{7}{100}$

4.4 $12\frac{1}{25}$

4.5 $40\frac{6}{500}$

5.1 6,2

5.2 2,47

5.3 0,145

5.4 1,61

4.2 Exercise 2

1.1 $\frac{3}{10}$

1.2 30%

1.3 0,25

1.4 25%

1.5 $\frac{15}{100}$

1.6 0,15

1.7 0,125

1.8 12,5%

1.9 $\frac{55}{100}$

1.10 55%

1.11 $\frac{1}{100}$

1.12 0,01

2.1.1 0,8

2.1.2 80%

2.1.3 $\frac{80}{100}$

2.2.1 0,05

2.2.2 5%

2.2.3 $\frac{5}{100}$

2.3.1 0,6

2.3.2 60%

2.3.3 $\frac{60}{100}$

2.4.1 0,35

2.4.2 35%

2.4.3 $\frac{35}{100}$

4.3 Exercise 3

1.1 A = 6,9 B = 7,2 C = 8,4 D = 8,75

1.2 A = 14,2 B = 14,5 C = 14,6 D = 14,9

1.3 A = 0,42 B = 0,46 C = 0,51 D = 0,54

1.4 A = 6,42 B = 6,46 C = 6,51 D = 6,575

1.5 A = 0,112 B = 0,117 C = 0,122 D = 0,127

1.6 A = 2,112 B = 2,115 C = 2,124 D = 2,1275

1.7 A = 6,342 B = 6,346 C = 6,351 D = 6,356

1.8 A = 17,41 B = 17,34 C = 17,26 D = 17,225

1.9 A = 90,088 B = 90,082 C = 90,072 D = 90,073

2. 12 689 5 267 1 300 1 267 1 263 635 126

3. 0,901 0,8 0,75 0,62 0,55 0,465 0,4

4.1 5,5

4.2 5,103

4.3 5,115

4.4 5,113

4.5 0,0002

4.6 0,75

5.1 2,6

5.2 5,64

5.3 0,11

5.4 $\frac{3}{4}$

5.5 $\frac{75}{100}$

5.6 0,25

6.1 Wladimir Klitschko has the advantage of height (he is taller), weight (he is heavier) and his reach is also further (longer).

7.1 True

7.2 True

7.3 False

7.4 False

7.5 True

7.6 False

8.1 Infinitely many

4.4 Exercise 4

1.1 29

1.2 4

1.3 14

1.4 3

1.5 39

1.6 565

1.7 2

2.1 19,5

2.2 421,3

2.3 490,0

2.4 24,4

2.5 6,8

3.1 8,35

3.2 6,63

3.3 5,56

3.4 34,24

3.5 21,90

4.1 True

5.1 3,3 kg

5.2 R8,26

6.1 2,3

6.2 16

4.5 Exercise 5

1. 84,7

2.1 18,87

2.2 25,90

2.3 26,30

2.4 32,98

2.5 0,145

2.6 10,98

3.1 22,42

3.2 21,87

3.3 89,15

3.4 0,011

3.5 0,855

-
- 3.6 28,2
 - 4.1 583 cm
 - 4.2 585 cm
 - 4.3 4(a)
 - 5. 0,63
 - 6. 17,65
 - 7.1 0,036
 - 7.2 0,0036
 - 7.3 0,36
 - 7.4 15,05
 - 7.5 0,001505
 - 7.6 0,0208
 - 7.7 2,08
 - 7.8 0,208
 - 8.1 3,965
 - 8.2 396,5
 - 8.3 0,03965
 - 8.4 3 965
 - 8.5 1,3
 - 8.6 130
 - 8.7 305
 - 8.8 0,0305
 - 9.1 150,5
 - 9.2 15,05
 - 9.3 0,1505
 - 9.4 43

9.5 350

10.1 25

10.2 2,5

10.3 25

10.4 0,25

4.6 Exercise 6

1.1 R6,35

1.2 seven weeks

2.1 2,42

2.2 1,5

3.1 $x = 1,69$

3.2 $x = 4,34$

3.3 $x = 1,88$

3.4 $x = 24,50$

3.5 $x = 2,61$

3.6 $x = 347,83$

4.1.1 49,75 kg

4.1.2 0,4975 kg

4.2.1 R114,53

4.2.2 R28,66