THEME 1

Numbers and numeration

Topic 1: Whole numbers

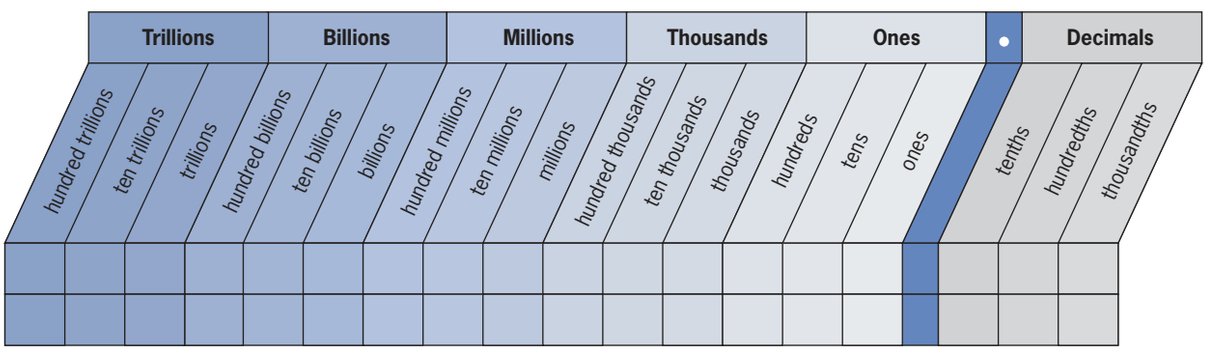
In this topic, we look at reading and writing very large numbers. You have previously examined numbers up to one billion. We now look at very large numbers up to a million million. This is called a trillion and it is written as 1 followed by 12 zeroes.

Unit 1: Working with large numbers

Place value

The value of the position of a digit within a number is called the place value. For example, in 352, the 5 is in the *tens* position, so it shows a value of 50.

Numbers can be infinitely large. We count up to millions, billions and trillions. The chart below shows the place values for our number system up to trillions.



Example

The table below shows the profit a bank made in one year.

Trillions (Tr)			Billions (B)			Millions (M)			Thousands (Th)			H	T	U
H	T	U	H	T	U	H	T	U	H	T	U			
100	10	1	100	10	1	100	10	1	100	10	1	100	10	1
		1	6	5	2	4	3	6	2	8	5	7	9	5

1 652 436 285 795 in expanded form is:
1 000 000 000 000 + 652 000 000 000 + 436 000 000 + 285 000 + 795
Read the number from left to right: ₦1 652 436 285 725.
Read trillion at the first space (after 1).

Read billion at the second space (after 652).
Read million at the third space (after 436).
Read thousand at the fourth space (after 285).
The amount of profit is 1 trillion, 652 billion, 436 million, 285 thousand and 725 naira.

As you move from left to right, each place value is 10 times smaller.
Alternatively, reading from right to left, each place value is 10 times greater.
The place value of 1 is trillions (Tr).
The place value of 4 is hundred millions (HM).
The place value of 3 is ten millions (TM).
The place value of 2 is hundred thousands (HTh).

Tr	HB	TB	B	HM	TM	M	HTh	TTh	Th	H	T	U
1	6	5	2	4	3	6	2	8	5	7	9	5

Exercise 1

1. Look at the place value table and give the value of the following digits in the table.

Trillions			Billions			Millions			Thousands			H	T	U
100	10	1	100	10	1	100	10	1	100	10	1	100	10	1
		4	0	0	9	2	5	1	8	3	7	6	1	5

a) 9 **b)** 2 **c)** 8 **d)** 6
e) 4 **f)** 7 **g)** 3

2. The table gives the abbreviations we use for place values. Copy the table and write the digits in each number in the correct place to show the place value of each one.

Number	Billions			Millions			Thousands			H	T	U
	HB	TB	B	HM	TM	M	HTh	TTh	Th	H	T	U
38 927												
972 140												
731												
912												
1 361 500												
27 714 403												
319 707 055												
1 010 313 001												

Number	Billions			Millions			Thousands			H	T	U
	HB	TB	B	HM	TM	M	HTh	TTh	Th	H	T	U
1 910 275 615												
25 592 716 320												
15 000 310 111												
19 436 792 002												

3. Give the place value of each underlined digit.

a) 5 $\underline{6}$98 **b)** 1$\underline{2}$ 708 563 **c)** 1 $\underline{2}$56 382 **d)** $\underline{8}$50 5258
e) 389 42$\underline{5}$ **f)** 3 1$\underline{2}$3 568 **g)** 21 $\underline{5}$70 200 **h)** 5 945 6$\underline{7}$0
i) $\underline{1}$26 767 **j)** 8 950 $\underline{6}$35

Unit 2: Writing numbers in words

Numbers are written by writing digits in groups of three: units, tens, hundreds. These digits are separated from the next group of thousands, ten thousands and hundred thousands by a space. Similarly a space separates trillions, ten trillions and hundred trillions. When we write numbers in words we use commas to separate the words of each group of three digits. We write 341 576 as three hundred and forty-one thousand, five hundred and seventy six.

Note the spelling of these words:

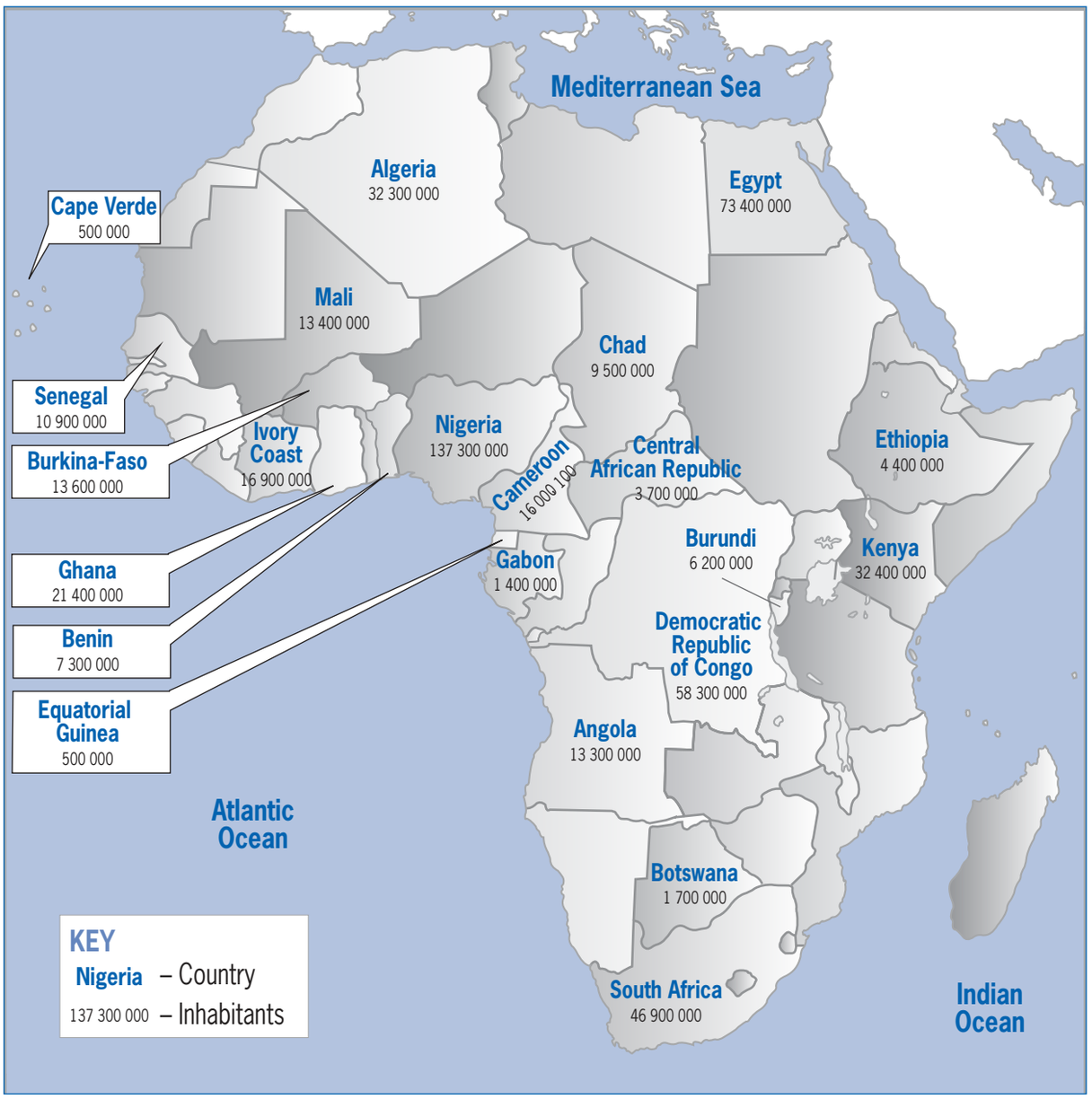
one	eight	fifteen	thousand
two	nine	sixteen	million
three	ten	seventeen	billion
four	eleven	eighteen	trillion
five	twelve	nineteen	
six	thirteen	twenty	
seven	fourteen	hundred	

Examples

500 000:	five hundred thousand
235 875:	two hundred and thirty-five thousand, eight hundred and seventy-five
13 000 000:	thirteen million
15 550 982:	fifteen million, five hundred and fifty thousand, nine hundred and eighty-two
6 720 000 000 005:	six trillion seven hundred and twenty thousand million and five

Do Worksheet 1 in the JSS 1 Workbook.

Exercise 2



1. For how many countries are the population numbers given on the map?

2. a) Which of these countries has the smallest population?
   b) Write this number in words.

3. a) Which of these countries has the highest population?
   b) Write this number in words.

4. a) Which five countries have the highest populations?
   b) Write the populations of these five countries in words.

Exercise 3

1. The following numbers are written using digits. Write each number in words.

a) 800 800
b) 906 104
c) 1 650 950
d) 2 089 405
e) 6 769 098
f) 6 900 065
g) 10 054 734
h) 28 937 211
i) 10 076 225
j) 8 732 163 462 705

2. The following numbers are written in words. Write the numbers using digits.

a) three hundred and forty-two thousand
b) eight hundred and fifty thousand, three hundred and twenty-five
c) four trillion, two hundred and twenty-six thousand, four hundred
d) two million, four hundred and thirty-five thousand, six hundred and twenty
e) seven million, eight hundred and sixty thousand, three hundred and fifteen
f) ten million, five hundred and seventy-eight thousand and fifty
g) fifteen million, seven hundred and fifty-three thousand, nine hundred and twelve
h) twenty-two million, nine hundred and fifty thousand and thirty-four

3. Work with a partner. Create the biggest whole number possible with the following digits.

Do Worksheet 2 in the JSS 1 Workbook.

THEME 1

Numbers and numeration

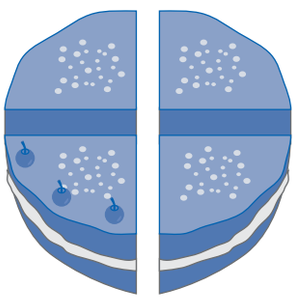
TERM 1

Topic 2: Fractions

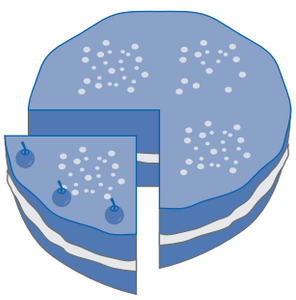
In this topic, we revise the parts of a fraction and types of fractions. We then examine equivalent fractions, compare fractions and convert fractions to decimal numbers and percentages and vice versa.

Unit 1: The parts of a fraction

You and three of your friends have baked a cake and would like to share it equally. The cake is shown below and has been divided into four equal parts.



Three of the four parts have only icing and one part has icing and cherries.



We can say that there are four parts and that one part has a cherry topping. We write this mathematically as:

$\frac{1}{4}$ → One part of the cake has icing and cherries.
→ The cake is divided into 4 parts.

Three parts have only icing, so we can show it in numbers as 3 of the 4 parts.

$\frac{3}{4}$ → Three parts of the cake have only icing.
→ The cake is divided into 4 parts.

The number at the bottom shows how many parts we have divided the cake into and the top number shows the number of parts we refer to as having icing only or both icing and cherries.

We call the number at the bottom the denominator and the number at the top the numerator:

$\frac{3}{4}$ → **Numerator:** How many parts we are referring to

→ **Denominator:** How many parts the whole is divided into

We use fractions to show any number of parts of a whole. Another example is that of an apple that is cut into 5 equal parts. If we eat one of the 5 parts then we can say we have eaten $\frac{1}{5}$ of the whole apple. The denominator is 5 and the numerator is 1.

What fraction will show 3 parts of the apple?

Unit 2: Types of fractions

Proper fractions and improper fractions

Consider the fractions $\frac{1}{2}$, $\frac{2}{5}$, $\frac{4}{7}$ and $\frac{1}{3}$.

In each fraction, the value of the numerator is smaller than the value of the denominator. Such fractions are called proper fractions.

Now, study the fractions $\frac{4}{7}$, $\frac{3}{2}$, $\frac{3}{5}$, $\frac{10}{19}$, $\frac{21}{20}$ and $\frac{27}{18}$.

We know that $\frac{4}{7}$, $\frac{3}{5}$ and $\frac{10}{19}$ are proper fractions. The other fractions in this list are not proper fractions, because the denominator is smaller than the numerator: $\frac{3}{2}$, $\frac{21}{20}$, $\frac{27}{18}$. Such fractions are called improper fractions.

Mixed fractions

When 5 whole oranges are divided equally among 4 students, each student has 1 whole orange, and the remaining orange must be divided into 4 equal parts, 1 part for each student. Each student then has 1 whole and 1 part out of 4 parts, i.e. $1 + \frac{1}{4} = 1\frac{1}{4}$.

A number that combines whole numbers and fractions is called a mixed number or mixed fraction.

Exercise 1

Identify the fractions below as proper, improper or mixed fractions.

1. $\frac{22}{7}$

2. $\frac{2}{5}$

3. $3\frac{1}{2}$

4. $\frac{1}{2}$

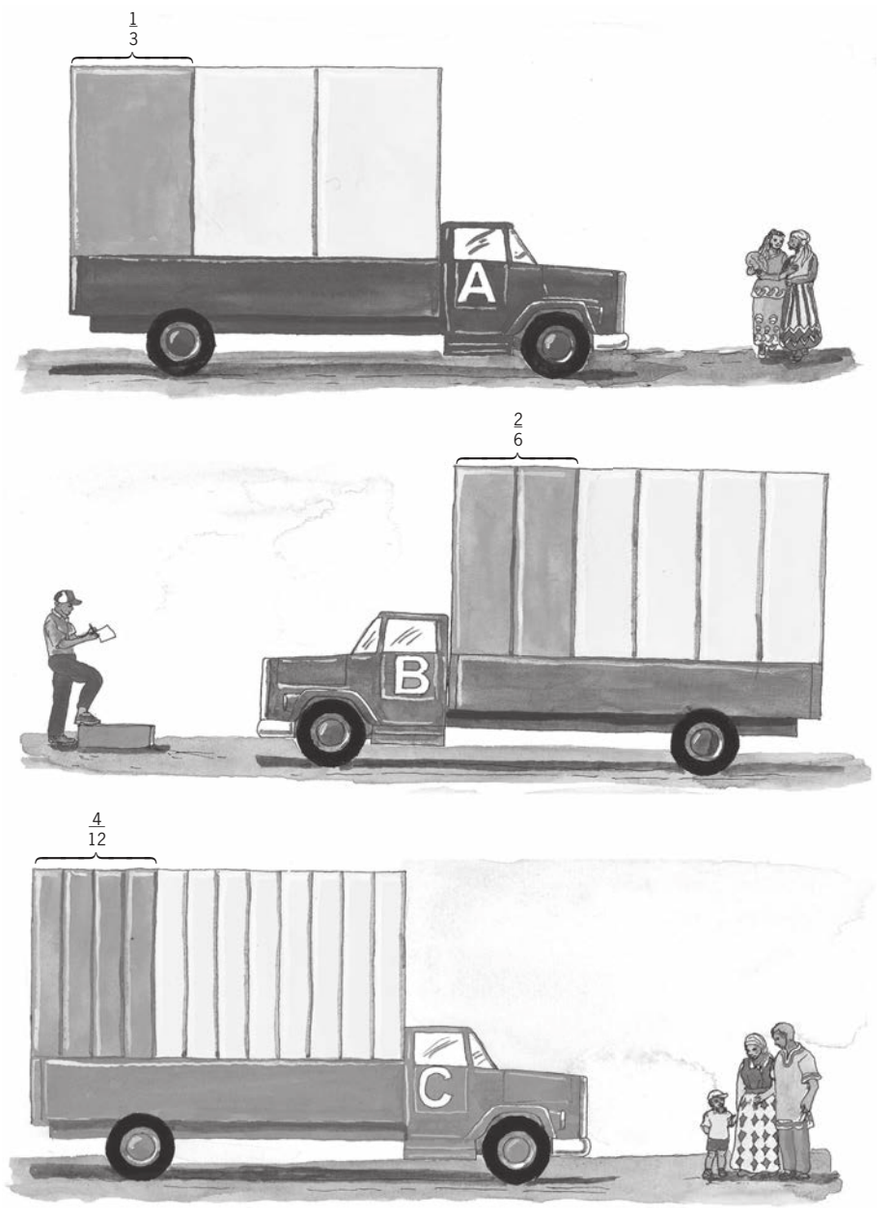
5. $\frac{5}{12}$

6. $2\frac{7}{8}$

7. $\frac{999}{1\,000}$

8. $\frac{11}{6}$

Unit 3: Equivalent fractions



Exercise 2

Look at the pictures of trucks.

1. **a)** How many blocks are there on Truck A?
   b) How many blocks are there on Truck B?
   c) How many blocks are there on Truck C?

2. **a)** What fraction of the blocks on Truck A is shaded?
   b) What fraction of the blocks on Truck B is shaded?
   c) What fraction of the blocks on Truck C is shaded?

3. **a)** Do the fractions have the same value?
b) What are these fractions called?

4. What do you think the word *equivalent* means?

Equivalent fractions are fractions that have the same value or represent the same part of an object.

Examples

1. Explain why $\frac{1}{3}$ and $\frac{2}{6}$ and $\frac{4}{12}$ are equivalent fractions.

2. Explain why the following are equivalent fractions:
$\frac{1}{2}, \frac{2}{4}, \frac{3}{6}, \frac{4}{8}$

3. Two sisters each have a strip of paper exactly the same length. Bisola divides her strip of paper into 4 equal pieces, while Jire divides her paper into 12 equal pieces. Bisola colours in 2 of her pieces of paper pink. How many pieces of paper must Jire colour pink to have an equal amount of pink paper?

Solutions

1. $\frac{1}{3}, \frac{2}{6}$ and $\frac{4}{12}$ are equivalent fractions. When simplified, we get the same result. To find an equivalent fraction, multiply both the numerator and the denominator by the same number.

$\frac{1}{3} \times \frac{2}{2} = \frac{2}{6}$

$\frac{1}{3} \times \frac{4}{4} = \frac{4}{12}$

$\frac{2}{6} \times \frac{2}{2} = \frac{4}{12}$

So $\frac{1}{3}$ and $\frac{2}{6}$ and $\frac{4}{12}$ are equivalent fractions.

2. These are equivalent fractions because they are all equal to $\frac{1}{2}$.

3. Bisola divided her strip of paper into 4 equal pieces, so each piece is $\frac{1}{4}$ of the paper. If she coloured two pieces, she coloured $\frac{2}{4}$ of her strip of paper.

Looking at the drawing below, we can see that dividing the strip of paper into 12 pieces means that each piece will be smaller than if we divided it into 4 pieces. Each piece is $\frac{1}{12}$ of the strip of paper.

To find the equivalent fraction, look at the denominators of the fractions. We need to multiply 4 by 3 to get 12. If we multiply the numerator by 3 also, we get 6. So Jire must colour $\frac{6}{12}$ of her strip of paper to have an equal amount of pink paper.

Exercise 3

1. Study each list and group the equivalent fractions together.

a) $\frac{1}{2}, \frac{2}{4}, \frac{3}{6}, \frac{1}{2}, \frac{2}{3}, \frac{2}{4}, \frac{2}{5}, \frac{4}{10}, \frac{1}{5}$

b) $\frac{1}{3}, \frac{2}{6}, \frac{1}{5}, \frac{4}{8}, \frac{5}{10}, \frac{6}{12}, \frac{3}{6}, \frac{2}{6}, \frac{1}{6}$

c) $\frac{1}{3}, \frac{2}{6}, \frac{3}{9}, \frac{2}{3}, \frac{4}{6}, \frac{2}{6}, \frac{4}{5}, \frac{8}{10}, \frac{2}{10}$

d) $\frac{1}{3}, \frac{4}{12}, \frac{5}{15}, \frac{2}{6}, \frac{4}{6}, \frac{6}{6}, \frac{3}{4}, \frac{1}{2}, \frac{2}{4}$

e) $\frac{1}{4}, \frac{2}{4}, \frac{3}{4}, \frac{3}{6}, \frac{6}{12}, \frac{1}{6}, \frac{1}{4}, \frac{2}{8}, \frac{3}{12}$

f) $\frac{4}{16}, \frac{5}{20}, \frac{2}{7}, \frac{6}{7}, \frac{4}{7}, \frac{3}{5}, \frac{4}{5}, \frac{5}{5}$

g) $\frac{2}{8}, \frac{3}{8}, \frac{4}{8}, \frac{1}{5}, \frac{2}{10}, \frac{3}{15}, \frac{3}{12}, \frac{4}{12}, \frac{6}{12}$

h) $\frac{2}{10}, \frac{4}{20}, \frac{5}{25}, \frac{2}{5}, \frac{4}{10}, \frac{5}{10}, \frac{2}{4}, \frac{2}{8}, \frac{1}{4}$

i) $\frac{2}{5}, \frac{4}{10}, \frac{6}{15}, \frac{3}{6}, \frac{3}{9}, \frac{3}{12}, \frac{1}{7}, \frac{1}{14}, \frac{1}{28}$

j) $\frac{6}{15}, \frac{8}{20}, \frac{10}{25}, \frac{1}{15}, \frac{2}{20}, \frac{4}{20}, \frac{4}{6}, \frac{3}{6}, \frac{2}{6}$

2. Copy and fill in the missing parts of the fractions to form the correct equivalent fractions.

a) $\frac{\square}{4} = \frac{1}{\square}$

b) $\frac{\square}{4} = \frac{8}{\square}$

c) $\frac{4}{8} = \frac{12}{\square} = \frac{\square}{36}$

d) $\frac{7}{\square} = \frac{\square}{24} = \frac{\square}{36} = \frac{28}{\square}$

e) $\frac{1}{5} = \frac{5}{\square}$

f) $\frac{4}{6} = \frac{\square}{48}$

g) $\frac{2}{3} = \frac{4}{\square}$

h) $\frac{3}{\square} = \frac{\square}{63}$

3. Give two equivalent fractions for each fraction.

a) $\frac{2}{4}$

b) $\frac{3}{5}$

c) $\frac{6}{7}$

d) $\frac{9}{13}$

e) $\frac{12}{17}$

f) $\frac{4}{9}$

4. Give an equivalent fraction for each fraction.

a) $\frac{3}{5}$

b) $\frac{2}{6}$

c) $\frac{11}{17}$

d) $\frac{13}{14}$

5. Abolaji wants the fraction of red blocks in Model B to be equivalent to the fraction of red blocks in Model A. How many blocks in Model B need to be red to make that happen?

Model A

Model B