Module 5: Sample Lesson Plans in Mathematics

Users:

All personnel at the school level

Objectives of this Module:

Module 5 provides CL and teachers with sample lesson plans of **challenging topics** in Mathematics. These sample lesson plans can be used or modified for SBI/CBI demonstration lessons.

All the sample lesson plans are in accordance with the *Ministry of Education (MOE) Teaching Syllabus for Mathematics (Primary School)*.

The module also provides concise explanation of what challenging topics are at the beginning of the module.

The module has sample lesson plans on some selected topics. Sample lesson plans have been prepared on topics such as; "Multiplication of a Fraction by a Fraction" and "Measurement of Area", looking at **Lesson Overview, Lesson Plan, Teaching Hints, Use of Chalkboard**, **English as a Teaching Tool** and **Appendix**. On the other hand, the other topics; "Investigation with Numbers –Triangular Numbers", "Shape and Space-(Angles)" and "Collecting and Handling Data" are covered by **Lesson Plan**, **English as a Teaching Tool** and **Appendix** only. Below is a brief explanation about them.

Lesson Overview consists of introduction, objectives of the topic and the lesson and R.P.K.. "Introduction" illustrates the importance and relevance of the lesson to real life. All the "objectives" are taken from the syllabus. "R.P.K." states relevant previous knowledge that pupils are expected to have.

Lesson Plan (sometimes also called lesson notes) is a written down approach to the teaching of a particular topic. This written down approach is sequential and directs the teacher in his/her teaching activities. A well planed lesson helps the teacher to teach with confidence. The format of the lesson plan is the same as the standard lesson plan that GES approves.

The sample lesson plans on "Multiplication of a Fraction by Fraction" and "Measurement of Area" also contain "lesson plan with teaching hints" on the next page of the standard lesson plan. The lesson plan with teaching hints is the same as the standard lesson plan on the previous page except for showing the speech blobs (rounded rectangular shapes) on the lesson plan. The speech blobs suggest where each of the teaching hints can be used.

Teaching Hints provide suggested teaching approaches. It is designed that each of the teaching hints elaborates how to deliver a particular teaching activity (e.g. introduction, Step 1,2…) in the development of a lesson. Because many of these teaching activities are linked with the core points of the lesson, successful delivery of the teaching activity should lead to a sound understanding of the core points.

The teaching hints deal with mainly general teaching approaches and questioning skills for particular teaching activities. The general teaching approaches describe how the teacher can lead pupils to the core points through the activities. When giving some mathematical activities in a classroom, the teaching approaches explain how to conduct the activities, paying special attention to the process skills of Mathematics. The questioning skills should also help the teacher to facilitate pupils to reach a good understanding of the core points. It is recommended that teachers develop better teaching approaches and questions for the lesson and other lessons once they get the sense of the teaching hints discussed.

Use of Chalkboard shows a suggested chalkboard plan. Well-organised chalkboard helps pupils

understand what they are learning in the lesson. Teachers need to consider how to use and organise the chalkboard. This part can help them consider and improve upon the way they plan the use of the chalkboard.

The section of **English as a Teaching Tool** suggests effective use of English Language in the Mathematics lessons. The section gives sample usages of English during particular activities. By using the actual content of the sample lessons, it helps pupils to understand Mathematics content better. It should be noted that a section of Module 4 highlights the use of English language as a teaching tool for other subjects, with a general and rather theoretical explanation of the use of it.

Appendix provides more ideas and alternative activities on the topic discussed.

Developing Lesson Plans by CL and teachers

CL and teachers must be encouraged to develop their lesson plans. Once CL and teachers have become familiar with the sample lesson plans and their teaching and learning strategies, it is strongly recommended that CL and teachers start creating their own original lesson plans of challenging topics. CL and teachers have opportunities to develop lesson plans of challenging topics when preparing their SBI/CBI. Besides, CL can improve lesson plans when discussing the challenging topics with other CLs in CL Sourcebook Training.

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Identification of Challenging Topics

Introduction

There are topics that some teachers find difficult to teach. They call such topics **challenging topics**. The teachers claim that the topics require subject teachers or specialists to teach them. However, with adequate preparation, teaching these topics should not be problematic. It is a matter of preparation. A little bit of extra effort and time to prepare a lesson makes a big difference and helps teachers to improve their lessons greatly.

This section provides some useful information about challenging topics for CLs and teachers. It helps to identify challenging topics.

Challenging Topics in Mathematics

The following are some examples of challenging topics in Mathematics. These are based on opinions gathered from serving teachers at the primary school level.

> *Operation on Fractions, Measurement of Area, Investigation with Numbers, Shape and Space, Collecting and Handling Data*

It seems that the reasons why teachers perceive some topics as challenging vary from teacher to teacher. However, some typical reasons are identifiable. For example, one of the reasons is that challenging topics are seen to be abstract because they are not seen in real life situations. Another reason can be that challenging topics lack relevant curriculum materials that teachers can use as resource materials. The following are some of the reasons some teachers gave for regarding certain topics as challenging.

- The tendency to teach the topics in abstract
- The lack of basic knowledge in Mathematics by teachers
- Absence of relevant materials (TLMs) in the initial stages/introductory stage of the topics
- Reluctance of some teachers to use the relevant curriculum materials and other references in preparation and delivery of the topics
- Unwillingness on the part of the teachers to approach colleagues with expert knowledge on the content and methodology of Mathematics
- The lack of relation between Mathematics and the pupils' environment or everyday life
- The lack of practical activities (little involvement of pupils)
- Insufficient exercises given to pupils to practise
- Negative attitudes towards Mathematics, as a result of Mathematics phobia
- Large class size which does not make it possible for activities to be smoothly carried out

Summary

The challenging topics are seen to be abstract in nature. Besides, there are no teaching/learning materials and relevant curriculum materials to support teachers to teach such topics. Some teachers do not use appropriate teaching methodology, and large class size makes the use of the activity method of teaching difficult.

These problems can be overcome by adopting good strategies in the teaching/learning processes.

The fundamental principle that underlies the In-Service Training (INSET) programme is that teachers learn effectively through sharing, implementation and discussion of a lesson with their colleagues. Thus, the CL and teachers should utilize the opportunities for lesson implementation and post-delivery discussion at SBI/CBI and CL sourcebook training session to treat challenging topics.

Sample Lesson Plans

Lesson 1: Multiplication of a Fraction by a Fraction (Primary 6)

1. Lesson overview

2. Lesson plan

3. Teaching hints

4. The Use of Chalkboard

5. English as a teaching tool

6. Appendix

Lesson 2: Measurement of Area (Primary 4)

1. Lesson overview

2. Lesson plan

3. Teaching hints

4. The Use of Chalkboard

5. English as a teaching tool

6. Appendix

Lesson 3: Investigation with Numbers – Triangular Numbers (Primary 5)

1. Lesson plan

2. English as a teaching tool

3. Appendix

Lesson 4: Shape and Space-Angles (Primary 5)

1. Lesson plan

2. English as a teaching tool

3. Appendix

Lesson 5: Collecting and Handling Data (Primary 6)

1. Lesson plan

2. English as a teaching tool

3. Appendix

Lesson 1: Primary 6 Multiplication of a Fraction by a Fraction

1. Lesson Overview

Introduction

Multiplication of fractions is one of the most difficult topics at the primary level, not only for pupils but also for teachers. The reason seems to be that it is taught just by rote learning (memorizing the formula of the multiplication) without understanding the meaning of multiplication of fractions based on their experiences or contexts in everyday life.

In this section, we are going to see a sample lesson plan on multiplication of fractions which attempts to help pupils at Primary 6 understand the meaning of multiplying two fractions relating to the concept of the area of a rectangle.

General Objectives of the Topic (Operations on Fractions in Primary 6)

The pupil will be able to:

- add or subtract two given fractions with different denominators
- find the result of multiplying two given fractions
- find the result of dividing a given whole number by a given fraction.
- solve word problems using 4 operations (addition, subtraction, multiplication, division) of fractions

Specific Objectives of the Lesson (Multiply a fraction by a fraction)

By the end of the lesson, pupils will be able to:

- multiply two given fractions
- solve word/story problem involving multiplication of fractions

Table 1: Class and Unit that this topic can be found

Class	Unit
Primary 2	Unit 2.8:Fractions
Primary 3	Unit 3.4: Fractions I Unit 3.11: Fractions II
Primary 4	Unit 4.6: Fractions I Unit 4.9: Fractions II
Primary 5	Unit 5.11: Operations on Fractions
Primary 6	**Unit 6.2: Operations on Fractions** **6.2.7 Multiply a fraction by a fraction (←The lesson plan is for this unit!)**

Relevant Previous Knowledge (R.P.K.)

(Topics covered in various classes)

Primary 2

- 1/2 (one-half) and 1/4 (a quarter or one-fourth)

Primary 3

- halves, fourths, eighths, thirds, and sixths
- comparing fractions

- fractions on the number line

Primary 4

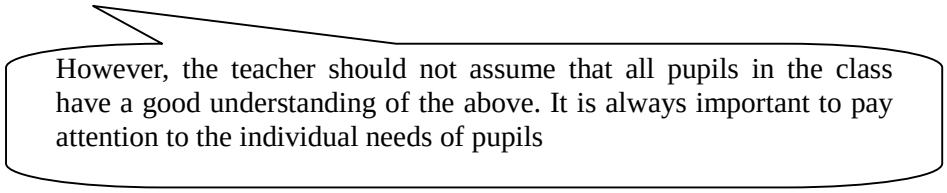
- writing different names for a fraction
- comparing unit fractions
- relating a fraction to the division of a whole number by a counting number
- addition and subtraction of fractions with different denominators
- relating decimal names to tenths and hundredths and locating them on the number line
- relating decimal names and percentage to hundredths

Primary 5

- multiplying a whole number by a fraction
- finding a fraction of a given whole number
- dividing a fraction by a counting number
- renaming simple fractions as tenths and hundredths and writing their decimal names
- comparing two fractions with different denominators
- changing simple fractions to hundredths and writing their percentage names, and vice versa

Primary 6

- ordering three fractions according to size in ascending or descending order
- addition and subtraction of fractions with different denominators

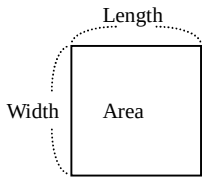


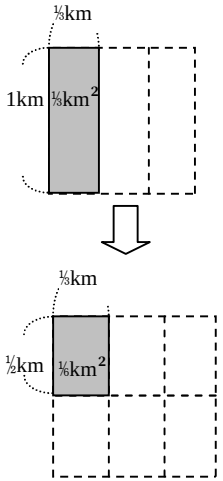
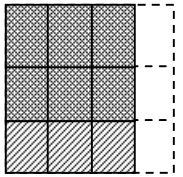
2. Lesson Plan

MULTIPLICATION OF A FRACTION BY A FRACTION

WEEKENDING
SUBJECT: Mathematics
CLASS: Primary 6

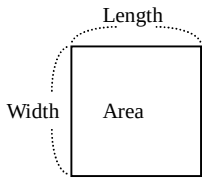
REFERENCES: 1. Mathematics Syllabus, p.106
2. Primary Mathematics 6 (Unimax Macmillan), p.16

DAY / DATE / DURATION	TOPIC/ SUB-TOPIC	R.P.K. OBJECTIVES	TEACHING/LEARNING MATERIALS KEYWORDS/VOCABULARY LIST TEACHER/LEARNER ACTIVITIES	TLMS	CORE POINTS	EVALUATION/ EXERCISE REMARKS
Wednesday 20th of Jun. 2007 60 MINS	UNIT 6.2 TOPIC Operations on fractions SUB-TOPIC Multiplica-tion of a fraction by a fraction	**R.P.K.:** Pupils can find the area of a rectangle. Pupils can multiply a fraction by a whole number. **OBJECTIVES:** By the end of the lesson, the pupil will be able to: S.R.N. 6.2.7 perform activities to solve at least two problems on multiplication of a fraction by a fraction.	Keywords/Vocabulary List: Fraction, Denominator, Numerator INTRODUCTION (5min): Teacher revises with pupils multiplication of a whole number and a fraction. e.g. $4 \times \frac{1}{2}$ Teacher gives pupils the following problem. Mr. Adamu had a plot of land in the shape of a square of side 1 km. Fati's father bought $\frac{1}{3}$ of the land and gave $\frac{1}{2}$ of it to Fati. We want to find out the fraction of the plot Fati got. ACTIVITIES: Step 1 (3min) Teacher gives pupils square sheets of paper to represent the plot of land.	Cut-out sheets (square sheet)	Core Point. 1 (Area) =(Length)×(Width)  	

			Step 2 (7min) Teacher guides pupils to fold the paper into 3 equal parts vertically and shade a third of it. Step 3 (10 min) Teacher guides pupils to fold the sheet again horizontally into halves and shade one half of it in another way. Step 4 (5min) Pupils identify the region with double shading as Fati's portion of the plot that is $\frac{1}{2}$ of $\frac{1}{3}$. Step 5 (5 min) Teacher gives another similar problem as in Step 1. Mr. Adamu had a plot of land in the shape of a square of side 1 km. Fati's father bought $\frac{3}{4}$ of the land and gave $\frac{2}{3}$ of it to Fati. We want to find out the fraction of the plot Fati got. Step 6 (10 min) Pupils fold the square sheet to solve the second problem. Step 7 (10 min) Teacher asks the pupils to count and describe the meaning of the numerator and the denominator of the answer. CONCLUSION (5 min): Teacher and the pupils reach the conclusion on how to calculate the multiplication of two fractions.	Cut-out sheets (square sheet)	Core Point 2  Core Point 3  In multiplying, find the product of the numerators and divide by the product of the denominators. Core Point 4 $\frac{\bigcirc}{\triangle} \times \frac{\diamond}{\star} = \frac{\bigcirc \times \diamond}{\triangle \times \star}$	(knowledge) $\frac{1}{4} \times \frac{1}{3}, \quad \frac{4}{5} \times \frac{2}{3}$ (understanding) $\frac{3}{4} \times \frac{a}{b} = \frac{6}{12}$ (application) Mrs Adu gave $\frac{3}{4}$ of a bar of key soap to Ama. Ama also gave $\frac{2}{5}$ of her share to Kofi. What fraction of the bar of soap did Kofi get? Home work: $\frac{2}{3} \times \frac{1}{2}$, $\frac{2}{9} \times \frac{2}{4}$, $\frac{5}{6} \times \frac{6}{10}$

Lesson Plan with Hints

The lesson plan below shows speech blobs (rounded rectangular shapes) that indicate hints for the teaching approach. The hints for the teaching approach deal with specific skills in the lesson delivery and they are explained in detail on the following pages. The position of each balloon indicates where each of the hints can be used. Also refer to the same lesson plan on the previous page.

DAY / DATE / DURATION	TOPIC/ SUB-TOPIC	R.P.K. OBJECTIVES	TEACHING/LEARNING MATERIALS KEYWORDS/VOCABULARY LIST TEACHER/LEARNER ACTIVITIES	TLMS	CORE POINTS	EVALUATION/ EXERCISE REMARKS
Wednesday 20th of Jun. 2007 60 MINS	UNIT 6.2 TOPIC Operations on fractions SUB-TOPIC Multiplica-tion of a fraction by a fraction	**R.P.K.:** Pupils can find the area of a rectangle. Pupils can multiply a fraction by a whole number. **OBJECTIVES:** By the end of the lesson, the pupil will be able to: S.R.N. 6.2.7 perform activities to solve at least two problems on multiplication of a fraction by a fraction.	Keywords/Vocabulary List: Fraction, Denominator, Numerator INTRODUCTION (5min): Teacher revises with pupils multiplication of a whole number and a fraction. e.g. $4 \times \frac{1}{2}$ Mr. Adamu had a plot of land in the shape of a square of side 1 km. Fati's father bought $\frac{1}{3}$ of the land and gave $\frac{1}{2}$ of it to Fati. We want to find out the fraction of the plot Fati got. ACTIVITIES: Step 1 (3min) Teacher gives pupils square sheets of paper to represent the plot of land.	Cut-out sheets (square sheet)	Core Point. 1 (Area) =(Length)×(Width)  	

Hints for **Introduction**

Hints for **Step 1**

Step 2 (7min)
Teacher guides pupils to fold the paper into 3 equal parts vertically and shade a third of it.

Hints for **Step 4**

Step 3 (10 min)
Teacher guides pupil… into halves and shade one …

Step 4 (5min)
Pupils identify the region with double shading as Fati's portion of the plot that is $\frac{1}{2}$ of $\frac{1}{3}$.

Step 5 (5 min)
Teacher gives another similar problem as in Step 1.

> Mr. Adamu had a plot of land in the shape of a square of side 1 km. Fati's father bought $\frac{3}{4}$ of the land and gave $\frac{2}{3}$ of it to Fati. We want to find out the fraction of the plot Fati got.

Hints for **Step 6**

Step 6 (10 min)
Pupils fold the square sheet to solve the second problem.

Hints for **Step 7**

Step 7 (10 min)
Teacher asks the pupil… the numerator and the d…

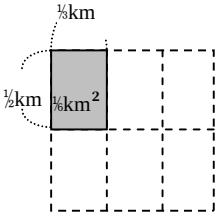
Hints for **Conclusion**

CONCLUSION (5 min):
Teacher and the pupils reach the conclusion on how to calculate the multiplication of two fractions.

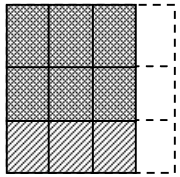
Cut-out sheets (square sheet)

Core Point 2

Hints for **Evaluation**



Core Point 3



In multiplying, find the product of the numerators and divide by the product of the denominators.

Core Point 4

$$\frac{\bigcirc}{\triangle}\times\frac{\diamond}{\star}=\frac{\bigcirc\times\diamond}{\triangle\times\star}$$

(knowledge)
$\frac{1}{4}\times\frac{1}{3}$, $\frac{4}{5}\times\frac{2}{3}$

(understanding)
$\frac{3}{4}\times\frac{a}{b}=\frac{6}{12}$

(application)
Mrs Adu gave $\frac{3}{4}$ of a bar of key soap to Ama.
Ama also gave $\frac{2}{5}$ of her share to Kofi.

What fraction of the bar of soap did Kofi get?

Home work:
$\frac{2}{3}\times\frac{1}{2}$,
$\frac{2}{9}\times\frac{2}{4}$,
$\frac{5}{6}\times\frac{6}{10}$

3. Teaching Hints

The discussion that follows is the suggested teaching approaches for presenting the lesson whose lesson plan can be found on the previous page.

Hints for Introduction

Questioning of Skills for Introduction

By way of introduction, the teacher can ask questions that check the pupils' R.P.K.

Example

T) "Given the length and the width of a rectangle, how do you calculate the area?"

T) "Simplify, $\frac{1}{2}$ of 6."

Hint for Step 1: For the first core question:

Mr. Adamu had a plot of land in the shape of a square of side 1 km. Fati's father bought $\frac{1}{3}$ of the land and gave $\frac{1}{2}$ of it to Fati. We want to find out the fraction of the plot Fati got.

The teacher asks for the intermediate answer from the pupils, that is $\frac{1}{2} \times \frac{1}{3}$. In this step, it is enough for the pupils to understand that the operation on the two numbers must be multiplication.

Approach to Step 1

In the previous lesson, pupils learnt multiplication of a fraction by a whole number

e.g. $\frac{1}{2}$ of 8 = $\frac{1}{2} \times 8 = \frac{8}{2} = 4$

By recalling this step, let the pupils notice that $\frac{1}{2}$ of $\frac{1}{3}$ is $\frac{1}{2} \times \frac{1}{3}$.

Questioning Skills for Step 1

After presenting the first main question, that is, "how many square kilometres of the land did Fati get?" the teacher asks:

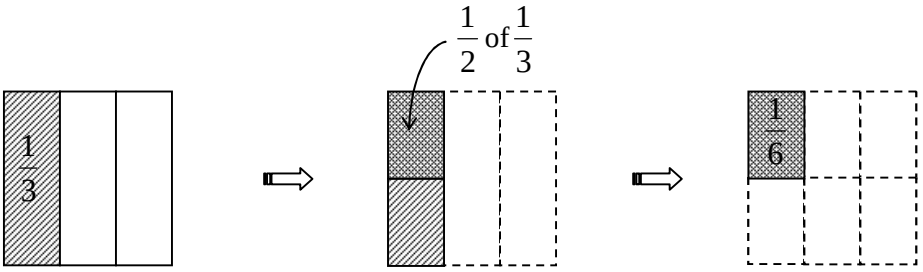
Example

T) Instead of the number 6, Fati was given $\frac{1}{3}$ square kilometres.
"How do you calculate the area?"

Hints for Step 4: Let the pupils notice that the denominator of the answer is 6 and the numerator of the answer is 1.

Approach to Step 4

(1) The teacher demonstrates paper folding and shading to get $\frac{1}{2} \times \frac{1}{3}$ as follows



Step 1
Fold into three equal parts and shade one part.

Step 2
Fold the shaded part into two equal parts and shade one of the two equal parts.

Step 3
Compare the double shaded part to the original whole.

(2) Pupils will follow the above step and consider the meaning of the shaded part.

Questioning Skills for Step 4

After demonstrating how to fold the paper, the teacher asks pupils:

Example

T) "Can you shade the part that Fati was given?"
T) "What is the fraction that describes the given part in relation to the whole area?"
T) "What is the denominator of $\frac{1}{6}$?"
T) "What is the numerator of $\frac{1}{6}$?"

Hints for Step 6: For the second core question:

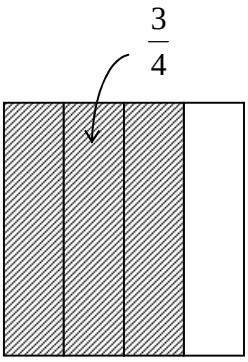
Mr. Adamu had a plot of land in the shape of a square of side 1 km. Fati's father bought $\frac{3}{4}$ of the land and gave $\frac{2}{3}$ of it to Fati. We want to find out the fraction of the plot Fati got.

Let the pupils notice that

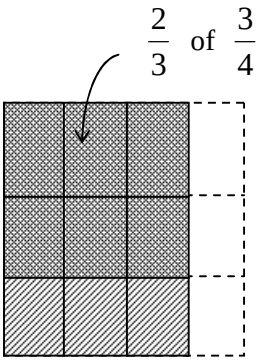
1. the intermediate answer is $\frac{2}{3}\times\frac{3}{4}$.
2. the denominator of the answer is 12 and the numerator of the answer is 6.

Approach to Step 6

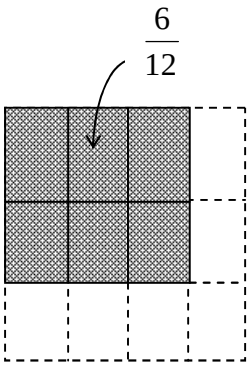
Let the pupils fold a sheet of paper to get $\frac{2}{3}\times\frac{3}{4}$.



Step 1
Fold into four equal parts and shade three parts



Step 2
Fold the shaded part into three equal parts and shade two of the three equal parts.



Step 3
Compare the double shaded part to the original whole.

Questioning Skills for Step 6

When the pupils finish the second main activity, the teacher asks:

Example

T) "Can you shade the part where Fati was given?"
T) "What is the fraction that describes the given part in relation to the whole area?"
T) "What is the denominator of $\frac{6}{12}$?€ 35
T) "What is the numerator of $\frac{6}{12}$?€ 35

Hints for Step 7:

Questioning Skills for Step7

To confirm the number which appeared in the solution, the teacher asks:

Example

T) "How many individual parts are there in the area of the first question?"
T) "How many individual parts are there in the area of the second question?"
T) "Is there any relation between the denominator and the individual parts?"

Hints for Evaluation:

Solve the problems based on knowledge, understanding and application of knowledge.

Hints for Conclusion:

Let the pupils realize that the multiplication of two given fractions is equal to a fraction whose numerator is the multiplication of the two numerators of the given fractions, and denominator is the multiplication of the two denominators of the given fractions.

Approach to Conclusion

1) The teacher confirms that $\frac{1}{2}\times\frac{1}{3}=\frac{1}{6}$ and $\frac{2}{3}\times\frac{3}{4}=\frac{6}{12}$.
2) The teacher asks the pupils what is the relation between the numerator and the denominator in each case.
3) The pupils discuss the above question.
4) The teacher summarizes the ideas and concludes that $\frac{\bigcirc}{\triangle}\times\frac{\diamond}{\star}=\frac{\bigcirc\times\diamond}{\triangle\times\star}$.

Questioning Skills for Conclusion

To conclude the way of calculating the multiplication of two given fractions, after writing symbols $\frac{\bigcirc}{\triangle}\times\frac{\diamond}{\star}=$ on the blackboard, the teacher asks:

Example

T) "What is the symbol on the top of the fraction on the right hand side?

In other words,
T) "How do you calculate the number on the top of the fraction on the right hand side? "
T) "How do you calculate the number below the line?"

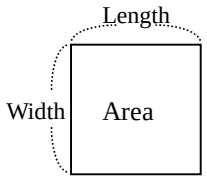
4. The Use of Chalkboard

A sample layout of chalkboard writing is shown below.

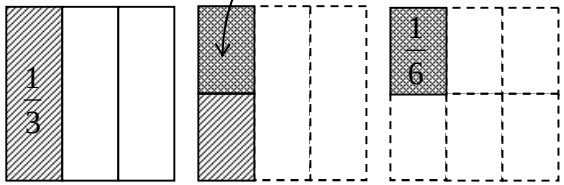
3/Oct/06 Multiplication of fractions

Mr. Adamu had a plot of land in a square shape of 1 km. Fati's father bought $\frac{1}{3}$ of the land and gave $\frac{1}{2}$ of it to Fati. We want to find out the fraction of the plot Fati got.

(Area) = (Length)×(Width)



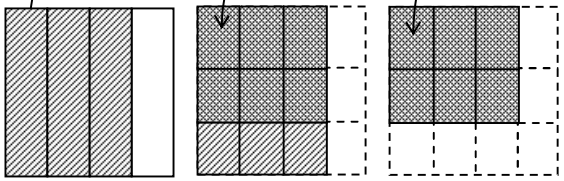
$\frac{1}{2}$ of $\frac{1}{3}$



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

Mr. Adamu had a plot of land in a square shape of 1 km. Fati's father bought $\frac{3}{4}$ of the land and gave $\frac{2}{3}$ of it to Fati. We want to find out the fraction of the plot Fati got.

$\frac{3}{4}$ $\frac{2}{3}$ of $\frac{3}{4}$ $\frac{6}{12}$



$\frac{2}{3} \times \frac{3}{4} = \frac{6}{12}$

Conclusion

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

$$\frac{2}{3} \times \frac{3}{4} = \frac{2 \times 3}{3 \times 4}$$

Conclusion/ today's summary

$$\frac{\bigcirc}{\triangle} \times \frac{\diamond}{\star} = \frac{\bigcirc \times \diamond}{\triangle \times \star}$$

5. English as a Teaching Tool

In Class 4 the pupils will have been introduced to the following FRACTION WORDS and SYMBOLS:

Table 2: Fraction words and symbols

Numerator	Whole	bigger than: >	ascending order	largest
denominator	Part	less than: <	descending order	smallest
		Equivalent		

fourths eighths	Thirds sixths twelfths	Fifths tenths hundredths	half	quarter
(in the topic Fractions I and Fractions II)			(in the topic Measuring Time)	

They will also need to read the written numeral "ninths" in the pupils' book.

Simple definitions are given in the pupils' book. The teacher should ensure that the pupils learn and understand the written definitions. To help the pupils the teacher can display a wall chart showing the key words and their definitions as given in the pupil's book.

In Class 5 the pupils use the same FRACTION WORDS as they used in Class 4 and they revise the concepts covered in Class 4.

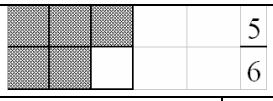
In Class 6 the section on fractions uses the following terms which will have to be reviewed with the pupils.

Table 3: List of the terms which will have to be reviewed with pupils

HCF	Abbreviation for Highest Common Factor
Halves	Irregular spelling
Product	Word Problems e.g. find the product of $\frac{3}{5}$ and $\frac{10}{12}$
One quarter is the same as one fourth	Equivalent terms

The teacher should remind the pupils of the following definitions by displaying a chart on the classroom wall for ready reference:

Table 4: List of the definitions related to Fraction

MATHEMATICS DEFINITIONS – FRACTIONS		
A fraction is a part of a whole	e.g. 	
The numerator is the number at the top of the fraction The denominator is the number below the line	e.g. the numerator is 5 and the denominator is 6	$\frac{5}{6}$
"of" means "x€ 35	$\frac{5}{6}$ of 12 = 10 $\frac{5}{6}$ × 12 = 10	

6. Appendix

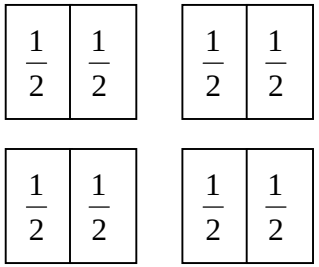
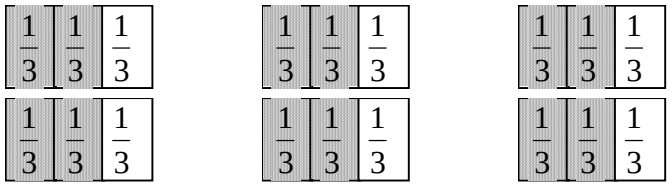
The lesson plan below is an example that the teacher can use to teach the division of a whole number by a fraction, which is one of the most challenging topics in teaching and learning.

DIVISION OF A WHOLE NUMBER BY A FRACTION

WEEKENDING
SUBJECT: Mathematics
CLASS: Primary 6

REFERENCES: 1. Mathematics Syllabus, p. 106
2. Primary Mathematics 6 (Unimax Macmillan), p.17

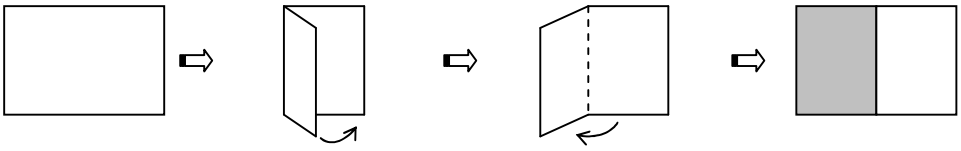
DAY/ DATE/ DURATION	TOPIC/ SUB-TOPIC	R.P.K. OBJECTIVE(S)	TEACHING/LEARNING MATERIALS KEYWORDS/VOCABULARY LIST TEACHER/LEARNER ACTIVITIES	TLMS	CORE POINTS	EVALUATION/ EXERCISE REMARKS
Friday 8th of July 2007 60 MINS	UNIT 6.2 TOPIC Operations on fractions SUB-TOPIC Division of a whole number by a fraction	**R.P.K.:** Pupils can multiply a whole number by a fraction. Pupils can also multiply a fraction by a fraction. **OBJECTIVES:** By the end of the lesson, the pupil will be able to: S.R.N. 6.2.8 divide a whole number by a fraction	Keywords/Vocabulary List: Fraction, Denominator, Numerator INTRODUCTION (5min): Teacher revises with pupils multiplication of a whole number by a fraction, and a fraction by a fraction. Teacher gives pupils the following problem. How many half litre bottles of liquids will fill a four (4) litre container? ACTIVITIES: Step 1 (15min) Teacher gives 4 equal rectangular sheets of papers to pupils where 1 rectangular paper represents a litre. Teacher guides pupils to fold each of the 4 papers into two equal parts and shade one part of each paper. Step 2 (5min) Teacher guides pupils to count the number of halves obtained as the result of	Cut-out sheets (rectangular sheets)	Core Point. 1 There are 8 of halves obtained from the 4. Therefore	

			$4 \div \frac{1}{2}$  Step 3 (25min) Similarly pupils solve the problems $9 \div \frac{1}{3}$ (the figure is omitted), and $6 \div \frac{2}{3}$  Step 4 (5min) Teacher guides pupils to discover how to solve problems involving division of a whole number by a fraction. CONCLUSION (5 min): Teacher and pupils reach the conclusion on how to calculate division of a whole number by a fraction.		$4 \div \frac{1}{2} = 8$ Core Point 2 There are 27 of the one-third in 9. Therefore $9 \div \frac{1}{3} = 27$ Core Point 3 There are 9 of the two-thirds in 6. Therefore $6 \div \frac{2}{3} = 9$ Core Point 4 $4 \div \frac{1}{2} = 8$; $4 \times \frac{2}{1}$ $9 \div \frac{1}{3} = 27$; $9 \times \frac{3}{1}$ $6 \div \frac{2}{3} = 9$; $6 \times \frac{3}{2}$ Generally, in dividing a whole number by a fraction, multiply the whole number by the reciprocal of the fraction. $a \div \frac{b}{c} = a \times \frac{c}{b}$	Solve $8 \div \frac{1}{3}$ Solve $10 \div \frac{1}{4}$ Solve $5 \div \frac{3}{4}$ Class exercise: Solve the following: $5 \div \frac{1}{3}$ $6 \div \frac{5}{2}$ $\square \div \frac{1}{8} = 32$

Activity 1

For a model of $\frac{1}{2}$, fold and shade a rectangular sheet of paper.

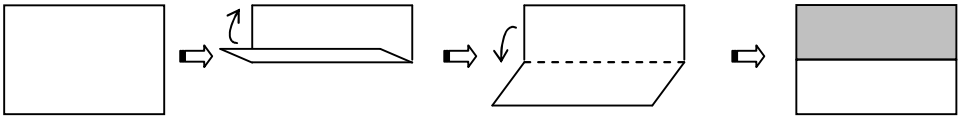
(a)



Step 1 Fold in half vertically

Step 2 Shade one part

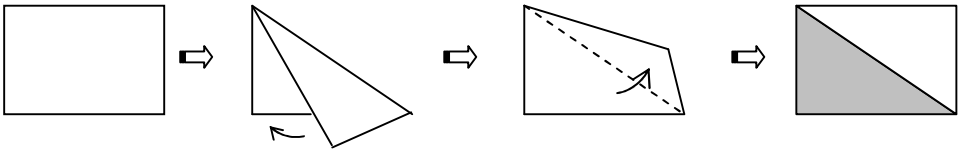
(b)



Step 1 Fold in half horizontally

Step 2 Shade one part

(c)

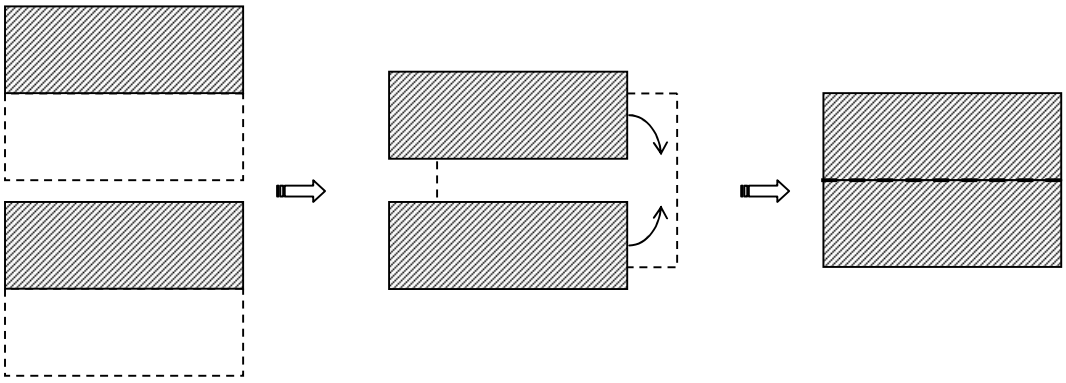


Step 1 Fold in half diagonally

Step 2 Shade one part

Activity 2

(1) Calculate $2 \times \frac{1}{2}$.



Step 1

Shade $\frac{1}{2}$ of each of two sheets of papers.

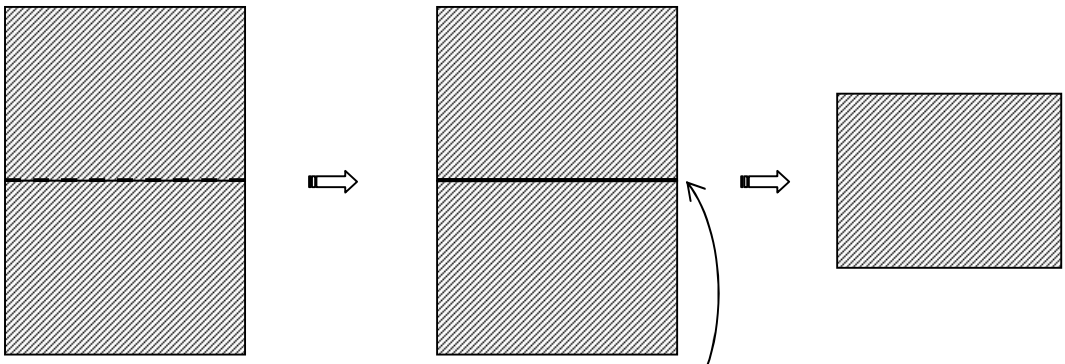
Step 2

Put the two shaded part together.

Step 3

Two halves is 1.

2) Calculate $\frac{1}{2} \times 2$.



Step 1

Shade two sheets of paper and put them together to represent 2.

Step 2

Divide it into two equal parts.

Step 3

One shaded part represents 1.

Lesson2: Primary 4 Measurement of Area

1. Lesson Overview

Introduction

When a farmer wants to farm, he/she takes many things into consideration, particularly, land available to him/her. The building contractor also considers the building plot at his/her disposal. Similarly, in the home, parents also consider the size of their rooms when they are laying beds for their children to sleep on. In our educational institutions, when admitting students into a class, we consider the amount of space in the classroom. When we talk about amount of surface an object possesses, then the concept of area is established.

Area therefore is the amount of surface an object has. It is measured in square units.

General Objectives of the Topic (Measurement of Length and Area in Primary 4)

The pupil will be able to

- measure lengths of line segments in centimetres.
- estimate and verify the lengths of given line segments.
- add measures of lengths in metres and centimetres.
- find the perimeter of given rectangular and circular shapes.
- write lengths given in metres and centimetres using decimal notation.

Specific Objectives of the Lesson (Area of a Square or Rectangular region)

By the end of the lesson, pupils will be able to

- make squares and rectangles using small square tiles (cut-outs).
- find the number of unit squares that will cover a square/rectangular region.

Table 5: Class and Unit that this topic can be found

Class	Unit
Primary 1	Unit 1.12:Measurement of Length, Capacity and Mass
Primary 2	Unit 2.5: Measurement of Length, Capacity and Mass
Primary 3	Unit 3.6: Measurement of Capacity and Weight
Primary 4	**Unit 4.10: Measurement of Length and Area** **4.10.7 Find the number of unit squares that will cover a square/rectangular region(←The lesson plan is for this unit!)** Unit 4.14: Measurement of Capacity and Volume
Primary 5	Unit 5.5: Measurement of Length, Mass and Capacity Unit 5.9: Area and Volume
Primary 6	Unit 6.6: Measurement of Length, Capacity and Mass Unit 6.12: Measurement of Area and Volume

Relevant Previous Knowledge (R.P.K)

(Topics covered in various classes)

Primary 1

- comparing the lengths and heights of various objects that cannot be put side by side.

Primary 2

- measuring and stating the lengths of given distance/heights in metres,
- estimating the lengths of given distances/heights in metres.

Primary 3

- estimating the capacity of containers in litres,
- identifying objects which are heavier or lighter than 1 kilogram,
- estimating the weight of object in kilograms.

Primary 4

- finding lengths of given segments in centimetres,
- estimating the lengths of line segments,
- finding the total lengths of two or more given measures,
- finding the perimeters of given rectangular and circular shapes,
- writing given lengths in decimal notation.

However, the teacher should not assume that all pupils in the class have a good understanding of the above. It is always important to pay attention to the individual needs of pupils

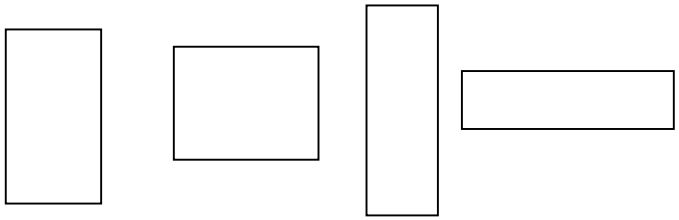
2. Lesson Plan

MEASUREMENT OF AREA

WEEKENDING
SUBJECT: Mathematics
CLASS: Primary 4

REFERENCES: 1. Mathematics Syllabus, p.70
2. Ghana Mathematics Series, Pupil's Book 4 (Ghana Publishing Corporation)p.72

DAY/ DATE/ DURATION	TOPIC/ SUB-TOPIC	R.P.K. OBJECTIVE(S)	TEACHING/LEARNING MATERIALS KEYWORDS/VOCABULARY LIST TEACHER/LEARNER ACTIVITIES	TLMS	CORE POINTS	EVALUATION/ EXERCISE REMARKS
Wednesday 4th of Oct. 2006 60 MINS	UNIT 4.10 TOPIC: Measure-ment of Length and Area SUB-TOPIC: Finding area of a rectangle	**R.P.K.:** Pupils can find the perimeter of a given rectangle. **OBJECTIVES:** By the end of the lesson, the pupil will be able to; S.R.N. 4.10.7 1. make rectangles using small square tiles (cut-outs). 2. find the number of unit squares that will cover a rectangular region.	Keywords/Vocabulary List: Length, width, area, long, wide INTRODUCTION (10 min): Teacher introduces the lesson by telling a story relating to area (e.g. land, plantation, etc.) Story: A farmer walked around his 2 plantations whose shapes are rectangular and said, "I have found the perimeters of my 2 plantations to be the same, so I will harvest the same amount of maize from each of them" ACTIVITIES: Step 1 (5 min) Pupils make 5 or 6 groups. Teacher gives a sheet on which 4 rectangles have been printed with A, B, C, D, and smaller square cut-outs of 1cm by 1cm to each group.	Cut-out shapes (small square) , Sheets with Diagrams (A,B,C,D)	Core Point 1 Teacher prepares 4 or 5 sheets and plenty of cut-outs.	Remarks: Pupils are not supposed to be introduced the unit "cm²€ 35 until P5 where they learn area with the unit "cm²€ 35

			A: 6cm×3cm B: 4cm×5cm C: 7cm×2cm D: 2cm×8cm  Step 2 (15 min) Pupils cover the rectangles with the smaller square cut-outs of 1cm by 1cm. Step 3 (15 min) Pupils complete the table on the chalkboard: <table><tr><th>Figure</th><th>Total no. of squares</th><th>No. of squares on the longer side</th><th>No. of squares on the shorter side</th></tr><tr><td>A</td><td></td><td></td><td></td></tr><tr><td>B</td><td></td><td></td><td></td></tr><tr><td>C</td><td></td><td></td><td></td></tr><tr><td>D</td><td></td><td></td><td></td></tr></table> Pupils find the relationship between the total number of squares and the numbers of squares on the sides of the rectangle. CONCLUSION (15 min): The teacher introduces the concept of area by summarizing the pupils' findings and explains the conclusion.		Core Point 2 Pupils activity (Pupils try to cover the rectangles without holes and count the squares.) Core Point 3 Total No. of squares = No. of squares on the longer side × No. of squares on the shorter side Core Point 4 (Area) =(Length)× (Width)	Find the number of square cut-outs that fill a given rectangular region. Indicate number of unit squares that will cover a given rectangular region. The area of a rectangle with (L___) and with (W___) is _____×_____.

Lesson Plan with Hints

The lesson plan below shows speech blobs (rounded rectangular shapes) that indicate hints for the teaching approach. The hints for the teaching approach deal with specific skills in the lesson delivery and they are explained in detail on the following pages. The position of each balloon indicates where each of the hints can be used. Also refer to the same lesson plan on the previous page.

DAY/ DATE/ DURATION	TOPIC/ SUB-TOPIC	R.P.K. OBJECTIVE(S)	TEACHING/LEARNING MATERIALS KEYWORDS/VOCABULARY LIST TEACHER/LEARNER ACTIVITIES	TLMS	CORE POINTS	EVALUATION/EXERCISE REMARKS
Wednesday 4th of Oct. 2006 60 MINS	UNIT 4.10 TOPIC: Measure-ment of Length and Area SUB-TOPIC: Finding area of a rectangle	**R.P.K.:** Pupils can find the perimeter of a given rectangle. **OBJECTIVES:** By the end of the lesson, the pupil will be able to; S.R.N. 4.10.7 1. make rectangles and squares using small square tiles (cut-outs). 2. find the number of unit squares that will cover a square/rectangular region.	Keywords/Vocabulary List: Length, width, area, long, wide Hints for **Introduction** INTRODUCTION (10 min): Teacher introduces the lesson by telling a story relating to area (e.g. land, plantation, etc.) Story: A farmer walked around his 2 plantations whose shapes are rectangular and said, "I have found the perimeters of my 2 plantations to be the same, so I will harvest the same amount of maize from each of them" . Hints for **Step 1** ACTIVITIES: Step 1 (5 min) Pupils make 5 or 6 groups. Teacher gives a sheet on which 4 rectangles have been printed with A, B, C, D, and smaller square cut-outs of 1cm by 1cm to each group.	Cut-out shapes (small square), Sheets with Diagrams (A,B,C,D)	Core Point 1 Teacher prepares 4 or 5 sheets and plenty of cut-outs.	Remarks: Pupils are not supposed to be introduced to the unit "cm²€ until P5 where they learn area with the unit "cm²€.35

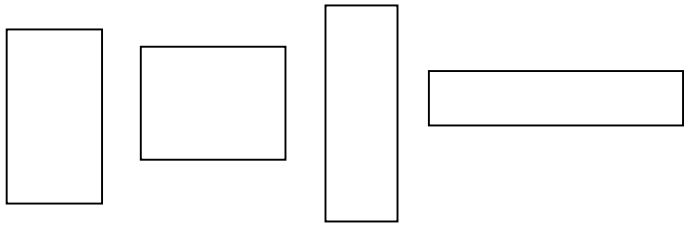
	Hints for **Step 2**	A: 6cm×3cm B: 4cm×5cm C: 7cm×2cm D: 2cm×8cm  Step 2 (15 min) Pupils cover the rectangles with the smaller square cut-outs of 1cm by 1cm.		Core Point 2 Pupils activity (Pupils try to cover the rectangles without holes and count the squares.)	Find the number of square cut-outs that fill a given rectangular region.
	Hints for **Step 3**	Step 3 (15 min) Pupils complete the table on the chalkboard:		Core Point 3 Total No.of squares = No. of squares on the longer side × No. of squares on the shorter side	Indicate number of unit squares that will cover a given rectangular region.
	Hints for **Conclusion**	Pupils find the relationship between the total number of squares and the numbers of squares on the sides of the rectangle. CONCLUSION (15 min): The teacher introduces the concept of area by summarizing the pupils' findings and explains the conclusion.		Core Point 4 (Area) =(Length)× (Width)	The area of a rectangle with (L___) and with (W___) is _____×_____.

Figure	Total no. of squares	No. of squares on the longer side	No. of squares on the shorter side
A			
B			
C			
D			

3. Teaching Hints

Hints for Introduction:

Introductory Questioning of Skills

By way of introduction, the teacher can ask questions that will check the pupil's R.P.K. based on the following story:

Story (1) A farmer walked around his 2 plantations whose shapes are rectangular and said, "I have found the perimeters of my 2 plantations to be the same, so I will harvest the same amount of maize from each of them"

Or

Story (2) A farmer walked around his 2 plantations whose shapes are rectangular and said "I have measured the perimeters of my 2 plantations and found that the perimeter of the plantation located in the east is greater than the one in the west, so I will harvest the larger amount from the plantation in the east."

Example

T) "Given a rectangle, how do you measure the perimeter?"
T) "Given 2 rectangles, if one has a longer perimeter does it necessarily make the area bigger? "
T) "Is the farmer's idea correct?"

After hearing the pupils' responses, the teacher states that the correct answers will become clear in the lesson.

Hints for Step 1:

For each group, the teacher prepares 4 or 5 sheets of paper on which 4 rectangles are drawn and labelled A, B, C, D; the teacher also prepares smaller square cut-outs of 1cm by 1cm in advance. The pupils are then organized into groups of 5 or 6.

Approach to Step 1

The teacher prepares 4 or 5 sheets of paper and many square cut-outs of 1cm by 1cm as follows:

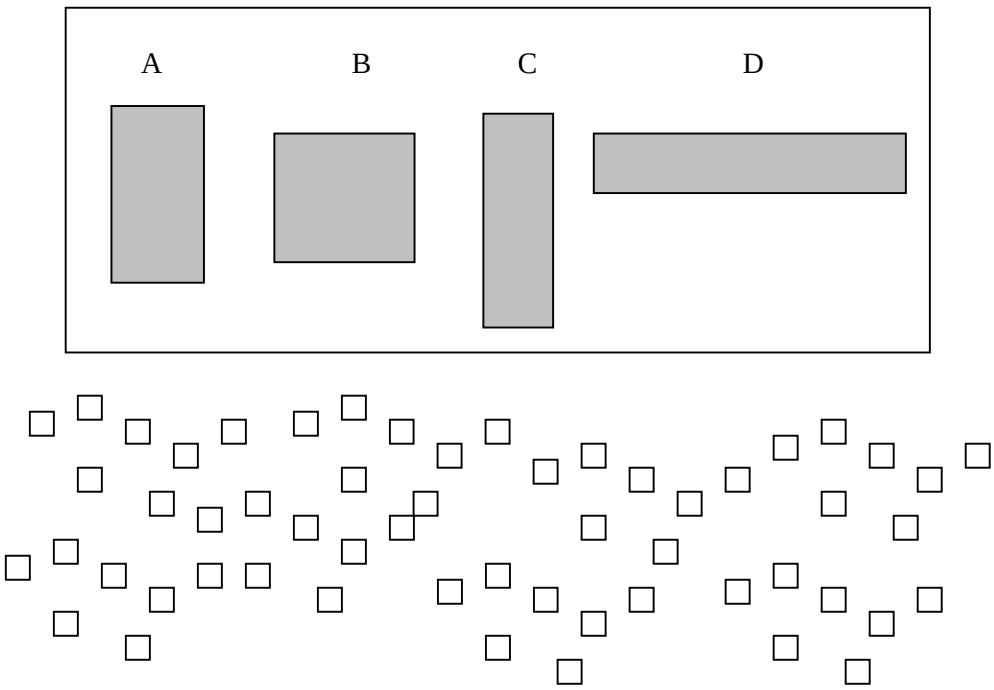


Figure 1

Hints for Step 2:

Let the pupils cover the rectangles with the square cut-outs of 1cm by 1cm without leaving any spaces or holes.

Approach to Step 2

It is valuable for each group to cover all the rectangles, however this is likely to take a long time. The teacher should be flexible. For example, if the class consists of 24 pupils organized into 4 groups, then the teacher lets one group cover the rectangles A & B while other groups concentrate on different rectangles, etc.

After covering the rectangles, let the pupils count the number of squares and write the result on the sheet.

While the pupils work, the teacher draws the following table on the chalkboard.

Table 6: Table for the investigation of the area of rectangles

Figure	Total No. of squares	No. of squares on the longer side	No. of squares on the shorter side
A			
B			
C			
D			

Hints for Step 3:

1. Let the groups complete the above table.
2. Let the pupils find the relation between the total number of squares and the number of squares on the sides of the rectangle.

Approach to Step 3

1. Use Table 6 to fill in the numbers.
2. Let the pupils see the relationship between length, width and area.
3. The teacher draws a diagram if necessary, as follows:

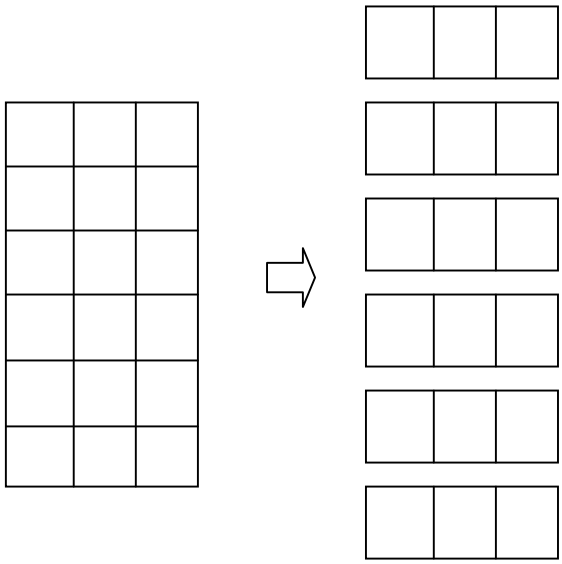


Figure 2

Questioning Skills for Step 3

1) After the group activity, the teacher asks each group to fill out Table2 on the chalkboard:

> **Note:** This is the first time the words "wide" and "width" are used in the pupils' book. (See English as a Teaching Tool)

Example

T) How many small squares cover shape A?
T) How many small squares wide is rectangle A?
(or How many small squares are there on the shorter side ?)
T) How many small squares long is rectangle A?
(or How many small squares are there on the longer side?)

2) Using Table 6, the teacher asks the pupils:

Example

T) Is there any relationship between the 3 numbers, 18, 6 and 3?

(20, 4 and 5, etc.)

T) Can you tell the relationship the 3 numbers in every rectangle have?

3) If the pupils find the relation, the teacher asks for the reason. If not, then the teacher explains Figure 2 and asks for the reason.

Example

T) Can you explain the reason why you choose multiplication to get the total number of small squares?

If the answer is yes,

T) Could you try to explain it?

Hints for Conclusion:

The teacher, in summarizing the pupils' findings, introduces the concepts of length, width and area.

Approach to Conclusion

1) Using Figure 2, the teacher explains $18 = 6 \times 3$, that is,

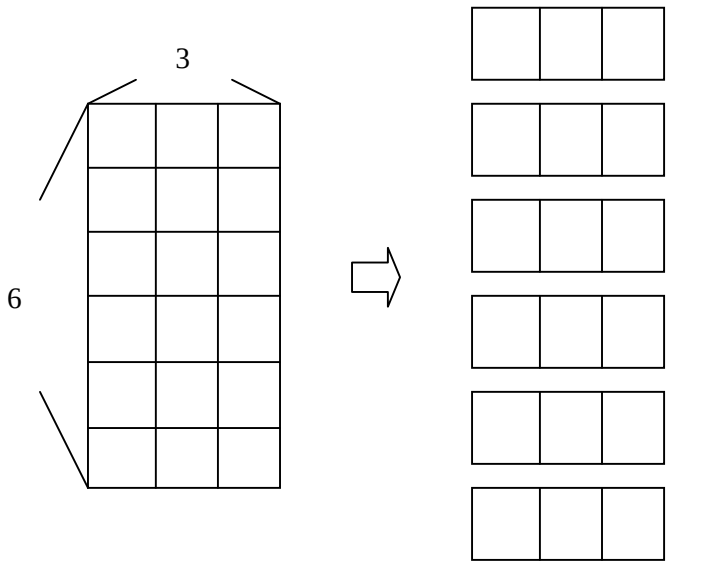


Figure 3

2) The teacher confirms with the pupils that:

Total No. of squares=No. of squares on the longer side× No. of squares on the shorter side.

3) The teacher introduces the new mathematical terms and concludes the lesson by stating the formula: AREA of a rectangle = LENGTH × WIDTH

Questioning Skills for Conclusion

The teacher asks for the perimeters of the rectangle A and B (resp.B and D) , and then asks for the answer to the initial **story.(1)** (resp. **story(2)**).

T) What is the perimeter of the rectangle A?
T) What is the perimeter of the rectangle B?
T) How many small squares cover each of A and B?
T) Was the statement of the farmer correct?

4. The Use of Chalkboard

A sample layout of chalkboard writing is shown below.

3/Oct/06 MEASUREMENT OF AREA

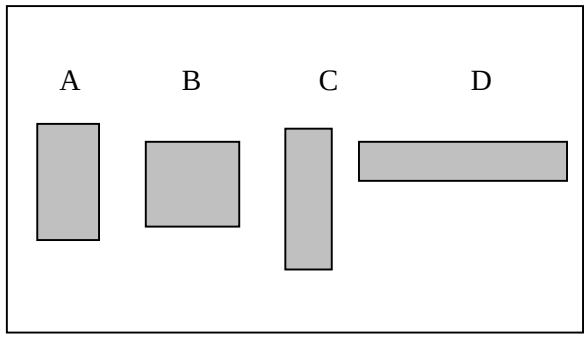
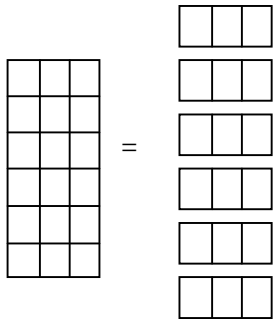


Figure	Total no. of squares	No. of squares on the longer side	No. of squares on the shorter side
A			
B			
C			
D			

A)



$18 = 6 \times 3$

B) $20 = 5 \times 4$ C) $14 = 7 \times 2$ D) $16 = 8 \times 2$

Total No.of squares = No. of squares on the longer side × No. of squares on the shorter side

Conclusion

(Area) = (Length) × (Width)

5. English as a Teaching Tool

The pupils will have learnt that area can be measured by counting the total number of squares that cover a regular shape (square or rectangle). In this lesson they learn, through deduction, how to calculate area by counting the number of squares in the length and width of the shape and multiplying the two numbers.

This is the first time the words "wide" and "width" are used in the pupils' book. The teacher should introduce these words carefully. The pupils need to understand and know how to use the words:

Table 7: The meanings of Length and Width

NEW VOCABULARY		PRACTICE SENTENCES	DEFINITION
length	long	*Measure the length* *How long is it?*"	*The area of a rectangle equals length multiplied by width* *area = length x width*
width	wide	*Measure the width.* *How wide is it?*	

This is a good opportunity for the pupils to understand by practising some simple phrases in English. They can practise these sentences in oral and written form. For example:

Table 8: List of the sentences in oral and written form

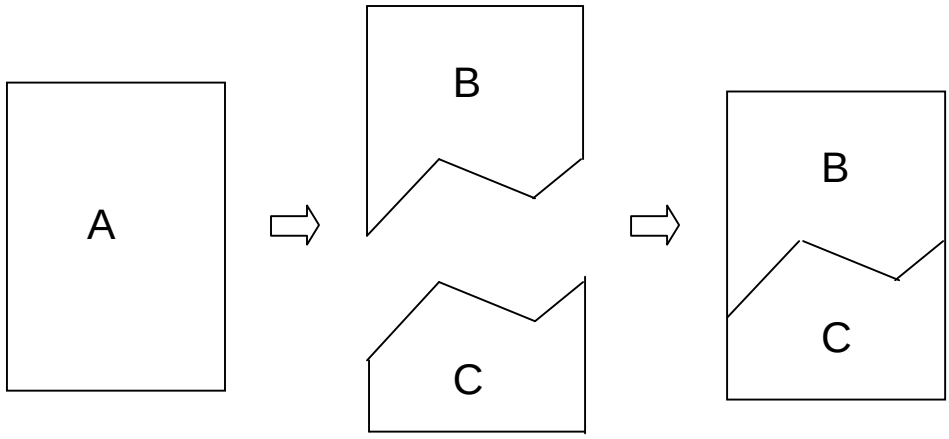
QUESTION / INSTRUCTION	ANSWER
Measure the length of rectangle A. How many small squares long is rectangle A?	Rectangle A is ….. small squares long.
Measure the width of rectangle A. How many small squares wide is rectangle A?	Rectangle A is ….. small squares wide.
How many small squares cover the shape? What is the area of the shape?	….. small squares cover the shape. The area of the shape is ….. small squares.
Multiply the length by the width.	

6. Appendix

Activity 1

Application to find the area of a rectangle

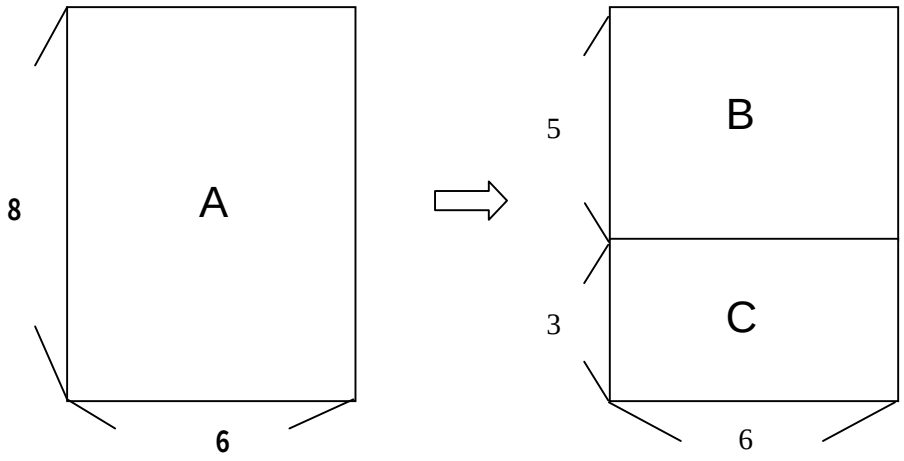
Using **"addition principle of area"** to find area.



Addition principle of area is A = B + C.

Application to explain $(b+c)\times a = (b\times a) + (c\times a)$

We can use addition principle of the area as follows:



$A=8\times 6$ $B=5\times 6$ $C=3\times 6$

So we have $(5+3)\times 6 = 8\times 6 =(5\times 6) + (3\times 6)$.

Therefore we conclude that $(b+c)\times a = (b\times a) + (c\times a)$.

Application to find the area of a parallelogram

To find the area of parallelogram ABCD

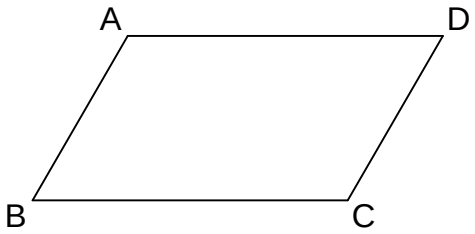
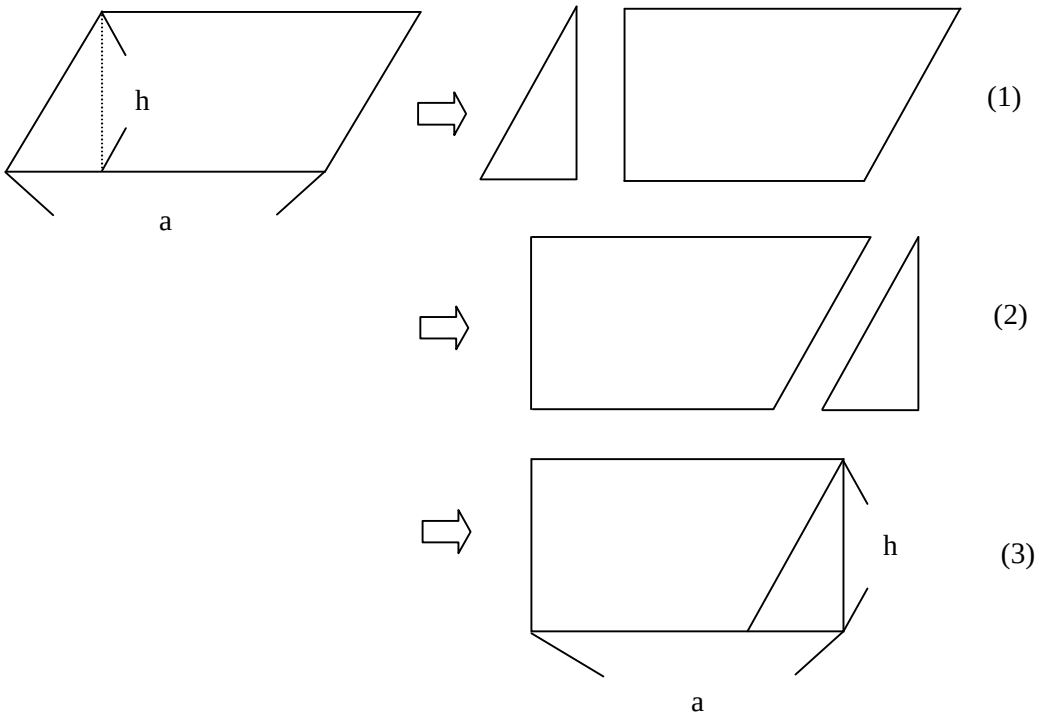


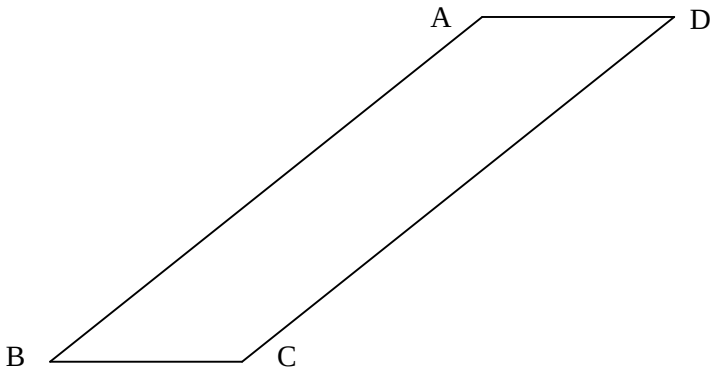
Figure 4

We can use the addition principle of area as follows:



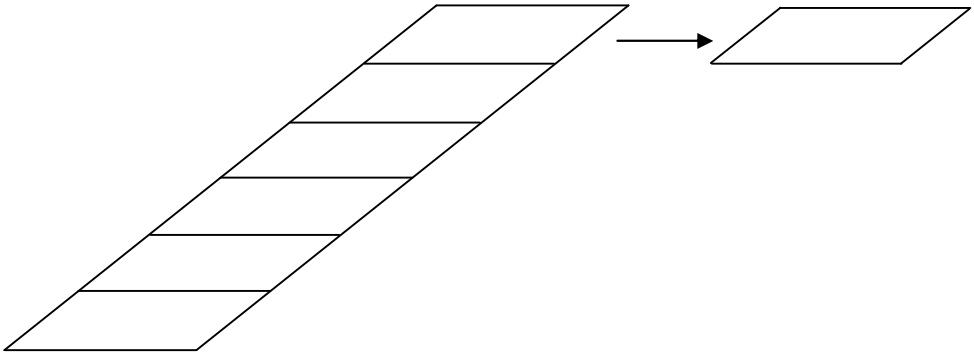
Therefore the area of parallelogram ABCD becomes the area of rectangle as above (3), that is, $a \times h$.

Application to find the area of a special type of parallelogram, for example



Step 1:

Cut parallelogram ABCD into slices as follows:



Step 2:

To each slice, cut one rectangular part. Arrange it as in the case of Figure 4 to get a rectangle.

Step 3:

Arrange the rectangular strips to obtain a bigger rectangle.

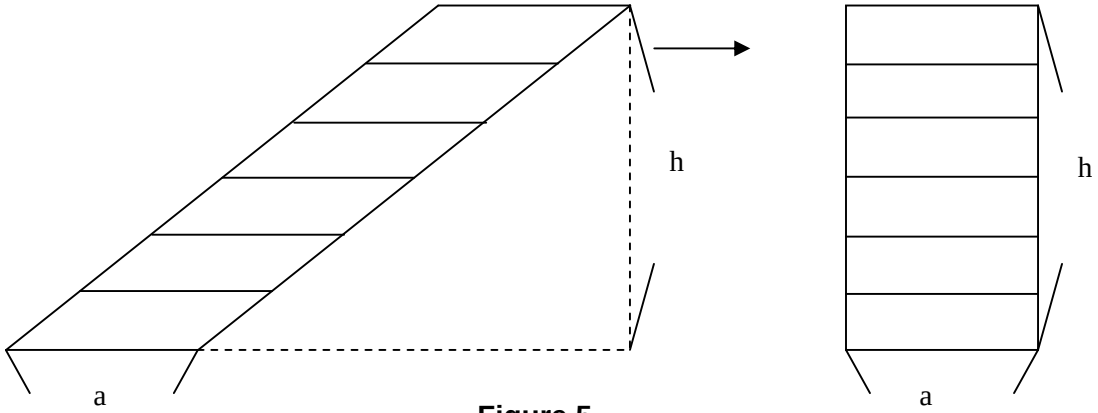


Figure 5

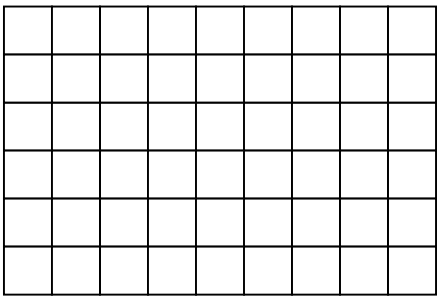
Step 4:

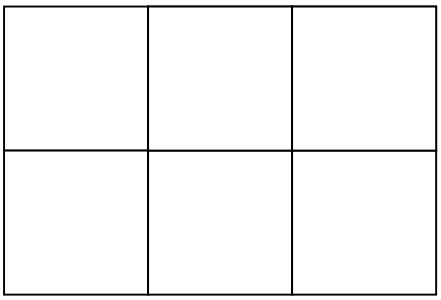
The area of the special parallelogram becomes the area of the rectangle obtained.

That is $a \times h$.

Activity 2

In groups, ask pupils to fit a rectangle with pieces of two types of squares, and to find the number of each type of squares in the rectangle.





One can come to realize the difference in the number of each type of squares, even though the same rectangle is used. What brings out these differences? This activity tells us the need to use standardized small square unit in measuring area.

Activity 3

Draw all possible rectangles with area 12cm² in Figure 6.

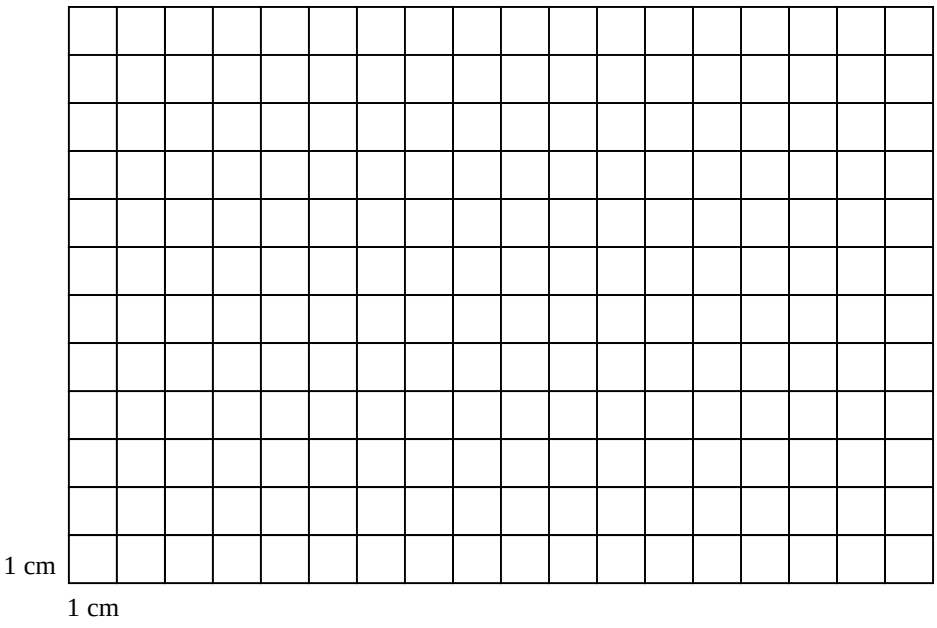


Figure 6

Activity 4

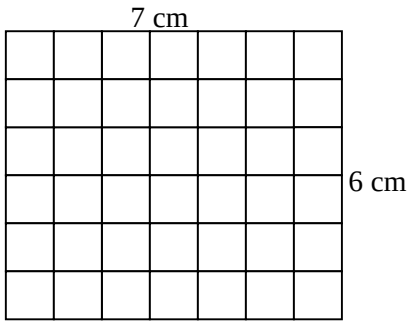


Figure 7

Draw different rectangles on a square grid of paper.

One can establish the relationship between the dimensions of squares and rectangular shapes and the total number of smaller squares they contain. See the example in Figure 7.

1. What is the total number of squares occupied by the rectangle? (42)
2. What are the length and the width of the rectangle in Figure 7? (7cm and 6cm)
3. Can a relationship been established between the total number of squares and the dimensions of the rectangle?

Activity 5

Find the area of the shaded portion in Figure 8.

Think about different approaches in (1), (2), (3) and (4).

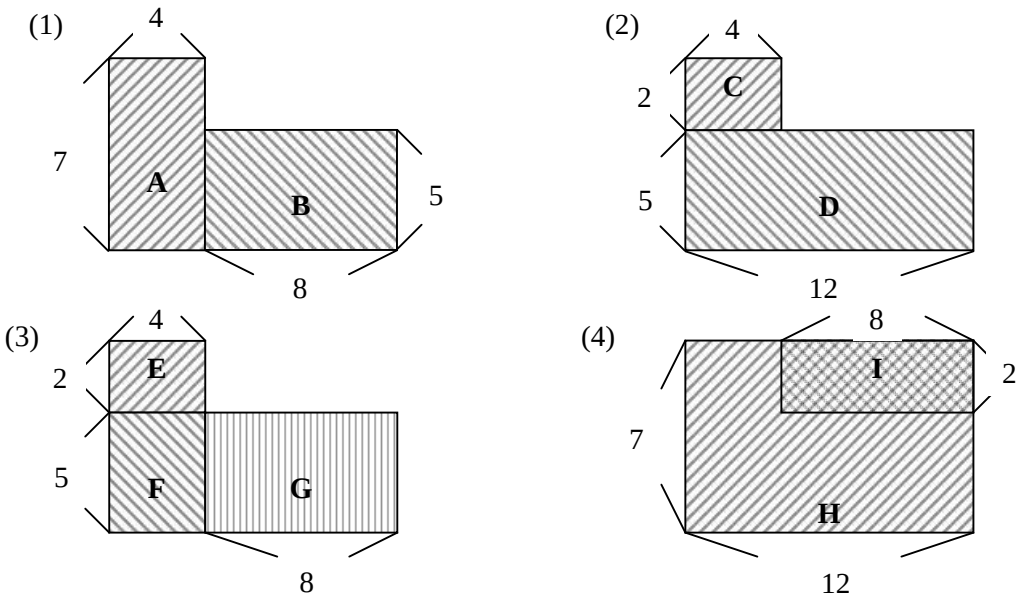


Figure 8

(1) $7\times4 + 8\times5$
(2) $4\times2 + 12\times5$
(3) $4\times2 + 5\times4 + 8\times5$
(4) $12\times7 - 8\times2$

Lesson 3: Primary 5 Investigation with Numbers – Triangular Numbers

1. Lesson Plan

WEEKENDING
SUBJECT: Mathematics **REFERENCES**: 1. Mathematics Syllabus p.98
CLASS: Primary 5 2. Primary Mathematics 5(Unimax Macmillan) p.130

DAY/ DATE/ DURATION	TOPIC/ SUB-TOPIC	R.P.K. OBJECTIVE(S)	TEACHING/LEARNING MATERIALS KEYWORDS/VOCABULARY LIST TEACHER/LEARNER ACTIVITIES	TLMS	CORE POINTS	EVALUATION/ EXERCISE REMARKS
Tuesday 3rd of Oct. 2007 30 MINS	UNIT 5.15 TOPIC: Investigation with number SUB-TOPIC: Triangular numbers	**R.P.K.:** Pupils can add and subtract whole numbers. **OBJECTIVES:** By the end of the lesson, the pupil will be able to; R.S.N.5.15.5 1. find the pattern in triangular numbers up to the 10th number	Keywords/Vocabulary List: Triangular number, Addition INTRODUCTION: Teacher revises with pupils addition and subtraction. ACTIVITIES: Teacher introduces triangular numbers as follows: Step 1 Pupils form the triangular numbers of the pattern No.1-3 using bottle tops. Step 2 Teacher asks pupils to find the total number of the bottle tops of the pattern No.1-3. Step 3 Teacher asks pupils to predict the number of the bottle tops of the patterns No.4, 5 and 6 without using bottle tops.	Bottle tops (to form figures)	Pattern No. 1 **1** 1 Pattern No. 2 **3** 1 2 Pattern No. 3 **6** 1 2 3	Finding the missing numbers; 1,3,6,10,__,__, 28

<table>
<tr>
<td></td>
<td></td>
<td></td>
<td>Step 4
Pupils investigate the pattern of triangular numbers using bottle tops.

Step 5
Pupils write their findings in the following table:

<table>
<tr><th>Pattern No.</th><th>Total</th><th>Pattern</th></tr>
<tr><td>1</td><td></td><td></td></tr>
<tr><td>2</td><td></td><td></td></tr>
<tr><td>3</td><td></td><td></td></tr>
<tr><td>4</td><td></td><td></td></tr>
<tr><td>5</td><td></td><td></td></tr>
<tr><td>6</td><td></td><td></td></tr>
<tr><td>7</td><td></td><td></td></tr>
<tr><td>8</td><td></td><td></td></tr>
<tr><td>9</td><td></td><td></td></tr>
<tr><td>10</td><td></td><td></td></tr>
</table>

Step 6
Pupils present their own finding to other pupils in the classroom.

CONCLUSION:
Pupils describe the pattern of triangular numbers.</td>
<td></td>
<td>
<table>
<tr><th>Pattern</th></tr>
<tr><td>1</td></tr>
<tr><td>1+2</td></tr>
<tr><td>1+2+3</td></tr>
<tr><td>1+2+3+4</td></tr>
<tr><td>1+2+3+4+5</td></tr>
</table>

Pattern:
1+2+3+4+5+6+…+10
</td>
<td>Triangular numbers are obtained by arranging objects in a triangular form and determining the total number of objects used to form each triangle.

Home work:
Copy complete
1 → 1 = 1
2 → 2+1 = 3
3 → 3+2+1 = 6
4 → 4+3+2+1 = 10
- -</td>
</tr>
</table>

2. English as a Teaching Tool

In this lesson the pupils investigate patterns in triangular numbers by building up the sequence of numbers and then looking at their results.

The teacher will need to think carefully about what he/she will expect from the pupils in Step 6 of the lesson when pupils present their own findings to others and in the concluding part of the lesson when pupils describe the pattern of triangular numbers. It is in these two parts of the lesson that the pupils will need to be able to express their ideas orally through English language. Here are some ways in which teachers' English as a teaching tool help develop the pupils' use of language.

Table 9: Ways of developing the pupils' use of language

Use simple language:	*"What pattern can you see in the numbers?€ 35* *"Look at this pattern. What is the next number?€ 35* *"What is the previous number?"* *"How do the numbers change?€ 35* *"What happens next?€ 35*
Help the children to answer in full sentences:	*"The next number is 10€ 35* *"The previous number is 6€ 35* *"We add one more number each time.€ 35*
What answers do you expect from the pupils?	*"Is there only one or more than one answer?"* *"In this investigation there is more than one answer - see the Solution below.€ 35*
Lesson Conclusion	*"One way to show the solutions is in written format which the children can read for oral practice.€ 35*

Solution **Unit 15. Investigation with Numbers: Triangular Numbers**

Description of the Patterns of Numbers

(i) In the first column the numbers increase by one.

We add 1 to get the next number in the pattern.

1+1=2, 2+1=3, 3+1=4, 4+1=5

(ii) In the second column the number increases by the number written in the first column.

For pattern number 4 we add 4 to the previous number. 6 + 4 = 10

For pattern number 5 we add 5 to the previous number 10 + 5 = 15

For pattern number 6 we add 6 to the previous number 15 + 6 = 21

(iii) In the third column we add all the numbers from 1 to the pattern number.

For pattern number 4 we add 1+2+3+4 = 10

For pattern number 5 we add 1+2+3+4+5 = 15

For pattern number 6 we add 1+2+3+4+5+6 = 21

We can also show the solutions diagrammatically. Some pupils may prefer this and it can help them to describe the patterns orally.

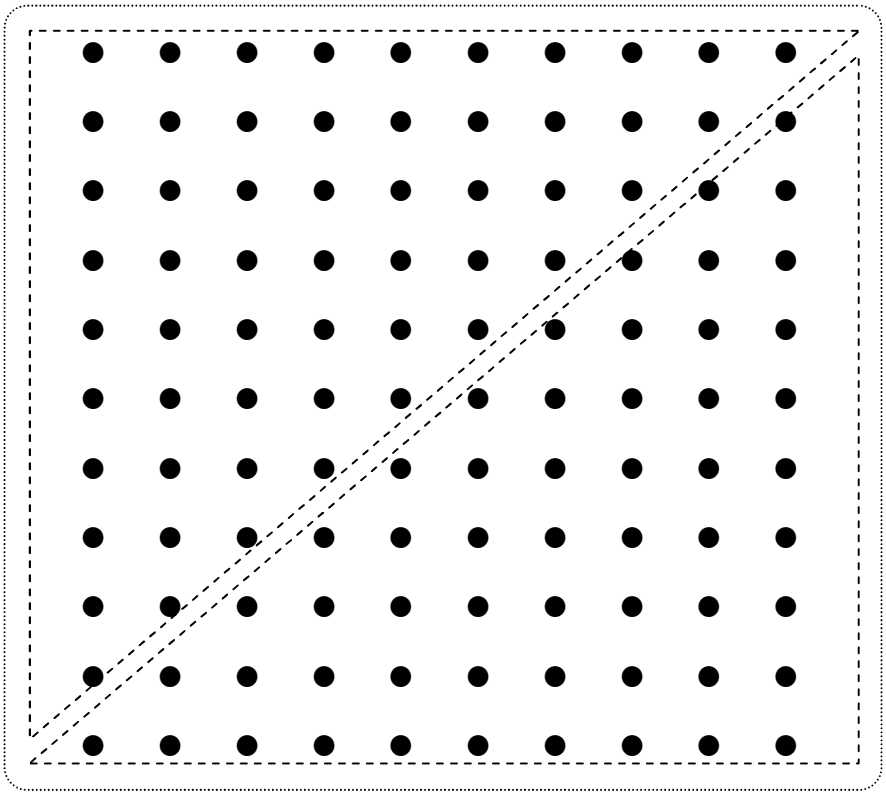
Solution **Unit 15. Investigation with Numbers: Triangular Numbers**

Description of the Patterns of Numbers

1	→	1 = 1	1	= 1
2	→	2 + 1 = 3	1 + 2	= (1) + 2
3	→	3 + 3 = 6	1 + 2 + 3	= (1 + 2) + 3
4	→	4 + 6 = 10	1 + 2 + 3 + 4	= (1 + 2 + 3) + 4
5	→	5 + 10 = 15	1 + 2 + 3 + 4 + 5	= (1 + 2 + 3 + 4) + 5
6	→	6 + 15 = 21	1 + 2 + 3 + 4 + 5 + 6	= (1 + 2 + 3 + 4 + 5) + 6

3. Appendix

To find 1 + 2 +3 +……+10, use the figure below.



a) How many dots are there in the rectangle?
(The answer is $11 \times 10=110$)

b) Find out 1 + 2 +3 +…**…**+10 in the figure.

c) Use it to solve 1 + 2 +3 +……+10

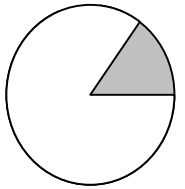
d) The answer is $\frac{11 \times 10}{2}$=55, can you explain why?

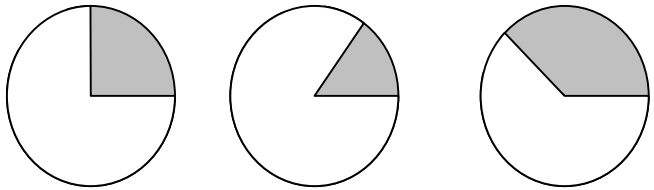
Lesson 4: Primary 5 Shape and Space -Angles

1. Lesson Plan

WEEKENDING
SUBJECT: Mathematics
CLASS: Primary 5

REFERENCES: 1. Mathematics Syllabus p.85
2. Primary Mathematics 5(Unimax Macmillan) p.66

DAY/ DATE/ DURATION	TOPIC/ SUB-TOPIC	R.P.K. OBJECTIVE(S)	TEACHING/LEARNING MATERIALS KEYWORDS/VOCABULARY LIST TEACHER/LEARNER ACTIVITIES	TLMS	CORE POINTS	EVALUATION/ EXERCISE REMARKS
Tuesday 3rd of Oct. 2007 60 MINS	UNIT 5.6 TOPIC: Shape and Space SUB-TOPIC: Angles less than and angles greater than a right angle	**R.P.K.:** Pupils can draw angles using rays. They can identify a right angle as one corner of a rectangular shape. **OBJECTIVES:** By the end of the lesson, the pupil will be able to; S.R.N. 5.6.3 state if an angle is greater or less than a right angle.	Keywords/Vocabulary List: Right angle INTRODUCTION Teacher asks pupils to draw intersecting rays and indicate angles formed. Pupils identify a right angle in their class room. ACTIVITIES: Step 1 Teacher forms an angle which is less than a right angle using the interlocking circles and asks pupils to describe it. Step 2 Pupils form different angles less than a right angle using the interlocking circle.	Interlocking Circles for Teacher Interlocking Circles for Pupils (Individually)	 The shaded part represents an angle less than a right angle.	1. Pupils are given the desktop type of interlocking circles and teacher uses the blackboard type to form various angles.

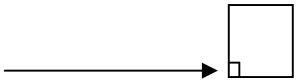
			Step 3 Teacher forms another angle greater than a right angle and asks pupils to describe it. Step 4 Pupils also form angles greater than a right angle using their interlocking circles. Step 5 Pupils form two more angles using their interlocking circles and describe them. A B C  Step 6 Pupils find angles which are less than a right angle, and angles which are greater than a right angle in their class room. CONCLUSION: Teacher discusses with pupils the importance of angles to our daily life. - We turn through an angle to talk to partners. - We open doors to have passage.		In diagram A, the shaded circle indicates a €Right angle". In diagram B, "Less than a right angle", and in diagram C, €More than a right angle" .	2. Pupils identify angles which are less than or greater than a right angle from the diagram drawn on a chart.

2. English as a Teaching Tool

The pupils learn about right angles in Grade 4 and Grade 5. Here are some simple definitions for angles which the children can write in their exercise book with an illustration. They can use this as a reference for revision and to practise their English:

Definitions of Angles

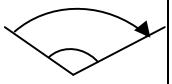
1) The angle at each corner of a book is **a right angle**.
We mark right angles like this.

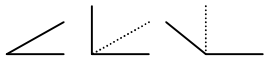


2) The space between **two straight lines** that meet is called **an angle**.

3) An angle is formed when a **straight line turns** about a point.

4) The more the line turns, the greater the angle formed.





NOTE:

In Grade 5, pupils study right angles, angles that are less than a right angle and angles that are more than a right angle. They do not use the words "acute angle" and "obtuse angle" until the secondary school grades.

3. Appendix

Teaching and learning materials (TLMs) are very important in the teaching/learning processes. They make teaching understandable, practical and interesting to the learner.

Today, we are to prepare "Interlocking Circles" which will help us to teach topics such as Angles, Parts of a circle, Fractions (Decimals and Percentages), and Bearing etc.

Interlocking circles are two equally cut out circles painted/shaded differently. They are both tilted at the centre and locked together. One of them is then kept fixed, whiles the other is made to be turning round.

The circles could be made from paper, cardboard, plywood and flat metals. (e.g. Zinc)

INTERLOCKING CIRCLES USING MANILA CARD / CARDBOARD

(1) Chalkboard Size

Materials needed:

- Pencils and chalk
- Pairs of compasses (Chalkboard and Mathematical set size)
- 25cm and 1m rulers
- Cardboards, Manila Cards, Empty Cartons
- Pairs of scissors / Blade (Cutting materials)

Procedure

Step 1: Draw a circle of radius 25 centimetres on each of the two cardboards
Step 2: Use the pair of scissors to cut the radii (25cm) of the circles drawn.
Step 3: Make a slit on the circles, the length should be the same as the radius of the circle.
Step 4: Tilt the two circles at the centre and lock together. One of the circles should be fixed and the other circle made to be turning round

Preparation of interlocking circles

Teacher stands in front of the blackboard, with cardboard on the table.

Step 1: Measure 25cm using the pair of compasses.
Step 2: Locate the centre of the circle on the cardboard to avoid waste.
Step 3: Draw two circles each of radius 25cm on different colour cardboards as shown in Figure 9 and 10.

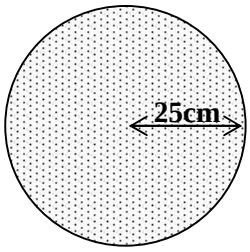


Figure 9

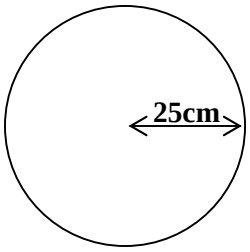


Figure 10

Step 4: Cut along the radii of the circles as shown in Figure 11 and 12.

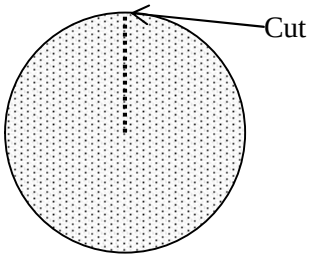


Figure 11

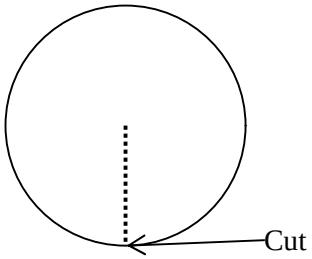


Figure 12

Step 5: Put the scales 0˚, 180˚, 270˚ and 360˚ on the one of the circle as shown in Figure 13.

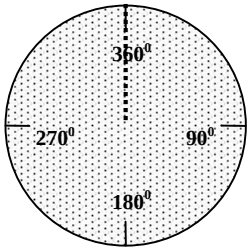


Figure 13

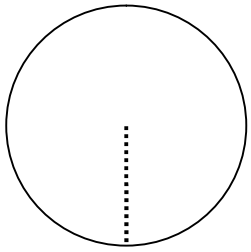


Figure 14

Step 6: Interlock the two circles as shown in Figure 15.

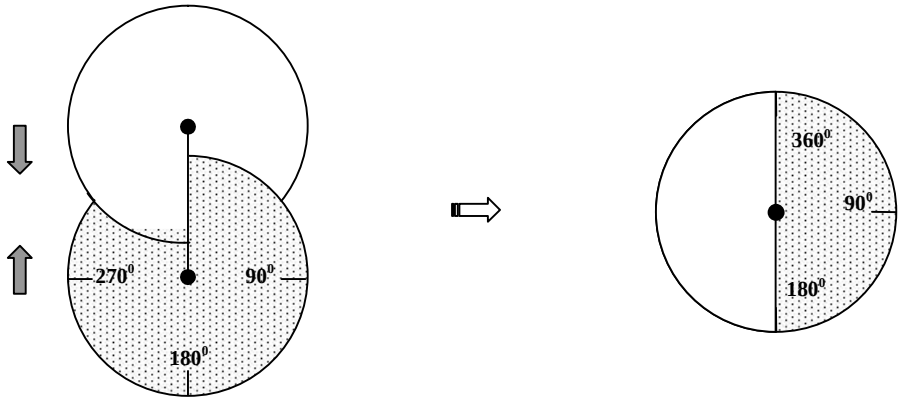


Figure 15

(2) Desktop Size for pupils and students

The interlocking circles for pupils can be prepared like the one for teacher, changing the radius of the circle into around 7cm and more.

(3) Topics that can be taught using Interlocking Circles:

- Types of angles (acute, obtuse, reflex, right angle etc.)
- Parts of circles
- Fractions (Decimals and percentages)
- Bearings

Lesson 5: Primary 6 Collecting and Handling Data

1. Lesson Plan

WEEKENDING
SUBJECT: Mathematics
CLASS: Primary 6

REFERENCES: 1. Mathematics Syllabus, p.118
2. Primary Mathematics 6(Unimax Macmillan), p.84

DAY/ DATE/ DURATION	TOPIC/ SUB-TOPIC	R.P.K. OBJECTIVE(S)	TEACHING/LEARNING MATERIALS KEYWORDS/VOCABULARY LIST TEACHER/LEARNER ACTIVITIES	TLMS	CORE POINTS	EVALUATION/ EXERCISE REMARKS
Tuesday 3rd of Oct. 2007 60 MINS	UNIT 6.9 TOPIC: Collecting and Handling Data SUB-TOPIC: Constructing a pictograph	**R.P.K.:** Pupils can count objects and record the results. **OBJECTIVES:** By the end of the lesson, the pupil will be able to; S.R.N. 6.9.3 1. draw and answer at least two questions correctly on the pictograph. 2. draw a frequency table.	Keywords/Vocabulary List: Pictograph INTRODUCTION: Ask a pupil to count all tables in the classroom, another to count the reading books, and record their findings. ACTIVITIES: Step 1 In pairs, pupils collect discrete objects and sort them into groups according to their attributes or characteristics. Step 2 Pupils record number of objects in each group. Step 3 Pupils present their arrangements of discrete objects to show a pictograph. E.g. Brands of matchboxes used in pupils homes.	Empty milk tins, bottle tops, matchboxes		

<table>
<tr>
<td></td>
<td></td>
<td></td>
<td>e.g. A Pictograph of brands of Matchboxes

Star boxes □□□

Rainbow boxes □□□□□

Pottery boxes □□

Key : □ represents a match box

Step 4
Teacher asks pupils to study the practical arrangement of discrete objects and design a statistical table to represent a given data.

A table for data collection of brands of Matchboxes
Frequency Table
<table>
<tr><th>Match boxes</th><th>Strokes</th><th>frequency</th></tr>
<tr><td>Starry</td><td>///</td><td>3</td></tr>
<tr><td>Rainbow</td><td>////</td><td>5</td></tr>
<tr><td>Pottery</td><td>//</td><td>2</td></tr>
</table>

CONCLUSION:
1. Let pupils tell the class how data collection and recording was done.
2. Pupils explain to the class that motifs are in drawing pictograph used to represent object. A key gives the meaning of each motif on a pictograph.
3. Pupils answer questions on their friends' favourite drinks in the frequency table.</td>
<td></td>
<td>A pictograph is a type of graph
In which simple motif (a symbol, picture or diagram) is used to represent a specific unit. A key is necessary to give the meaning of each motif on the pictograph.

Frequency means the number of times something occurs. The number of strokes gives the frequency for each group of objects.</td>
<td>1. Draw a pictograph to show the favourite drink of 20 pupils
Fanta- 4
Coke- 8
Sprite- 6
Pepsi- 2

2. From the pictograph which drink did pupils like most?

3. From the pictograph, which of the drinks was least liked by pupils?

4. Draw a frequency table showing the favourite drinks using the information below:
Fanta- 4
Coke- 8
Sprite- 6
Pepsi- 2

5. Write down the number which shows the highest frequency</td>
</tr>
</table>

2. English as a Teaching Tool

In Class 5 the pupils will have learnt to analyze information from frequency tables, block graphs and bar graphs. In Class 6 the pupils have to conduct their own survey and complete each stage of the survey including collecting and handling the data.

The teacher can introduce simple phrases for the pupils to use at each stage of the process. This provides a good opportunity to practice using English in real situations. For example, in conducting a survey of favourite drinks the teacher can introduce the following phrases for each stage:

Stage 1: Designing the Survey

The pupils can practice the following question and answer:

"*What do you like to drink*?€ 35 or "*What is your favourite drink*?€ 35

"*I like Fanta*" or "*My favourite drink is Fanta*"

The teacher asks the pupils

"*Make a list of the favourite drinks*" or €*Make a table of favourite drinks like this*".

[on the chalkboard]

Frequency Table		
favourite drinks	tally / count	frequency
Fanta		
Sprite		
Coke		

Ask the children to suggest the list of words to write on the frequency table.

frequency means the number of times something occurs

Write the definition of frequency to help the children to understand the concept of a frequency table.

Stage 2: Conducting the Survey

The pupils can use the same questions as above, this time making a tally mark on the frequency table as each answer is given.

Stage 3: Drawing the Block Graph

The teacher will need to give the pupils clear step-by-step instructions in English for them to draw the block graph correctly.

Stage 4: Analysing the Data

In small groups the pupils should practice asking each other simple questions about the survey results. The teacher can give them some suggestions, for example:

"*What is your favourite drink?*" - the pupil should answer with a sentence: €*My favourite drink is … …*"

"*How many pupils like coke best*" – the pupil answers: "*…… pupils like coke best*"

3. Appendix

1. Collecting data

Data can be obtained from experiments, studies, surveys, records, observation and/or participation, interviews, as well as other areas of research. In the classroom situation it is the responsibility of the teacher to make data collection as practical as possible. Pupils can be made to carry out a simple survey to collect data by using some or all of the following:

1. Days of the week pupils were born
2. The number of different types of bottle tops
3. Heights of pupils in a class
4. Favourite food of pupils
5. Monthly births at a given hospital
6. Rainfall patterns throughout the year
7. Weekly attendance of pupils in a class
8. Marks scored by pupils in a Mathematics test

2. Organising data

One way of organising data is by constructing a frequency table. A frequency table is a table containing items in an observed data and their corresponding frequencies. It could be heights, weights, ages of pupils/students or marks scored by pupils/students in a class.

3. Representing data

Data can be represented by diagrams for easy interpretation. They are Pictographs, Line graphs, Block graphs, Bar graphs, Pie charts and others.

1) Pictograph

This is a representation of data which uses pictures, symbols and/or diagrams (pictorial) to represent a specific unit. Pictograph uses a key.

2) Block graph

A block graph is a chart using a simple square or rectangular block for a unit to represent the data. In drawing a block graph;

1. the blocks must be of the same width
2. the space between the adjacent blocks must be of the same width
3. a block graph does not have a vertical axis, but a horizontal axis which represents the items
4. it has a key

The data can be collated in a 3-dimensional block chart using concrete materials like matchboxes, Cuisenaire rods, Multi-base Blocks (cubes) etc.

3) Bar graph

A bar graph is a chart that uses bars of equal width to represent data. In drawing any of the bar graphs;

1. the widths of bars must be the same

2. the distance between any two adjacent bars must be equal
3. the length of each bar is proportional to the number of items in that column

Activity 1

The shoe sizes of pupils in class were measured by a pupil as follows;

35, 37, 37, 35, 36, 36, 36, 35, 38, 38, 38,
39, 38, 36, 36, 36, 40, 40, 37, 37, 37, 37,
37, 41, 42, 37, 37, 37, 37, 37, 38, 38, 38, 38,

Put this data on a frequency table

Shoe size	Tally	Number of pupils
35	///	3
36	~~////~~ /	6
37	~~////~~ ~~////~~ //	12
38	~~////~~ ///	8
39	/	1
40	//	2
41	/	1
42	/	1

Step 1
Arrange the shoe sizes in order of magnitude.

Step 2
Take each figure in the raw data and insert a tally mark (/) against the size which it falls. Note that every fifth tally mark is scored across the previous four.

Step 3
Total the tally marks to find the frequency of each size.

Activity 2

20 pupils in a class mentioned particular days of the week on which they were born. The result is shown in the table below.

Table 10: Pupils born on a particular day of the week

Day	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Pupils born	2	2	1	4	5	3	3

Draw a pictogram for this data.

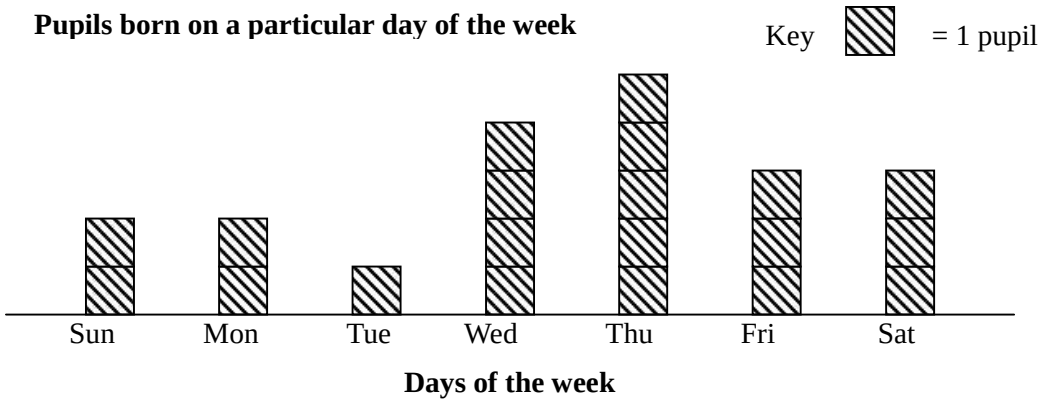
Week	Pupils born on a particular day of the week
Sunday	♀ ♀
Monday	♀ ♀
Tuesday	♀
Wednesday	♀ ♀ ♀ ♀

Thursday	♀♀♀♀♀
Friday	♀♀♀
Saturday	♀♀♀

Key: ♀ represents one pupil.

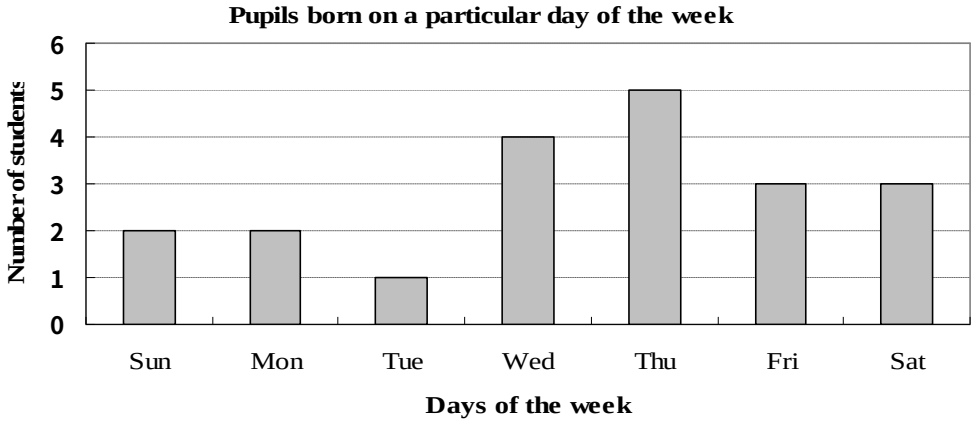
Activity 3

Draw a block graph to represent data in the table of Activity 2



Activity 4

Draw a bar graph to represent data in the table of Activity 2.



Practice 1

The weights of forty (40) pupils in a class are as follows;

24, 28, 26, 25, 23, 27, 22, 24, 28, 26, 27, 23, 28, 27,
30, 23, 22, 24, 28, 25, 29, 32, 25, 25, 20, 26, 29, 21,
24, 24, 24, 31, 29, 25, 30, 27, 28, 25, 25, 23

1. Construct a frequency table using the data given above.
2. How many pupils weigh 30kg?
3. What is the difference in weight between the lightest and the heaviest?

Practice 2

The following marks were scored by pupils in a Mathematics test

7, 6, 4, 5, 8, 6, 6, 6, 4, 9, 5, 6, 5, 4, 7, 6, 6,
5, 8, 6, 5, 6, 6, 5, 2, 7, 7, 6, 5, 4, 8, 6, 5, 6

1. Represent the data on a frequency table.
2. How many pupils scored the highest mark?
3. Find the mark which occurred most frequently.

Practice 3

After a survey, pupils' attendance at school was recorded as shown in the table below. Draw a vertical bar graph, using 2cm for the width of each bar and 1cm for the unit of attendance.

Table 11: Attendance of pupils at school

Class	P1	P2	P3	P4	P5	P6
Attendance	12	14	10	9	5	8

Practice 4

The table below shows the distribution of weights and number of pupils in a class. Draw a horizontal bar graph to represent this distribution.

Table 12: Distribution of masses

Weight (kg)	20	21	22	23	24	25	26	27	28	29	30	31	32
Number of pupils	1	1	2	4	6	7	3	4	5	3	2	1	1

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